2002 Groundwater Data Summary and Evaluation Report
Former Plum Brook Ordnance Works
Sandusky, Ohio

Volume 2 - Appendices

Prepared for:

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Knoxville, Tennessee 37923

Shaw Project No. 833886

Revision 2

June 2003

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APPENDIX A

DIRECT-PUSH HTRW DRILL LOGS
TEMPORARY PIEZOMETER CONSTRUCTION DIAGRAMS

TNT MANUFACTURING AREA A

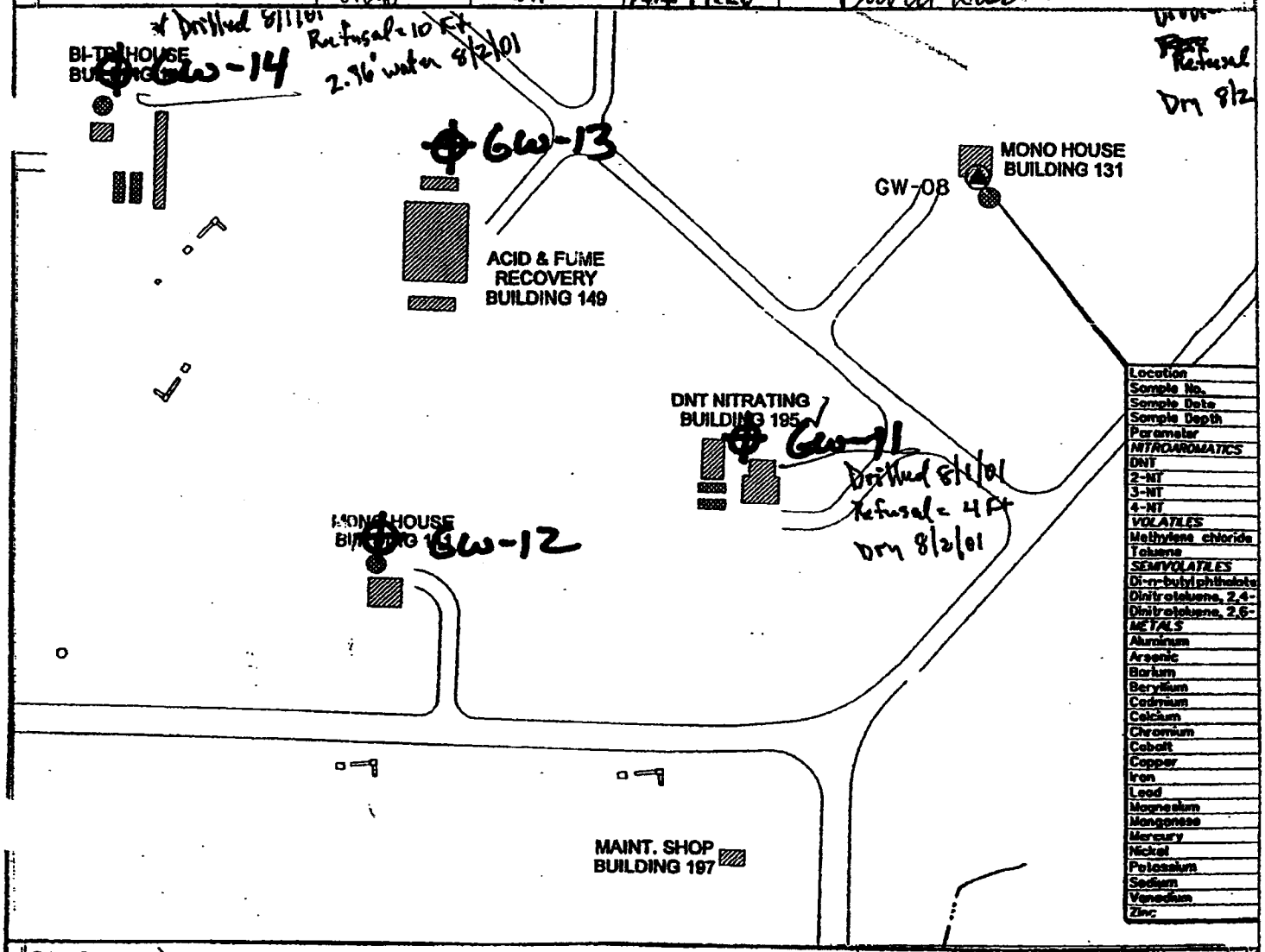
HTRW DRILLING LOG

DISTRICT: USACE - Nashville	HOLE NUMBER: GW-11	
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT Area A	
5. NAME OF DRILLER: Pete Goss	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT 66	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: DT 66 All terrain, track mounted geoprobe rig with 3 1/4 Inch OD probe. Temporary piezometer 2" OD, Sch 40 PVC. 0.010" slot screen	8. HOLE LOCATION: Bldg 195	
	9. SURFACE ELEVATION: 660.78 Ft N: 622927.39 E: 1923122.51	
	10. DATE STARTED: 8/1/01	11. DATE COMPLETED: 8/1/01
12. OVERBURDEN THICKNESS: 4 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Groundwater not encountered	
13. DEPTH DRILLED INTO ROCK: -0-	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: Dry 8/6/01 0805	
14. TOTAL DEPTH OF HOLE: 4 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Keach



Location
Sample No.
Sample Date
Sample Depth
Parameter
NITROAROMATICS
DNT
2-NT
3-NT
4-NT
VOLATILES
Methylene chloride
Toluene
SEMIVOLATILES
Di-n-butylphthalate
Dinitrotoluene, 2,4-
Dinitrotoluene, 2,6-
METALS
Aluminum
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Potassium
Sodium
Vanadium
Zinc

PROJECT: PBOW	HOLE NO: GW-11

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PW-11

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 2 Sheets

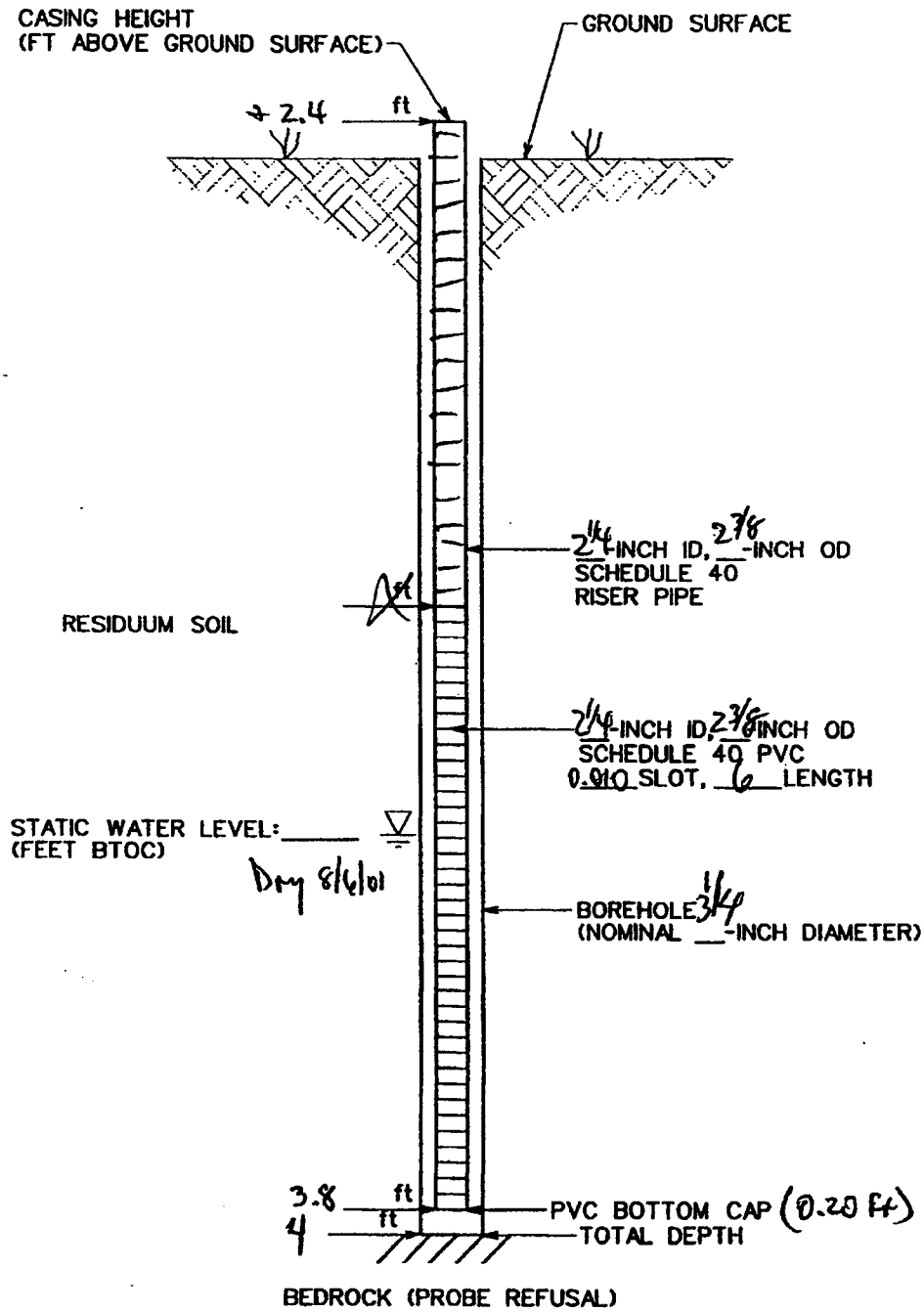
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uiks	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Mown weeds	NA	NA	NA	NA	NA	Began drilling
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							No lithologic samples collected.
	4	Probe Refusal @ 4 ft TD = 4 ft						
	5							
	6							
	7							
	8							
	9							
	9							

Project: PBOW

Hole Number: PW-11

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNTA



NOTES:

PIEZOMETER NO.: GW-11

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01 | DATE LAST REV.: | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: C. WILLIAMS | DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF | DRAWN BY: | ENGR. CHCK. BY: C. WILLIAMS | PROJ. MGR.: SPANGBERG | PROJ. NO.: 825635

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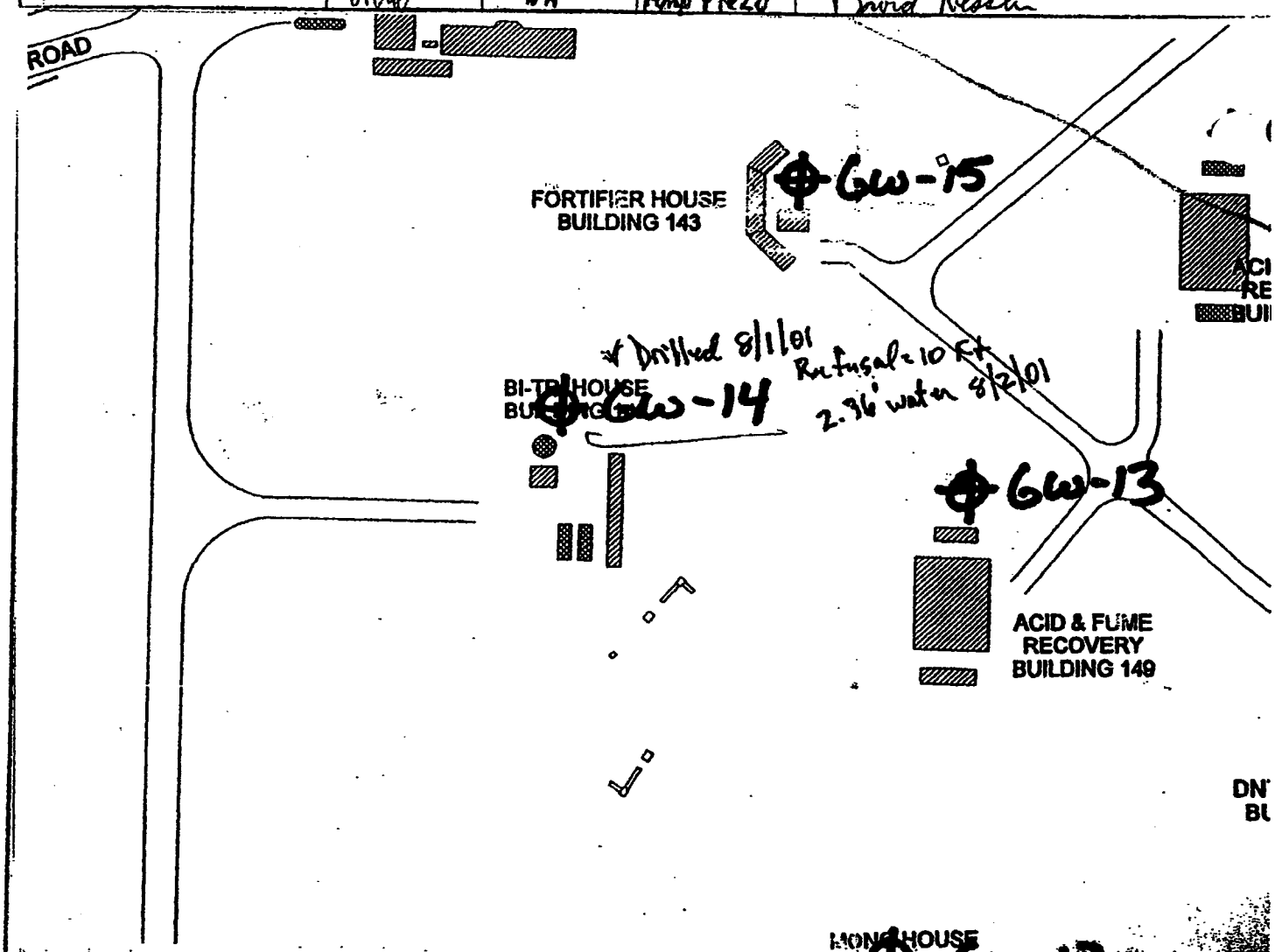
HTRW DRILLING LOG

DISTRICT	USACE - Nashville
HOLE NUMBER	GW-14
1. COMPANY NAME	IT Corporation
2. DRILL SUBCONTRACTOR	Prosonic
SHEET / OF 2	
3. PROJECT	PBOW
4. LOCATION	TNT Area A
5. NAME OF DRILLER	Pete Gross
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe DT 66
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	DT 66 All terrain, track mounted geoprobe rig with 3 1/4 inch OD probe. Temporary piezometer 2" OD Sch 40 PVC. 0.010" slot screen
8. HOLE LOCATION	Bldg 142
9. SURFACE ELEVATION	651.03 Ft N: 623190.96 E: 1922681.12
10. DATE STARTED	8/1/01
11. DATE COMPLETED	8/1/01
12. OVERBURDEN THICKNESS	10 Ft
13. DEPTH DRILLED INTO ROCK	-0-
14. TOTAL DEPTH OF HOLE	10 Ft
15. DEPTH GROUNDWATER ENCOUNTERED	Groundwater not encountered
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	7.70 Ft 8/6/01 0808 - Sampled
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	—

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	yes	yes	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kresch



PROJECT PBOW

HOLE NO GW-14

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-14

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 2 Sheets

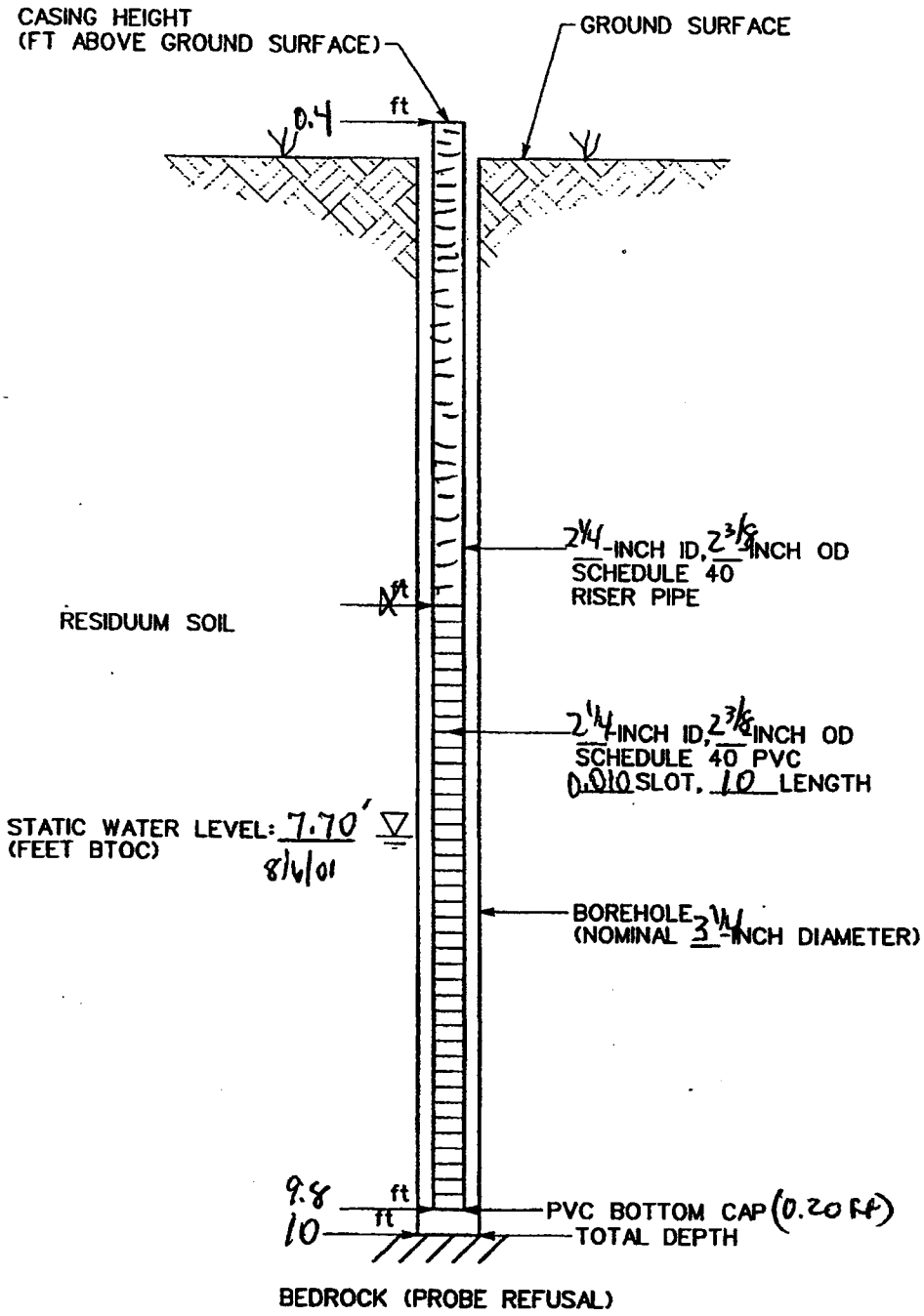
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
			NA		NA		NA	Began drilling 8/1/01 1545
	1			O.D		BA 3014		
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							Breathing Air PID = 0.0ppm
	6							VRAE:
	7							CO = 0 ppm LEL = 1 ppm H_2S = 0 ppm O_2 = 21.2%
	8							
	9							
	10	Probe Refused @ 10 ft TD = 10 ft						

Project: PBOW

Hole Number: GW-14

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT A



NOTES:

PIEZOMETER NO.: GW-14

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

DWG. NO.: \825635ES.016 | PROJ. NO.: 825635
INITIATOR: C. WILLIAMS | PROJ. MGR.: SPANGBERG
DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY: C. WILLIAMS
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 07/23/01 | DRAWN BY: B. VANDERGRIFF
10:02:05 07/30/01
bvanderg c:\cadd\design\825635es.016

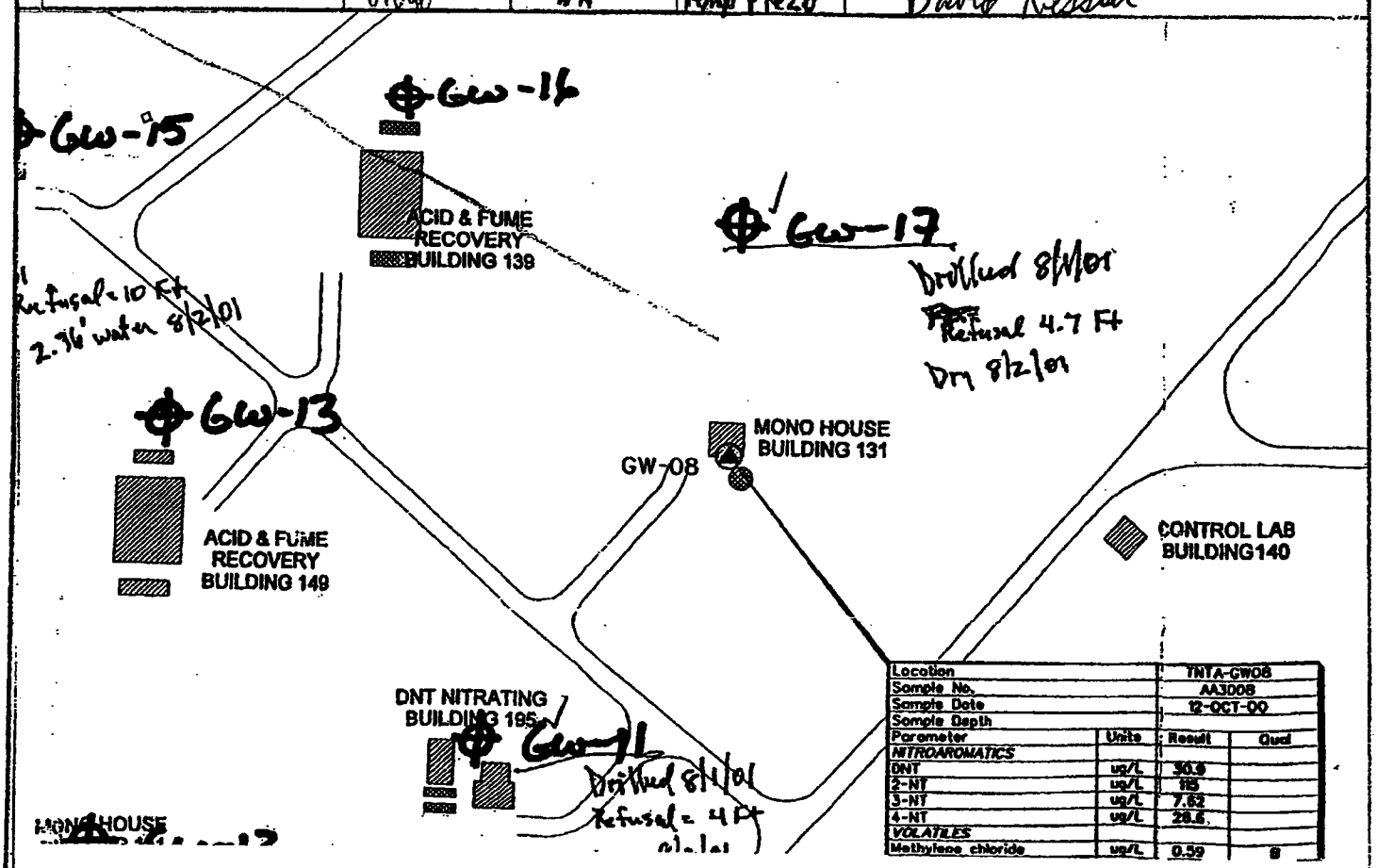
HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: GW-17
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT Area A	
5. NAME OF DRILLER: Pete Goss	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT 66	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: DT 66 All terrain, track mounted geoprobe rig with 3 1/4 Inch OD probe. Temporary piezometer 2" OD, Sch 40 PVC. 0.010" slot screen	8. HOLE LOCATION: Bldg 131 (Downgradient)	
	9. SURFACE ELEVATION: 657.67 Ft	N: 623355.61 E: 1923280.93
	10. DATE STARTED: 8/1/01	11. DATE COMPLETED: 8/1/01
12. OVERBURDEN THICKNESS: 4-3 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Groundwater not encountered	
13. DEPTH DRILLED INTO ROCK: 0-4 Ft	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: Dry 8/6/01 0802	
14. TOTAL DEPTH OF HOLE: 4-7 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kessler



Location		TNTA-GW08	
Sample No.		AA3008	
Sample Date		12-OCT-00	
Sample Depth			
Parameter	Units	Result	Qual
NITROAROMATICS			
DNT	ug/L	30.9	
2-NT	ug/L	115	
3-NT	ug/L	7.62	
4-NT	ug/L	28.6	
VOLATILES			
Methylene chloride	ug/L	0.59	B

PROJECT: PBOW

HOLE NO: GW-17

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-17

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 2 Sheets

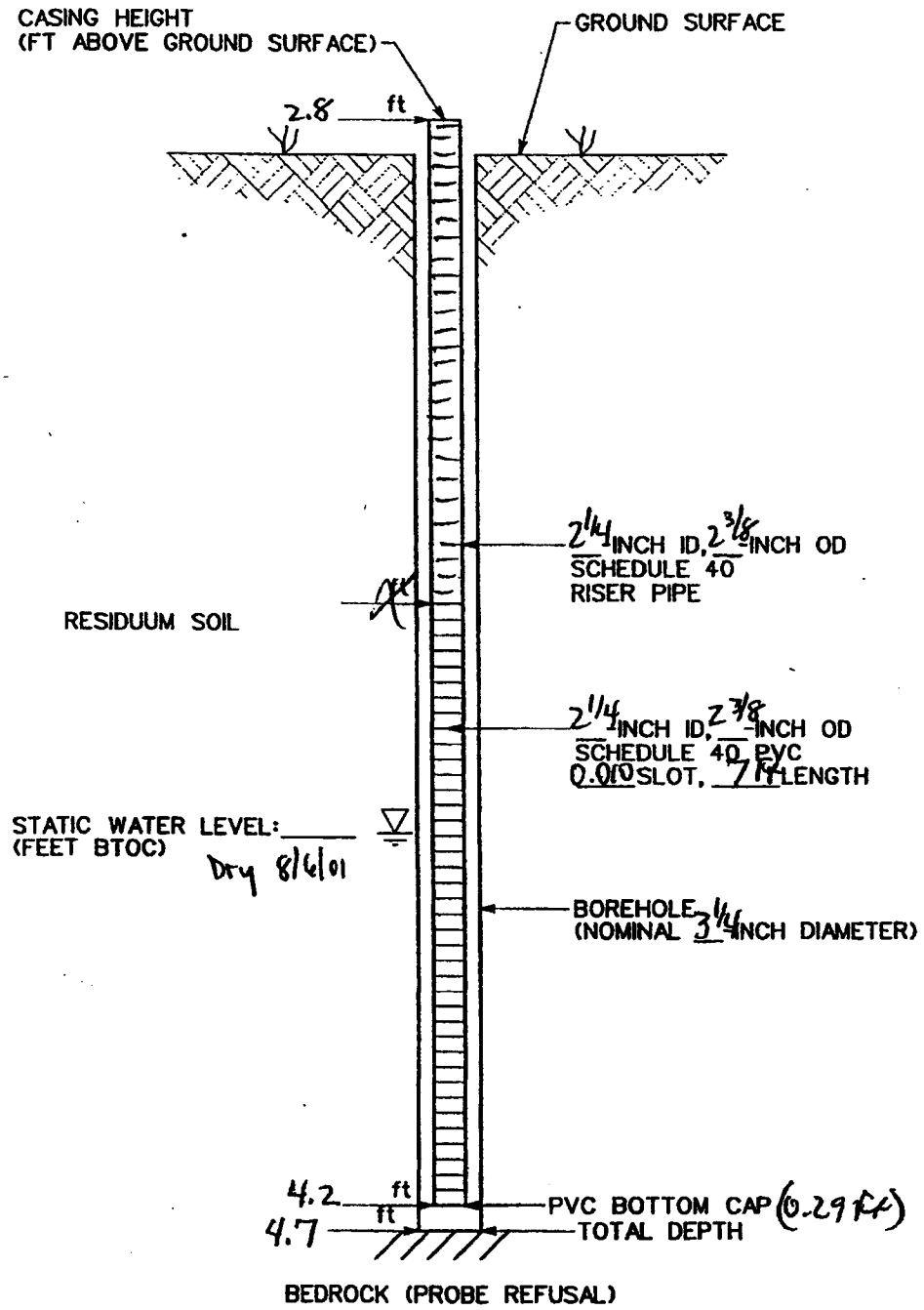
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
			NA	0.0	NA	NA	NA	Began drilling 8/1/01 1645
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
		SHALE, white, dry						
	5	Probe Refusal @ 4.7 ft TD = 4.7 ft						Breathing Air. PID = 0.0 ppm
	6							Drilled to 0.4 ft white shale
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: GW-17

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNTA



NOTES:

PIEZOMETER NO.: GW-17

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
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NOT TO SCALE

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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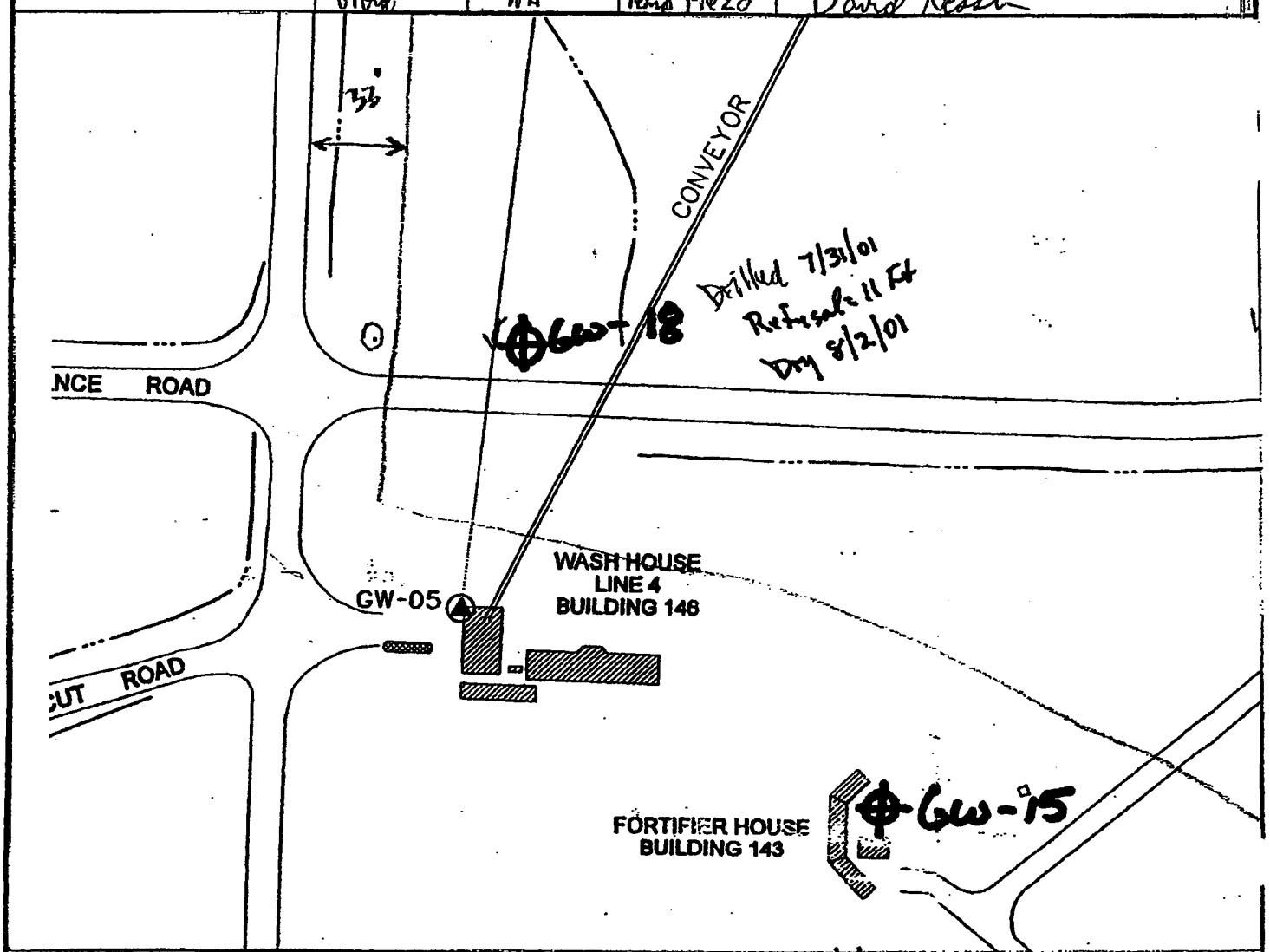
HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: GW-18
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	SHEET 1 OF 3
3. PROJECT: PBOW	4. LOCATION: TNT Area A	
5. NAME OF DRILLER: Pete Goss	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT66	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3 1/4" DT 66 All terrain, track mounted geoprobe rig with ~~2.5~~ inch OD probe. Temporary piezometer 2" OD, Sch 40 PVC 0.010" slot screen	8. HOLE LOCATION: Downgradient Bldg 146	
	9. SURFACE ELEVATION: 635.99 Ft N: 623615.68 E: 1922615.98	
	10. DATE STARTED: 7/31/01	11. DATE COMPLETED: 7/31/01
12. OVERBURDEN THICKNESS: 11 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Groundwater not encountered	
13. DEPTH DRILLED INTO ROCK: -0-	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: Dry 8/6/01 0728	
14. TOTAL DEPTH OF HOLE: 11 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Keach



PROJECT: PBOW	HOLE NO. GW-18

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-18

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 3 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Grass	NA	NA	NA	NA	NA	Began drilling 7/31/01 1630
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							PID Battery Being recharged. No Air quality readings taken
	6							
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: GW-18

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-18

Project: PBOW

Geologist: D. Kessler

Sheet 3 of 3 Sheets

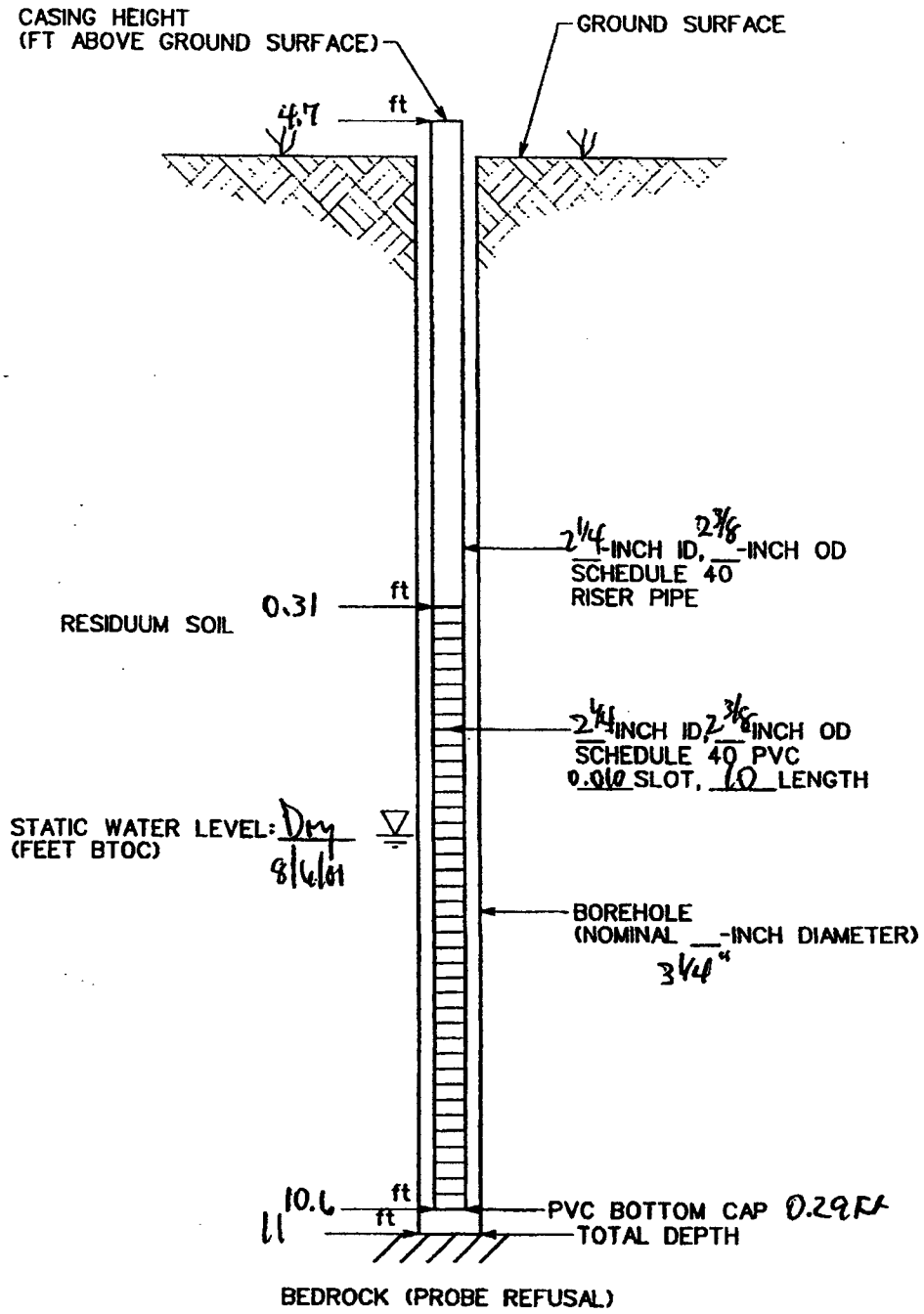
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
			NA		NA	NA	NA	
	1	SILT (1GLEY 2.5/N) Black, soft						
		Probe Refusal @ 11 Ft						
		TD = 11 Ft						
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: GW-18

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT A



NOTES:

PIEZOMETER NO.: GW-18

DATE INSTALLED: 7/31/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

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DWG. NO.: \825_\3ES.016	PROJ. NO.: 825635
INITIATOR: C. WILLIAMS	PROJ. MGR.: SPANGBERG
DRAFT. CHCK. BY: C. TUMLIN	ENGR. CHCK. BY: C. WILLIAMS
DATE LAST REV.:	DRAWN BY:
STARTING DATE: 07/23/01	DRAWN BY: B. VANDERGRIFF

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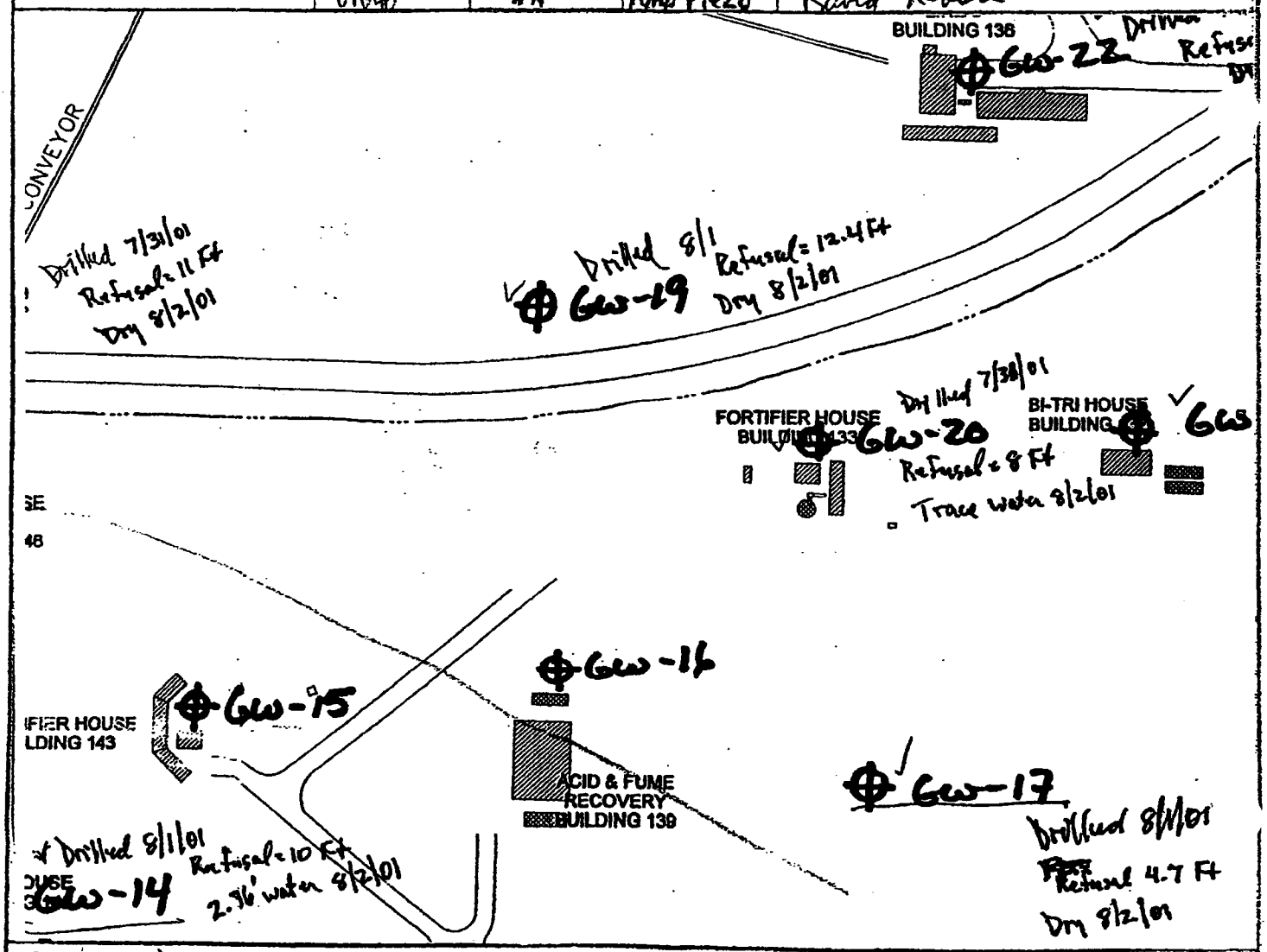
HTRW DRILLING LOG

DISTRICT	USACE - Nashville
HOLE NUMBER	GW-19
SHEET	1 OF 3
1 COMPANY NAME	IT Corporation
2 DRILL SUBCONTRACTOR	Prosonic
3 PROJECT	PBOW
4 LOCATION	TNT Area A
5 NAME OF DRILLER	Pete Goss
6 MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe DT 66
7 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	DT 66 All terrain, track mounted geoprobe rig with 3 1/4 inch OD probe. Temporary piezometer 2" OD Sch 40 PVC 0.010" slot screen
8 HOLE LOCATION	Bldg 133 Down and side gradient (NW of Bldg)
9 SURFACE ELEVATION	640.78 Ft N: 623612.68 E: 1923052.20
10 DATE STARTED	8/1/01
11 DATE COMPLETED	8/1/01
12 OVERBURDEN THICKNESS	12.4 Ft
15 DEPTH GROUNDWATER ENCOUNTERED	Not encountered
13 DEPTH DRILLED INTO ROCK	-0-
16 DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	Dry 8/6/01 0733
14 TOTAL DEPTH OF HOLE	12.4 Ft
17 OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	—

18 GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19 TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20 SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21 TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22 DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23 SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kessler



PROJECT	HOLE NO.
PBOW	GW-19

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-19

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 3 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
					NA	NA	NA	Began drilling 8/1/01 0900
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	6							PID = 0.0 ppm
								LEL:
	8							CO = 0 ppm LEL - 1 H_2S = 0 ppm O_2 = 21.3 %
	7							
	8							
	9							
	0			0.0				

Project: PBOW

Hole Number: GW-19

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-~~20~~ 19

Project: PBOW

Geologist: D. Kessler

Sheet 3 of 3 Sheets

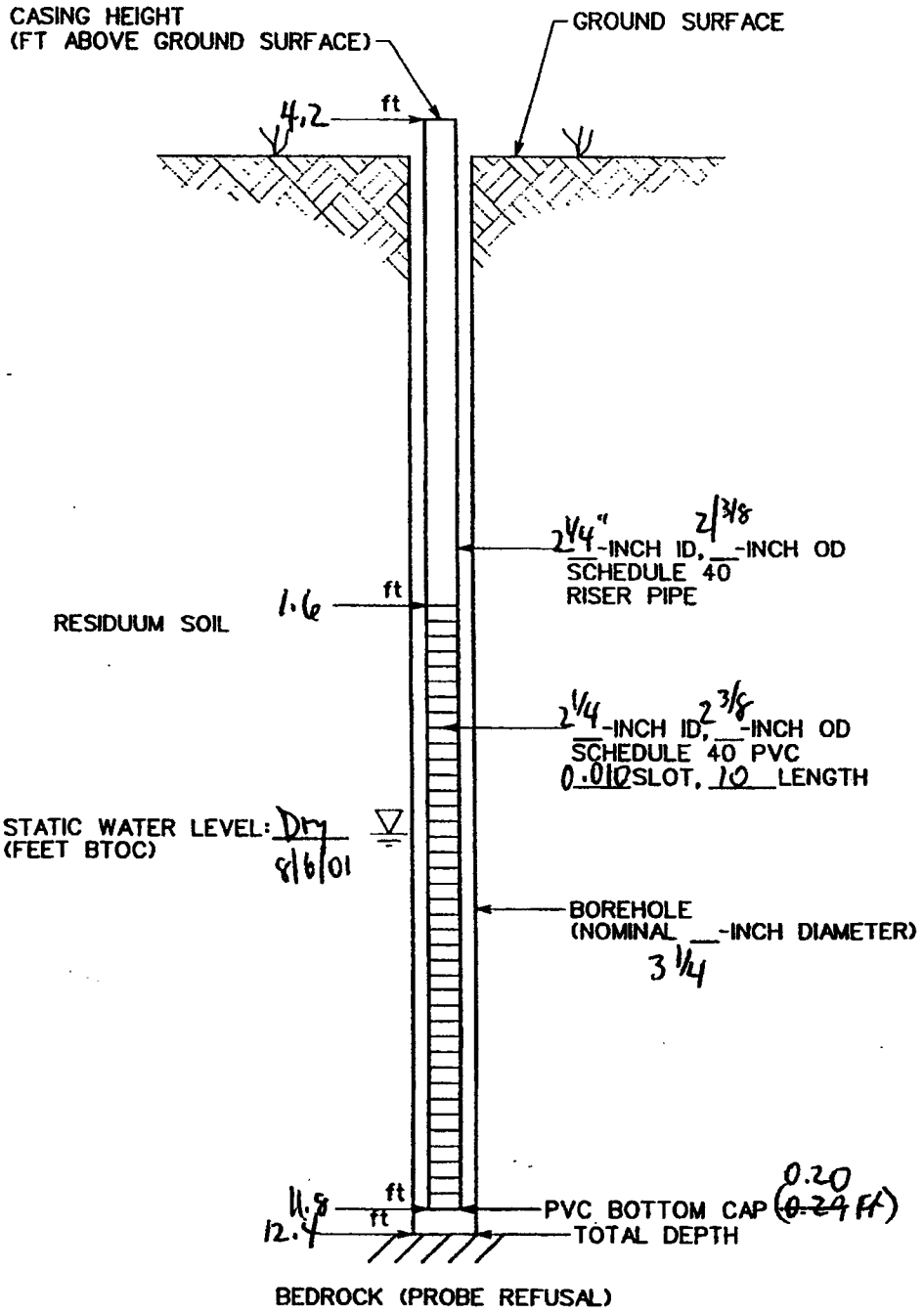
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uiks	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
			NA	NA	NA	NA	NA	
	11	SAND, very fine grain, dark yellowish brown (10YR 4/6), moist.						
	12							
		Probe Refusal @ 12.4 ft TD = 12.4 ft						
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							

Project: PBOW

Hole Number: GW-~~20~~ 19

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT A



NOTES:

PIEZOMETER NO.: GW-19

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01 | DATE LAST REV. | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: C. WILLIAMS | DWG. NO.: \82... .S. 016

DRAWN BY: B. VANDERGRIFF | DRAWN BY: | ENGR. CHCK. BY: C. WILLIAMS | PROJ. MGR.: SPANGBERG | PROJ. NO.: 825635

10:02:05 07/30/01

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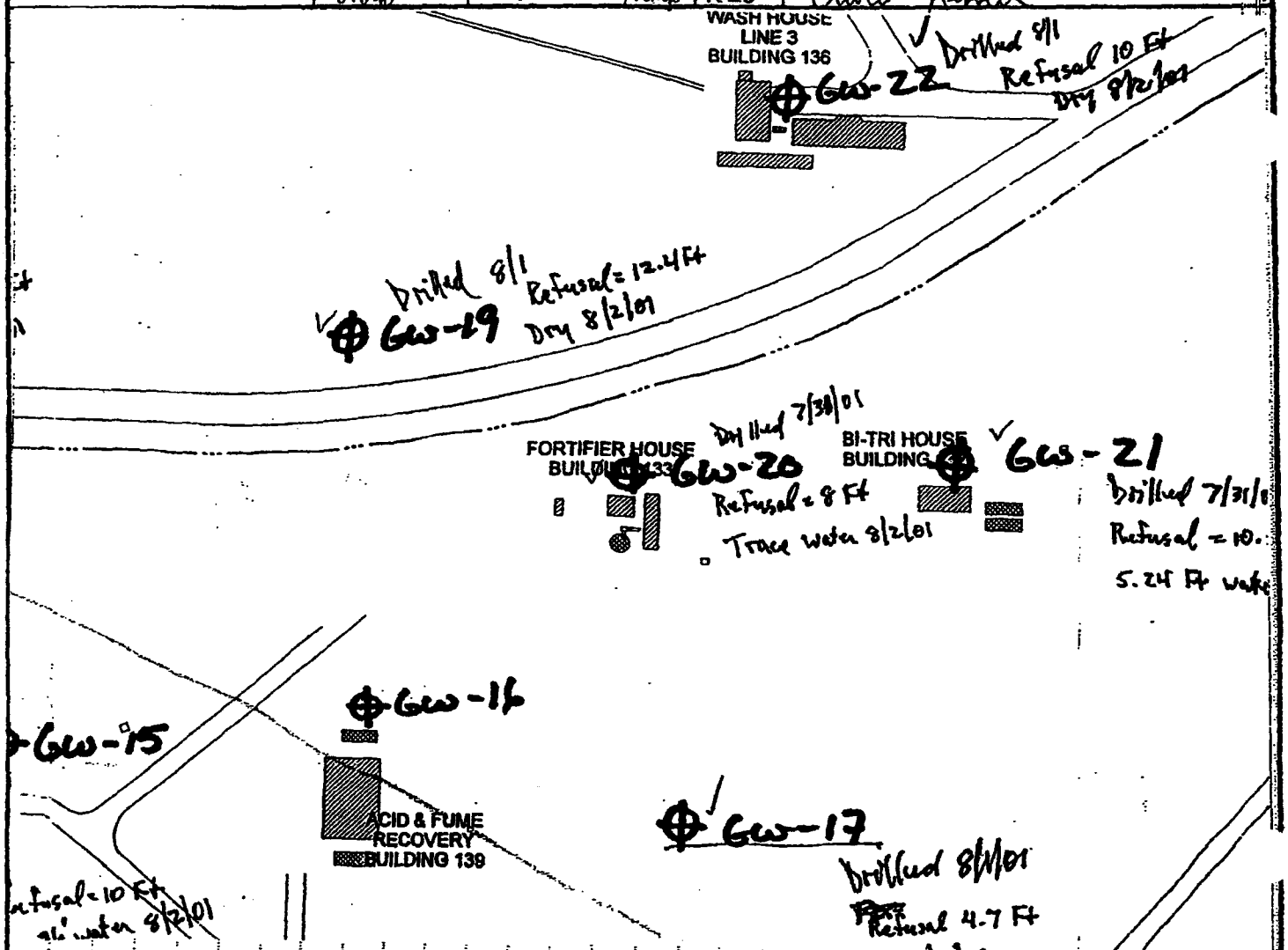
HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: GW-20
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	SHEET 1 OF 2 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT Area ~~B~~ A	
5. NAME OF DRILLER: Pete Goss	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT 66	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3 1/4" DT 66 All terrain, track mounted geoprobe rig with 2 5/8 inch OD probe. Temporary Piezometer 2" OD, Sch 40 PVC 0.010" slot screen	8. HOLE LOCATION: Bldg 133	
	9. SURFACE ELEVATION: 650.07 Ft N: 623518.06 E: 1923277.55	
	10. DATE STARTED: 7/31/01	11. DATE COMPLETED: 7/31/01
12. OVERBURDEN THICKNESS: 8 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Groundwater not encountered	
13. DEPTH DRILLED INTO ROCK: -0-	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 9.91 Ft 8/6/01 0800 - No sample (0.2 Ft water column)	
14. TOTAL DEPTH OF HOLE: 8 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kessler



PROJECT: PBOW	HOLE NO. GW-20

HTRW DRILLING LOG

(continuation sheet) TNTA

Hole Number: GW-20

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 2 Sheets

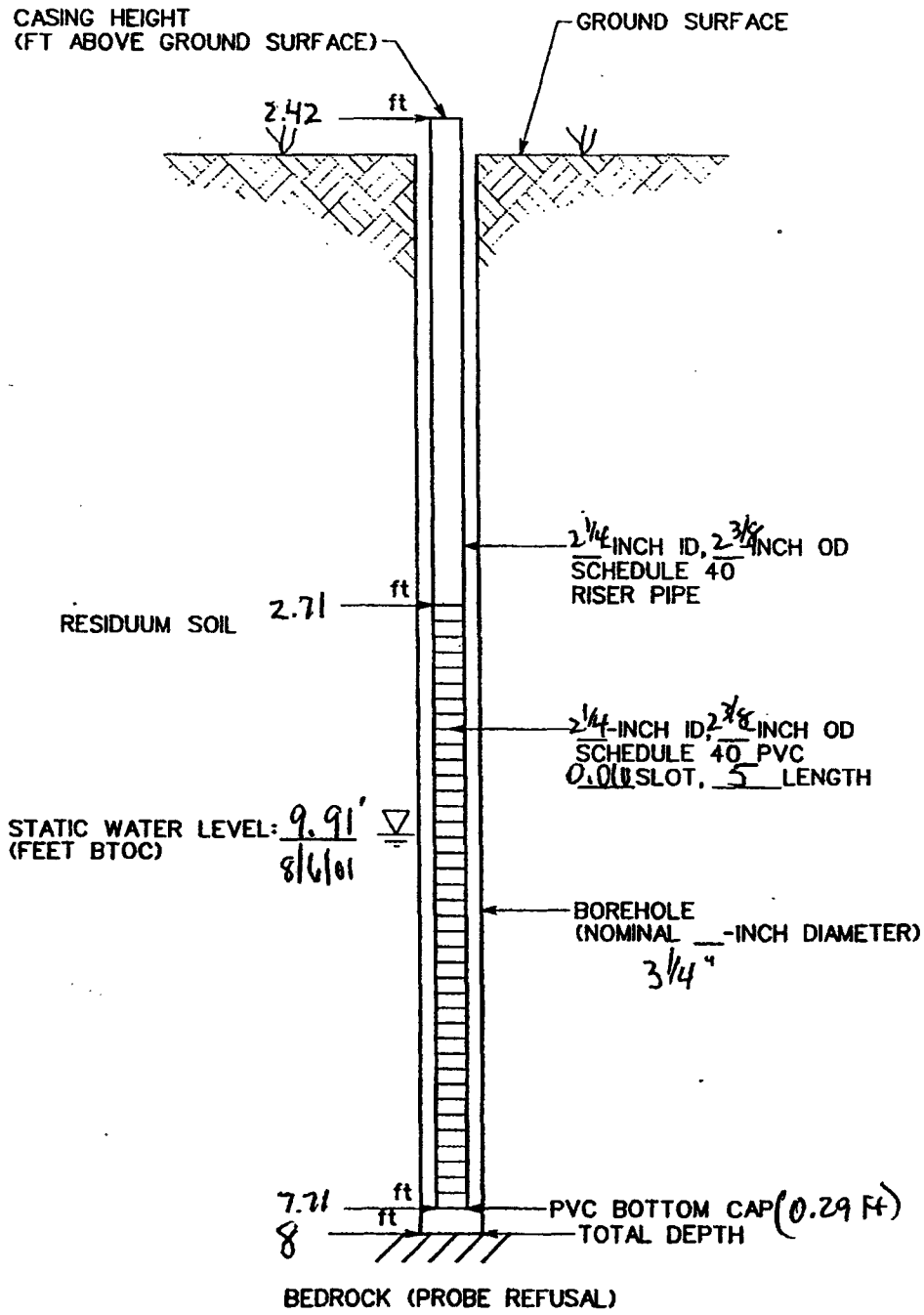
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ USM	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Tall Grass	NA	NA	NA	NA	NA	Began drilling 7/31/01 1700
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							PID Battery being recharged. No air quality readings taken.
	6							
	7	SAND, very fine grain, very moist, dark gray/black						
	8	Probe Refusal @ 8 ft TD = 8 ft						
	9							
	10							

Project: PBOW

Hole Number: GW-20

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT A



NOTES:

PIEZOMETER NO.: GW-20

DATE INSTALLED: 7/31/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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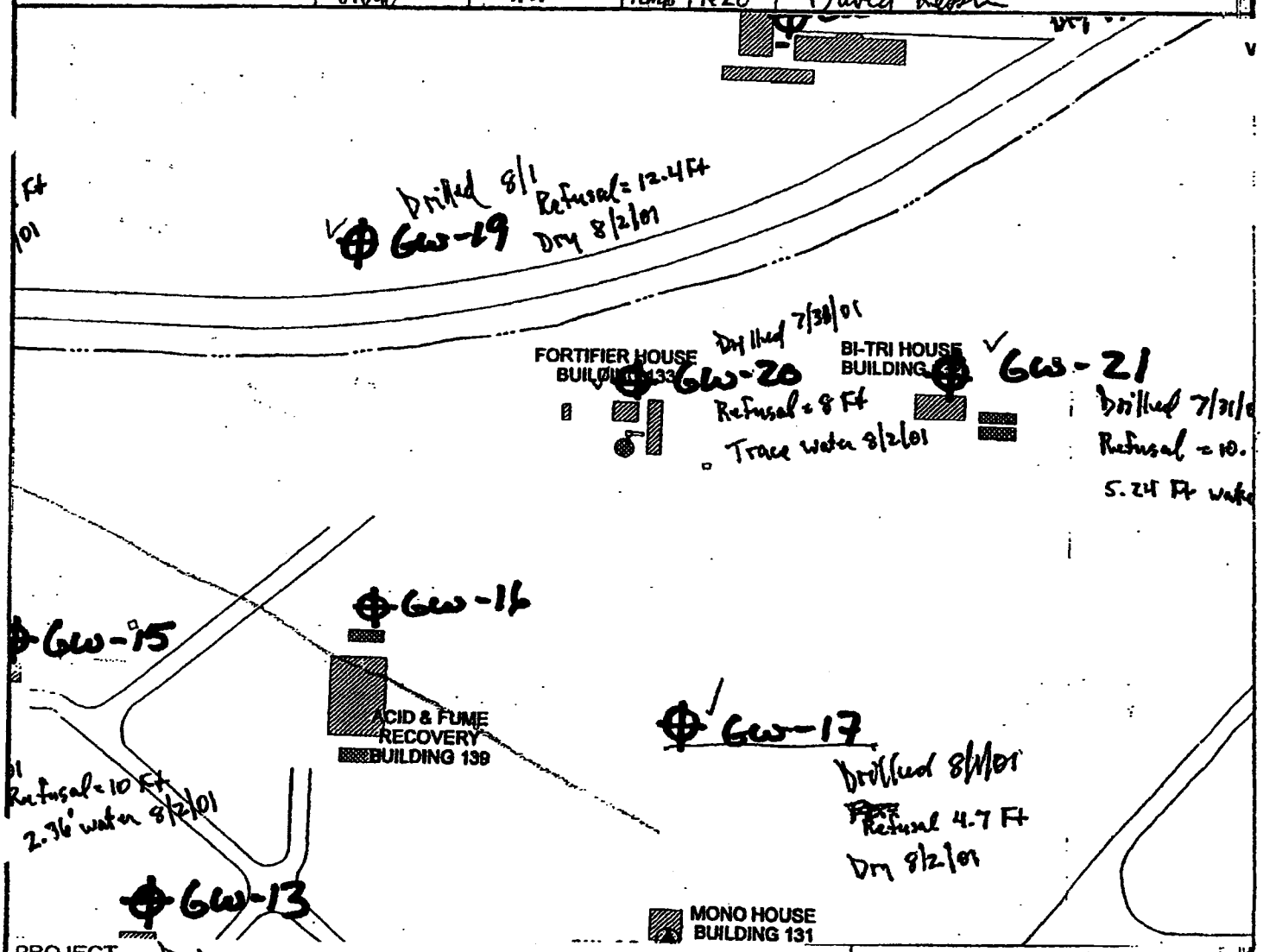
HTRW DRILLING LOG

DISTRICT	USACE - Nashville
HOLE NUMBER	GW-21
1. COMPANY NAME	IT Corporation
2. DRILL SUBCONTRACTOR	Rosonic
SHEET / OF SHEETS	1 of 2
3. PROJECT	PBOW
4. LOCATION	TNT Area A
5. NAME OF DRILLER	Pete Goss
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe DT 66
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	DT 66 All terrain, track mounted geoprobe rig with 2 5/8 inch OD probe. Temporary Piezometer 2" OD, Sch 40 PVC. 0.010" slot screen
8. HOLE LOCATION	Bldg 132
9. SURFACE ELEVATION	653.45 Ft N: 623536.52 E: 1923487.37
10. DATE STARTED	7/31/01
11. DATE COMPLETED	7/31/01
12. OVERBURDEN THICKNESS	10.5 Ft
15. DEPTH GROUNDWATER ENCOUNTERED	8.5 Ft
13. DEPTH DRILLED INTO ROCK	-0-
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	5.26 Ft / 5.24 Ft water column 1700 8/1/01 (~24 hrs) sampled
14. TOTAL DEPTH OF HOLE	10.5 Ft
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	—

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	Screening	Screening	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Keesh



PROJECT PBOW

HOLE NO. GW-21

HTRW DRILLING LOG

(continuation sheet) TNTA

Hole Number: GW-21

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 2 Sheets

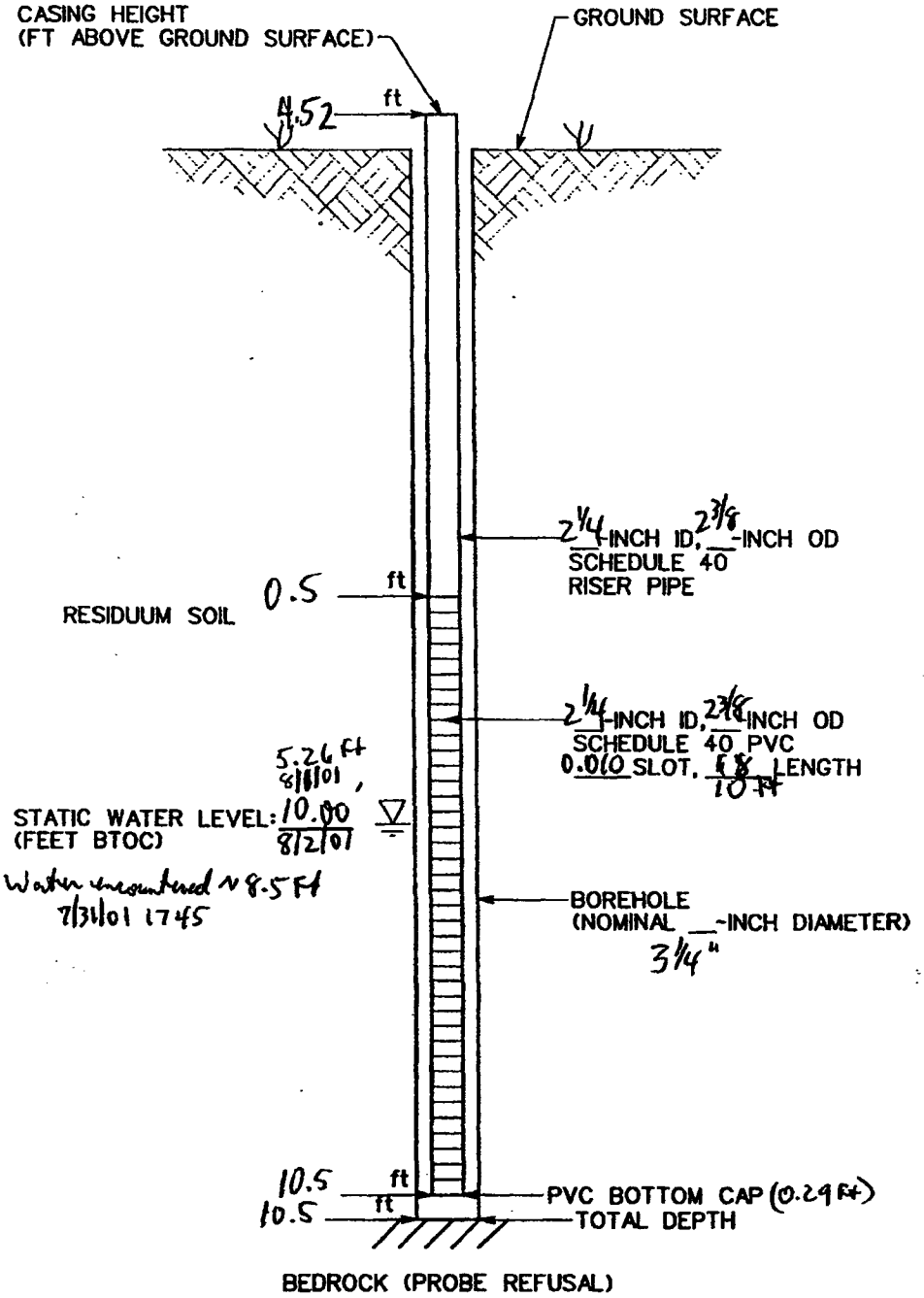
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unc	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Tall Grass	NA	NA	NA		NA	Began drilling 7/31/01 1730
	1					BA 3021		
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							No PID readings Battery being changed.
	6							
	7							
	8							
	9							Water in borehole
	10	Probe Refusal 10.5 Ft TD = 10.5 Ft						

Project: PBOW

Hole Number: GW-21

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNTA



NOTES:

PIEZOMETER NO.: GW-21

DATE INSTALLED: 7/31/01

DATE REMOVED: 8/2/01

Used 3/4 bag (50 lbs sack) bentonite

NOT TO SCALE

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES. 016	
ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635	
STARTING DATE: 07/23/01	DATE LAST REV.:		
DRAWN BY: B. VANDERGRIFF	DRAWN BY:		

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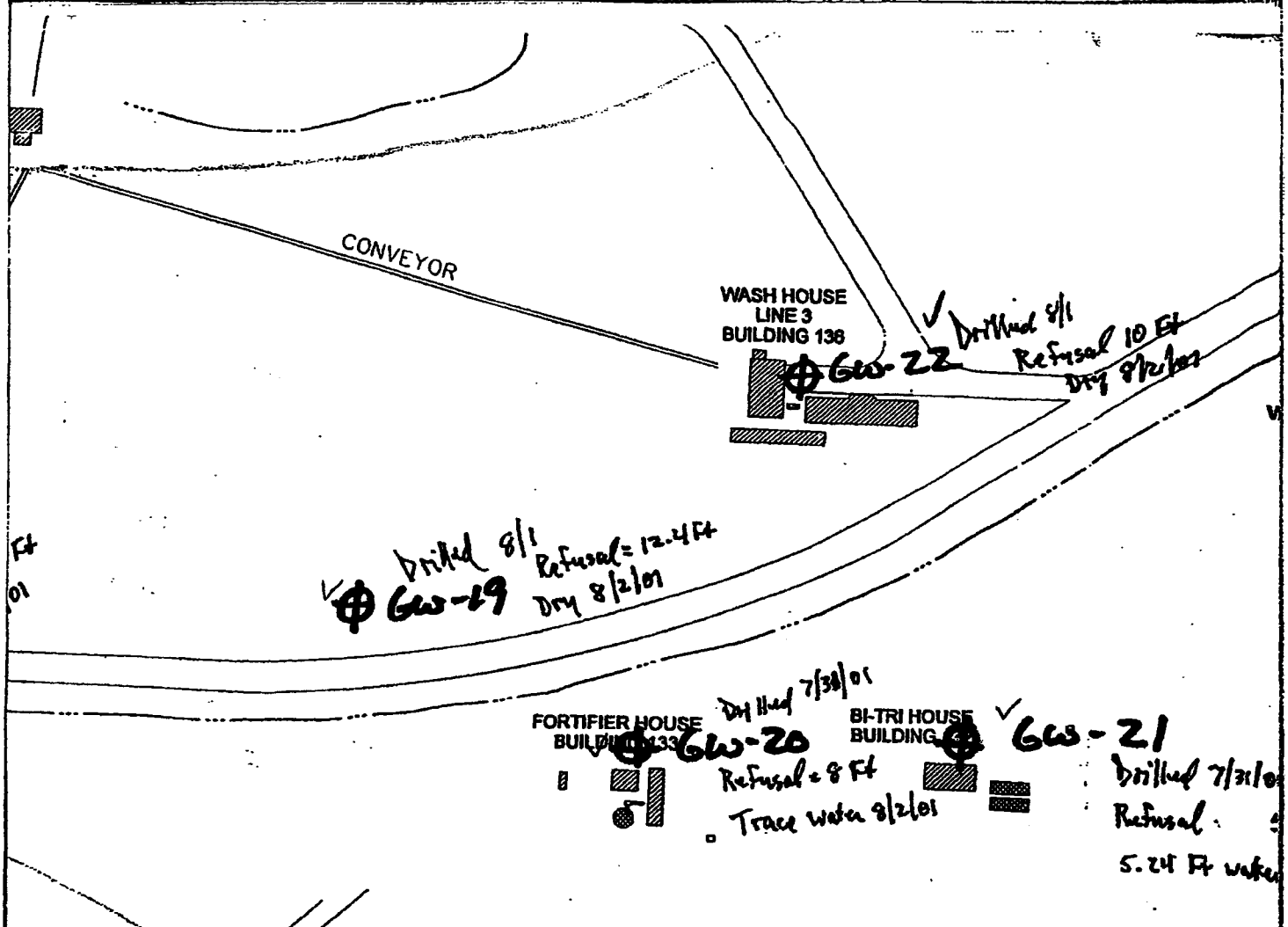
HTRW DRILLING LOG

DISTRICT	USACE - Nashville
HOLE NUMBER	GW-22
1. COMPANY NAME	IT Corporation
2. DRILL SUBCONTRACTOR	Prosonic
SHEET	1 OF 2
3. PROJECT	PBOW
4. LOCATION	TNT Area A
5. NAME OF DRILLER	Pete Gross
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe DT66
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	DT 66 All terrain, track mounted geoprobe rig with 3 1/4 Inch OD probe. Temporary piezometer 2" OD, Sch 40 PVC. 0.010" slot screen
8. HOLE LOCATION	Bldg 136 (Wash House)
9. SURFACE ELEVATION	636.96 Ft N: 623786.50 E: 1923374.41
10. DATE STARTED	8/1/01
11. DATE COMPLETED	8/1/01
12. OVERBURDEN THICKNESS	10 Ft
13. DEPTH DRILLED INTO ROCK	-0-
14. TOTAL DEPTH OF HOLE	10 Ft
15. DEPTH GROUNDWATER ENCOUNTERED	Not encountered.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	Dry 8/6/01 0736
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	—

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kessler



PROJECT	PBOW
HOLE NO.	GW-22

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-22

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 2 Sheets

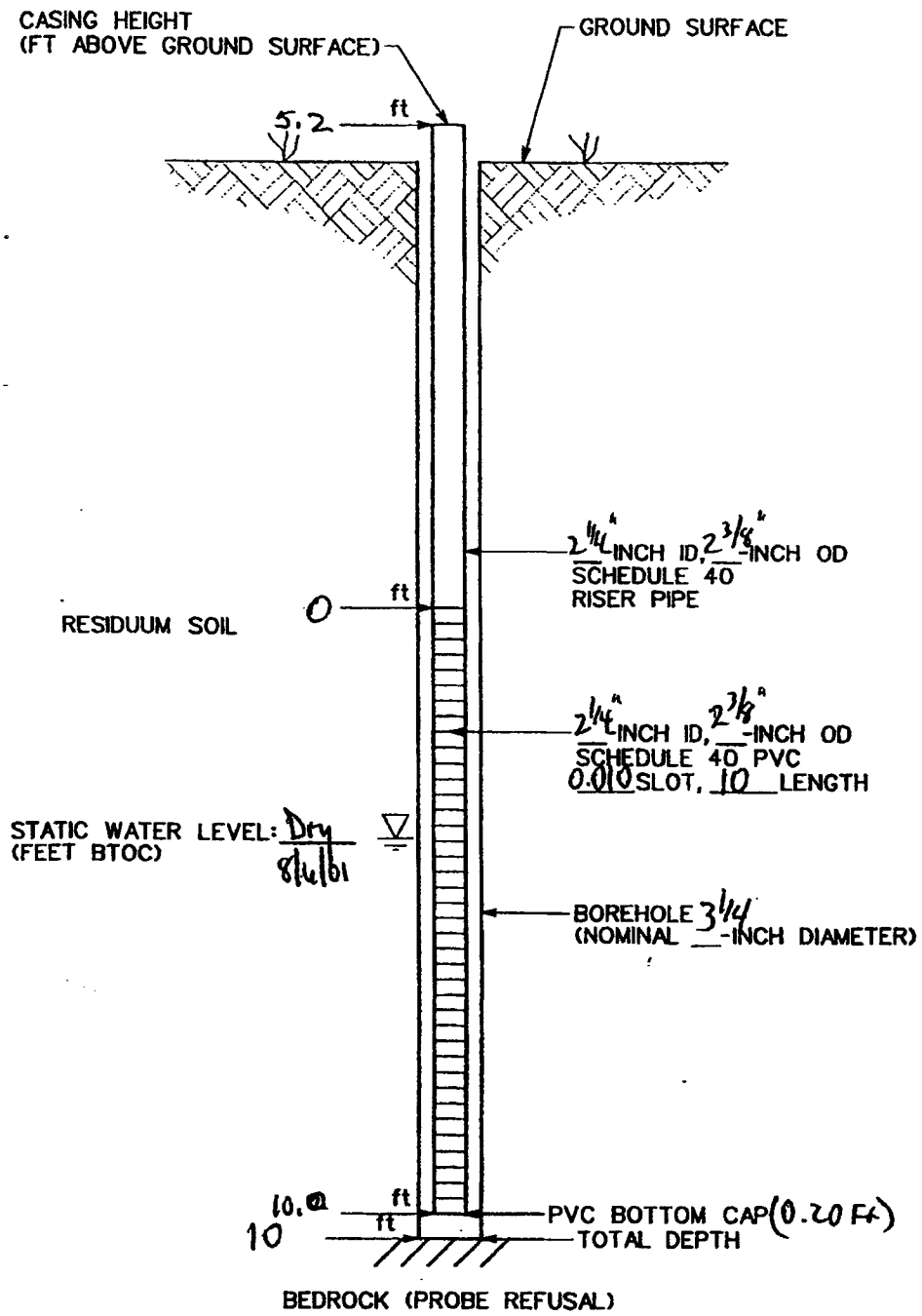
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Hummocky Grass	NA		NA	NA	NA	Began drilling 8/1/01 0955
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							Breathing Air: 0.0 PID
	6							VRAE: CO: 0ppm LEL: 1ppm H_2S: 0ppm O_2: 21.3%
	7							
	8							
	9							
	10	Probe Refusal @ 10 Ft TD = 10 Ft.						

Project: PBOW

Hole Number: GW-22

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: JNT A



NOTES:

PIEZOMETER NO.: GW-22

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

NOT TO SCALE

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.:\825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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HTRW DRILLING LOG

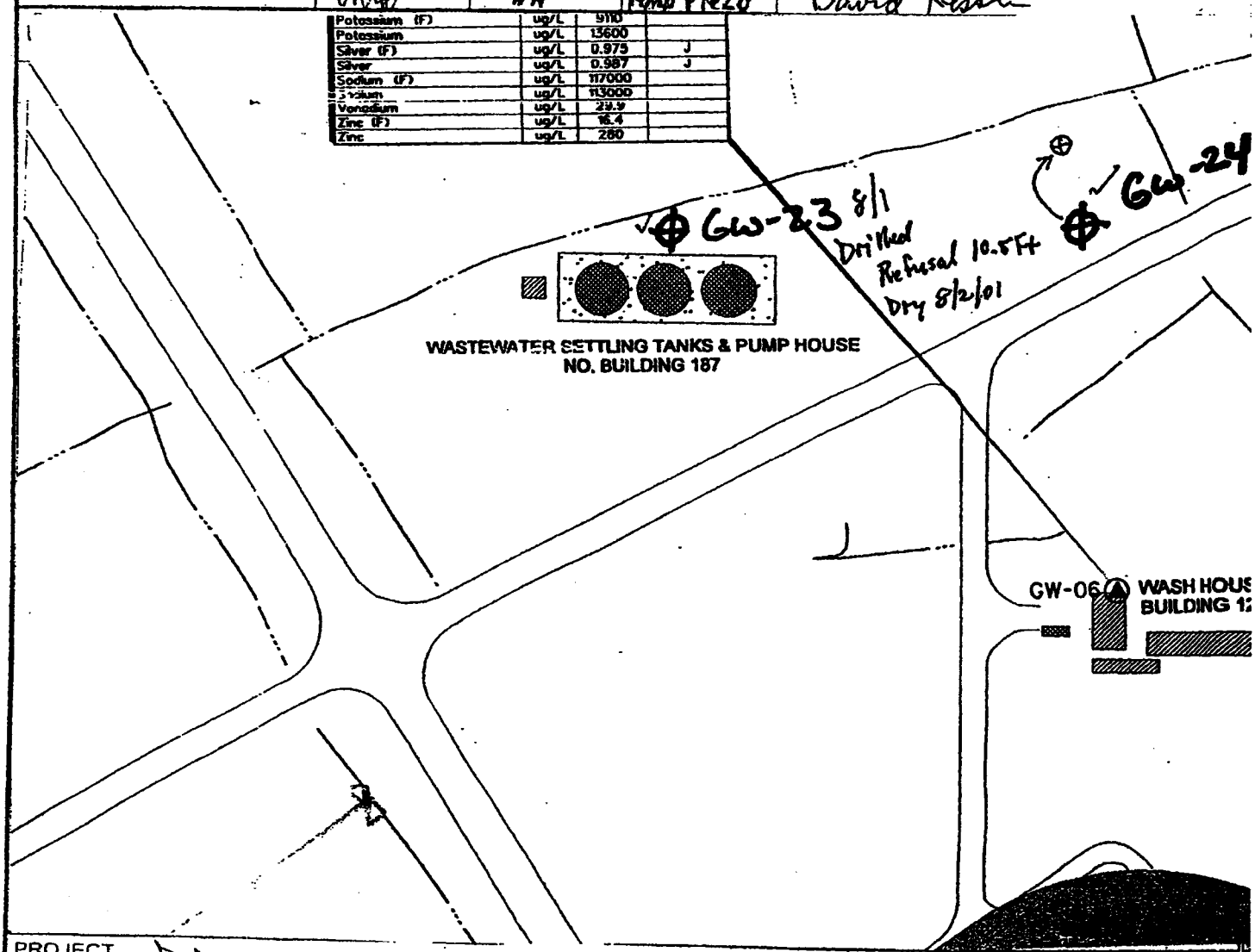
DISTRICT: USACE - Nashville	HOLE NUMBER: GW-23	
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	SHEET 1 OF 2
3. PROJECT: PBOW	4. LOCATION: TNT Area A	
5. NAME OF DRILLER: Pete Gross	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT 66	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: DT 66 All terrain, track mounted geoprobe rig with 3 1/4 inch OD probe. Temporary piezometer 2" OD, Sch 40 PVC 0.010" slot screen	8. HOLE LOCATION: Bldg 136	
	9. SURFACE ELEVATION: 630.05 Ft	N: 624594.64 E: 1923848.63
	10. DATE STARTED: 8/1/01	11. DATE COMPLETED: 8/1/01
12. OVERBURDEN THICKNESS: 10.5 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Groundwater not encountered	
13. DEPTH DRILLED INTO ROCK: -0-	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: Dry 8/6/01 0740	
14. TOTAL DEPTH OF HOLE: 10.5 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kessler

Potassium (F)	ug/L	9110	
Potassium	ug/L	13600	
Silver (F)	ug/L	0.975	J
Silver	ug/L	0.987	J
Sodium (F)	ug/L	117000	
Sodium	ug/L	113000	
Vanadium	ug/L	29.9	
Zinc (F)	ug/L	16.4	
Zinc	ug/L	280	



PROJECT: PBOW

HOLE NO. GW-23

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-23

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 2 Sheets

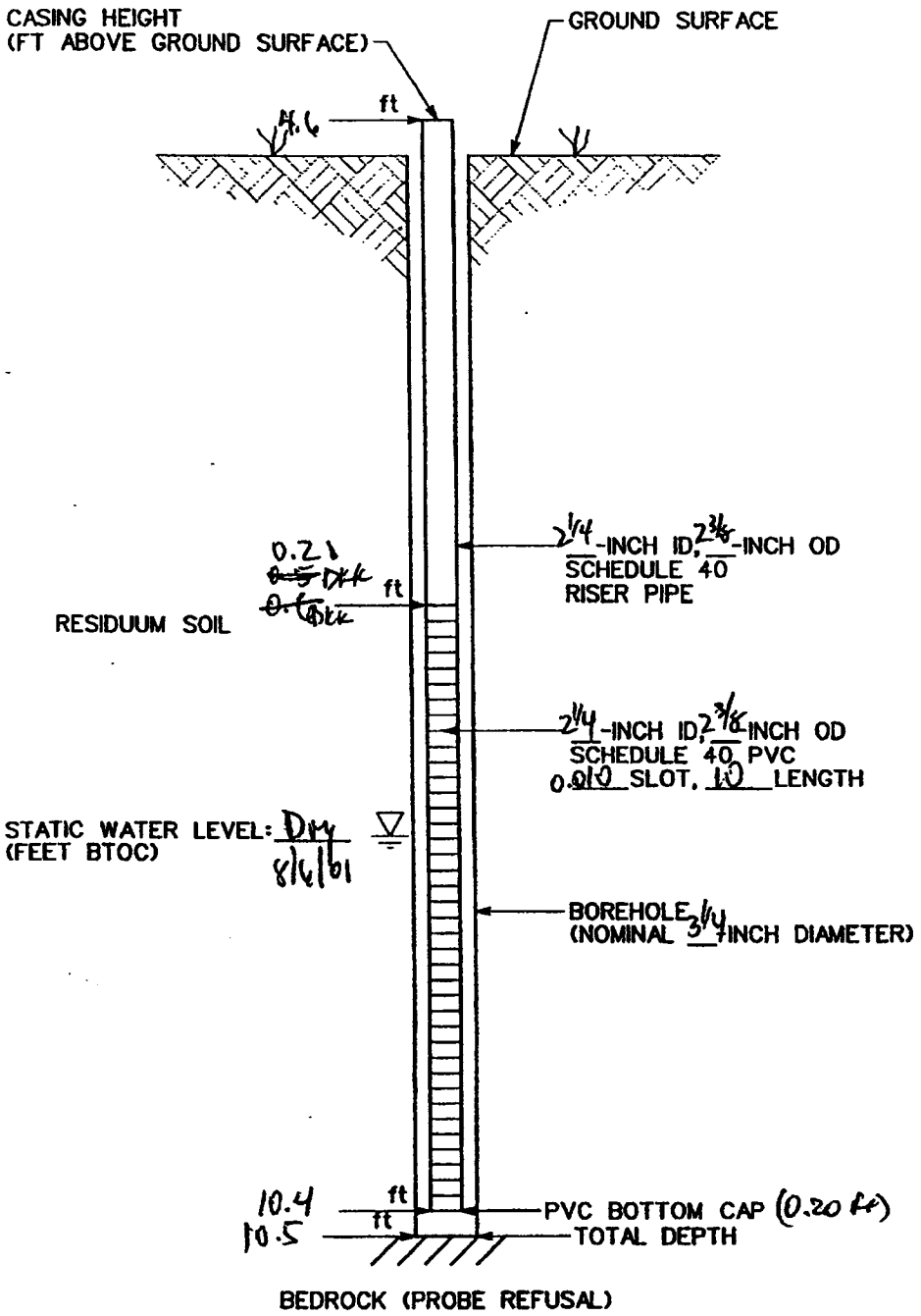
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Tall (Mown) Grass	NA		NA	NA	NA	Began drilling 8/1/01 1100
	1			0.0				Non-flowing water in creek ~20 ft away (north)
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							PID = 0.0 ppm
								VRAE
	6							CO = 0 ppm
								LEL = 0 ppm
								H_2S = 0 ppm
								O_2 = 21.3%
	7							
	8							
	9							
	10	Probe Refusal @ 10.5 ft TD = 10.5 ft						

Project: PBOW

Hole Number: GW-23

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNTA



NOTES:

PIEZOMETER NO.: GW-23

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \821 .S. 016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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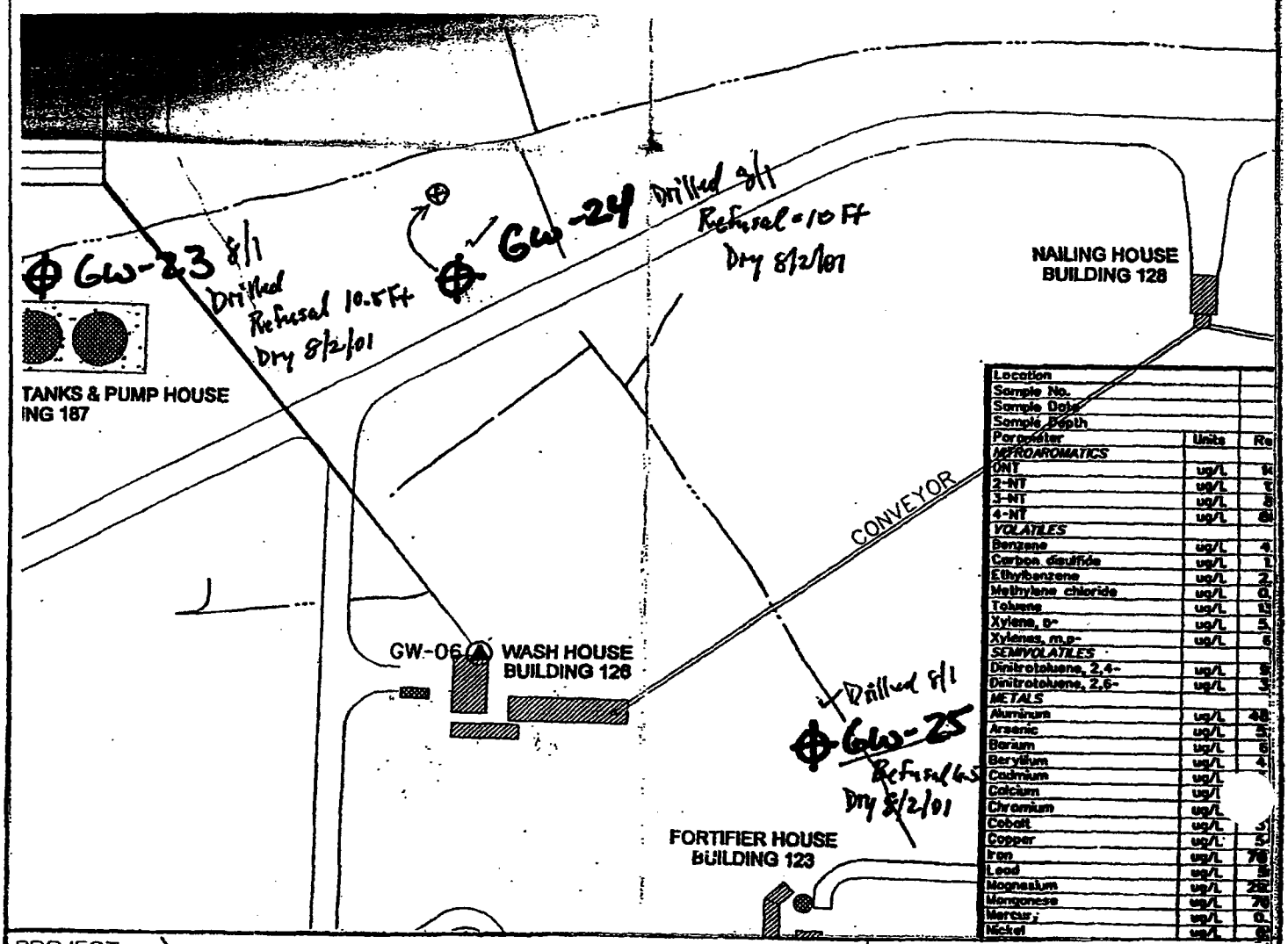
HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: GW-24
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	SHEET: 1 OF 2
3. PROJECT: PBOW	4. LOCATION: TNT Area A	
5. NAME OF DRILLER: Pete Gross	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT 66	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: DT 66 All terrain, track mounted geoprobe rig with 3 1/4 Inch OD probe. Temporary piezometer 2" OD Sch 40 PVC. 0.010" slot screen	8. HOLE LOCATION: Bldg 187	
	9. SURFACE ELEVATION: 630.71 Ft	N: 624626.18 E: 1924076.12
	10. DATE STARTED: 8/1/01	11. DATE COMPLETED: 8/1/01
12. OVERBURDEN THICKNESS: 10 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Groundwater not encountered	
13. DEPTH DRILLED INTO ROCK: -0-	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: Dry 8/6/01 0743	
14. TOTAL DEPTH OF HOLE: 10 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kessler



Location		
Sample No.		
Sample Date		
Sample Depth		
Parameter	Units	Re
NITROAROMATICS		
DNT	ug/L	9
2-NT	ug/L	2
3-NT	ug/L	5
4-NT	ug/L	6
VOLATILES		
Benzene	ug/L	4
Carbon disulfide	ug/L	1
Ethylbenzene	ug/L	2
Methylene chloride	ug/L	0
Toluene	ug/L	1
Xylene, o-	ug/L	5
Xylenes, m,p-	ug/L	6
SEMIVOLATILES		
Dinitrotoluene, 2,4-	ug/L	5
Dinitrotoluene, 2,6-	ug/L	3
METALS		
Aluminum	ug/L	48
Arsenic	ug/L	5
Barium	ug/L	6
Beryllium	ug/L	4
Cadmium	ug/L	
Calcium	ug/L	
Chromium	ug/L	
Cobalt	ug/L	3
Copper	ug/L	5
Iron	ug/L	70
Lead	ug/L	3
Magnesium	ug/L	25
Manganese	ug/L	70
Mercury	ug/L	0
Nickel	ug/L	9

PROJECT: PBOW

HOLE NO. GW-24

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-24

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 2 Sheets

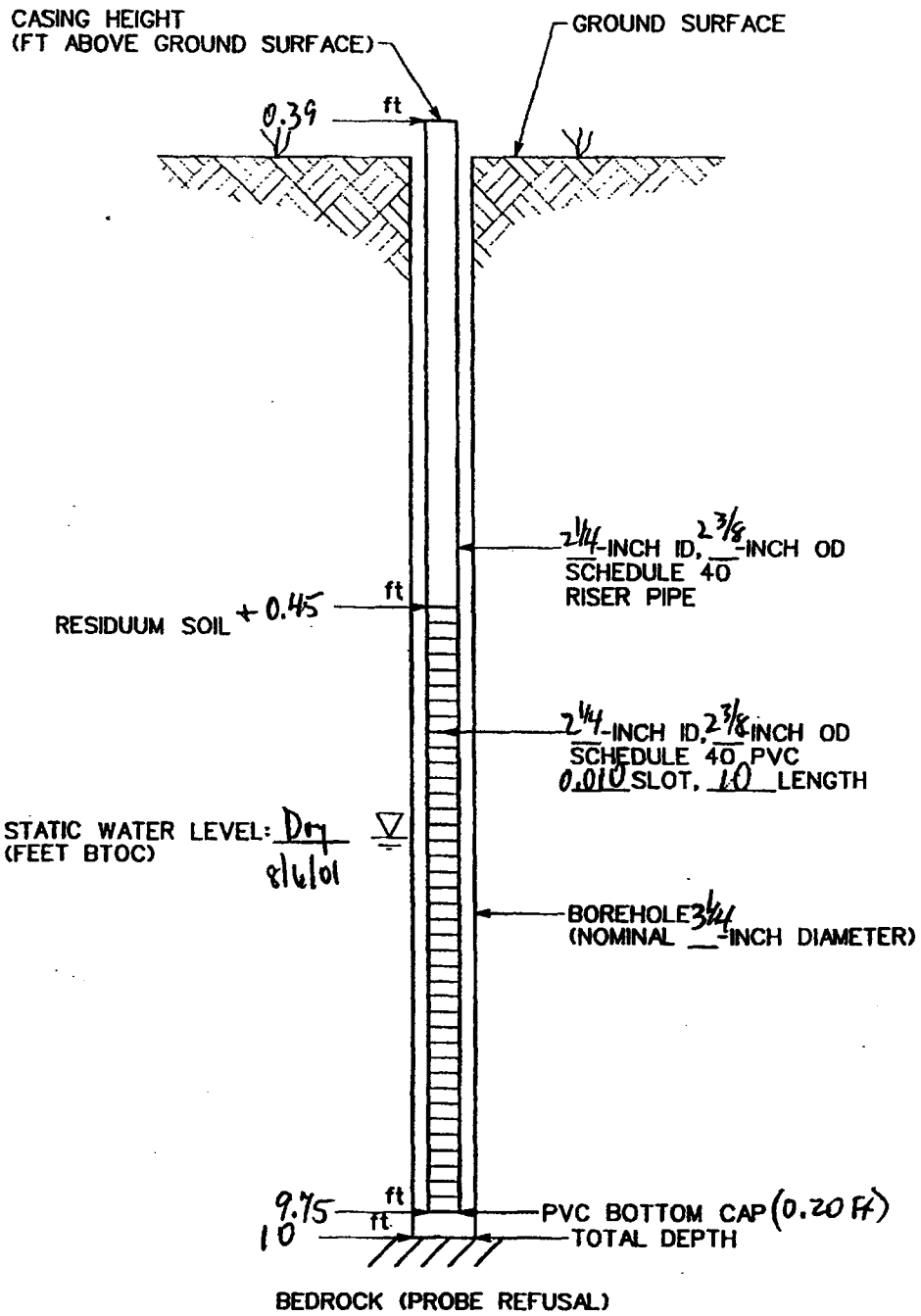
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Grass	NA		NA	NA	NA	Began drilling 8/1/01 1030
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5			0.0				Breathing Air PID = 0.0 ppm
	6							VRAE: CO = 0 ppm LEL = 1 ppm H_2S = 0 ppm O_2 = 21.3%
	7							
	8							
	9	CLAY, little sand, moist						
	10	Probe Refusal @ 10 Ft TD = 10 Ft						

Project: PBOW

Hole Number: GW-24

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNTA



NOTES:

PIEZOMETER NO.: GW-24

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

DWG. NO.: \825635ES.016 | PROJ. NO.: 825635
INITIATOR: C. WILLIAMS | PROJ. MGR.: SPANGBERG
DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY: C. WILLIAMS
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 07/23/01 | DRAWN BY: B. VANDERGRIFF
10:02:05 07/30/01
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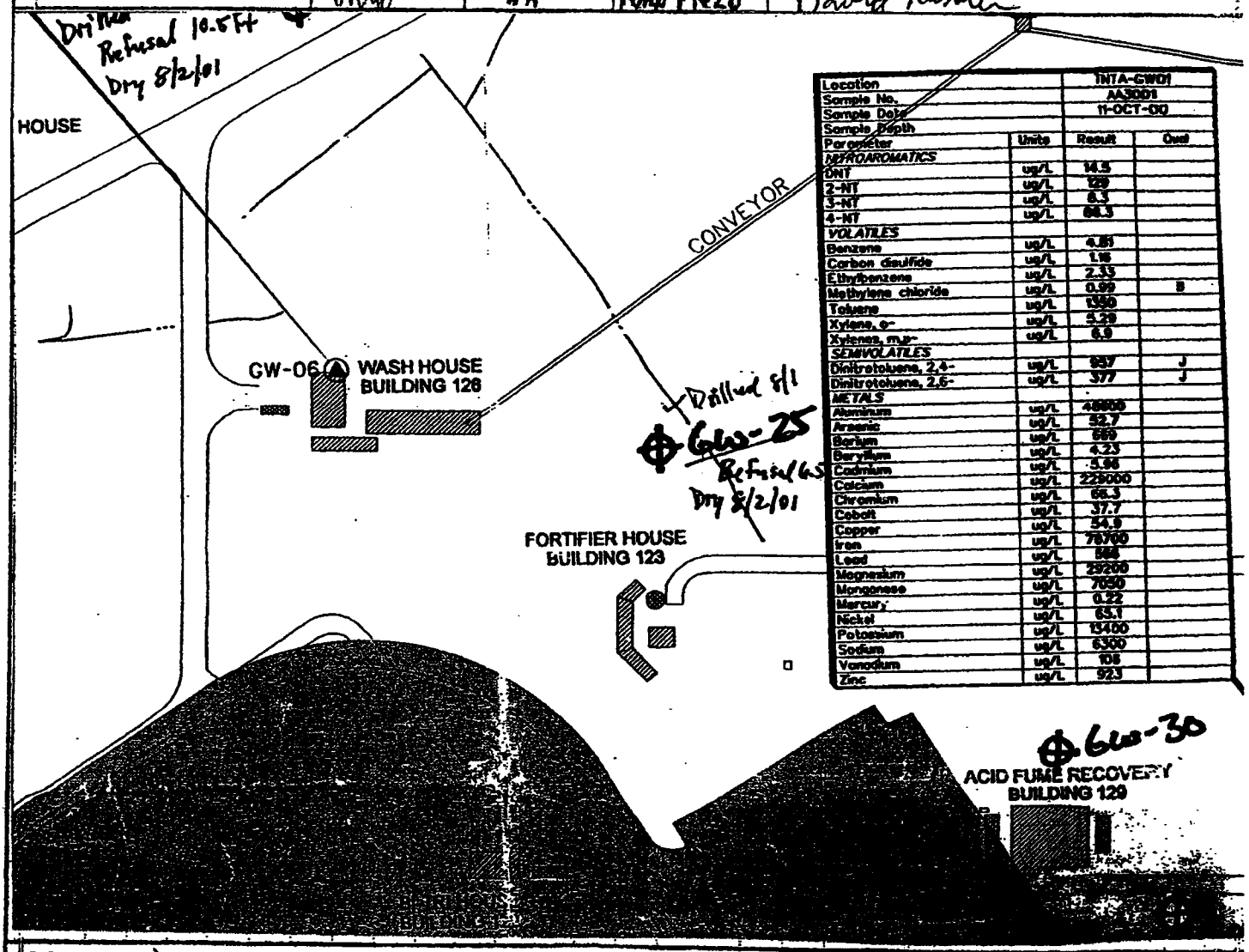
HTRW DRILLING LOG

1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	DISTRICT: USACE - Nashville
3. PROJECT: PBOW	4. LOCATION: TNT Area A	HOLE NUMBER: GW-25
5. NAME OF DRILLER: Pete Goss	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT 66	SHEET 1 OF 2 SHEETS
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: DT 66 All terrain, track mounted geoprobe rig with 3 1/4 inch OD probe. Temporary Piezometer 2" OD Sch 40 PVC 0.010" slot screen	8. HOLE LOCATION: Bldg 123 (Downgradient)	
	9. SURFACE ELEVATION: 647.27 Ft N: 624216.21 E: 1924365.21	
	10. DATE STARTED: 8/1/01	11. DATE COMPLETED: 8/1/01
12. OVERBURDEN THICKNESS: 6.5 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Groundwater not encountered	
13. DEPTH DRILLED INTO ROCK: -0-	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 9.60 Ft 8/6/01 0754 (0.3' water column - NO Sc	
14. TOTAL DEPTH OF HOLE: 6.5 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kesler



Location		TNTA-GW01	
Sample No.		AA3001	
Sample Date		11-OCT-00	
Sample Depth			
Parameter	Units	Result	Qual
NITROAROMATICS			
0NT	ug/L	14.5	
2-NT	ug/L	129	
3-NT	ug/L	8.3	
4-NT	ug/L	88.3	
VOLATILES			
Benzene	ug/L	4.81	
Carbon disulfide	ug/L	1.16	
Ethylbenzene	ug/L	2.35	
Methylene chloride	ug/L	0.99	B
Toluene	ug/L	1350	
Xylene, o-	ug/L	5.29	
Xylenes, m,p-	ug/L	6.9	
SEMIVOLATILES			
Dinitrotoluene, 2,4-	ug/L	957	J
Dinitrotoluene, 2,6-	ug/L	377	J
METALS			
Aluminum	ug/L	48600	
Arsenic	ug/L	52.7	
Barium	ug/L	669	
Beryllium	ug/L	4.23	
Cadmium	ug/L	5.96	
Calcium	ug/L	225000	
Chromium	ug/L	68.3	
Cobalt	ug/L	37.7	
Copper	ug/L	54.9	
Iron	ug/L	78700	
Lead	ug/L	588	
Magnesium	ug/L	29200	
Manganese	ug/L	7050	
Mercury	ug/L	0.22	
Nickel	ug/L	65.1	
Potassium	ug/L	13400	
Sodium	ug/L	6300	
Vanadium	ug/L	108	
Zinc	ug/L	923	

PROJECT: PBOW	HOLE NO.: GW-25

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-25

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 2 Sheets

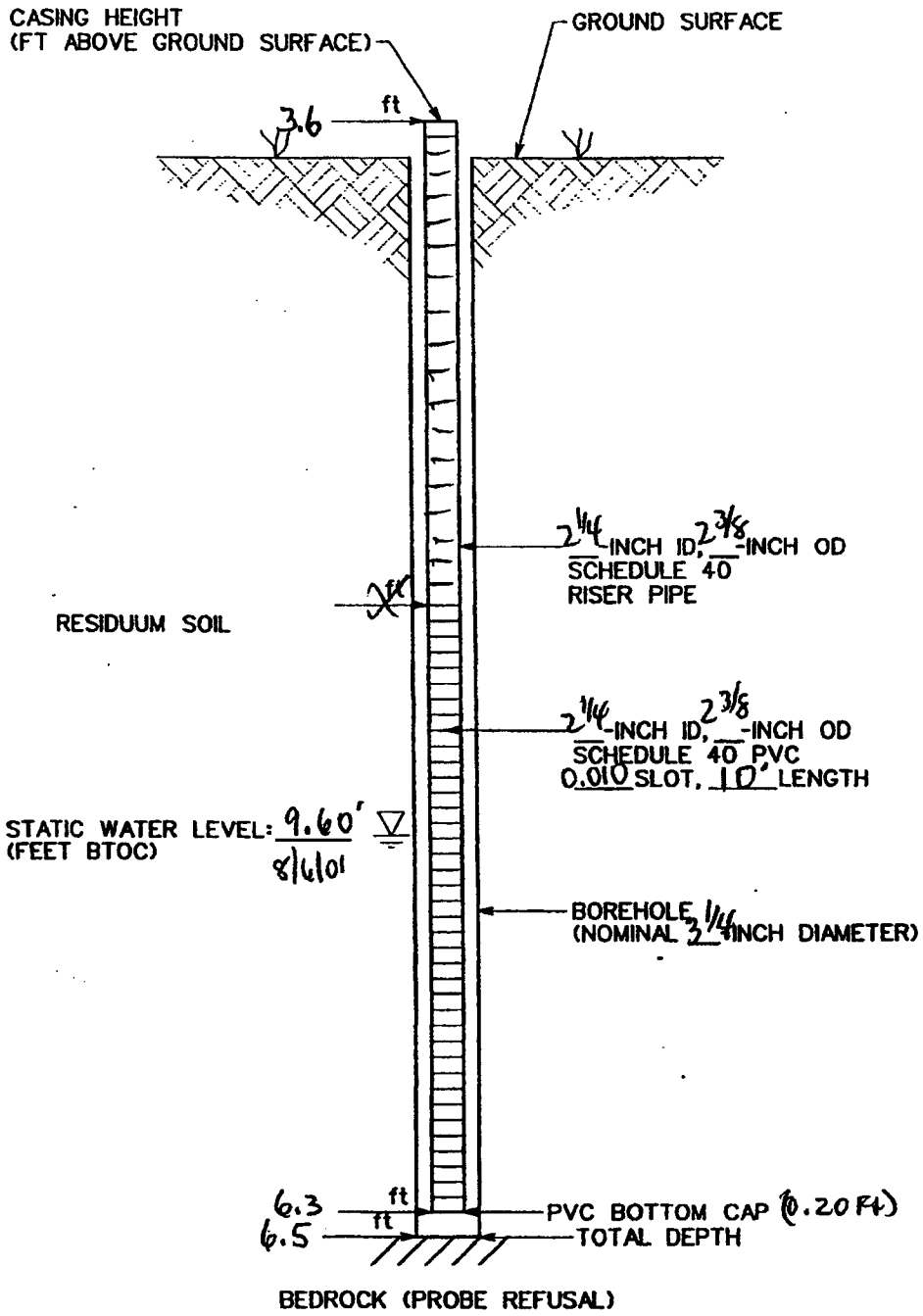
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Litho	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Mown Weeds						
			NA		NA	NA	NA	Began drilling 8/1/01 1455
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							Breathing Air PID = 0.0 ppm
	6							VRAE: CO = 0 ppm LEL = 1 ppm H_2S = 0 ppm O_2 = 21.3%
	7	Probe Refusal @ 6.5 ft TD = 6.5 ft						
	8							
	9			0.0				
	10							

Project: PBOW

Hole Number: GW-25

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT A



NOTES:

PIEZOMETER NO.: GW-25

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016	
ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635	
STARTING DATE: 07/23/01	DATE LAST REV.:		
DRAWN BY: B. VANDERGRIFF	DRAWN BY:		

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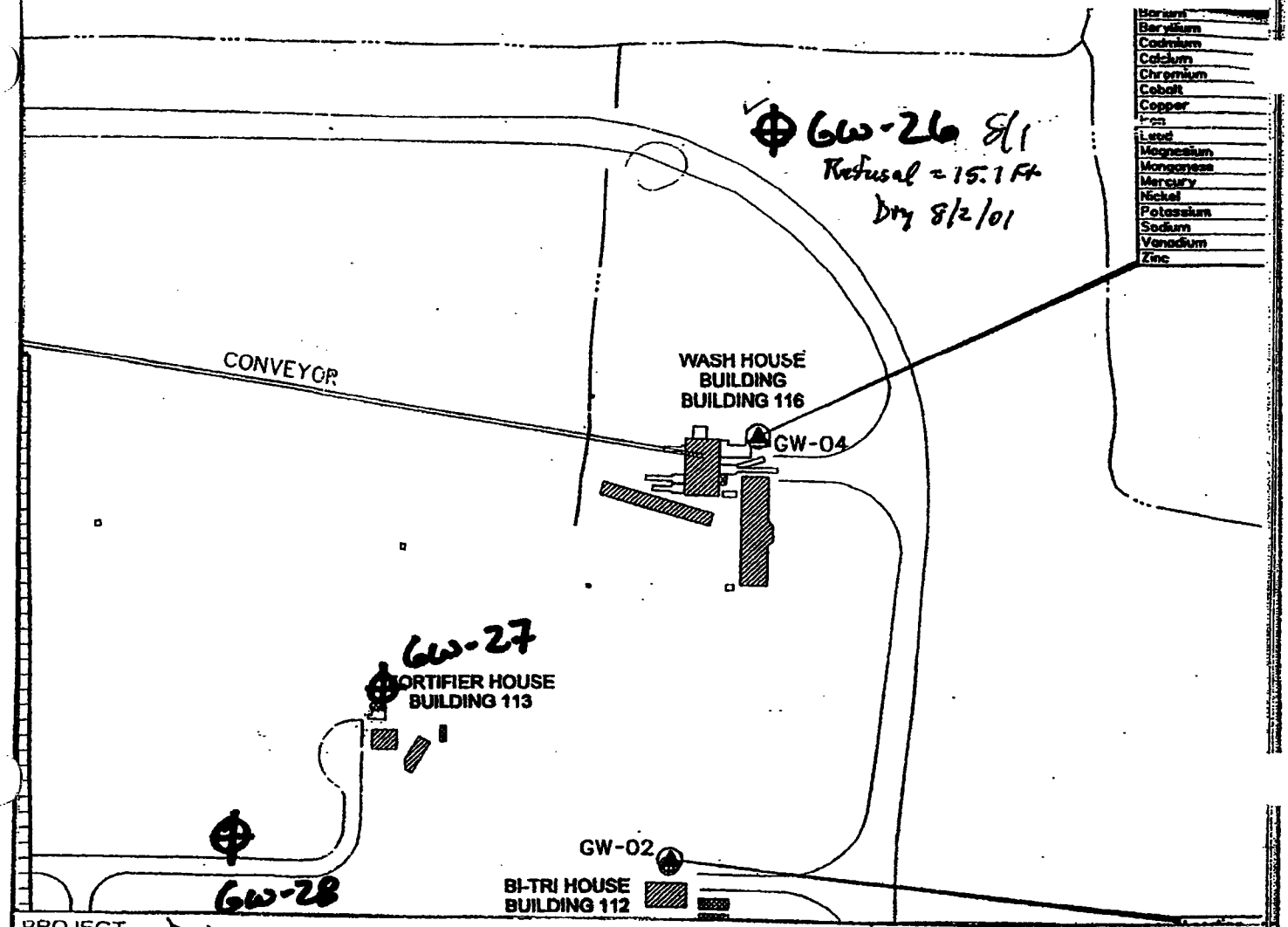
HTRW DRILLING LOG

DISTRICT: USACE - Nashville	HOLE NUMBER: GW-26	
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	SHEET 1 OF 3
3. PROJECT: PBOW	4. LOCATION: TNT Area A	
5. NAME OF DRILLER: Pete Goss	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT 66	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: DT 66 All terrain, track mounted geoprobe rig with 3 1/4 inch OD probe. Temporary piezometer 2" OD, Sch 40 PVC. 0.010" slot screen	8. HOLE LOCATION: Bldg 116	
	9. SURFACE ELEVATION: 635.59 Ft	N: 624710.32 E: 1925228.32
	10. DATE STARTED: 8/1/01	11. DATE COMPLETED: 8/1/01
12. OVERBURDEN THICKNESS: 15.1 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Groundwater not encountered	
13. DEPTH DRILLED INTO ROCK: -0-	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: Dry 8/6/01 0745	
14. TOTAL DEPTH OF HOLE: 15.1 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kessler



PROJECT: PBOW

HOLE NO. GW-26

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-26

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 3 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhc	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Mown Weeds	NA		NA	NA	NA	Began drilling 8/1/01 1205
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							PID=0.0ppm
								VRAE:
	6							CO= 0ppm
								LEL= 0 ppm
	7							~~H2O~~ H_2S = 0ppm
								O_2 = 21.3%
	8							
	9							
	10							

Project: PBOW

Hole Number: GW-26

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-26

Project: PBOW

Geologist: D. Kessler

Sheet 3 of 3 Sheets

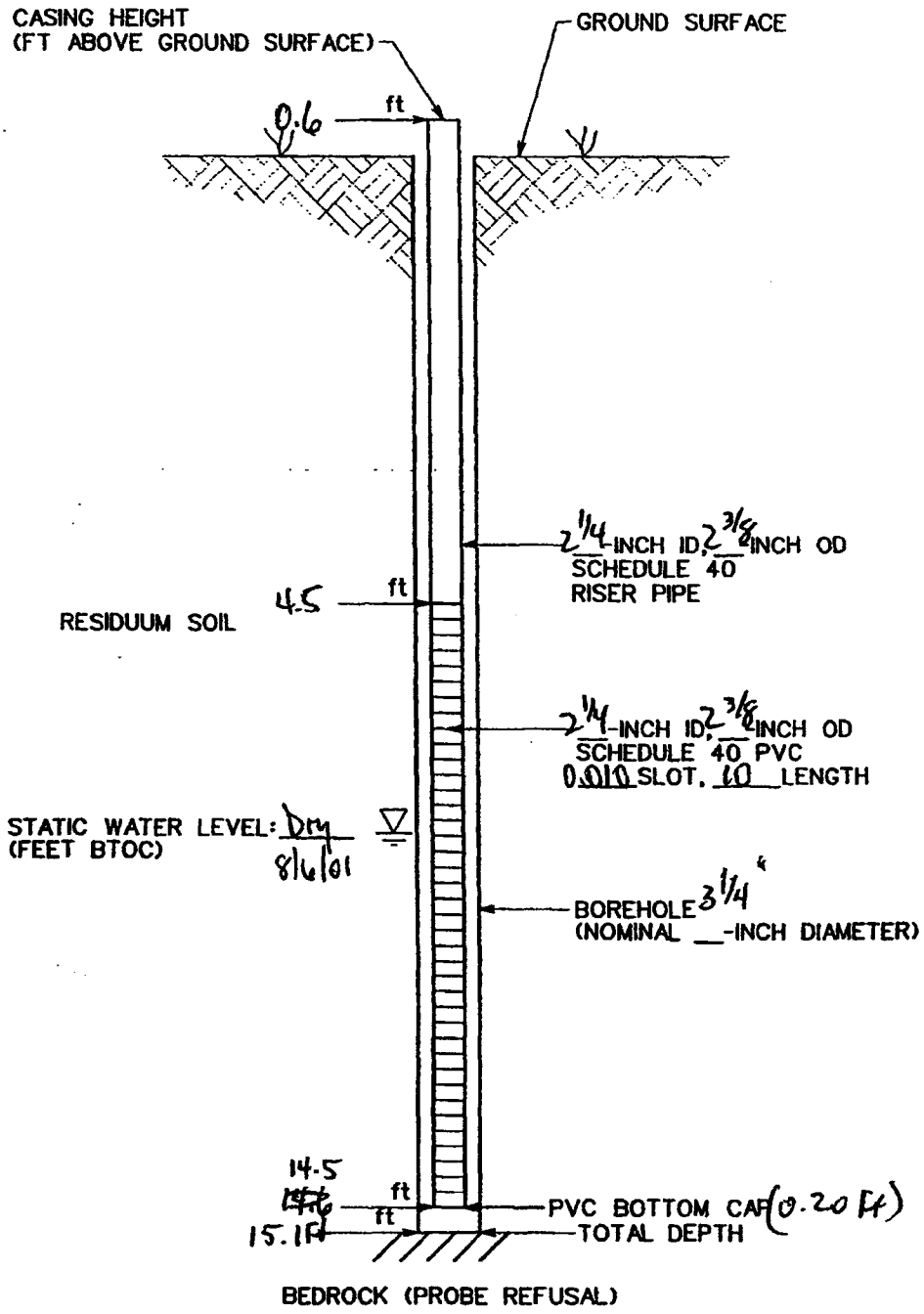
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
			NA	0.0	NA	NA	NA	
	11							
	12							
	13							
	14							
	15							
		Probe Refusal @ 15.1 ft TD = 15.1 ft						
	16							
	17							
	18							
	19							
	20							

Project: PBOW

Hole Number: GW-26

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: INTA



NOTES:

PIEZOMETER NO.: GW-26

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/28/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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HTRW DRILLING LOG

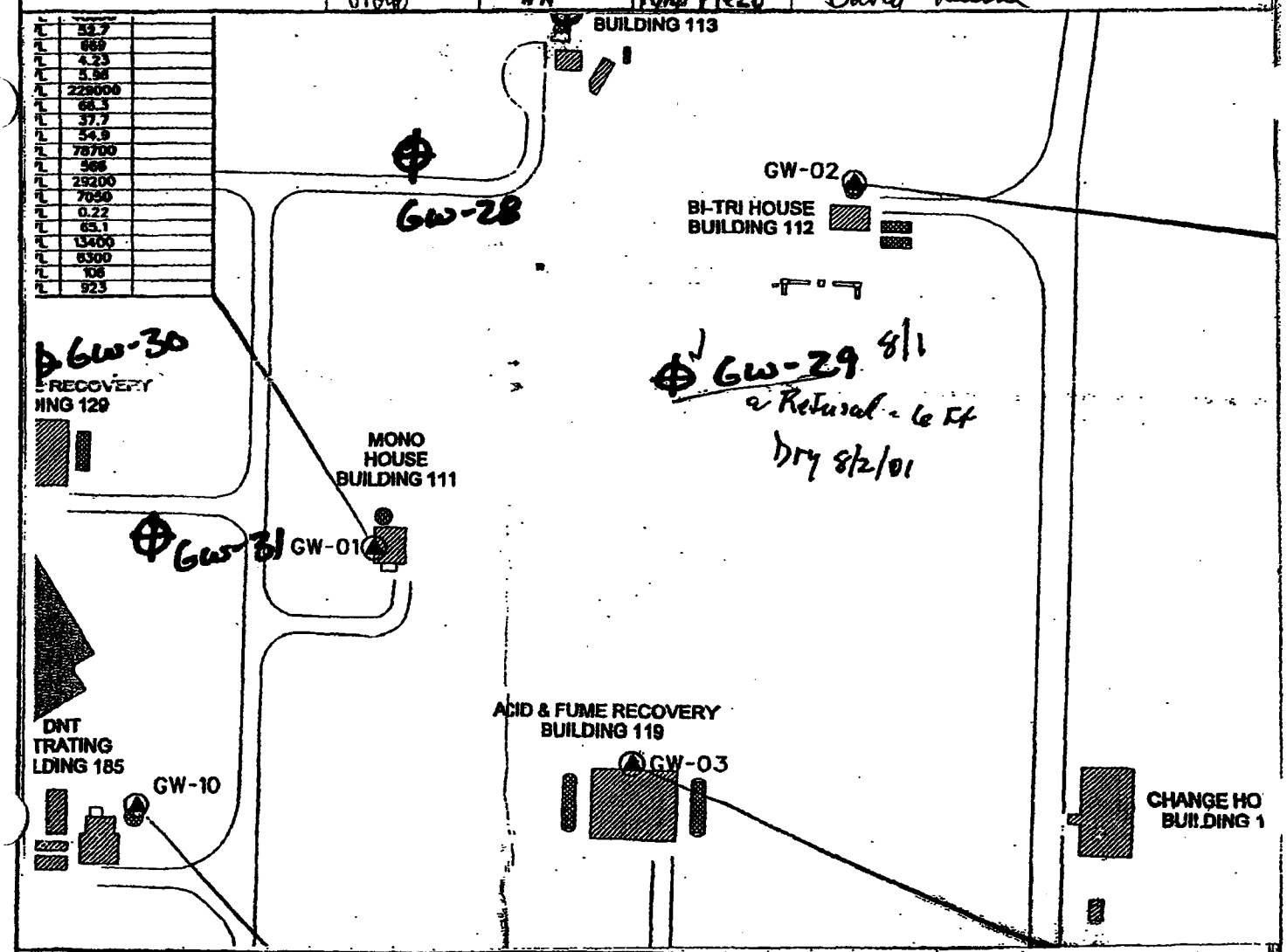
DISTRICT	USACE - Nashville
HOLE NUMBER	GW-29
SHEET / OF	1 / 2
1. COMPANY NAME	IT Corporation
2. DRILL SUBCONTRACTOR	Prosonic
3. PROJECT	PBOW
4. LOCATION	TNT Area A
5. NAME OF DRILLER	Pete Goss
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe DT 66
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	DT 66 All terrain, track mounted geoprobe rig with 3 1/4 inch OD probe. Temporary piezometer 2" OD, Sch 40 PVC 0.010" slot screen
8. HOLE LOCATION	Bldg 112 (Upgradient)
9. SURFACE ELEVATION	651.70 Ft N: 624060.50 E: 1925148.99
10. DATE STARTED	8/1/01
11. DATE COMPLETED	8/1/01
12. OVERBURDEN THICKNESS	6 Ft
13. DEPTH DRILLED INTO ROCK	-0-
14. TOTAL DEPTH OF HOLE	6 FT
15. DEPTH GROUNDWATER ENCOUNTERED	Groundwater not encountered.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	Dry 8/6/01 0749
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	—

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kussh

℄	58.7
℄	669
℄	4.23
℄	5.56
℄	228000
℄	68.3
℄	37.7
℄	54.9
℄	78700
℄	566
℄	29200
℄	7050
℄	0.22
℄	65.1
℄	13400
℄	6300
℄	106
℄	923



PROJECT PBOW

HOLE NO.

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-29

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 2 Sheets

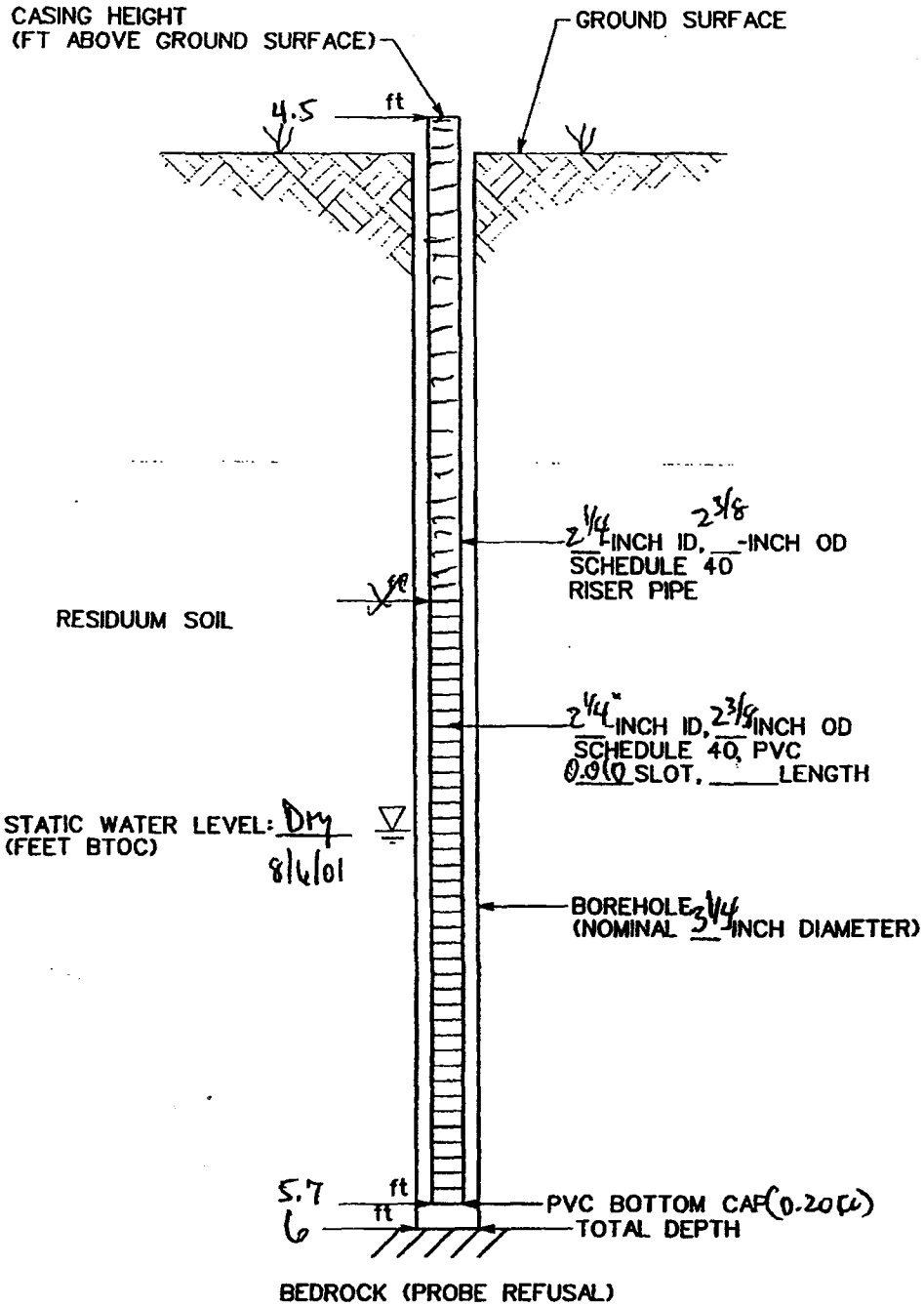
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Mown Weeds	NA		NA	NA	NA	Began drilling 8/1/01 1420
	1			0.0				
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							Breathing Air: PID = 0.0 ppm
	6	Probe Refusal @ 6 Ft TD = 6 Ft						VRAE: CO = 0 ppm LEL = 1 ppm H_2S = 0 ppm O_2 = 21.2%
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: GW-29

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: INTA



NOTES:

PIEZOMETER NO.: GW-29

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

NOT TO SCALE

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.:\825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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TNT MANUFACTURING AREA B

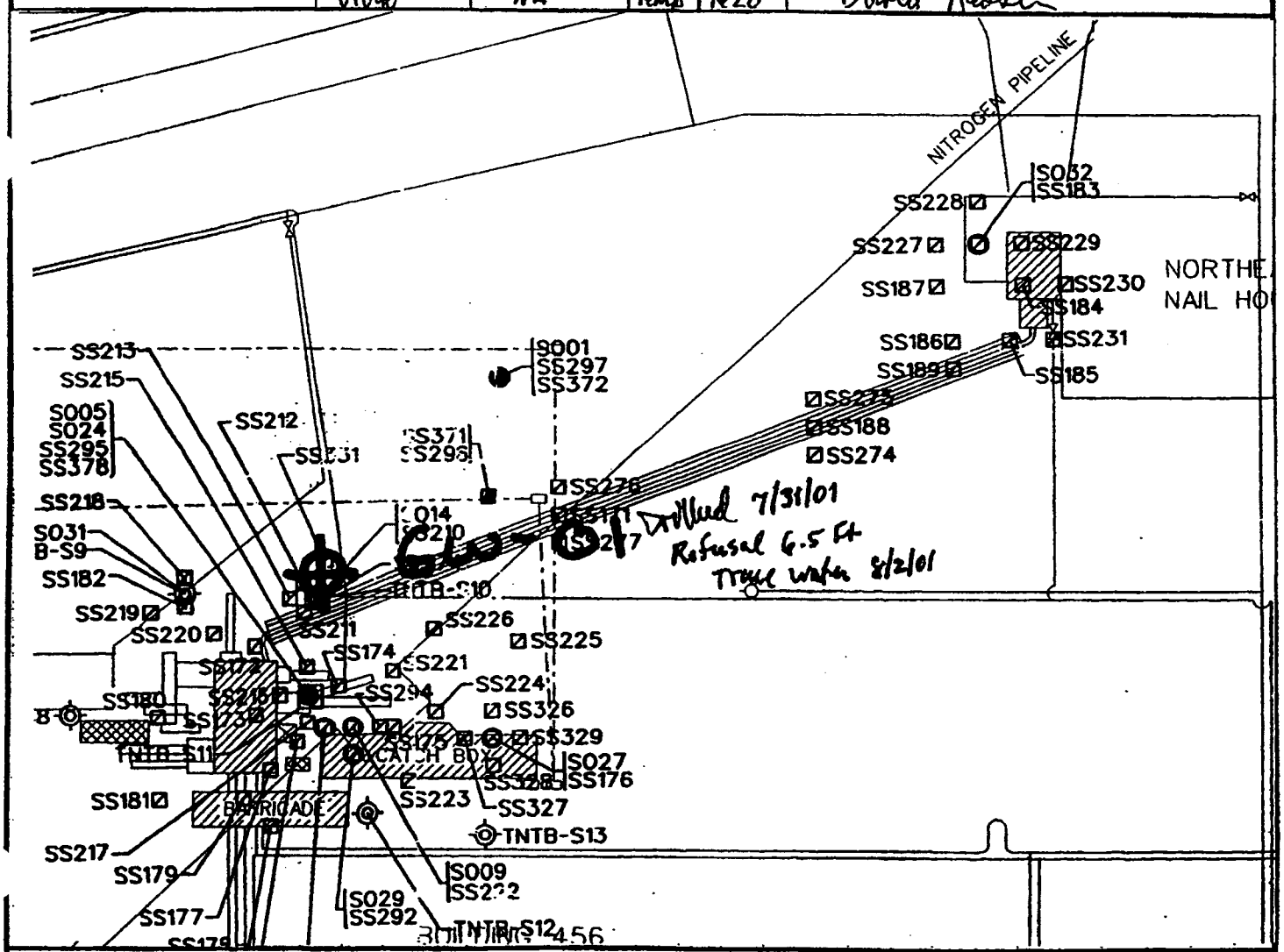
HTRW DRILLING LOG

DISTRICT: USACE - Nashville	HOLE NUMBER: GW-01	SHEET 1 OF 2 SHEETS
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	
3. PROJECT: PBOW	4. LOCATION: TNT Area B	
5. NAME OF DRILLER: Pete Goss	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT66	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: DT66 All terrain, track mounted geoprobe rig with 2 5/8 Inch OD probe. Temporary Piezometer 2" OD, Sch 40 PVC, 0.010" slot screen	8. HOLE LOCATION: Bldg 456	
	9. SURFACE ELEVATION: 666.70 Ft N: 618367.59 E: 1918624.93	
	10. DATE STARTED: 7/31/01	11. DATE COMPLETED: 7/31/01
12. OVERBURDEN THICKNESS: 6.5 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Not encountered	
13. DEPTH DRILLED INTO ROCK: -0-	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: ~~dry~~ 9.86 Ft 8/2/01 (0.14' water column)	
14. TOTAL DEPTH OF HOLE: 6.5 Ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 9.85 Ft 8/6/01 (0.15' water column) - No Sample	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Keasel



PROJECT	HOLE NO.
PBOW	GW-01

HTRW DRILLING LOG

(continuation sheet) NTB

Hole Number: GW-01

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 2 Sheets

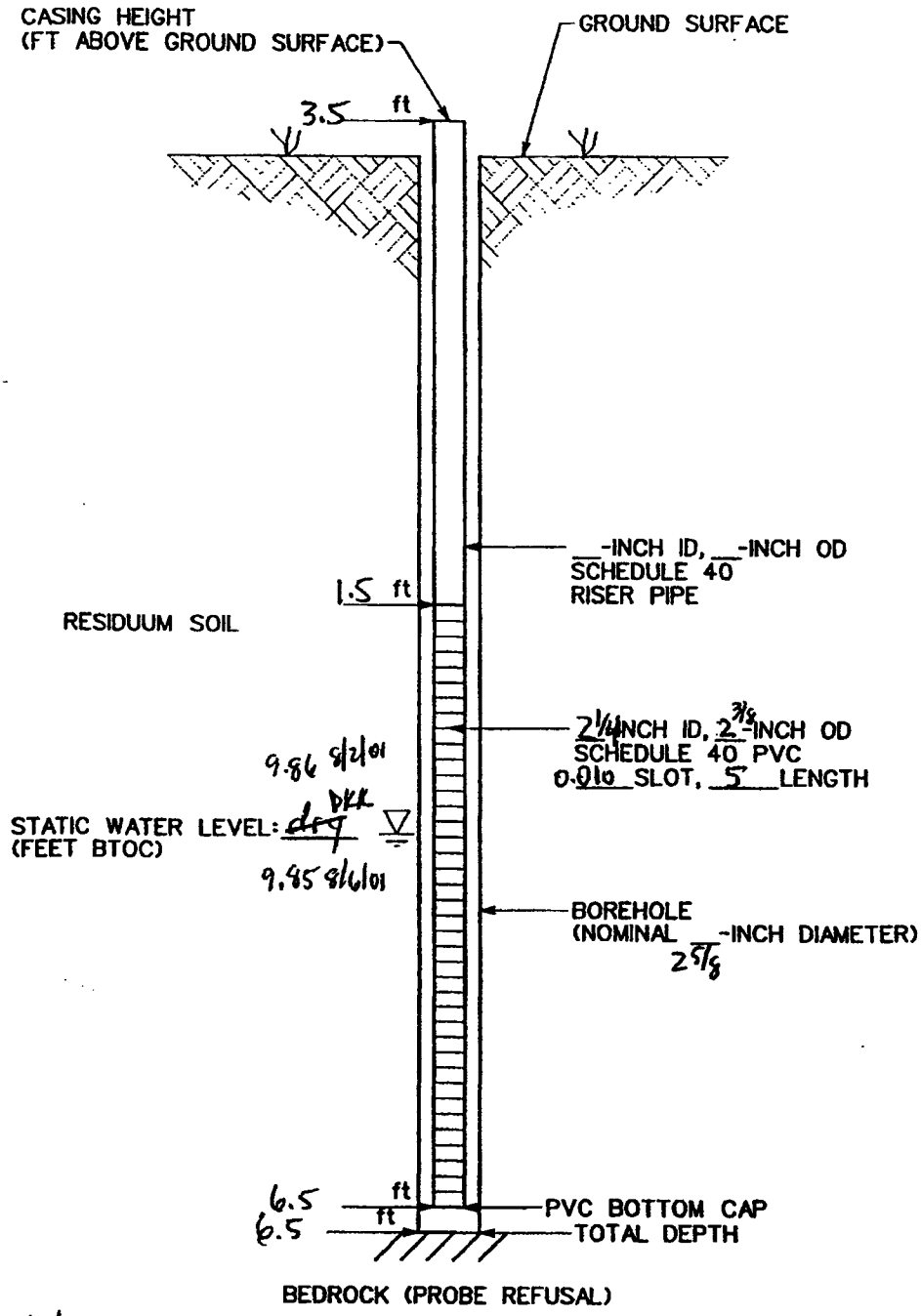
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Grass			NA	NA		Began drilling 7/31/01
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							1st Attempt: 4 Ft 2nd Attempt: 4 Ft 3RD Attempt: 6.5 Ft Total 14.5 Ft
	6							
								Location 12 Ft. southeast stake
	7	Probe Refusal @ 6.5 Ft TD = 6.5 Ft						
	8							
	9							
	10							

Project: PBOW

Hole Number: GW-01

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNTB:GW-01



Trace Water

NOTES:

PIEZOMETER NO.: GW-01

DATE INSTALLED: 7/31/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

DWG. NO.: \825635ES.016 | PROJ. NO.: 825635 | INITIATOR: C. WILLIAMS | PROJ. MGR.: SPANGBERG | DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY: C. WILLIAMS | DATE LAST REV.: | DRAWN BY: | STARTING DATE: 07/23/01 | DRAWN BY: B. VANDERGRIFF

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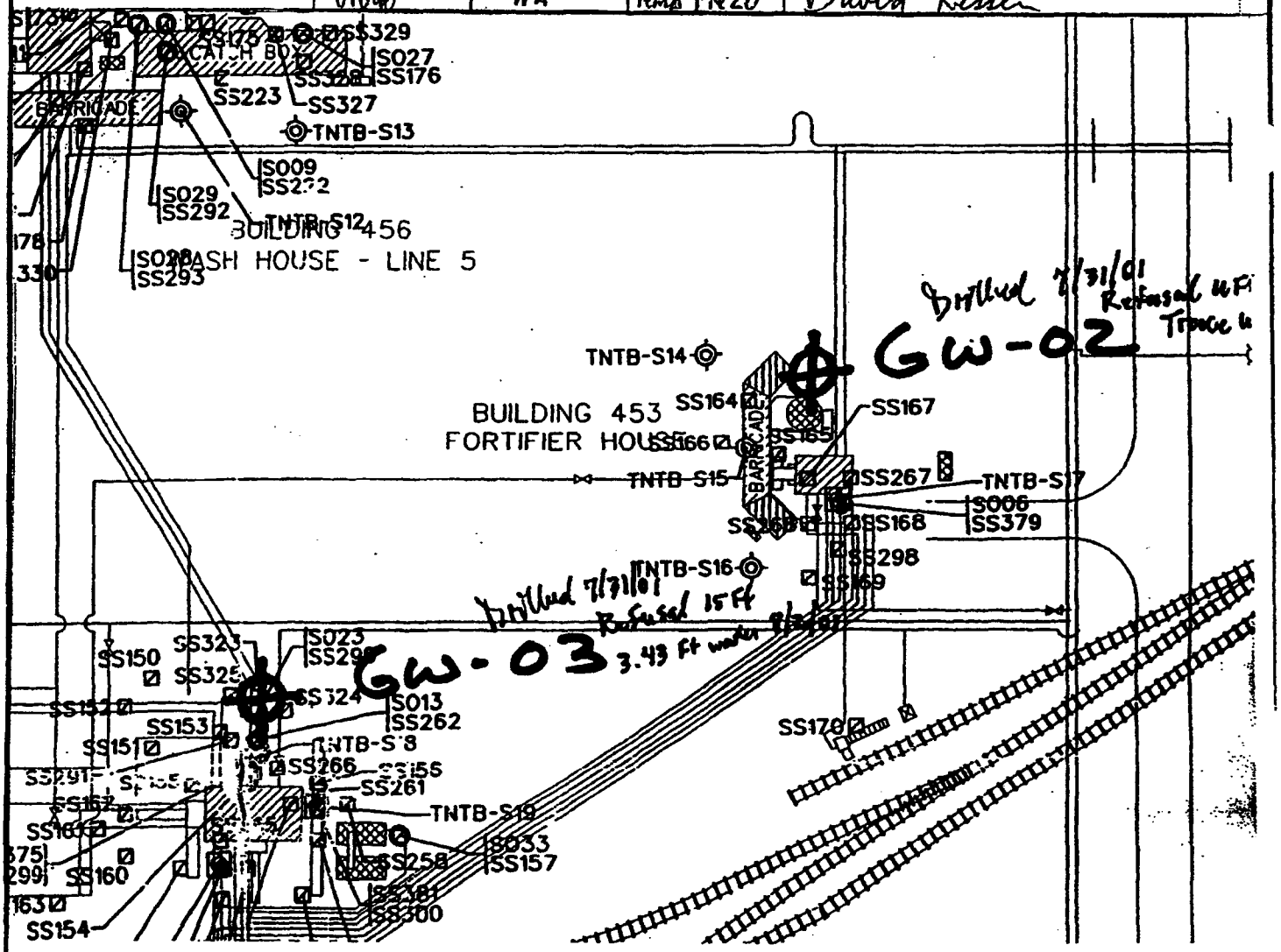
HTRW DRILLING LOG

DISTRICT: USACE - Nashville		HOLE NUMBER: GW-02
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	SHEET 1 OF 3 SHEETS
3. PROJECT: PBOW	4. LOCATION: TNT Area B	
5. NAME OF DRILLER: Pete Goss	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT 66	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3¼" DT 66 All terrain, track mounted geoprobe rig with 2¼ inch OD probe. Temporary Piezometer 2" OD, Sch 40 PVC. 0.010" slot screen	8. HOLE LOCATION: Bldg 453 (Fortifier House)	
	9. SURFACE ELEVATION: 675.42 Ft N: 618188.48 E: 1918855.64	
	10. DATE STARTED: 7/31/01	11. DATE COMPLETED: 7/31/01
12. OVERBURDEN THICKNESS: 11 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Not encountered.	
13. DEPTH DRILLED INTO ROCK: -0-	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: ~~dry~~ 13.60 Ft 8/6/01 1145	
14. TOTAL DEPTH OF HOLE: 11 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	yes	yes	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kessler



PROJECT: PBOW	HOLE NO: GW-02

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-02

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 3 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ USRS	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Grass	NA	NA	NA		NA	Began drilling 7/31/01 1210
	1					BB 3002		
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							PID recharging
	6							
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: GW-02

HTRW DRILLING LOG

(continuation sheet)

Hole Number: GW-02

Project: PBOW

Geologist: D. Kressler

Sheet 3 of 3 Sheets

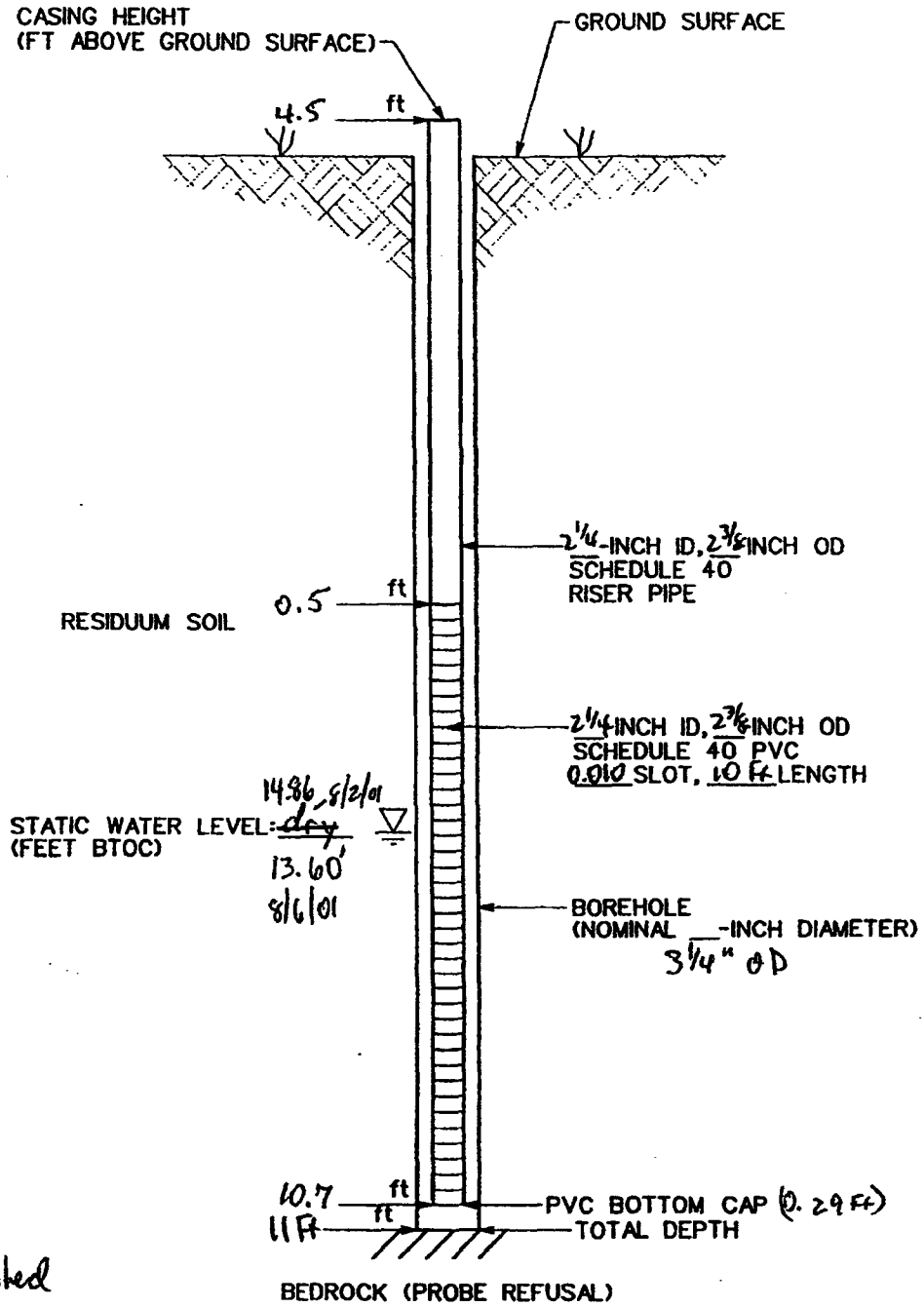
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NA	NA		NA	
	11	Probe Refusal @ 11 Ft. TD= 11 Ft.						
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							

Project: PBOW

Hole Number: GW-02

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNTB-GW02



Sampled
~~Free water~~

NOTES:

PIEZOMETER NO.: GW-02
DATE INSTALLED: 7/31/01
DATE REMOVED: 8/6/01

NOT TO SCALE

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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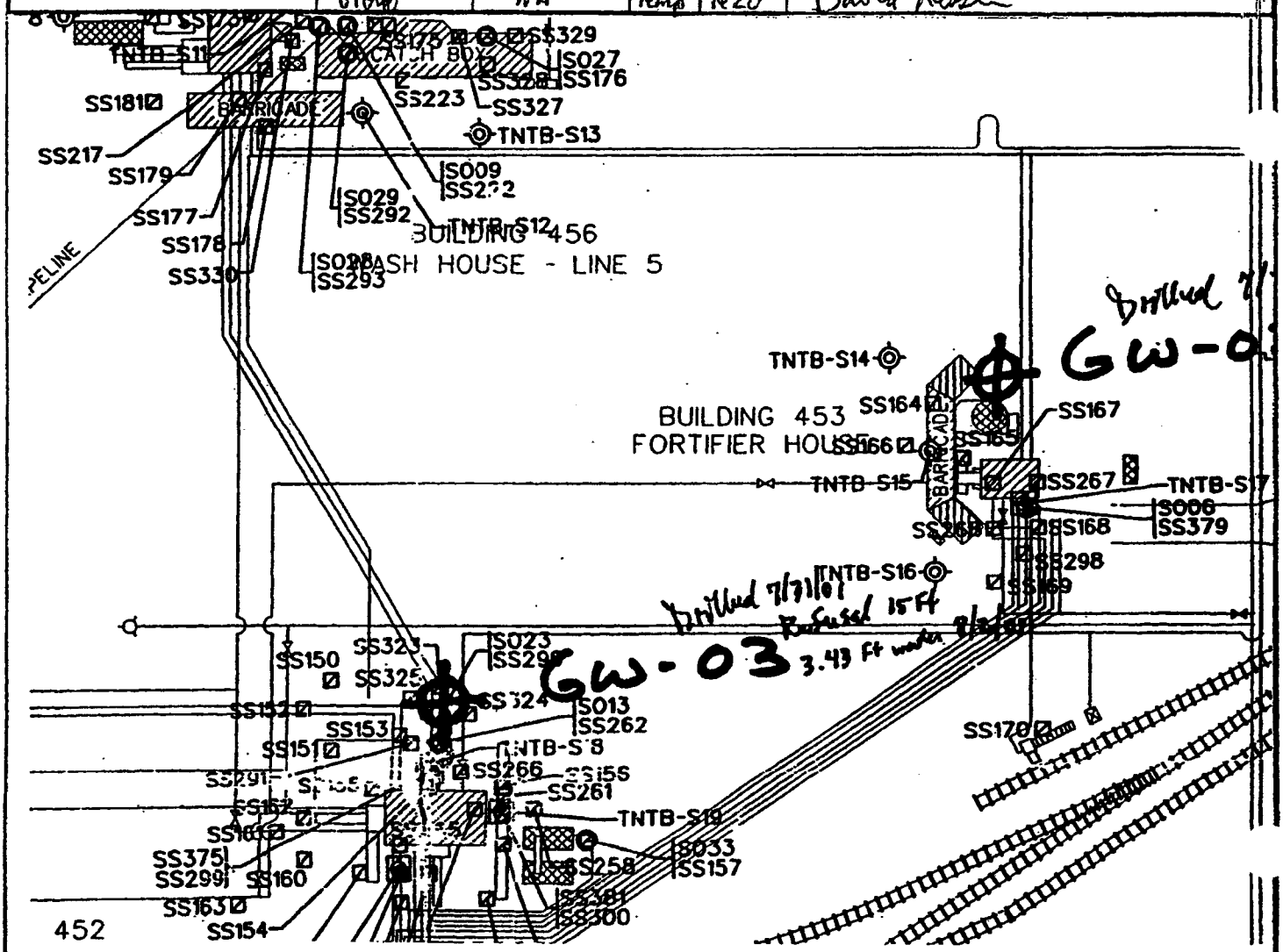
HTRW DRILLING LOG

DISTRICT: USACE - Nashville	HOLE NUMBER: GW-003	
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	SHEET 1 OF 3
3. PROJECT: PBOW	4. LOCATION: TNT Area B	
5. NAME OF DRILLER: Pete Goss	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT 66	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: DT 66 All terrain, track mounted geoprobe rig with ~~2-1/4~~ 1 3/4 inch OD probe. Temporary Piezometer 2" OD, Sch 40 PVC. 0.010" slot screen	8. HOLE LOCATION: Bldg 452	
	9. SURFACE ELEVATION: 680.81 Ft N: 618102.55 E: 1918710.11	
	10. DATE STARTED: 7/31/01	11. DATE COMPLETED: 7/31/01
12. OVERBURDEN THICKNESS: 15 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Groundwater not encountered	
13. DEPTH DRILLED INTO ROCK: -0-	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 15.31 ft. 8/1/01, 15.28 Ft 8/1/01 1533 - sampled	
14. TOTAL DEPTH OF HOLE: 15 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	yes	yes	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kessler



PROJECT	HOLE NO.
PBOW	GW-003

HTRW DRILLING LOG

(continuation sheet) TNT-B

Hole Number: GW-003

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 3 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ USDA	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Grass	NA	NA	NA		NA	Began drilling 7/31/01 1435
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							PID unit being recharged. No readings (air quality) taken.
	6							
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: GW-003

HTRW DRILLING LOG

(continuation sheet) FNTB

Hole Number: GW-003

Project: PBOW

Geologist: D. Kessler

Sheet 3 of 3 Sheets

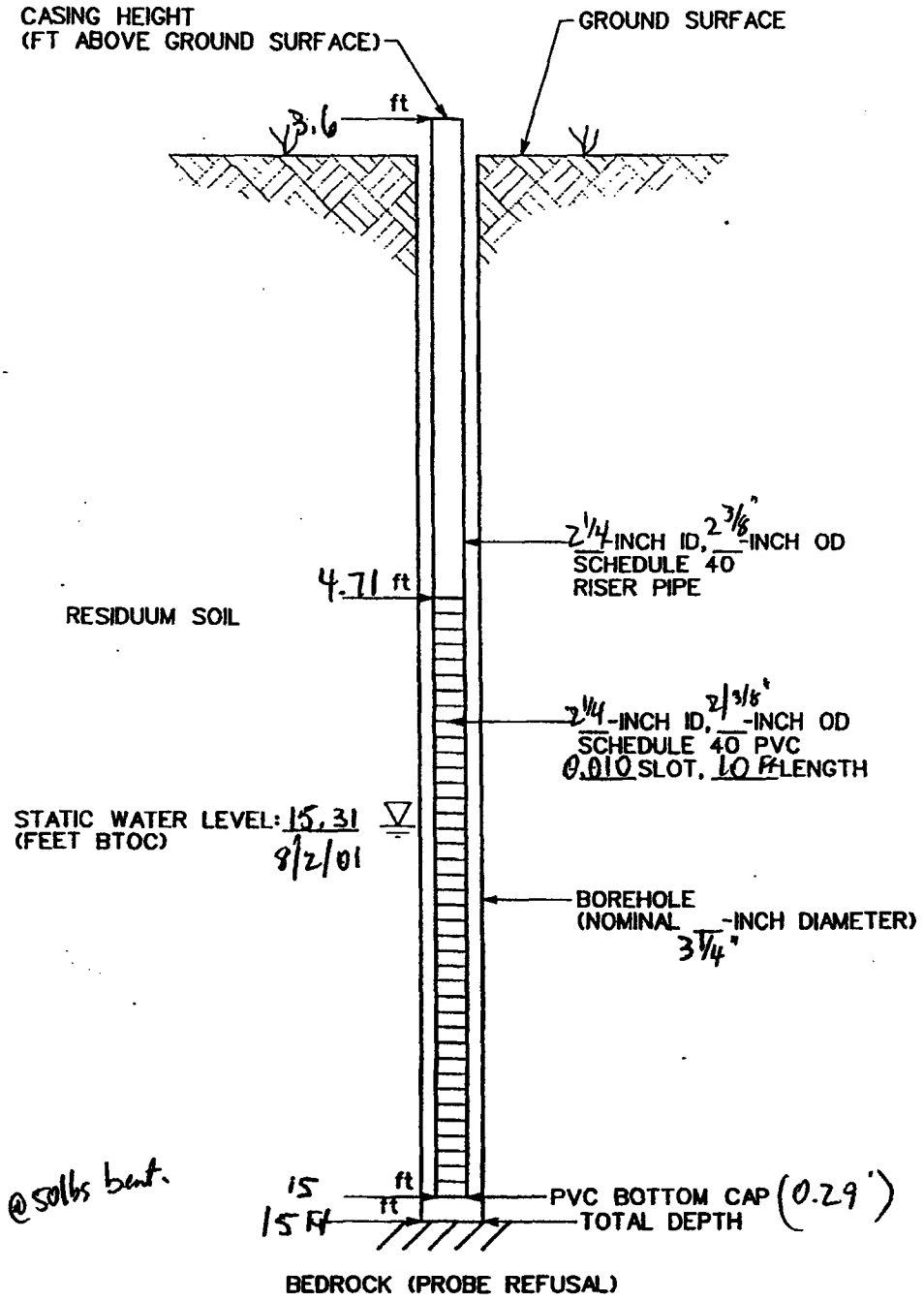
Elev (ft)	Depth (ft) Dgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
			NA		NA		NA	
						BB		
						3003		
	11							
	12							
	13							
	14							
	15	Probe Refusal @ 15 Ft						
		TD = 15 Ft						
	16							
	17							
	18							
	19							
	20							

Project: PBOW

Hole Number: GW-003

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: INTB-GW-003



2 1/2 bags @ 50lbs bent.

Sampled

NOTES:

PIEZOMETER NO.: GW-003

DATE INSTALLED: 7/31/01

DATE REMOVED: 8/2/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

DWG. NO.: \825635ES.016 | PROJ. NO.: 825635
INITIATOR: C. WILLIAMS | PROJ. MGR.: SPANGBERG
DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY: C. WILLIAMS
STARTING DATE: 07/23/01 | DATE LAST REV.
DRAWN BY: B. VANDERGRIFF | DRAWN BY:
10:02:05 07/30/01
bvanderg
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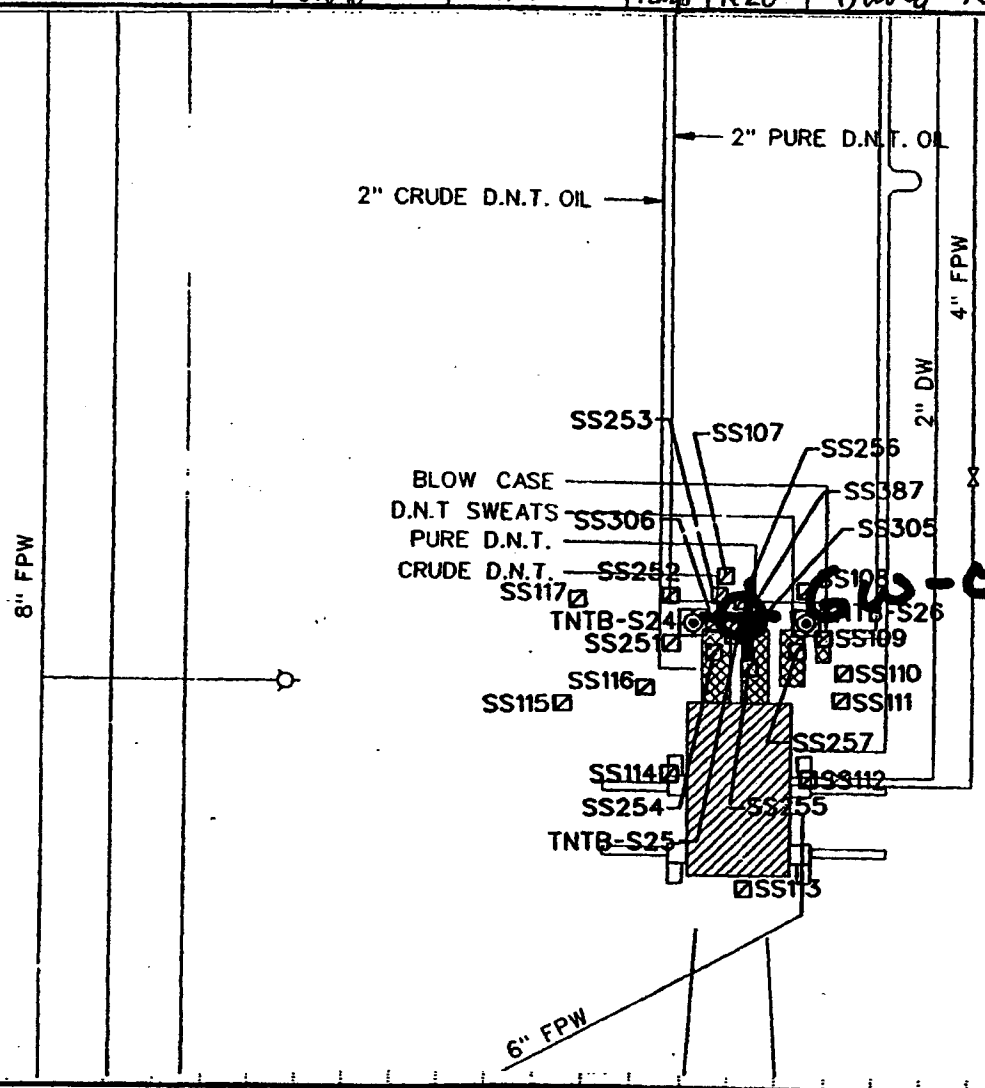
HTRW DRILLING LOG

DISTRICT	USACE - Nashville
HOLE NUMBER	GW-004
1. COMPANY NAME	IT Corporation
2. DRILL SUBCONTRACTOR	Prosonic
SHEET	1 OF 2
3. PROJECT	PBOW
4. LOCATION	TNT Area B
5. NAME OF DRILLER	Pete Goss
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe DT 66
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3 1/4" DT 66 AK terrain, track mounted geoprobe rig with ~~2.5~~ inch OD probe. Temporary Piezometer 2" OD, Sch 40 PVC 0.010" slot screen
8. HOLE LOCATION	Bldg 412 (DNT Sweating + Graining House) N: 617135.01 E: 1918389.94
9. SURFACE ELEVATION	671.48 Ft
10. DATE STARTED	7/31/01
11. DATE COMPLETED	7/31/01
12. OVERBURDEN THICKNESS	6 Ft
13. DEPTH DRILLED INTO ROCK	-0-
14. TOTAL DEPTH OF HOLE	6 Ft
15. DEPTH GROUNDWATER ENCOUNTERED	Groundwater not encountered
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	dry 8/6/01 0825
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	—

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kessler



D. N

PROJECT	HOLE NO.
PBOW	GW-004

HTRW DRILLING LOG

(continuation sheet) TNTB

Hole Number: GW-004

Project: PBOW

Geologist: D. Kressler

Sheet 2 of 2 Sheets

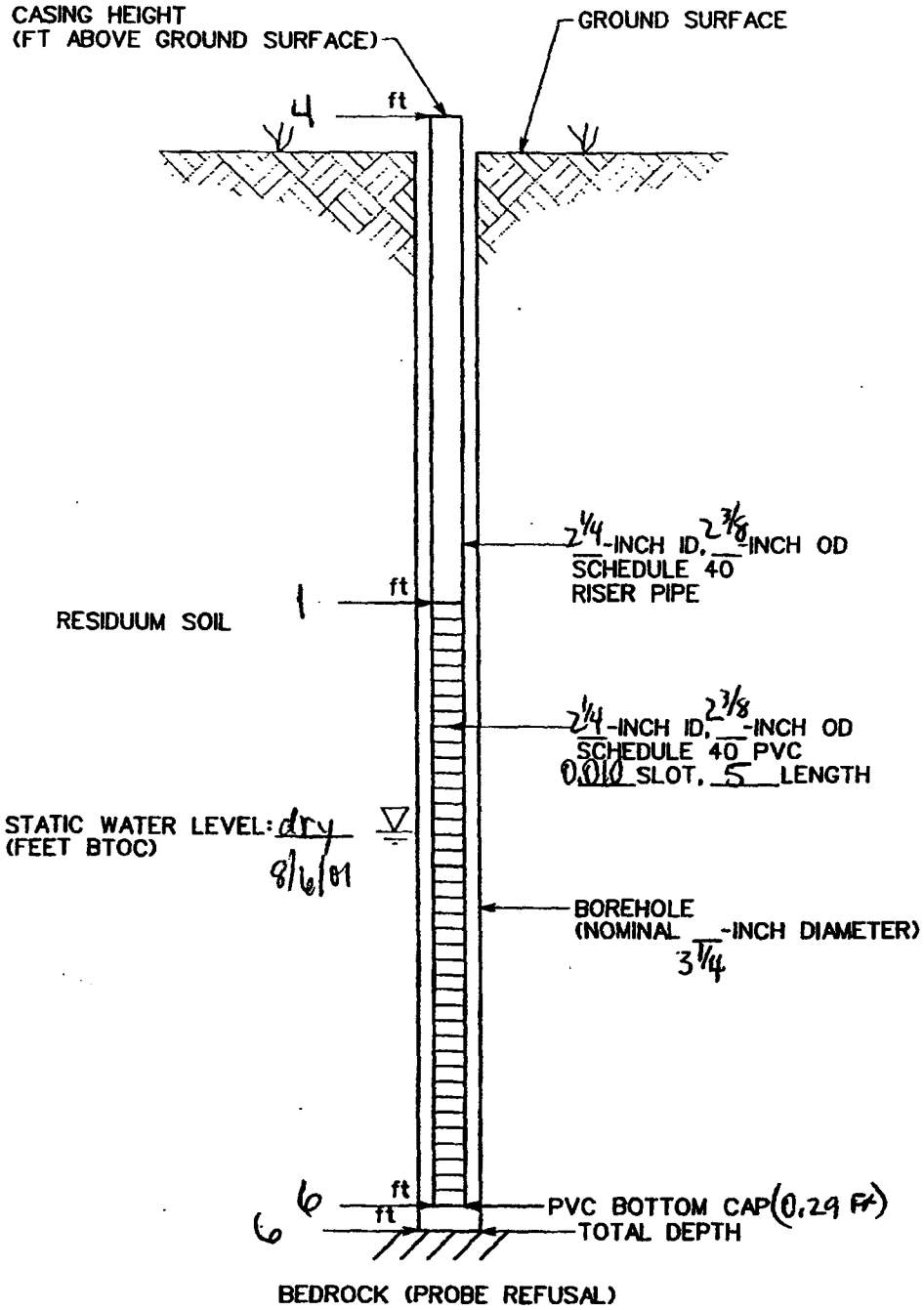
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ USM	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Grass	NA	NA	NA	NA	NA	Began drilling 7/31/01 1525
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5							PID meter being recharged No air quality readings taken
	6	Probe Refusal @ 6 Ft TD = 6 Ft						
	7							1st attempt Bedrock 4 Ft. 2nd attempt. Moved 20 Ft straight south.
	8							Shale present (outcrop) in nearby ditch.
	9							
	10							

Project: PBOW

Hole Number: GW-004

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNTB = GW-004



Dry

NOTES:

PIEZOMETER NO.: GW-004

DATE INSTALLED: 7/31/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

DWG. NO.: \825635ES.016	
PROJ. NO.: 825635	
INITIATOR: C. WILLIAMS	
PROJ. MGR.: SPANGBERG	
DRAFT. CHCK. BY: C. TUMLIN	
ENGR. CHCK. BY: C. WILLIAMS	
DATE LAST REV.:	
DRAWN BY:	
STARTING DATE: 07/23/01	
DRAWN BY: B. VANDERGRIFF	

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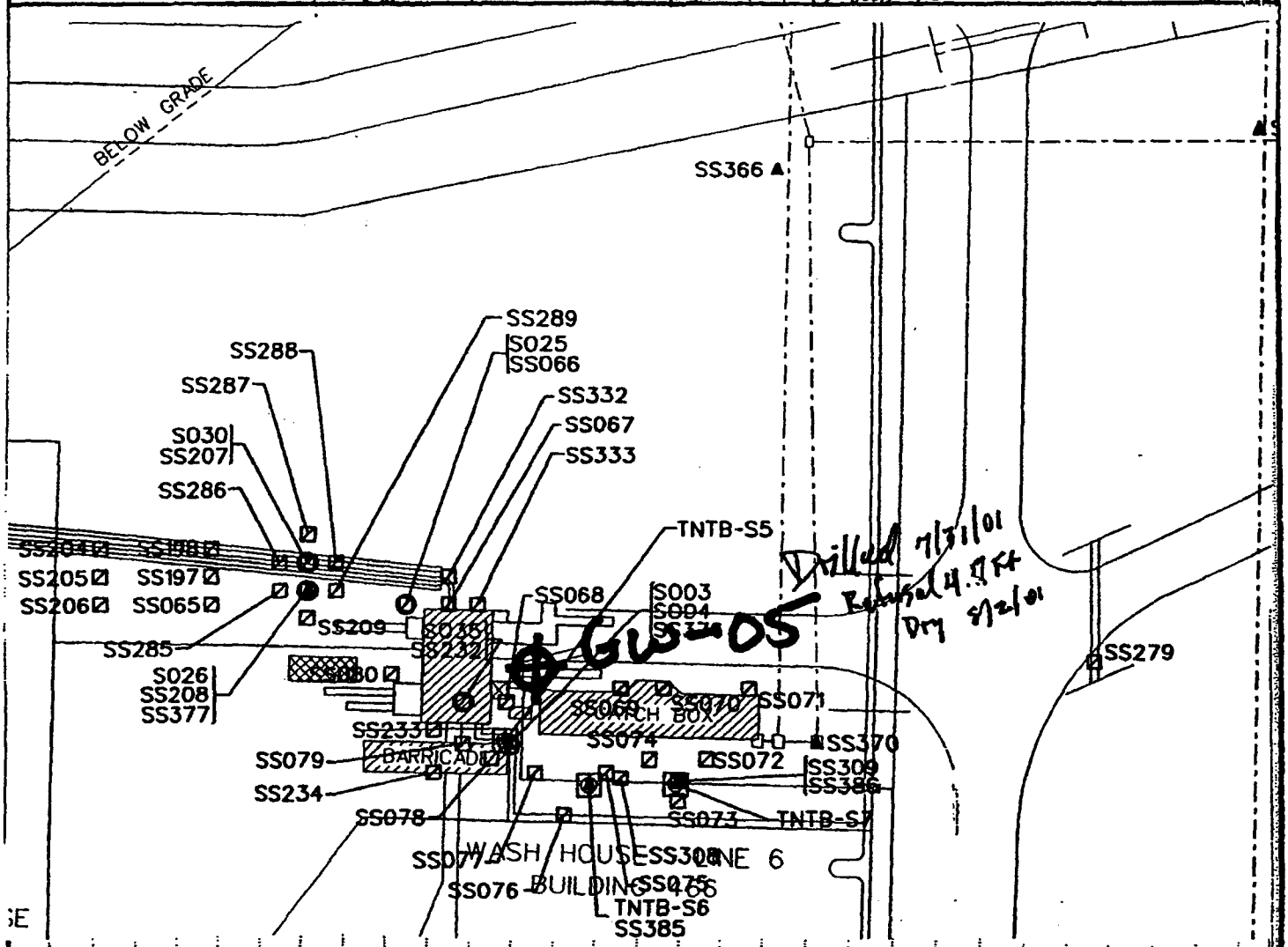
HTRW DRILLING LOG

DISTRICT: USACE - Nashville	HOLE NUMBER: GW-005	
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Prosonic	SHEET 1 OF 2
3. PROJECT: PBOW	4. LOCATION: TNT Area B	
5. NAME OF DRILLER: Pete Goss	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe DT66	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3¼" DT66 ATV terrain, track mounted geoprobe rig with 2.5 inch OD probe. Temporary piezometer 2" OD, Sch 40 PVC. 0.010" slot screen	8. HOLE LOCATION: Bldg 466	
	9. SURFACE ELEVATION: 668.41 Ft N: 618217.99 E: 1918058.62	
	10. DATE STARTED: 7/31/01	11. DATE COMPLETED: 7/31/01
12. OVERBURDEN THICKNESS: 4.7 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: Groundwater not encountered	
13. DEPTH DRILLED INTO ROCK: -0-	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: dry 8/6/01 0829	
14. TOTAL DEPTH OF HOLE: 4.7 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): —	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	Grout	NA	Temp Piezo	David Kesh



PROJECT	HOLE NO.
PBOW	GW-005

HTRW DRILLING LOG

(continuation sheet) TNTB

Hole Number: GW-005

Project: PBOW

Geologist: D. Kessler

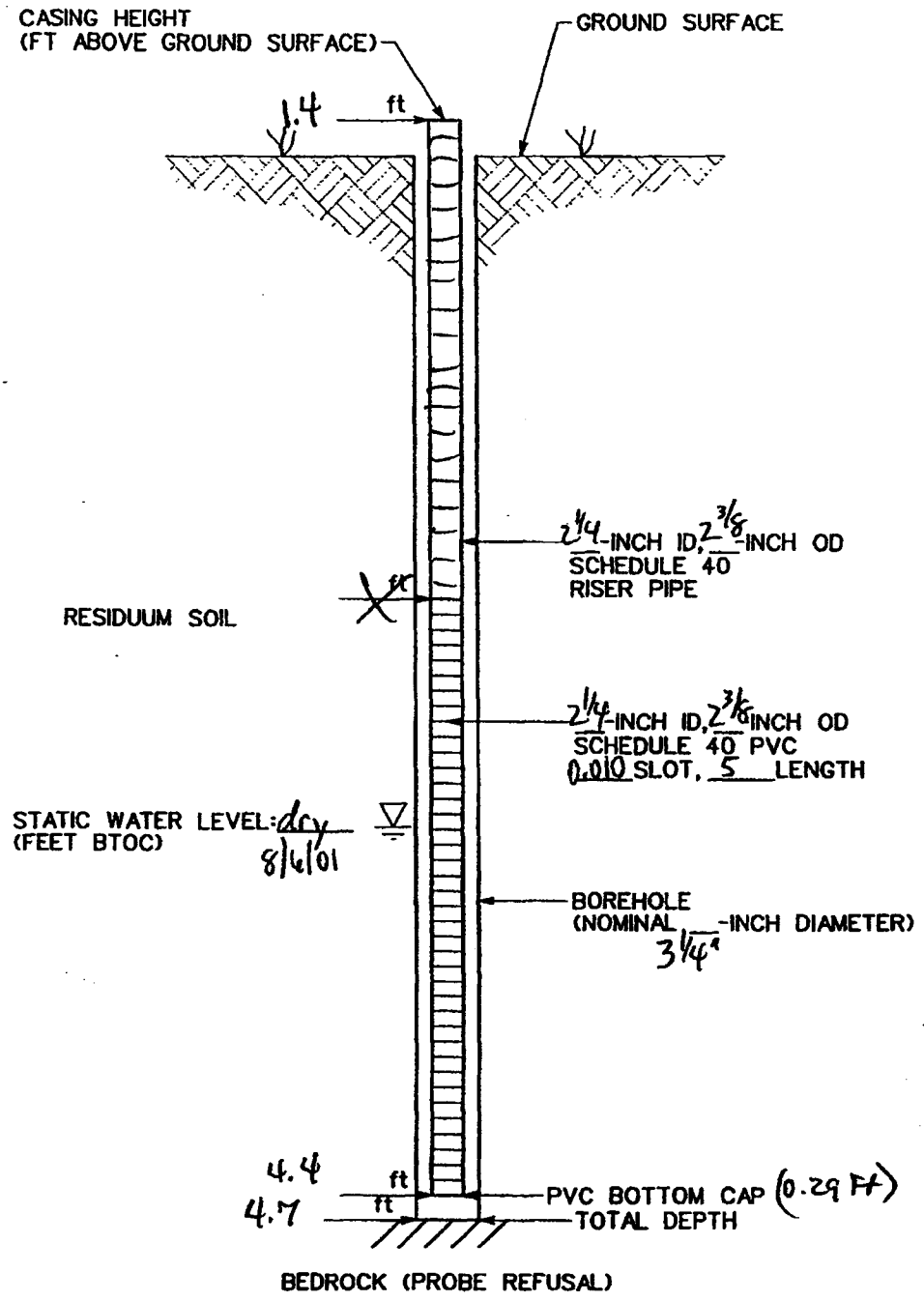
Sheet 2 of 2 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Urb.	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		GRASS			NA	NA		Began drilling 7/31/01 1555
	1							
	2							Inserted 2" OD temporary piezometer for groundwater sample collection.
	3							
	4							No lithologic samples collected.
	5	Probe Refusal @ 4.7 ft TD = 4.7 ft Shale fragments on tip						
	6							
	7							
	8							
	9							
	10							

Project PBOW TNTB Hole Number: GW-005

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNTB GW-005



Dry

NOTES:

PIEZOMETER NO.: GW-005

DATE INSTALLED: 7/31/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

DWG. NO.: \825635ES.016	
PROJ. NO.: 825635	
INITIATOR: C. WILLIAMS	
PROJ. MGR.: SPANGBERG	
DRAFT. CHCK. BY: C. TUMLIN	
ENGR. CHCK. BY: C. WILLIAMS	
DATE LAST REV.:	
DRAWN BY:	
STARTING DATE: 07/23/01	
DRAWN BY: B. VANDERGRIFF	

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TNT MANUFACTURING AREA C

TNT-C GW-11

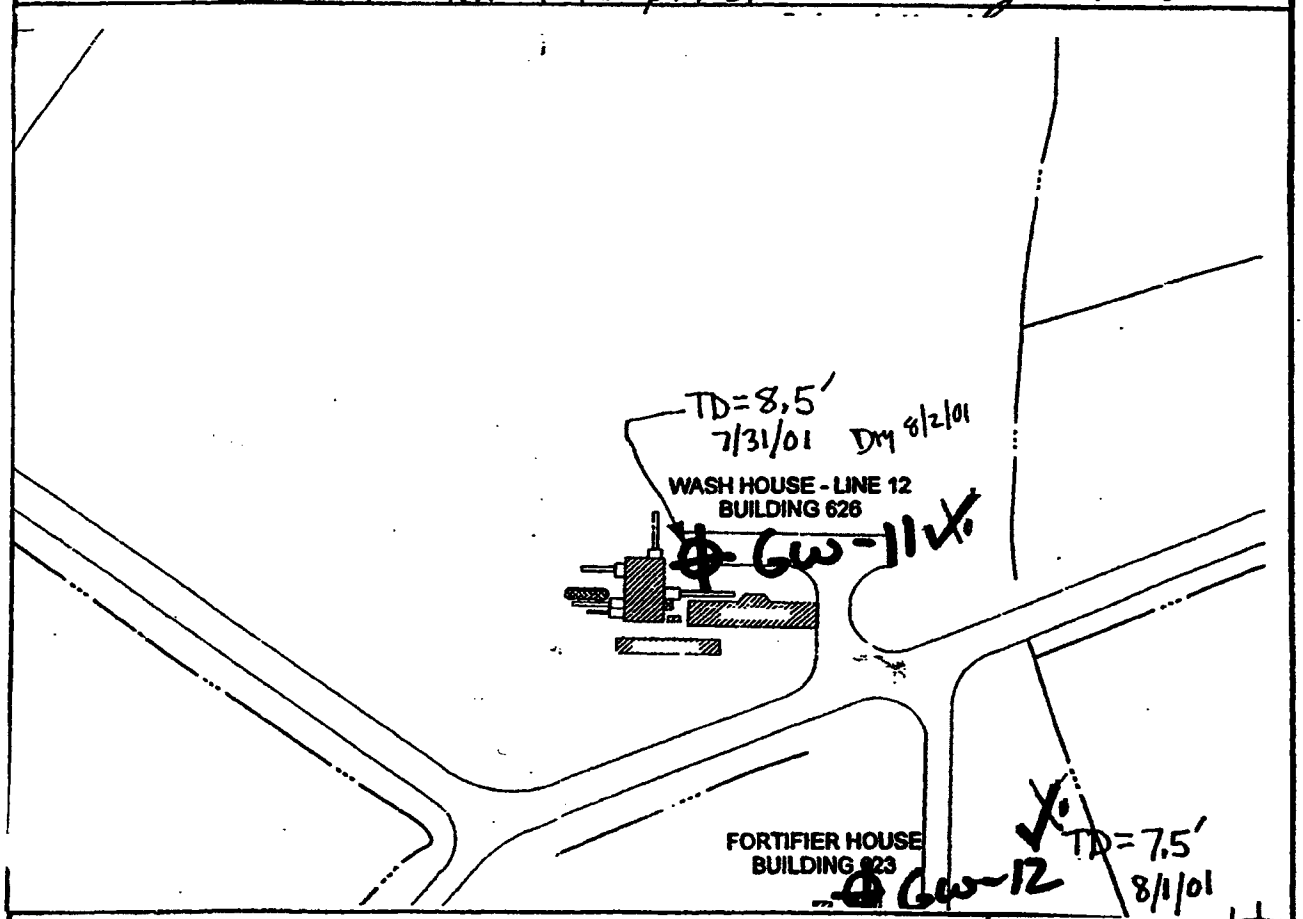
HTRW DRILLING LOG

District	USACE- Nashville
Hole Number	TNT-C/GW-11
Company Name	IT Corporation
Drilling Subcontractor	ProSonic
Sheet / Sheets	1 of 2
Project	PBOW
Location	TNT Area C, Bldg 626
Name of Driller	Fred Herzog
Manufacturer's Designation of Drill	GeoProbe 66DT
Sizes and Types of Drilling and Sampling Equipment	66DT All terrain tracked Geoprobe Rig w/ 3 3/4" OD Probe Temp piezometer 2" OD, Sch40 PVC w/ 0.010" slot screen
Northing	620331.71
Easting	1910550.71
NAD	1983
NGVD	1929
Surface Elevation	653.83 ft
Date Started	7/31/01
Date Completed	7/31/01
Overburden Thickness	8.5'
Depth to Bedrock	8.5'
Depth Groundwater Encountered	N/A
Depth Drilled into Rock	0'
Depth to Water and Elapsed Time After Drilling Completed	Dry 8/6/01 0913
Total Depth of Hole	8.5'
Other Water Level Measurements (Specify)	—

Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
—	Grout	NA	Temp Piezo	Tony E. Nolen



Project	Hole Number
PBOW	TNT-C/GW-11

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C/GW-11

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

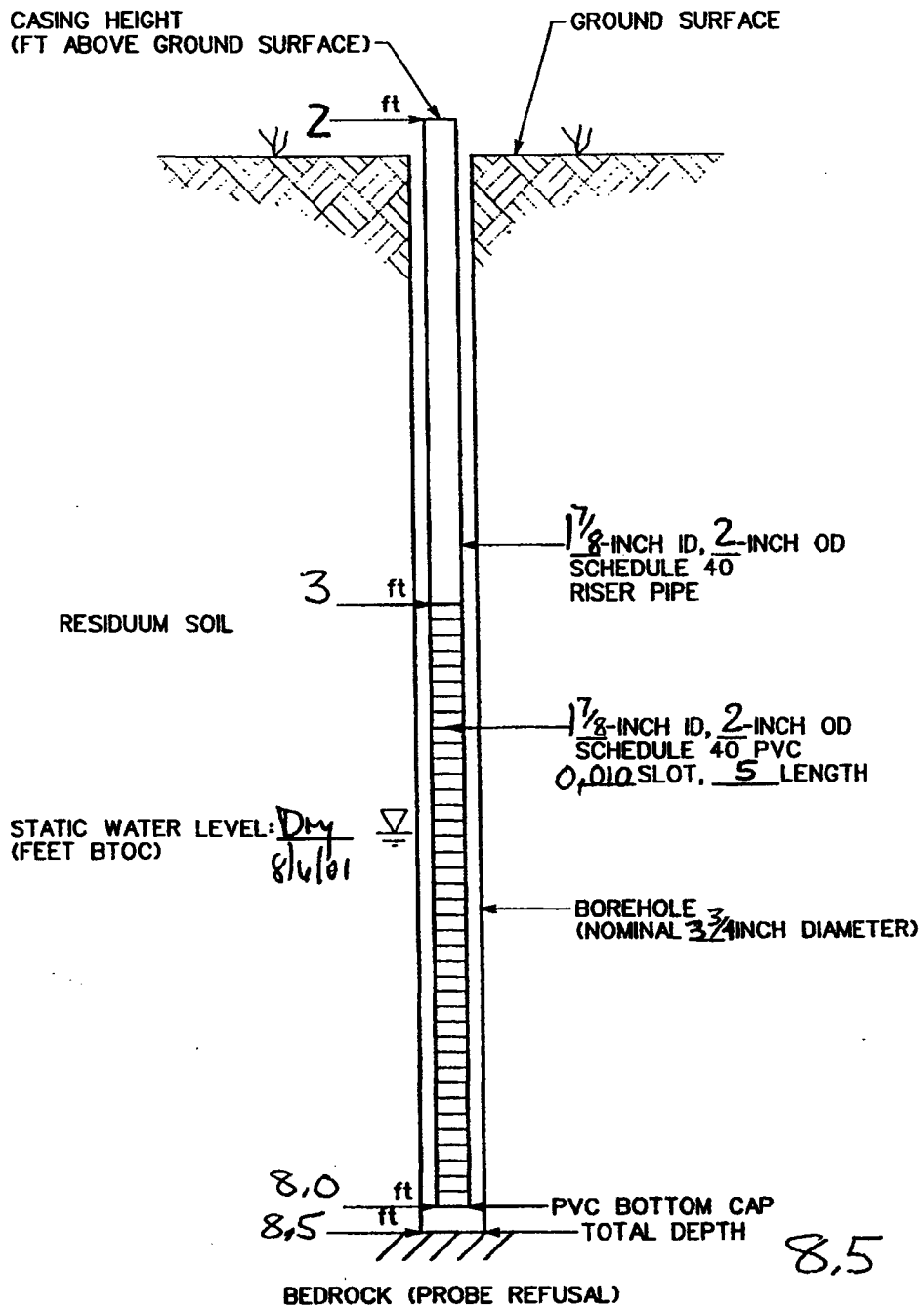
Elev (ft)	Depth (ft) bgs	Description of Materials	Uscs/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	NA	NA	NA	
	1							TD = 8'
	2							Inserted 2" OD temporary piezometer for groundwater sample collection
	3							
	4							
	5							No lithologic samples collected.
	6							
	7							
	8	TD = 8.5'						
	9							
	10							

Project: PBOW

Hole Number: TNT-C/GW-11

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: INT-C/GW-11



NOTES:

PIEZOMETER NO.: INT-C/GW-11

DATE INSTALLED: 7/31/01

DATE REMOVED: 8/6/01

NOT TO SCALE

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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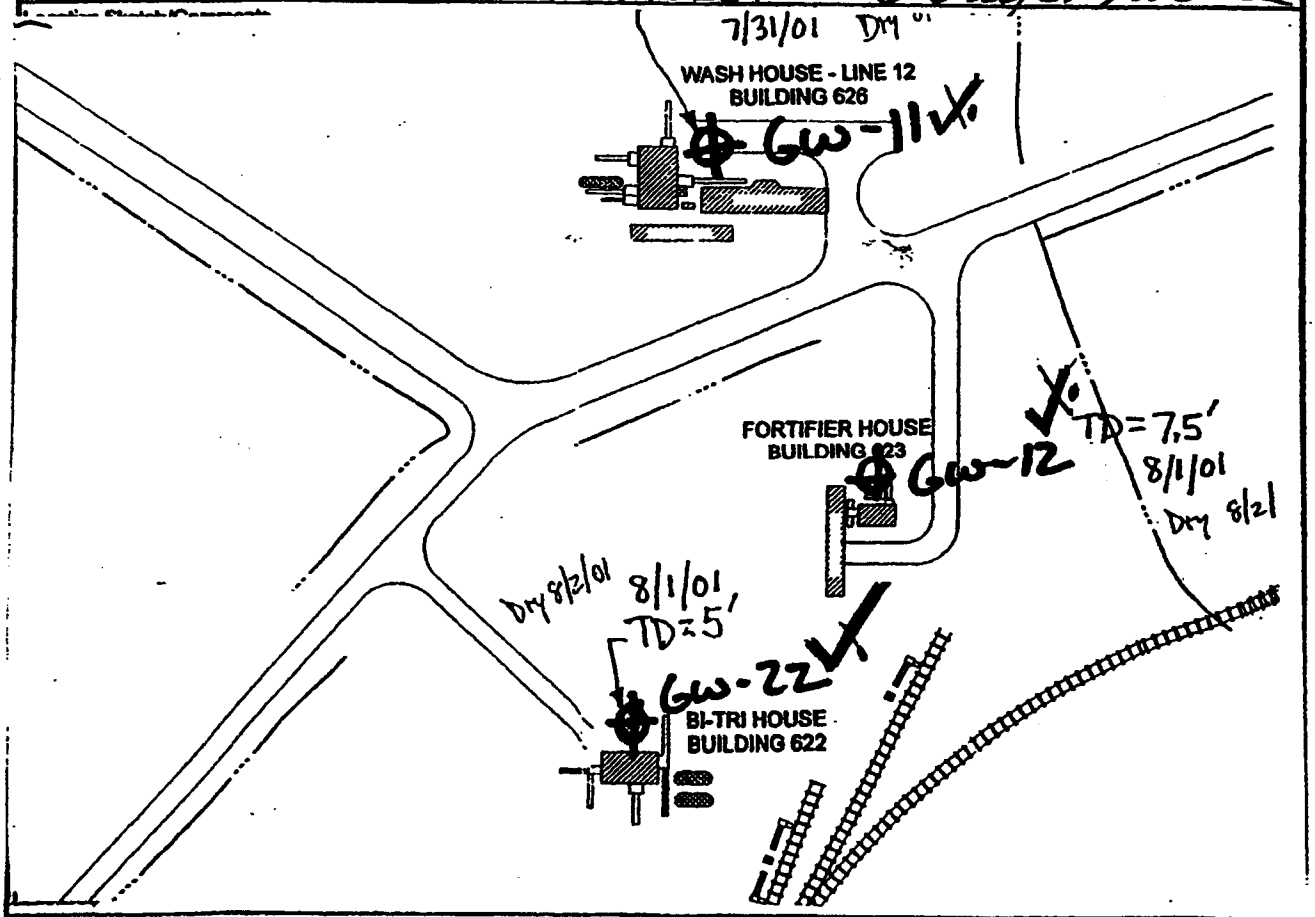
HTRW DRILLING LOG

District	USACE Nashville
Hole Number	TNT-C GW-12
Company Name	IT Corporation
Drilling Subcontractor	ProSonic
Sheet / Sheets	1 of 2
Project	PBOW
Location	TNT Area C, Bldg 623
Name of Driller	Fred Herzog
Manufacturer's Designation of Drill	GeoProbe 66DT
Sizes and Types of Drilling and Sampling Equipment	GeoProbe 66DT; 3 3/4" PROBE; 2" Sch 40 PVC PIEZOMETER
Northing	620146.52
Easting	1910611.70
NAD	1983
NGVD	1929
Surface Elevation	662.05 Ft
Date Started	8/1/01
Date Completed	8/1/01
Overburden Thickness	7.5'
Depth to Bedrock	7.5'
Depth Groundwater Encountered	N/A
Depth Drilled Into Rock	0'
Depth to Water and Elapsed Time After Drilling Completed	Dry 8/6/01 0916
Total Depth of Hole	7.5'
Other Water Level Measurements (Specify)	

Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
NA	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
			Piezo	Tony E. Nolan



Project	Hole Number
PBOW	TNT-C/GW-12

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C GW-12

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

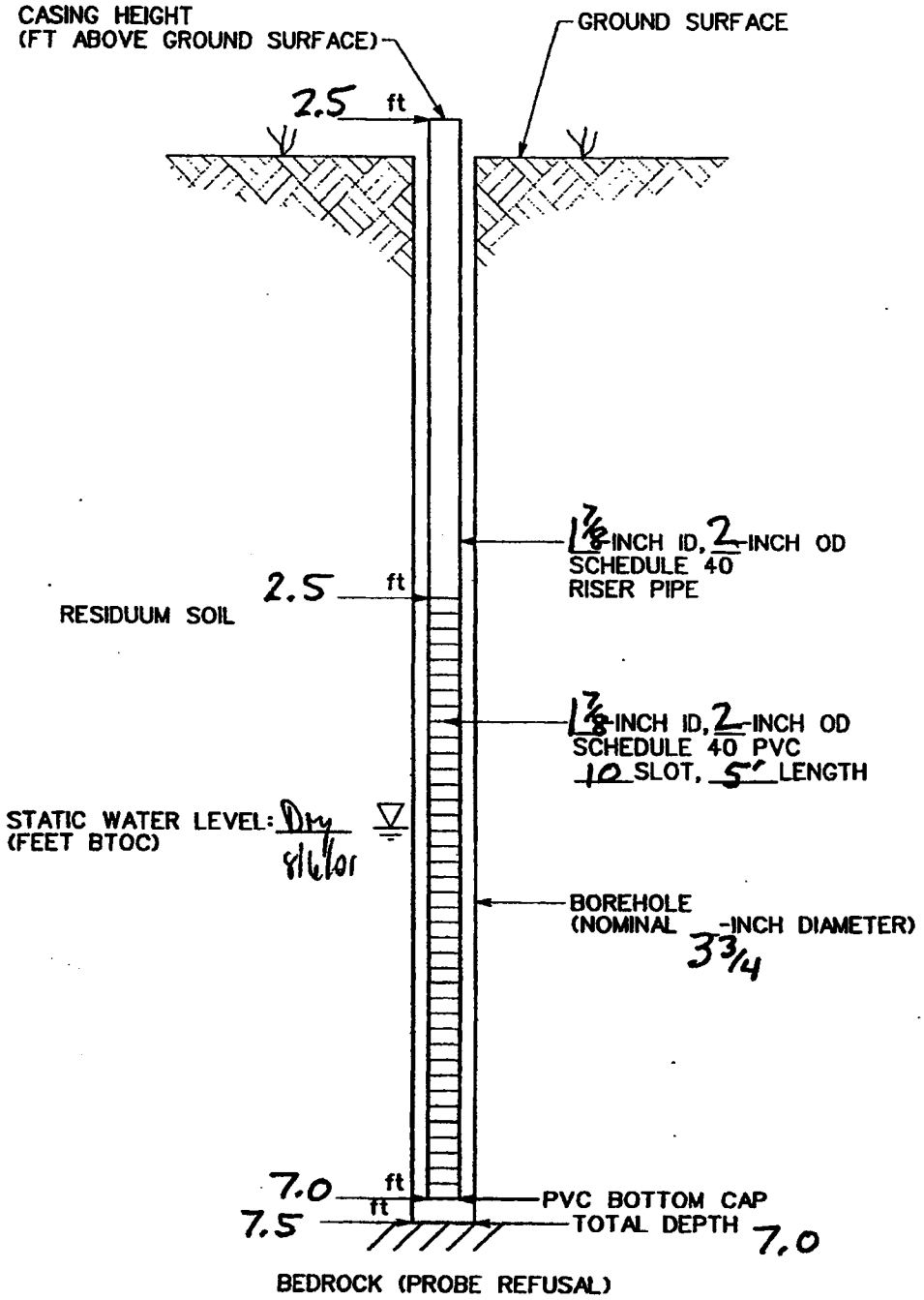
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ USHS	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
					N/A	NA	NA	Begin DPT
	1							Inserted 2" Sch 40 PVC Piezometer (temporary)
	2							
	3							No Lithologic Samples Collected.
	4							
	5							
	6							
	7	TD = 7.5'						
	8							
	9							
	10							

Project: PBOW

Hole Number: TNT-C GW-12

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: INT-C/GW-12



NOTES:

PIEZOMETER NO.: INT-C/GW-12

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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HTRW DRILLING LOG

District	USACE-Nashville
Hole Number	TNT-C/GW-13
Company Name	IT Corporation
Drilling Subcontractor	ProSonic
Sheet	1 of 2 Sheets
Project	PBOW
Location	TNT Area C Bldg 616 (Downgradient)
Name of Driller	Fred Herzog
Manufacturer's Designation of Drill	GeoProbe 66DT
Sizes and Types of Drilling and Sampling Equipment	66DT All Terrain tracked GeoProbe Rig w/ 3 3/4" OD Probe & Temp Piezometer 2" OD Sch 40 PVC/ w 0.010" slot screen
Northing	620758.68
Easting	1911179.14
NAD	1983
NGVD	1929
Surface Elevation	646.45 ft
Date Started	7/31/01
Date Completed	7/31/01
Overburden Thickness	8'
Depth to Bedrock	8'
Depth Groundwater Encountered	N/A
Depth Drilled into Rock	0'
Depth to Water and Elapsed Time After Drilling Completed	6.38 btoc after 24 hrs (8/1/01)
Total Depth of Hole	8'
Other Water Level Measurements (Specify)	—

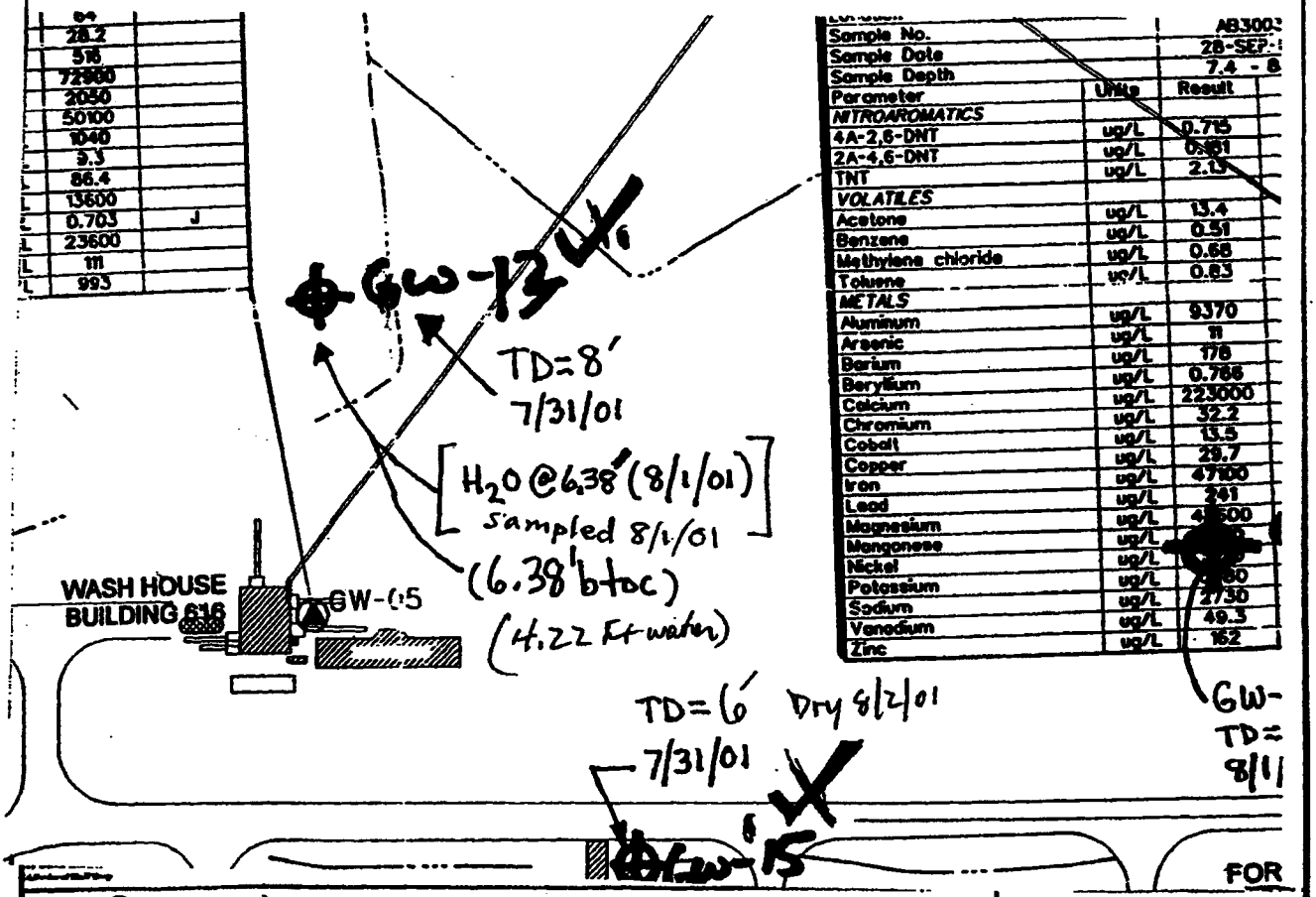
Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	yes	yes	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
	Grout	NA	Temp Piezo	Tony E. Nola

84		
28.2		
516		
72800		
2050		
50100		
1040		
5.3		
86.4		
13600		
0.703	J	
23600		
111		
993		

Sample No.		AB3002
Sample Date		28-SEP-
Sample Depth		7.4 - 8
Parameter	Units	Result
NITROAROMATICS		
4A-2,6-DNT	ug/L	0.715
2A-4,6-DNT	ug/L	0.481
TNT	ug/L	2.13
VOLATILES		
Acetone	ug/L	13.4
Benzene	ug/L	0.51
Methylene chloride	ug/L	0.68
Toluene	ug/L	0.83
METALS		
Aluminum	ug/L	9370
Arsenic	ug/L	11
Barium	ug/L	176
Beryllium	ug/L	0.766
Calcium	ug/L	223000
Chromium	ug/L	32.2
Cobalt	ug/L	13.5
Copper	ug/L	29.7
Iron	ug/L	47100
Lead	ug/L	241
Magnesium	ug/L	41500
Manganese	ug/L	[illegible]
Nickel	ug/L	[illegible]
Potassium	ug/L	[illegible]
Sodium	ug/L	2730
Vanadium	ug/L	49.3
Zinc	ug/L	152



FOR

Project	PBOW
Hole Number	TNT-C/GW-13

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C/GW-13

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

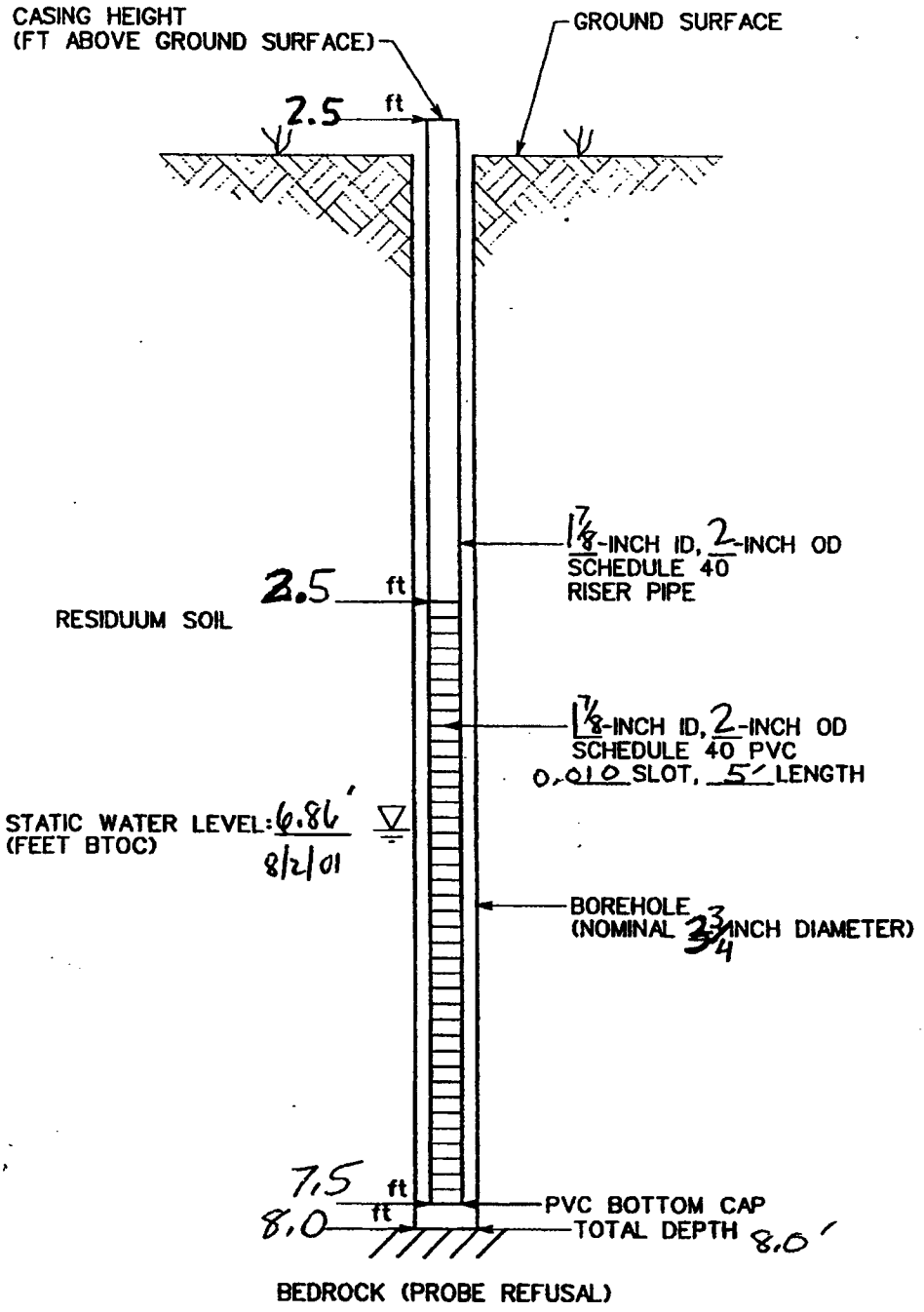
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Units	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	NA			Start DPT
	1					BC 3013		TD=8' Inserted temporary piezometer (2"OD) for groundwater sampling
	2							
	3							No lithologic samples collected.
	4							
	5							
	6							
	7							
	8	TD=8'						
	9							
	10							

Project: PBOW

Hole Number: TNT-C GW-13

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT-C/GW-13



NOTES:

PIEZOMETER NO.: TNT-C/GW-13

DATE INSTALLED: 7/31/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635es.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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GW14

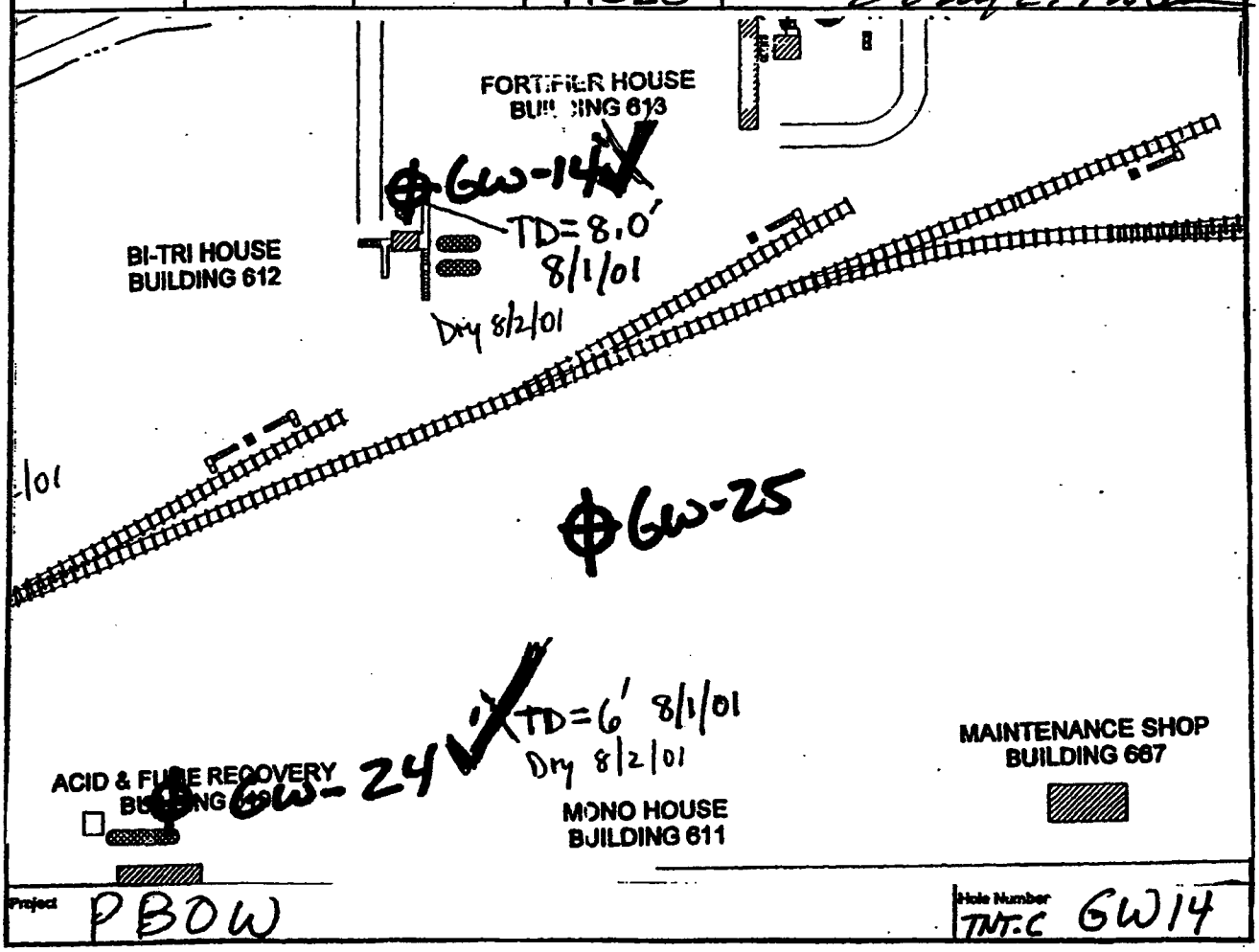
HTRW DRILLING LOG

District	USACE Nashville
Hole Number	TNT-C/GW14
Company Name	IT Corporation
Drilling Subcontractor	ProSonic
Sheet / Sheets	1 of 2
Project	PBOW
Location	TNT Area C, Bldg 612
Name of Driller	Fred Herzog
Manufacturer's Designation of Drill	GeoProbe 66DT
Sizes and Types of Drilling and Sampling Equipment	GeoProbe 66DT 3 3/4" Probe
Northing	1620274.22
Easting	1911096.54
NAD	1983
NGVD	1929
Surface Elevation	665.86 Ft
Date Started	8/1/01
Date Completed	8/1/01
Overburden Thickness	8'
Depth to Bedrock	8'
Depth Groundwater Encountered	N/A
Depth Drilled into Rock	0'
Depth to Water and Elapsed Time After Drilling Completed	Dry 8/6/01 0905
Total Depth of Hole	8'
Other Water Level Measurements (Specify)	—

Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
	—	—	Piezo	Tony E. Nolen



Project	Hole Number
PBOW	TNT-C GW14

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C GW-14

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

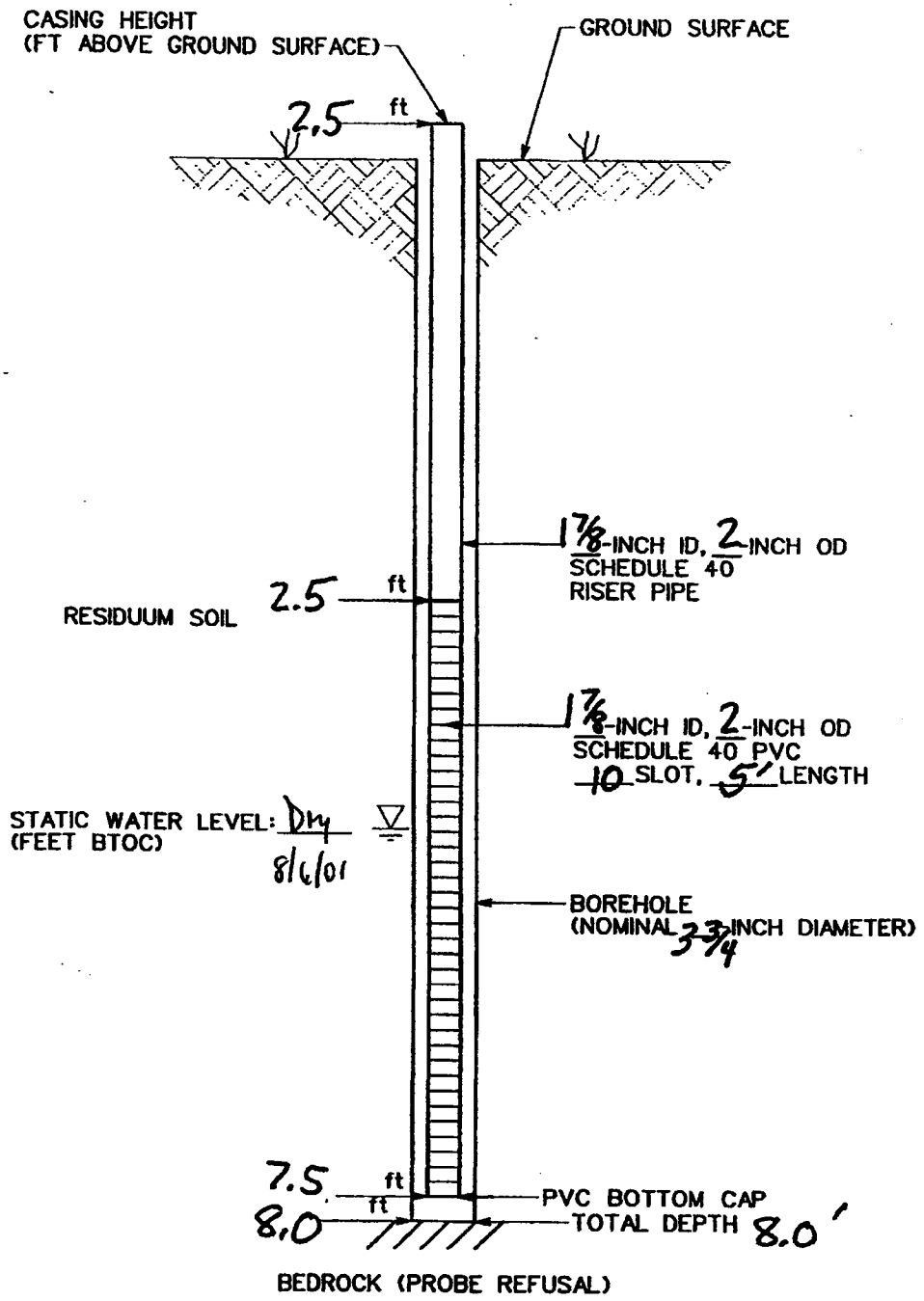
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	N/A	NA	NA	Begin DPT
	1							Inserted 2" PVC Sch 40 Piezometer
	2							
	3							NO Lithologic Samples Collected
	4							
	5							
	6							
	7							
	8	TD = 8'						
	9							
	10							

Project: PBOW

Hole Number: TNT-C GW14

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: INT-C/GW-14



NOTES:

PIEZOMETER NO.: INT-C/GW-14

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

NOT TO SCALE

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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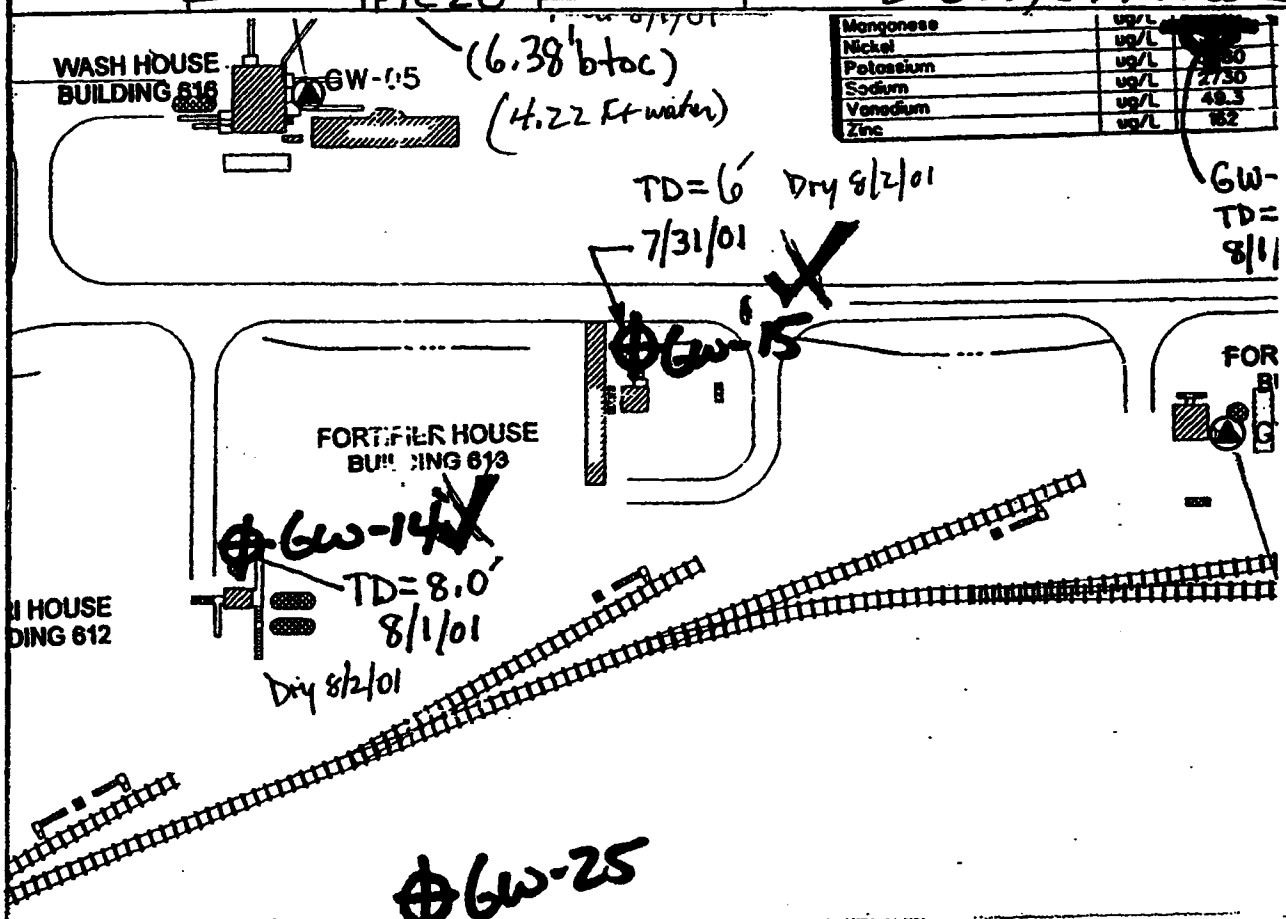
HTRW DRILLING LOG

District	USACE Nashville
Hole Number	TNT-C GW15
Company Name	IT Corporation
Drilling Subcontractor	ProSonic
Sheet / Sheets	1 of 2
Project	PBOW
Location	TNT Area C, Bldg 613
Name of Driller	Fred Herzog
Manufacturer's Designation of Drill	GeoProbe 66DT
Sizes and Types of Drilling and Sampling Equipment	66 DT GeoProbe 3 3/4" Probe
Northing	620356.05
Easting	1911289.11
NAD	1983
NGVD	1929
Surface Elevation	663.64 Ft
Date Started	7-31-01
Date Completed	7-31-01
Overburden Thickness	6'
Depth to Bedrock	6'
Depth Groundwater Encountered	NA
Depth Drilled into Rock	0'
Depth to Water and Elapsed Time After Drilling Completed	9.8 Ft 8/6/01 0909 (0.3' water column - No Sample)
Total Depth of Hole	6'
Other Water Level Measurements (Specify)	

Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
		PIEZO		Tony E. Nolen



Manganese	ug/L	[redacted]
Nickel	ug/L	[redacted]
Potassium	ug/L	[redacted]
Sodium	ug/L	2730
Vanadium	ug/L	48.3
Zinc	ug/L	162

GW-
TD=
8/1

Project	Hole Number
PBOW	TNT-C GW-15

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C / GW15

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

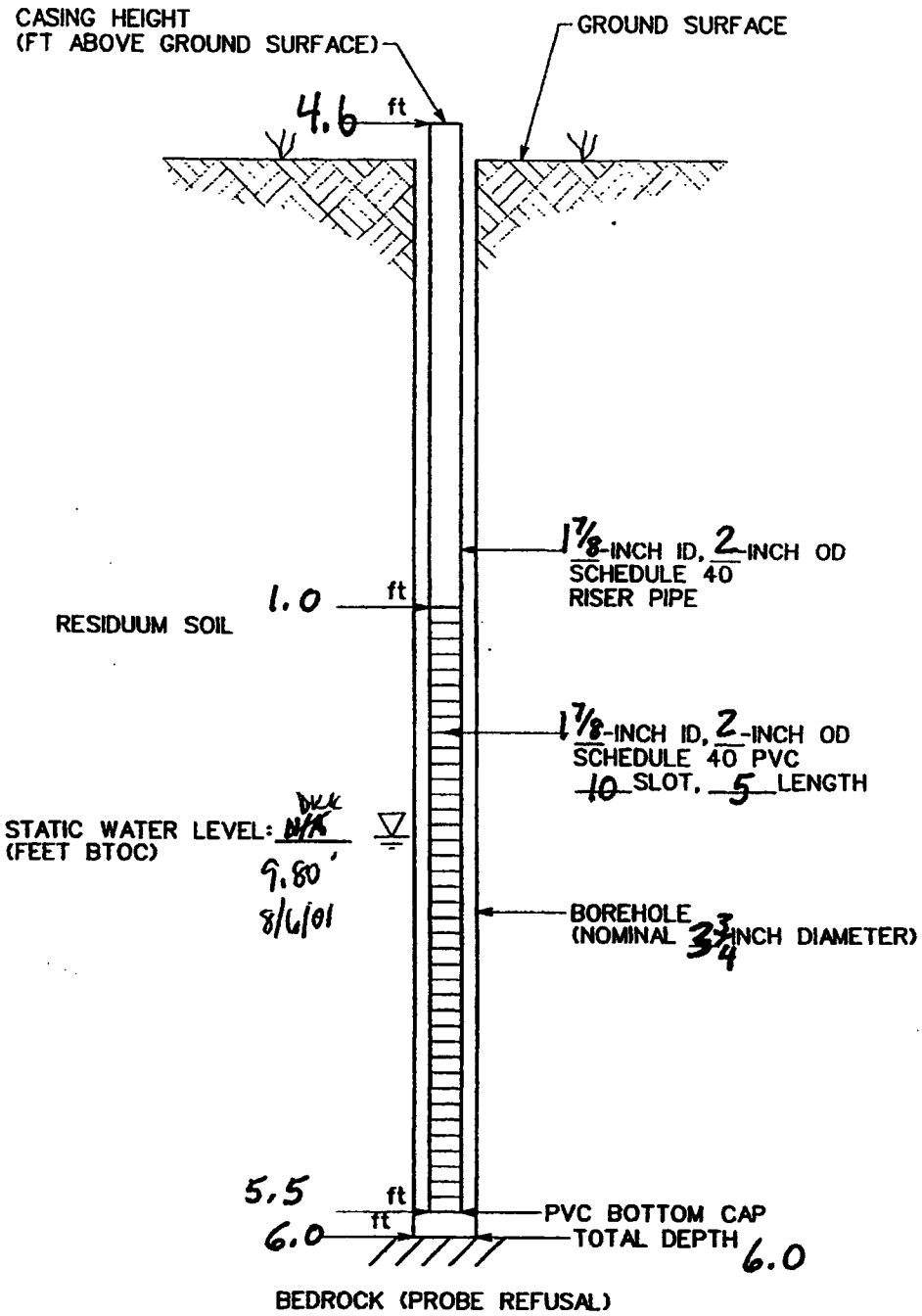
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	NA	NA	NA	Begin DPT
	1							
	2							Inserted 2" OD PVC Sch 40 Piezometer
	3							NO Lithologic Samples
	4							
	5							
	6	TD = 6'						
	7							
	8							
	9							
	0							

Project: PBOW

Hole Number: TNT-C GW-15

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT-C/GW-15



NOTES:

PIEZOMETER NO.: TNT-C/GW-15

DATE INSTALLED: 7/31/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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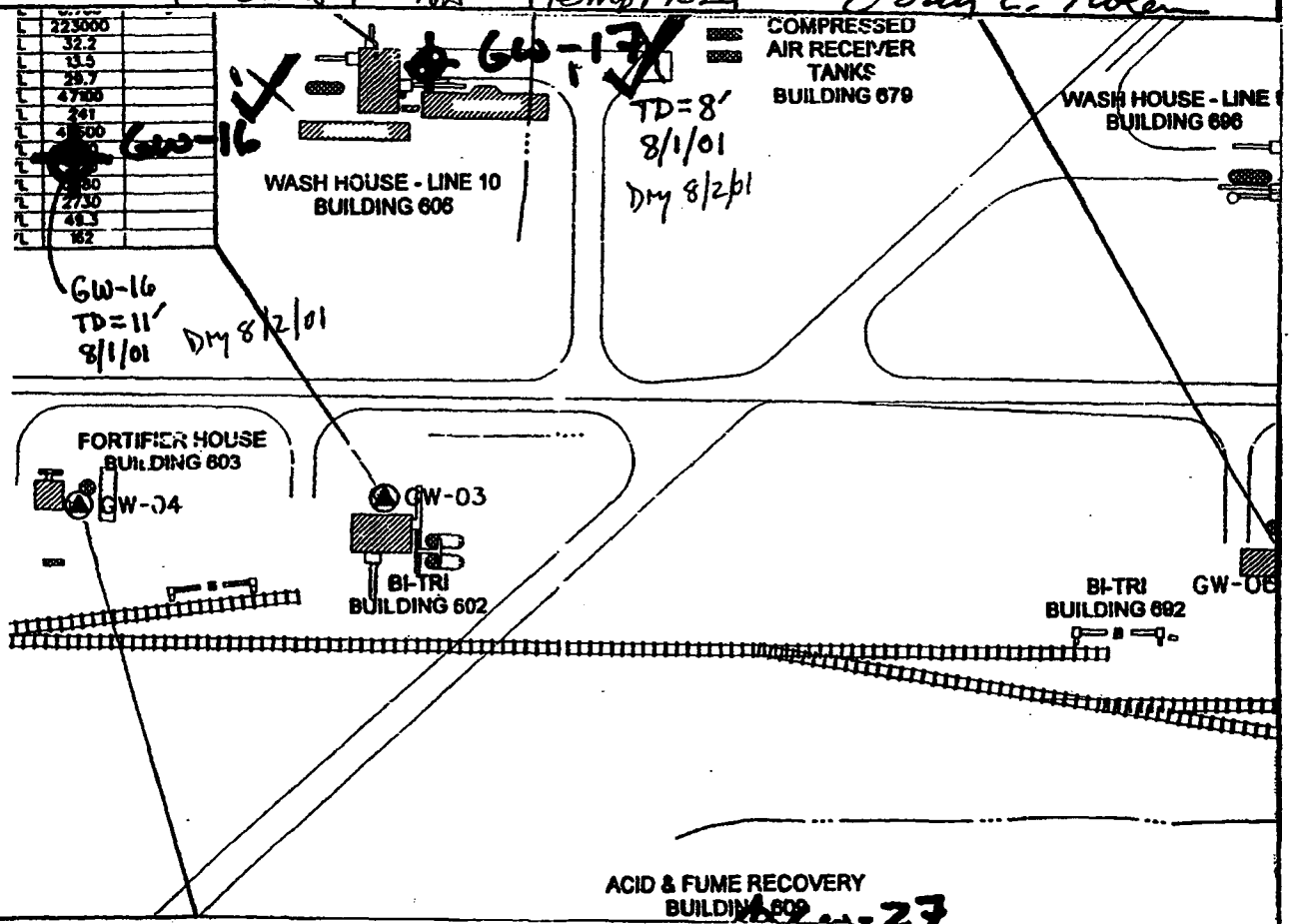
HTRW DRILLING LOG

Company Name: IT Corporation	District: USACE - Nashville	Hole Number: TNT-C/GW-16	
	Drilling Subcontractor: ProSonic	Sheet 1 of 3 Sheets	
Project: PBOW	Location: TNT Area C, Bldg 603 (Downgradient)		
Name of Driller: Fred Herzog	Manufacturer's Designation of Drill: GeoProbe 66 DT		
Sizes and Types of Drilling and Sampling Equipment: 66 DT All Terrain tracked GeoProbe Rig w/ 3 3/4" OD Probe. Temp Piezometer 2" OD Sch 40 PVC w/ 0.010" screen slots	Northing: 620580.09	Easting: 1911620.41	NAD 1983 / NGVD 1929
	Surface Elevation: 652.40 Ft		
	Date Started: 7/31/01	Date Completed: 8/1/01	
Overburden Thickness: 11'	Depth to Bedrock: 11'	Depth Groundwater Encountered: NA	
Depth Drilled into Rock: 0'		Depth to Water and Elapsed Time After Drilling Completed: Dry 8/6/01 0900	
Total Depth of Hole: 11'		Other Water Level Measurements (Specify):	

Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
	Grout	NA	Temp Piezo	Tony E. Nolen



Project	Hole Number
PBOW	TNT-C/GW-16

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C/GW-16

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 3 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Litho	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	N/A	NA	NA	Begin DPT
	1							Inserted 2" OD temp piezometer for ground water sample collection
	2							
	3							No lithologic samples collected.
	4							
	5							
	6							
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: TNT-C/GW-16

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C/GW-16

Project: PBOW

Geologist: T. Nolen

Sheet 3 of 3 Sheets

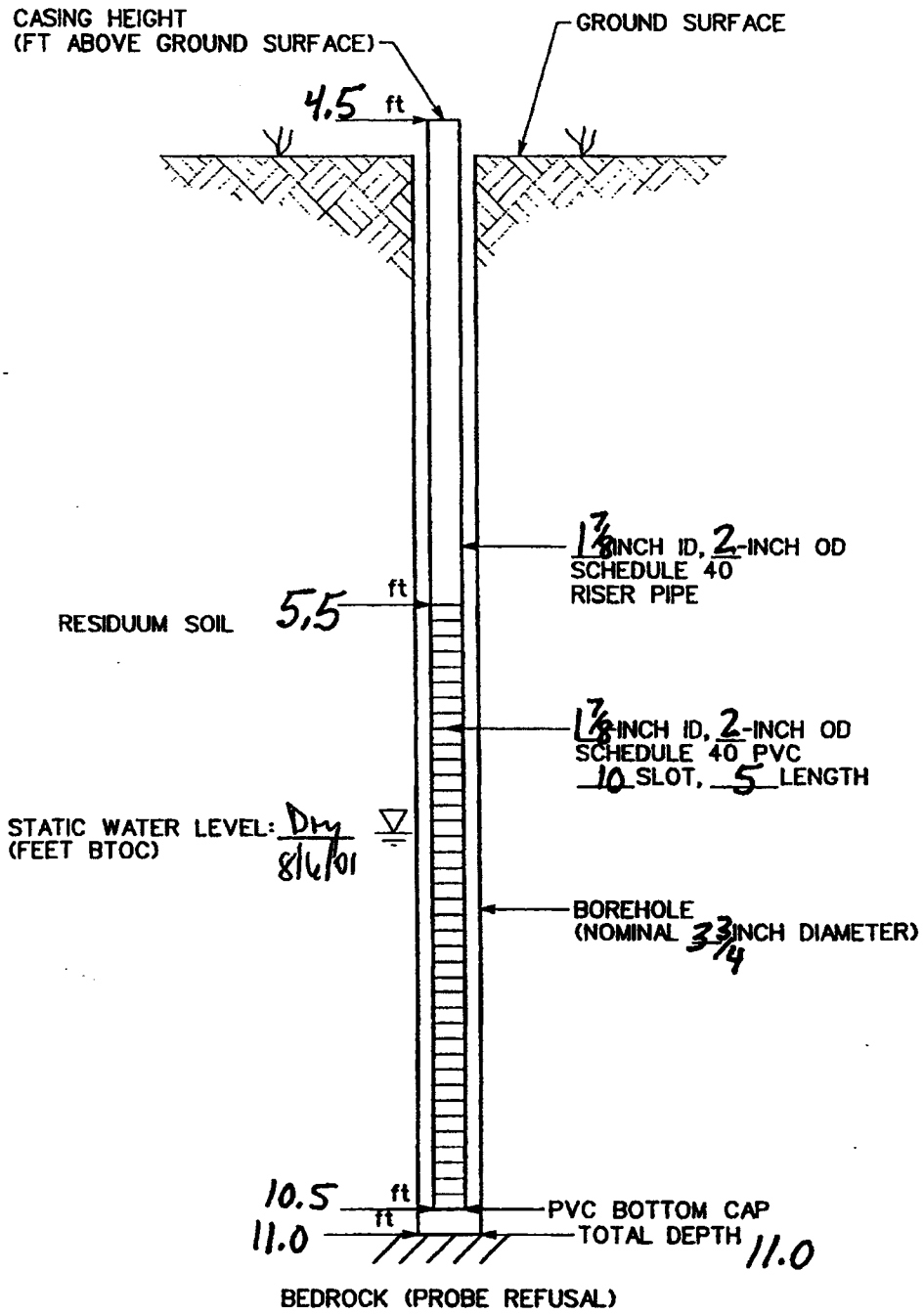
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	10			NM	NA	NA	NA	
		TD = 11'						
	11							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: TNT-C/GW16

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT-C GW-16



NOTES:

PIEZOMETER NO.: TNT-C/GW-16

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.:\825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.:SPANGBERG	PROJ. NO.: 825635

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HTRW DRILLING LOG

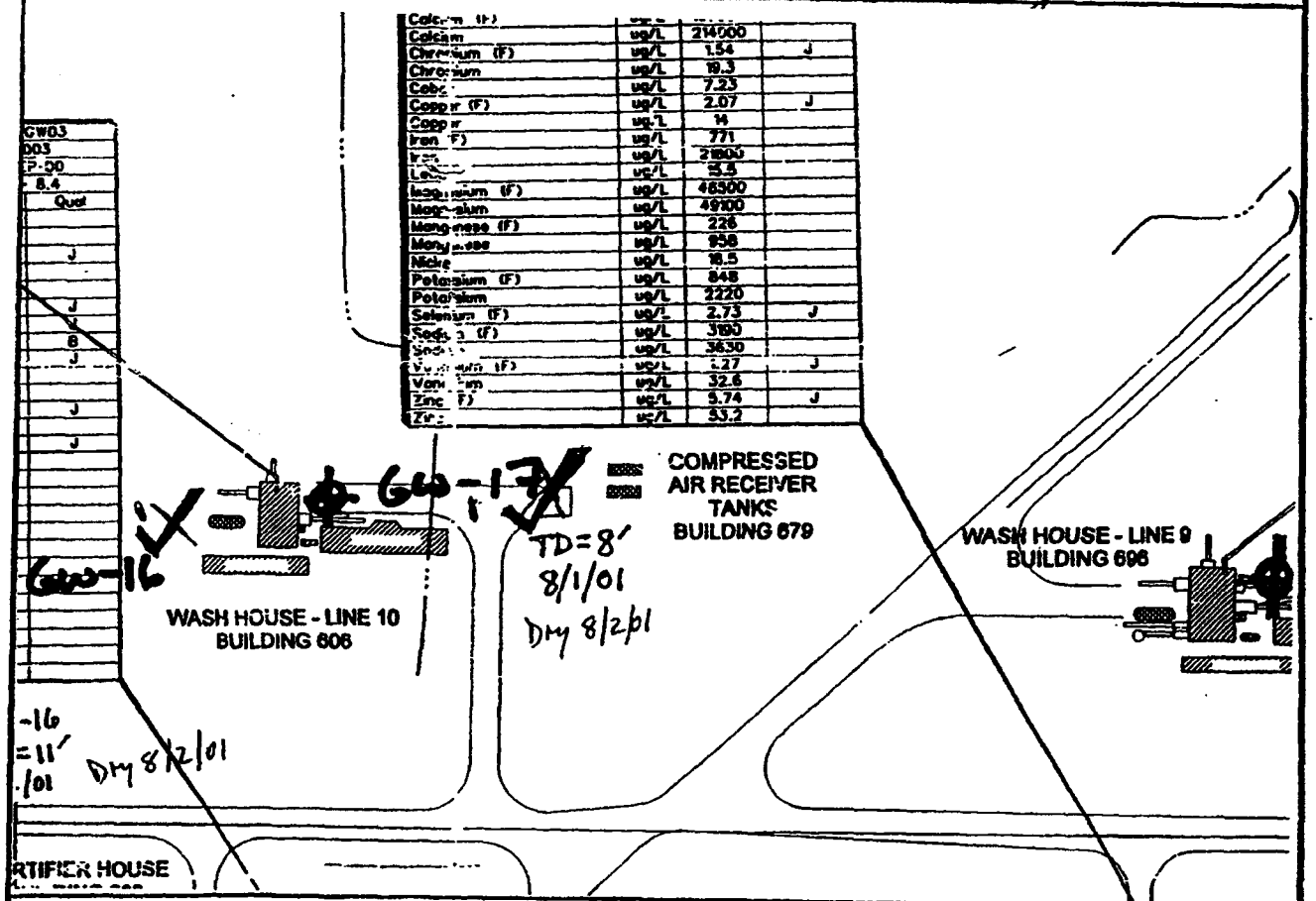
District	USACE - Nashville
Hole Number	TNT-C GW-17
Company Name	IT Corporation
Drilling Subcontractor	Pro Sonic
Sheet / Sheets	1 of 2
Project	PBOW
Location	TNT Area C, Bldg 606
Name of Driller	Fred Herzog
Manufacturer's Designation of Drill	GEOPROBE 66DT
Sizes and Types of Drilling and Sampling Equipment	GEOPROBE 66DT 3 3/4" Probe
Northing	620595.30
Easting	1911806.33
NAD	1983
NGVD	1929
Surface Elevation	654.39 Ft
Date Started	8/1/01
Date Completed	8/1/01
Overburden Thickness	8'
Depth to Bedrock	8'
Depth Groundwater Encountered	NA
Depth Drilled into Rock	0'
Depth to Water and Elapsed Time After Drilling Completed	Dry 8/6/01 0856
Total Depth of Hole	8'
Other Water Level Measurements (Specify)	

Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
	yes	—	—	Tony E. Nolan

Calcium (F)	ug/L	214000	
Chromium (F)	ug/L	1.54	J
Chromium	ug/L	19.3	
Cobalt	ug/L	7.23	
Copper (F)	ug/L	2.07	J
Copper	ug/L	14	
Iron (F)	ug/L	771	
Iron	ug/L	21800	
Lead	ug/L	5.5	
Magnesium (F)	ug/L	46300	
Magnesium	ug/L	49100	
Manganese (F)	ug/L	226	
Manganese	ug/L	958	
Nickel	ug/L	18.5	
Potassium (F)	ug/L	848	
Potassium	ug/L	2220	
Selenium (F)	ug/L	2.73	J
Sodium (F)	ug/L	3190	
Sodium	ug/L	3630	
Vanadium (F)	ug/L	1.27	J
Vanadium	ug/L	32.6	
Zinc (F)	ug/L	5.74	J
Zinc	ug/L	53.2	



Project	PBOW
Hole Number	TNT-C GW-17

HTRW DRILLING LOG

(continuation sheet)

Hole Number: 7NT-C GW17

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

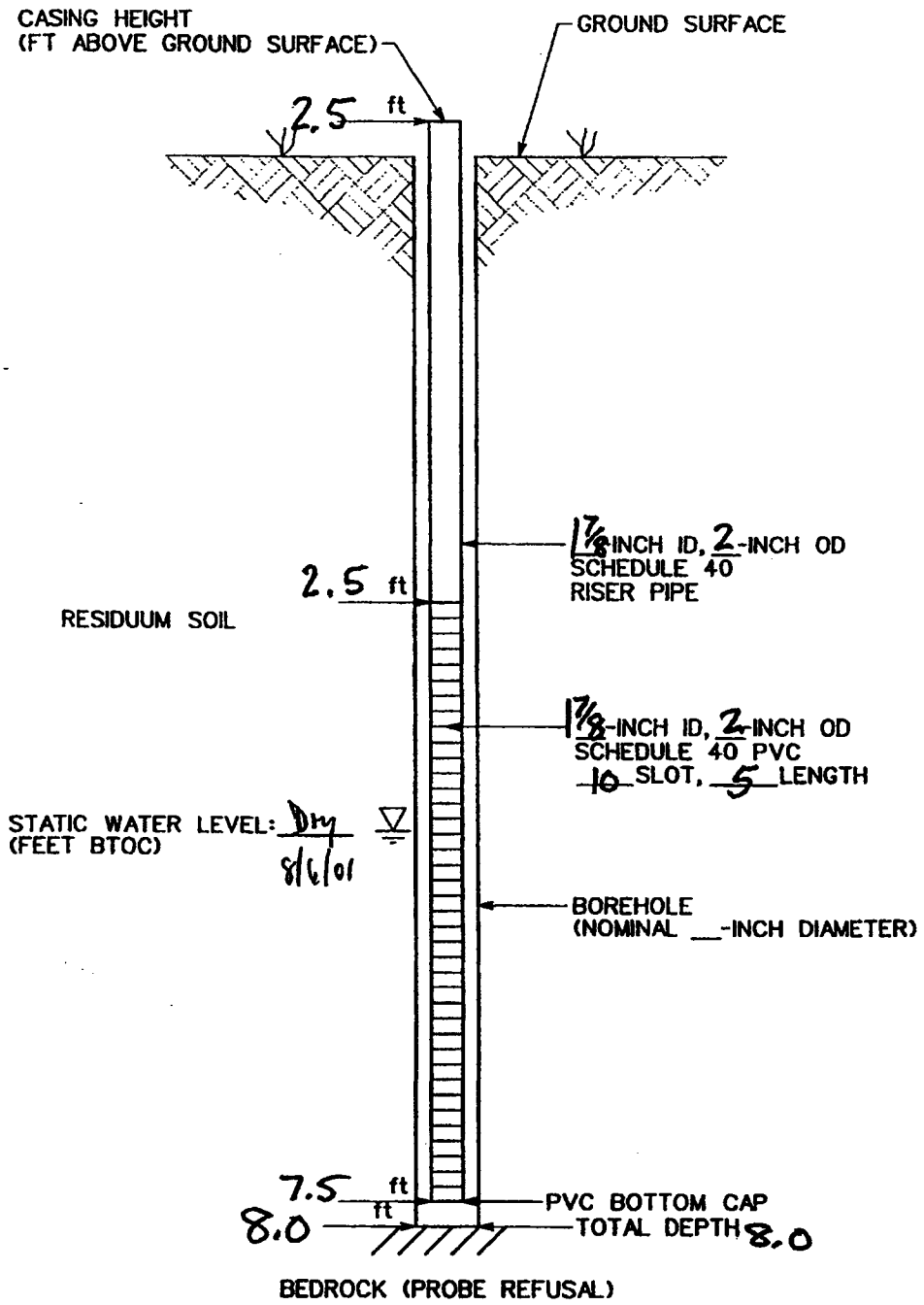
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Units	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	N/A	NA	NA	Begin DPT
	1							
	2							Inserted 2" Sch 40 PVC temp Piezometer
	3							
	4							NO Lithologic Samples Collected
	5							
	6							
	7							
	8	TD=8'						
	9							
	10							

Project

Hole Number

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: INT-C GW17



NOTES:

PIEZOMETER NO.: INT-C/GW-17

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

DWG. NO.: \825635ES.016	DRAFT. CHCK. BY: C. TUMLIN
PROJ. NO.: 825635	ENGR. CHCK. BY: C. WILLIAMS
INITIATOR: C. WILLIAMS	STARTING DATE: 07/23/01
PROJ. MGR.: SPANGBERG	DATE LAST REV.:
DRAWN BY: B. VANDERGRIFF	DRAWN BY:

10:02:05 07/30/01

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HTRW DRILLING LOG

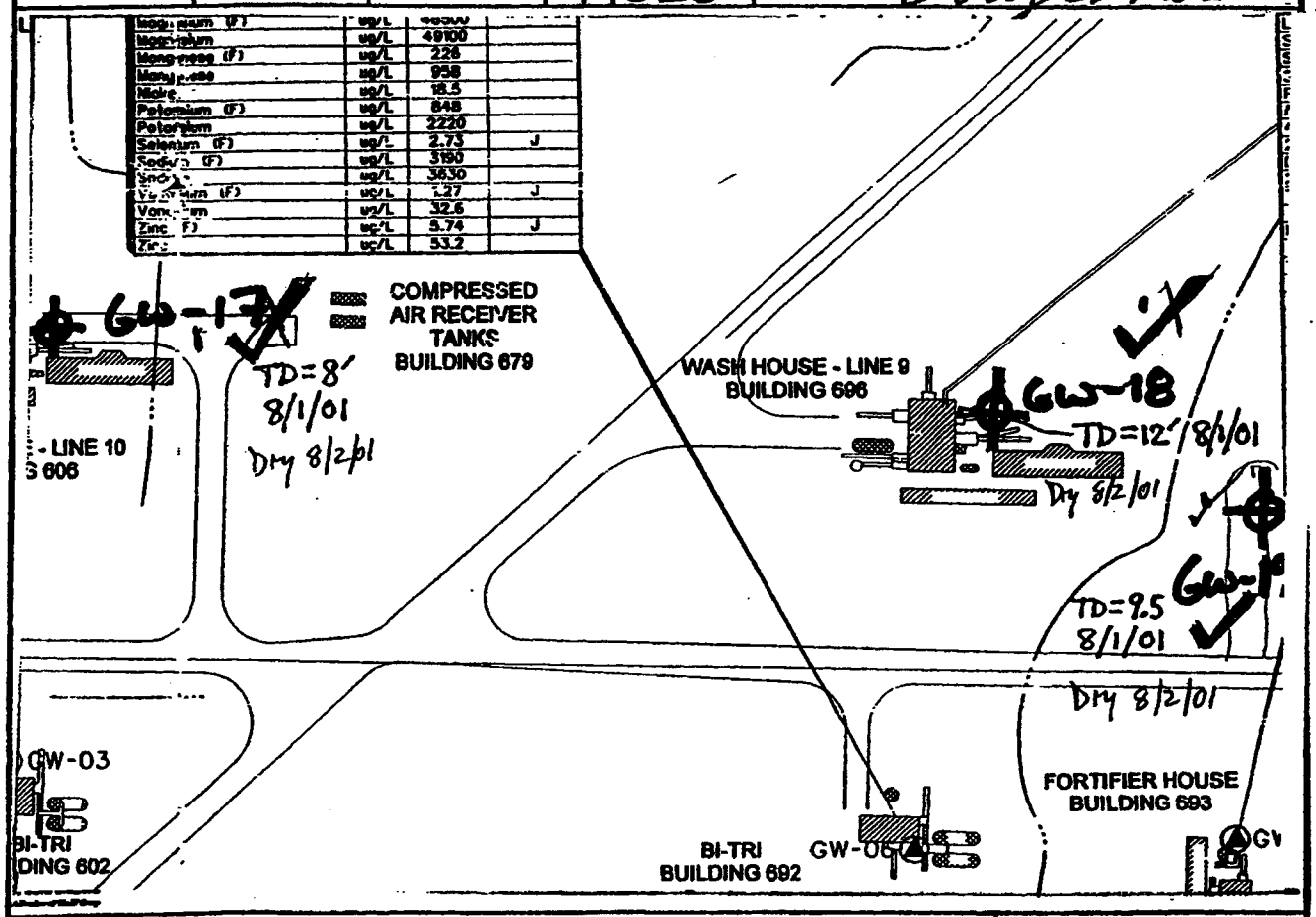
District: USACE Nashville		Hole Number: TNT-C GW18	
Company Name: IT Corporation	Drilling Subcontractor: ProSonic	Sheet 1 of 3 Sheets	
Project: PBOW	Location: TNT Area C, Bldg 696		
Name of Driller: Fred Herzog	Manufacturer's Designation of Drill: GeoProbe 66DT		
Sizes and Types of Drilling and Sampling Equipment: GeoPROBE 66DT 3/3/4" PROBE PVC 2" SCH 40 : PIEZOMETER	Northing: 620512.15	Easting: 1912367.61	NAD 1983 / NGVD 1929
	Surface Elevation: 656.21 Ft		
	Date Started: 8/1/01	Date Completed: 8/1/01	
Overburden Thickness: 12'	Depth to Bedrock: 12'	Depth Groundwater Encountered: NA	
Depth Drilled into Rock: 0'	Depth to Water and Elapsed Time After Drilling Completed: Dry 8/6/01 0848		
Total Depth of Hole: 12'	Other Water Level Measurements (Specify):		

Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
			PIEZO	Tony E. Nolan

Magnesium (F)	ug/L	49100	
Magnesium	ug/L	226	
Manganese (F)	ug/L	958	
Manganese	ug/L	18.5	
Molybdenum (F)	ug/L	848	
Potassium	ug/L	2220	
Selenium (F)	ug/L	2.73	J
Sodium (F)	ug/L	3190	
Sodium	ug/L	3630	
Vanadium (F)	ug/L	1.27	J
Vanadium	ug/L	32.6	
Zinc (F)	ug/L	3.74	J
Zinc	ug/L	53.2	



Project: PBOW | Hole Number: TNT-C/GW18

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C GW-18

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 3 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Units	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	N/A	NA	NA	Begin DPT
	1							
	2							
	3							Inserted 2" PVC Sch 40 Piezometer
	4							
	5							No Lithologic Samples Collected.
	6							
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: TNT-C GW-18

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C GW-18

Project: PBOW

Contact: T. Nolen

Sheet 3 of 3 Sheets

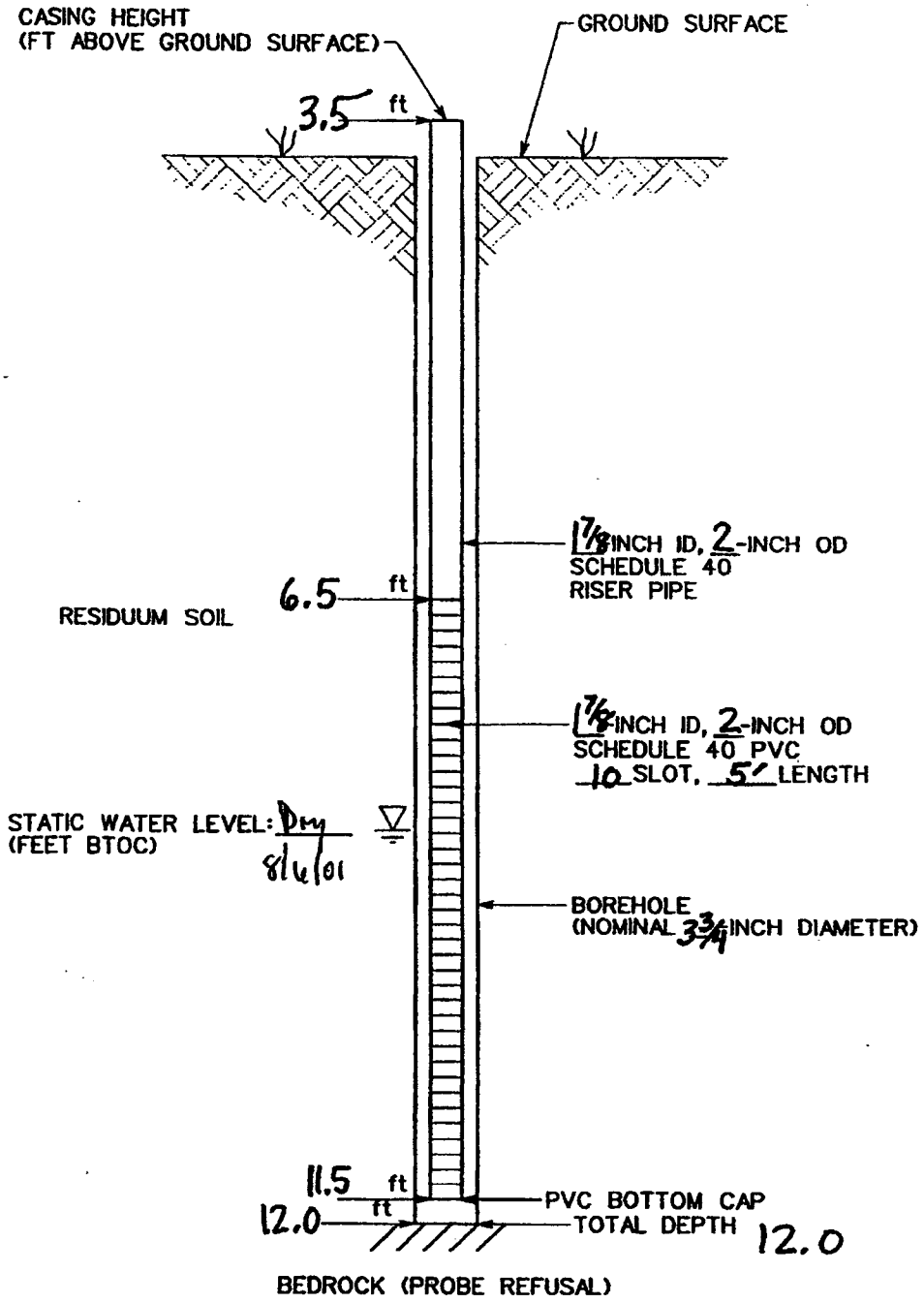
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Units	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	10			NM	NA	NA	NA	
	11							
	12	TD = 12'						
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							

Project: PBOW

Hole Number: TNT-C GW-18

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: INT-C/GW-18



NOTES:

PIEZOMETER NO.: INT-C/GW-18

DATE INSTALLED: 8/6/01

DATE REMOVED: 8/6/01

NOT TO SCALE

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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HTRW DRILLING LOG

District	USACE NASHVILLE
Hole Number	TNT-C/GW-19
Company Name	IT Corporation
Drilling Subcontractor	Pro Sonic
Sheet / Sheets	1 of 2
Project	PBOW
Location	TNT Area C, Bldg 693 (Downgradient)
Name of Driller	~~Tony N~~ (TN) Fred Herzog
Manufacturer's Designation of Drill	GeoProbe 66DT
Sizes and Types of Drilling and Sampling Equipment	GeoProbe 66DT; 3 3/4" Probe; 2" PVC Sch 40 Piezometer
Northing	620501.15
Easting	1912567.12
NAD	1983
NGVD	1929
Surface Elevation	653.19 Ft
Date Started	8/1/01
Date Completed	8/1/01
Overburden Thickness	9.5'
Depth to Bedrock	9.5'
Depth Groundwater Encountered	NA
Depth Drilled into Rock	0'
Depth to Water and Elapsed Time After Drilling Completed	7.38 Ft 8/6/01 0852 (2.62' water column - sampled
Total Depth of Hole	9.5'
Other Water Level Measurements (Specify)	

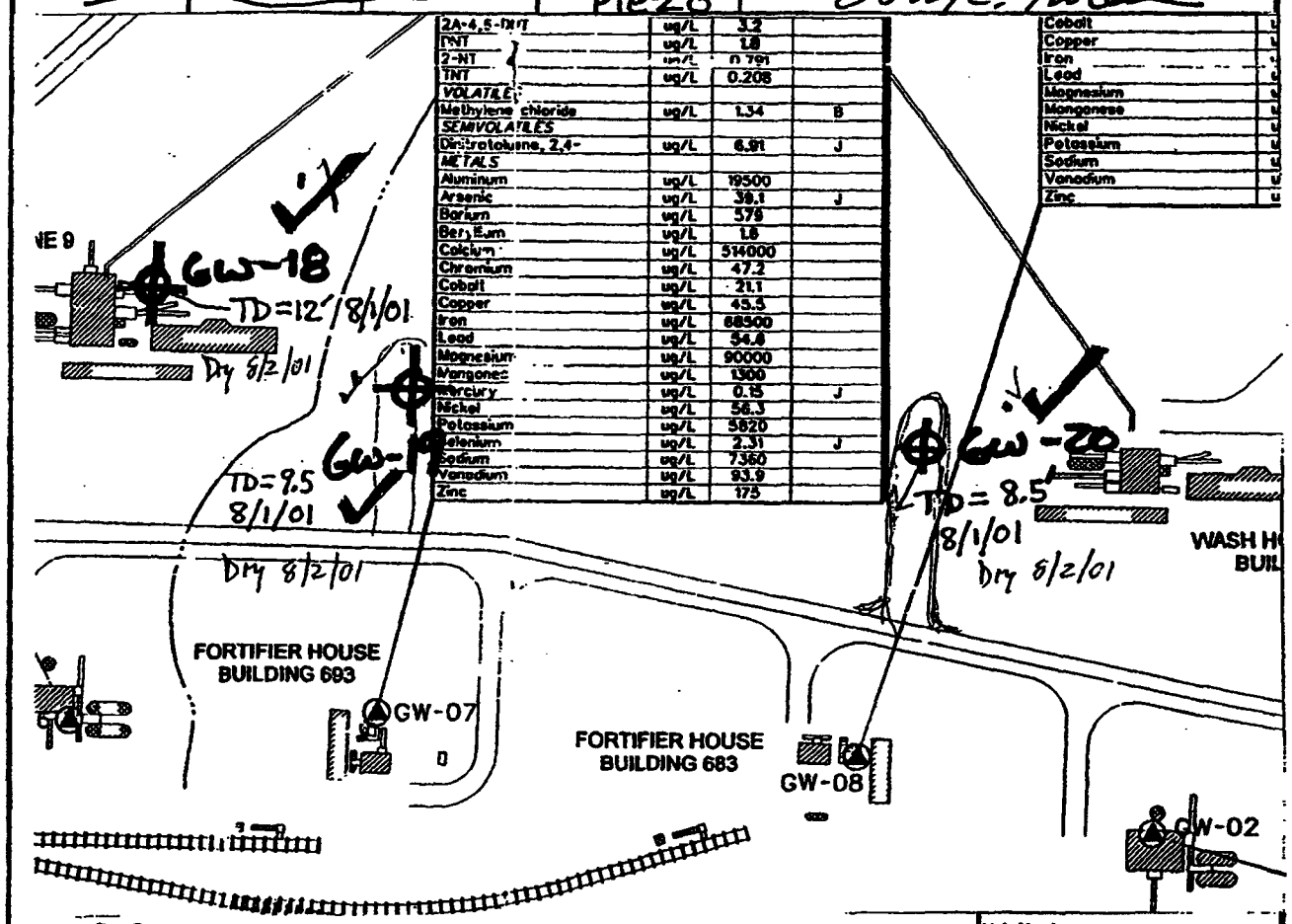
Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	yes	yes	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
			Piezo	Tony E. Nolen

2A-4,5-DNT	ug/L	3.2	
DNT	ug/L	1.8	
2-NT	ug/L	0.791	
TNT	ug/L	0.208	
VOLATILES			
Methylene chloride	ug/L	1.34	B
SEMIVOLATILES			
Dinitrotoluene, 2,4-	ug/L	6.91	J
METALS			
Aluminum	ug/L	19500	
Arsenic	ug/L	38.1	J
Barium	ug/L	575	
Beryllium	ug/L	1.8	
Calcium	ug/L	514000	
Chromium	ug/L	47.2	
Cobalt	ug/L	21.1	
Copper	ug/L	45.5	
Iron	ug/L	68500	
Lead	ug/L	54.8	
Magnesium	ug/L	90000	
Manganese	ug/L	1300	
Mercury	ug/L	0.15	J
Nickel	ug/L	58.3	
Potassium	ug/L	5820	
Selenium	ug/L	2.31	J
Sodium	ug/L	7360	
Vanadium	ug/L	93.9	
Zinc	ug/L	175	

Cobalt	
Copper	
Iron	
Lead	
Magnesium	
Manganese	
Nickel	
Potassium	
Sodium	
Vanadium	
Zinc	



Project PBOW

Hole Number TNT-C / GW-19

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C/GW-19

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

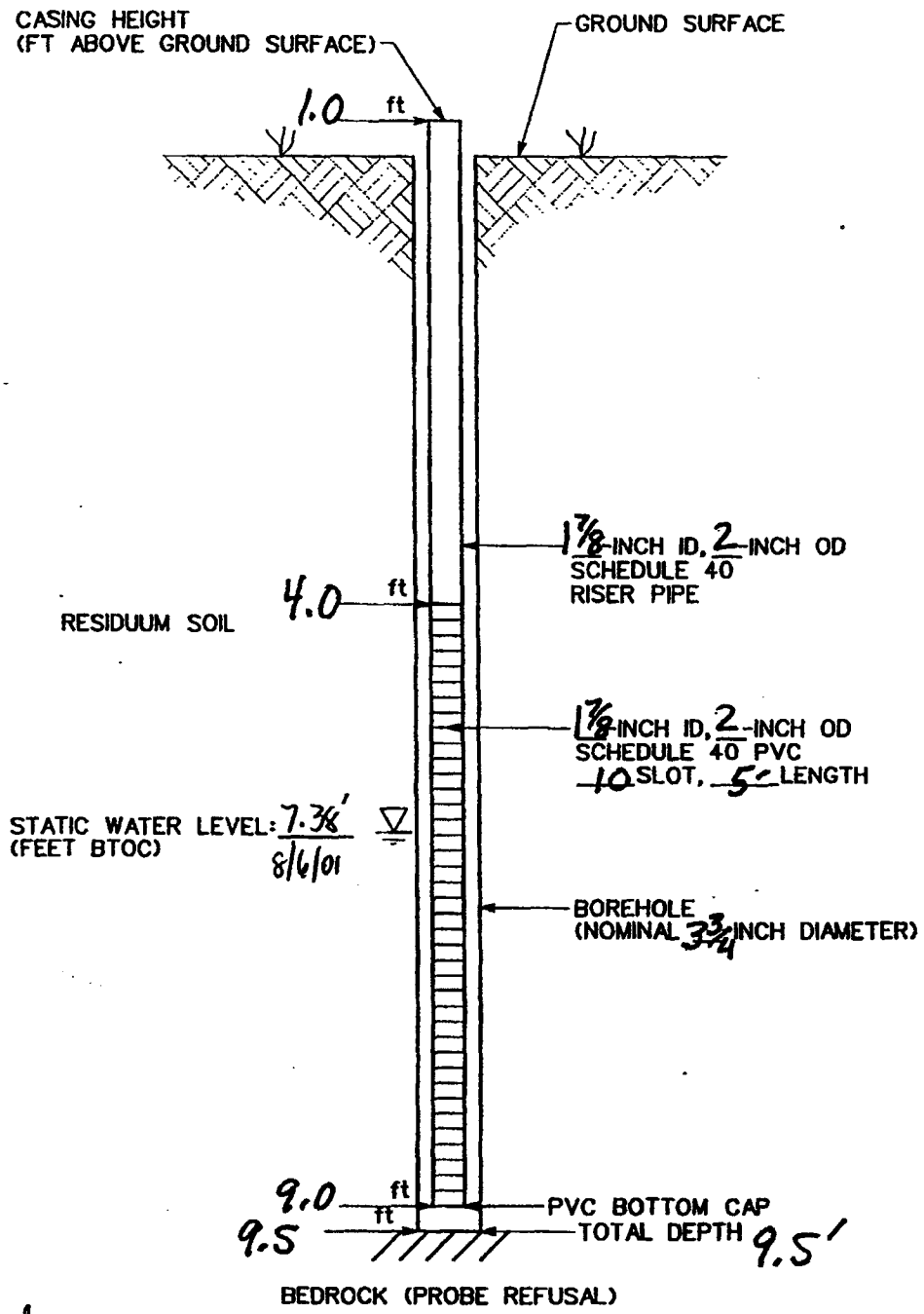
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	N/A		NA	Begin DPT
	1					BC 3019		
	2							Inserted 2" Sch 40 PVC temp. Piezometer
	3							
	4							No LITHOLOGIC SAMPLES COLLECTED
	5							
	6							
	7							
	8							
	9	TD= 9.5'						
	0							

Project: PBOW

Hole Number: TNT-C/GW-19

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: INT-C/GW-19



Sampled

NOTES:

PIEZOMETER NO.: INT-C/GW-19

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016	
ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635	
STARTING DATE: 07/23/01	DATE LAST REV.:		
DRAWN BY: B. VANDERGRIFF	DRAWN BY:		

10:02:05 07/30/01

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HTRW DRILLING LOG

District	USACE Nashville
Hole Number	TNT-C/GW-20
Company Name	IT Corporation
Drilling Subcontractor	Pro Sonic
Sheet / Sheets	1 of 2
Project	PBOW
Location	TNT Area C, Bldg 683 (Downgradient)
Name of Driller	Fred Herzog
Manufacturer's Designation of Drill	GeoProbe 66DT
Sizes and Types of Drilling and Sampling Equipment	GeoProbe 66 DT 3 3/4" Probe 2" PVC Sch 40 Piezometer
Northing	620516.74
Easting	1912868.10
NAD	1983
NGVD	1929
Surface Elevation	650.61 Ft
Date Started	8/1/01
Date Completed	8/1/01
Overburden Thickness	8.5'
Depth to Bedrock	8.5'
Depth Groundwater Encountered	NA
Depth Drilled into Rock	0'
Depth to Water and Elapsed Time After Drilling Completed	Dry 8/6/01 0844
Total Depth of Hole	8.5'
Other Water Level Measurements (Specify)	—

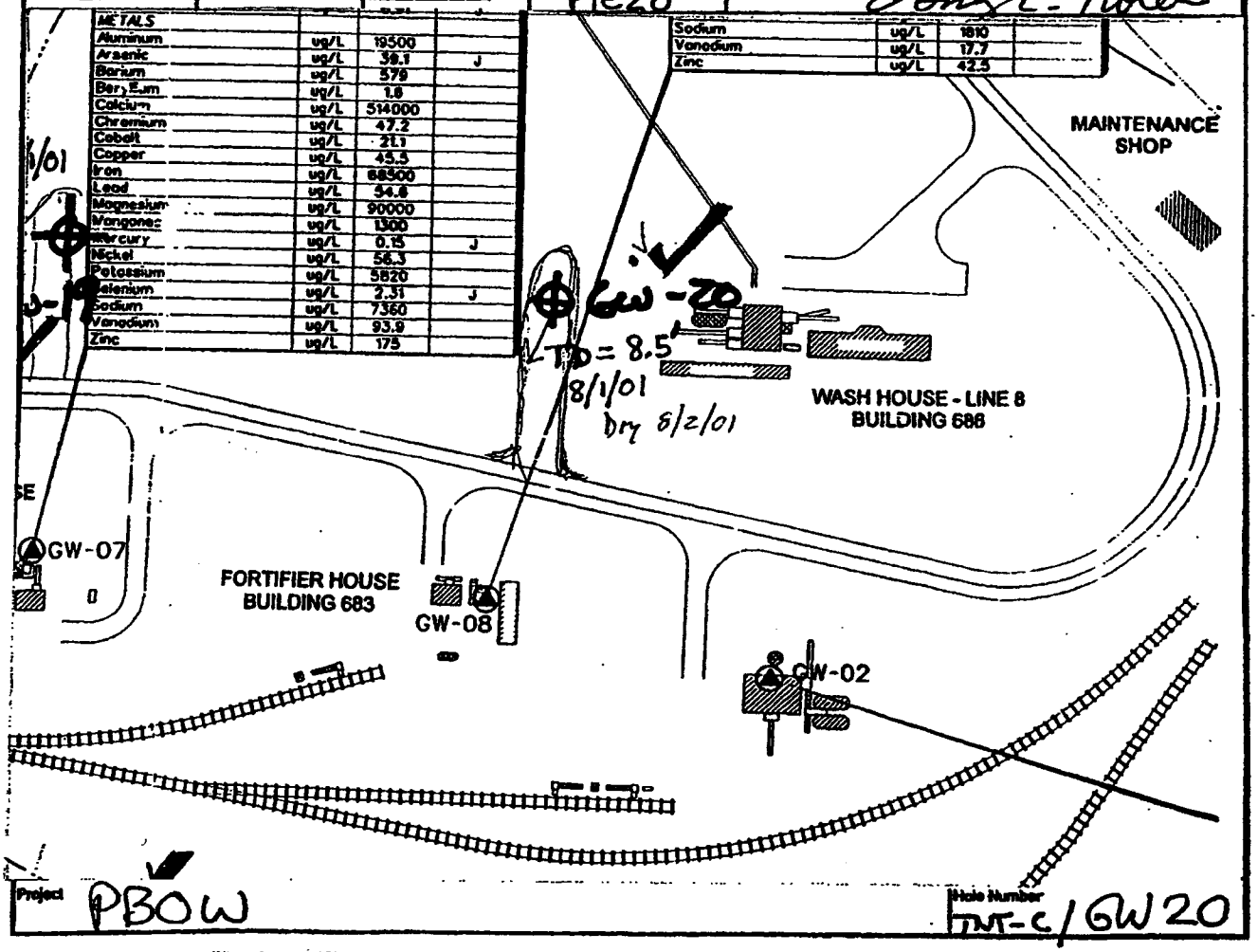
Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
—	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
—		—	PIEZO	Tony E. Nolen

METALS			
Aluminum	ug/L	19500	
Arsenic	ug/L	38.1	J
Barium	ug/L	579	
Beryllium	ug/L	1.8	
Calcium	ug/L	514000	
Chromium	ug/L	47.2	
Cobalt	ug/L	21.1	
Copper	ug/L	45.5	
Iron	ug/L	68500	
Lead	ug/L	54.8	
Magnesium	ug/L	90000	
Manganese	ug/L	1300	
Mercury	ug/L	0.15	J
Nickel	ug/L	56.3	
Potassium	ug/L	5820	
Selenium	ug/L	2.31	J
Sodium	ug/L	7360	
Vanadium	ug/L	93.9	
Zinc	ug/L	175	

Sodium	ug/L	1810	
Vanadium	ug/L	17.7	
Zinc	ug/L	42.5	



Project PBOW

Hole Number TNT-C/GW20

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HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C/GW20

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

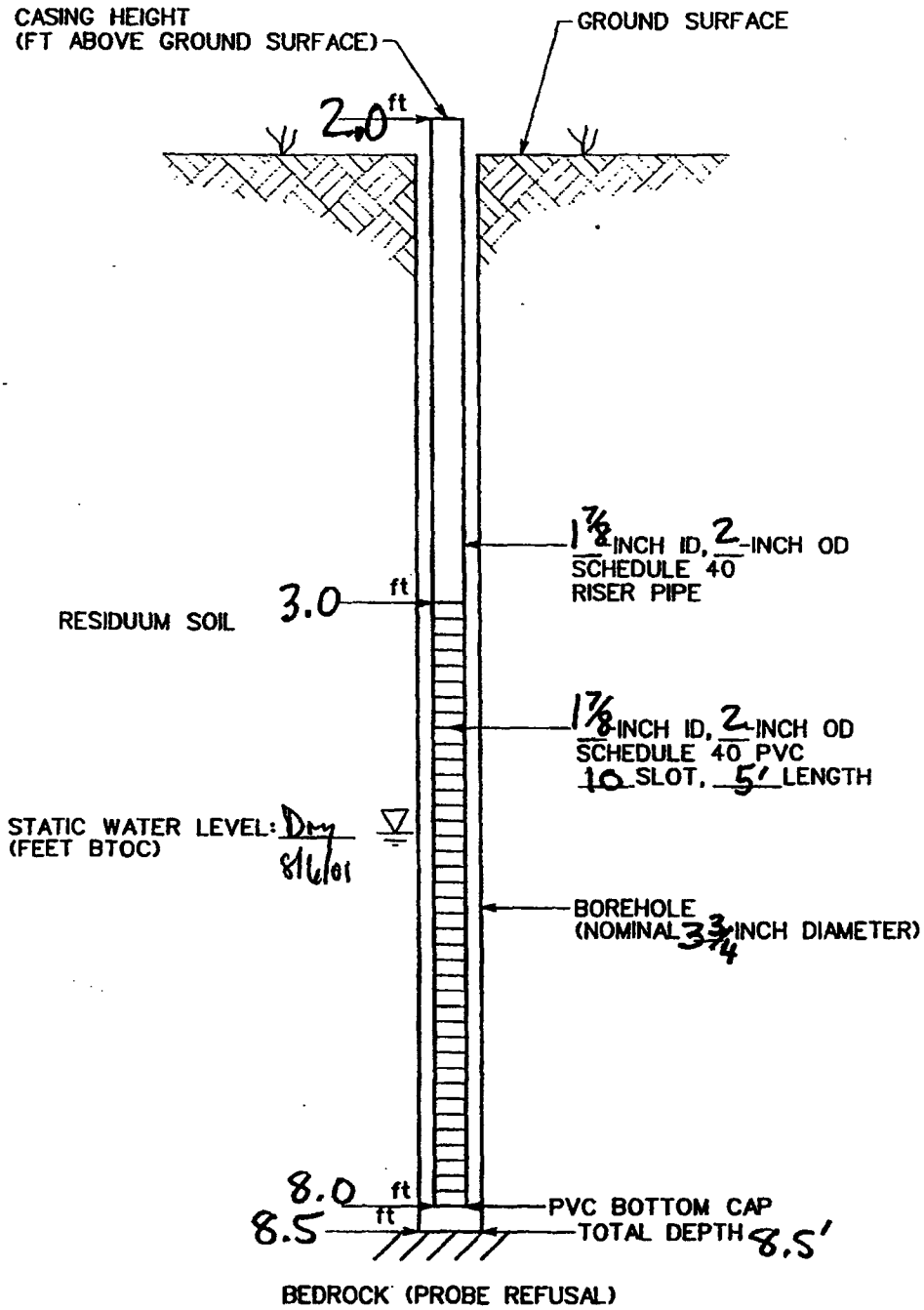
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Units	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	N/A	NA	NM	Begin DPT
	1							
	2							Inserted 2" PVC Sch 40 temp Piezometer
	3							
	4							No Lithologic Samples Collected
	5							
	6							
	7							
	8	TD = 8.5'						
	9							
	10							

Project: PBOW

Hole Number: TNT-C/GW-20

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT-C/GW-20



NOTES:

PIEZOMETER NO.: TNT-C/GW20

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

NOT TO SCALE

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

10:02:05 07/30/01

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HTRW DRILLING LOG	District: USACE Nashville	Hole Number: TNT-C/GW-22
Company Name: IT Corporation	Drilling Subcontractor: ProSonic	Sheet 1 of 2 Sheets
Project: PBOW	Location: TNT Area C, Bldg 622	
Name of Driller: Fred Herzog	Manufacturer's Designation of Drill: GEOPROBE 66DT	
Sizes and Types of Drilling and Sampling Equipment: GEOPROBE 66DT 3 3/4" PROBE 2" PVC Sch 40 PIEZOMETER	Northing: 620004.91 Easting: 1910543.65 NAD: 1983 NGVD: 1929	
	Surface Elevation: 667.56 Ft	
	Date Started: 8/1/01 Date Completed: 8/1/01	
Overburden Thickness: 5' Depth to Bedrock: 5'	Depth Groundwater Encountered: N/A	
Depth Drilled into Rock: 0'	Depth to Water and Elapsed Time After Drilling Completed: Dry 8/6/01 0921	
Total Depth of Hole: 5'	Other Water Level Measurements (Specify):	

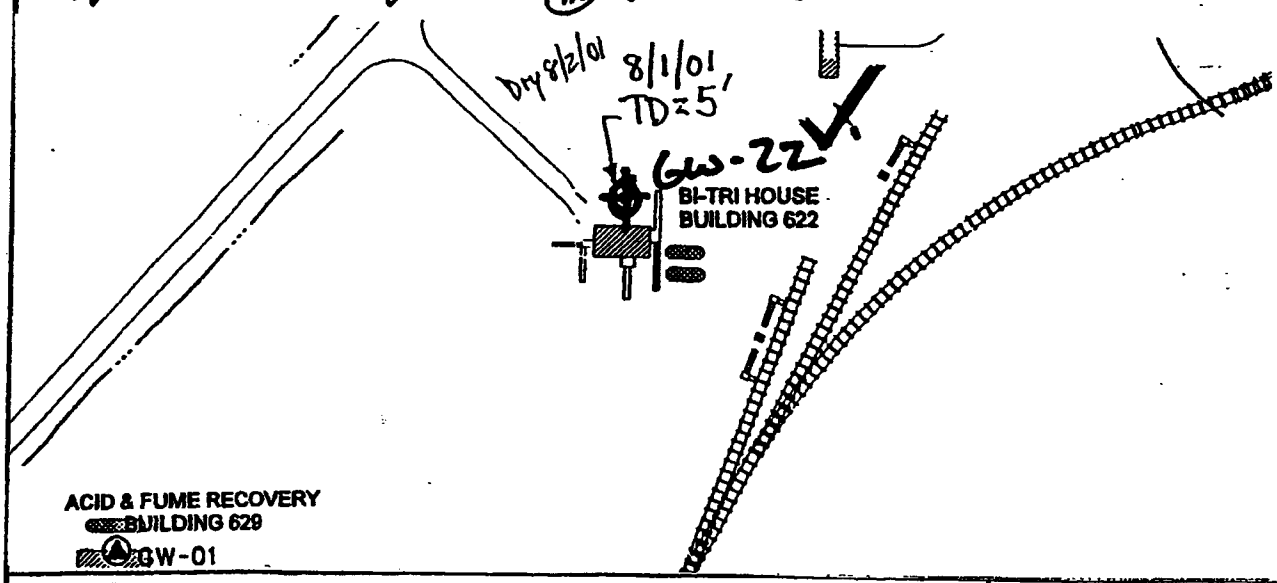
Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
NA	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
			PIEZO	Tony E. Nolan

Location Sketch/Comments — Scale: (not to scale)

Moved borehole 15' WNW of original location because of rock ledge/or rubble/debris; 1st try only reached 2.5' total depth. Move was downslope off the "knee" of the ~~ledge~~ (TN) ledge.



Project: PBOW	Hole Number: TNT-C GW-22

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C/ GW-22

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

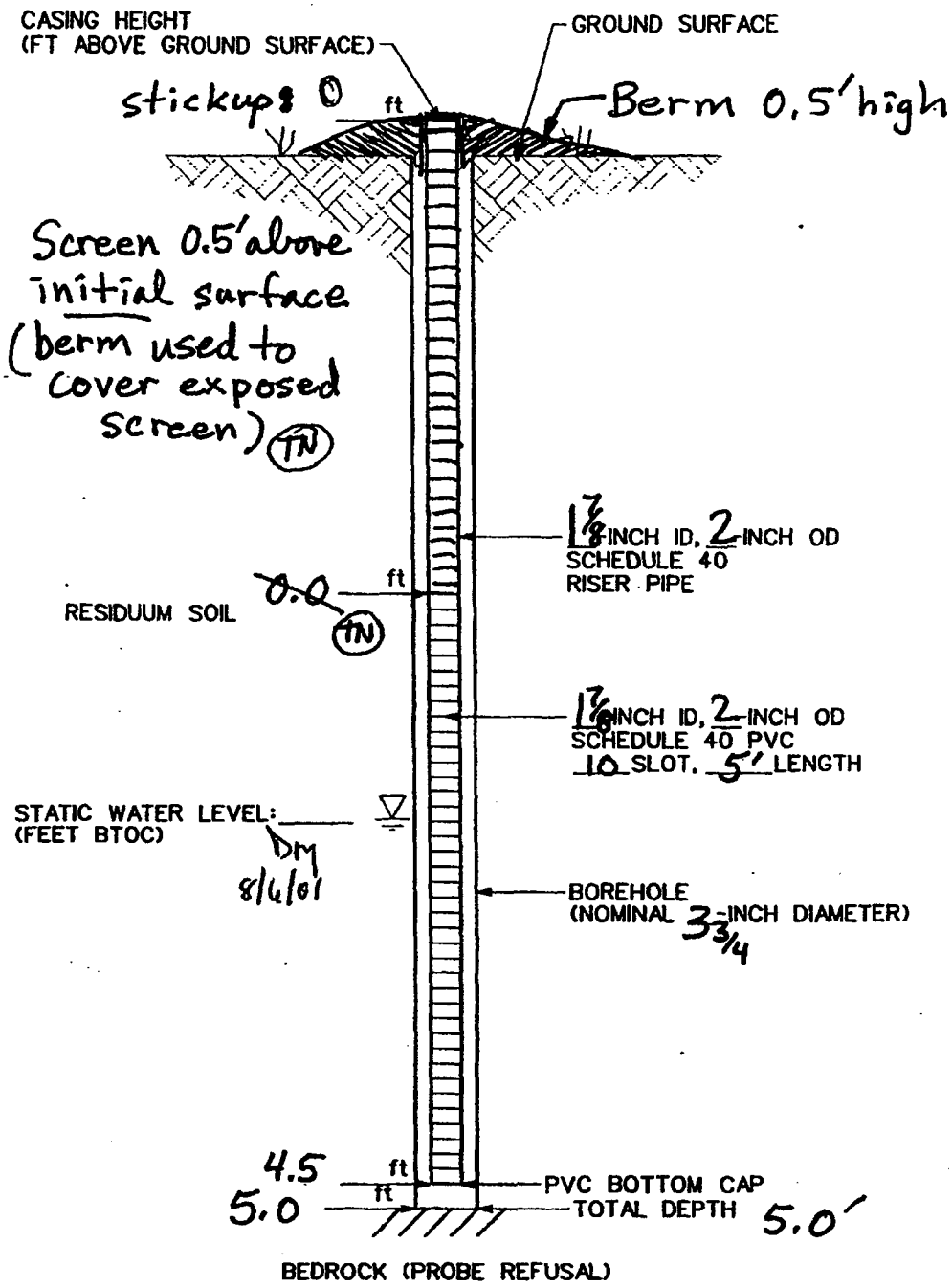
Elev (ft)	Depth (ft) Scale	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	N/A	NA	NA	Begin DPT
	1							Inserted 2" PVC Sch 40 Piezometer
	2							
	3							No Lithologic Samples
	4							
	5	TD = 5'						
	6							
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: ~~TNT-C~~ GW-22 ~~GW21~~

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: INT-C/GW-22



NOTES:

PIEZOMETER NO.: INT-C GW-22

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

DWG. NO.: \825635ES.016 | INITIATOR: C. WILLIAMS | DRAFT. CHCK. BY: C. TUMLIN | DATE LAST REV.: | STARTING DATE: 07/23/01
PROJ. NO.: 825635 | PROJ. MGR.: SPANGBERG | ENGR. CHCK. BY: C. WILLIAMS | DRAWN BY: | DRAWN BY: B. VANDERGRIFF
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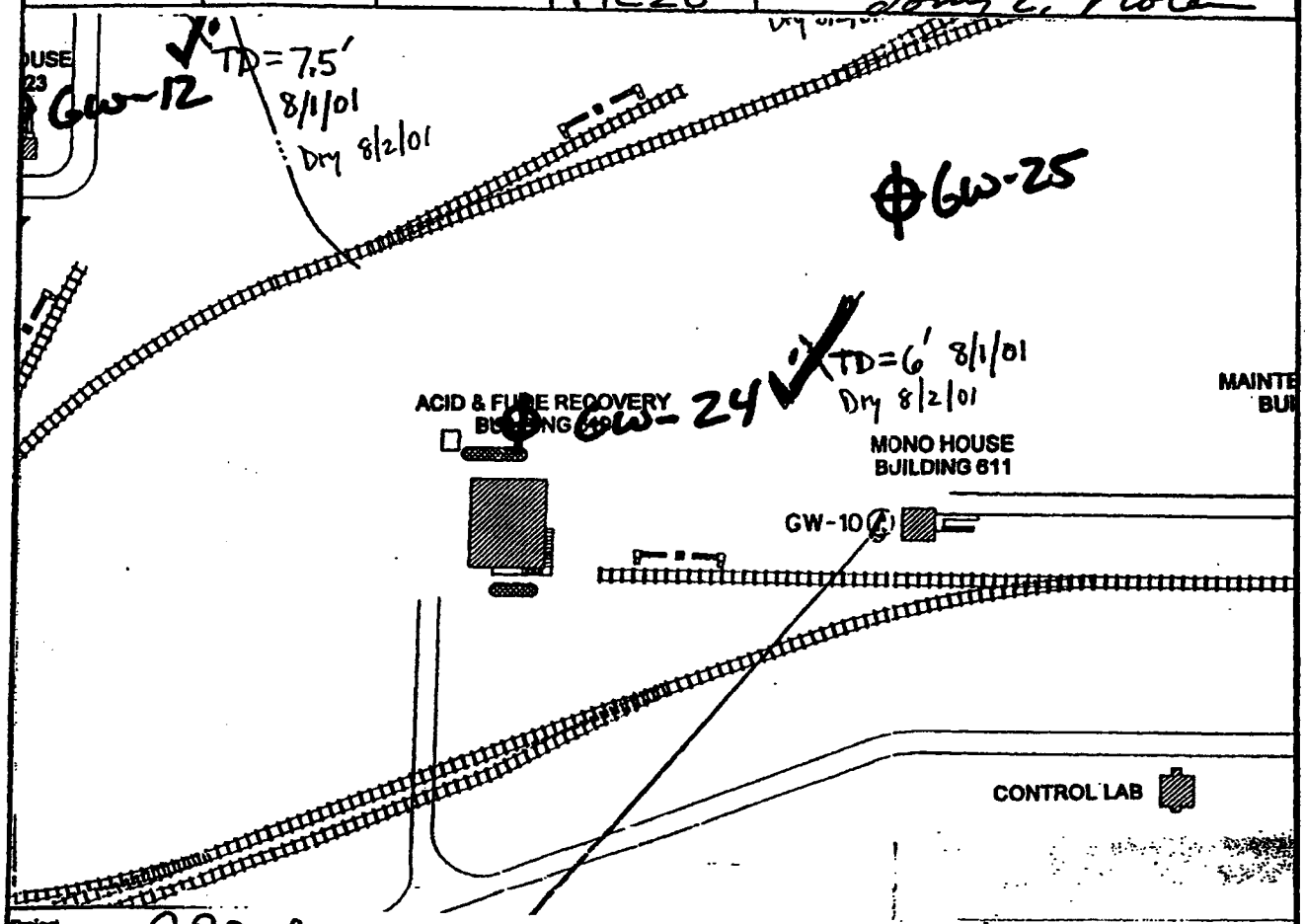
HTRW DRILLING LOG

District	USACE Nashville
Hole Number	TNT-C GW24
Company Name	IT Corporation
Drilling Subcontractor	ProSonic
Sheet	1 of 2 Sheets
Project	PBOW
Location	TNT Area C, Bldg 619
Name of Driller	Fred Herzog
Manufacturer's Designation of Drill	66DT GeoProbe
Sizes and Types of Drilling and Sampling Equipment	66 DT GeoProbe 3 3/4" Probe
Northing	619961.51
Easting	1910900.21
NAD	1983
NGVD	1929
Surface Elevation	673.99 Ft
Date Started	8/1/01
Date Completed	8/1/01
Overburden Thickness	6'
Depth to Bedrock	6'
Depth Groundwater Encountered	NA
Depth Drilled into Rock	0'
Depth to Water and Elapsed Time After Drilling Completed	Dry 8/6/01 0927
Total Depth of Hole	6'
Other Water Level Measurements (Specify)	

Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
NA	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
			PIEZO	Tommy E. Nola



Project PBOW

Hole Number TNT-C /GW-24

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C/GW-24

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

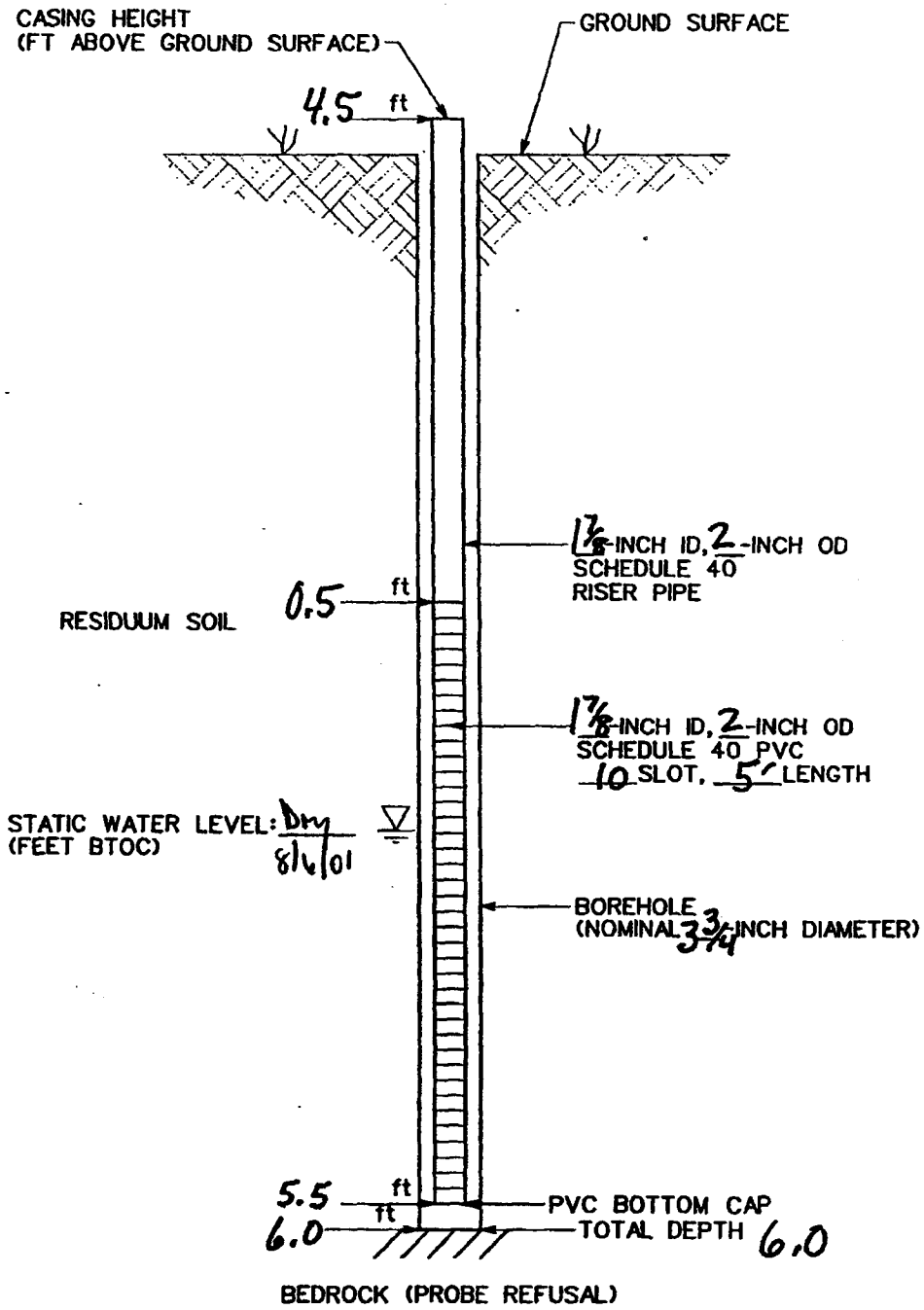
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	N/A	NA	NA	Begin DPT
	1							Inserted 2" PVC Sch 40 temp. Piezometer
	2							
	3							No Lithologic Samples
	4							
	5							
	6	TD=6'						
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: TNT-C GW24

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT-C/GW-24



NOTES:

PIEZOMETER NO.: TNT-C GW-24

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

prepared for:
USACE - NASHVILLE
PLUMBROOK ORDNANCE WORKS

NOT TO SCALE

IT CORPORATION
A Member of The IT Group

STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016	
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635	

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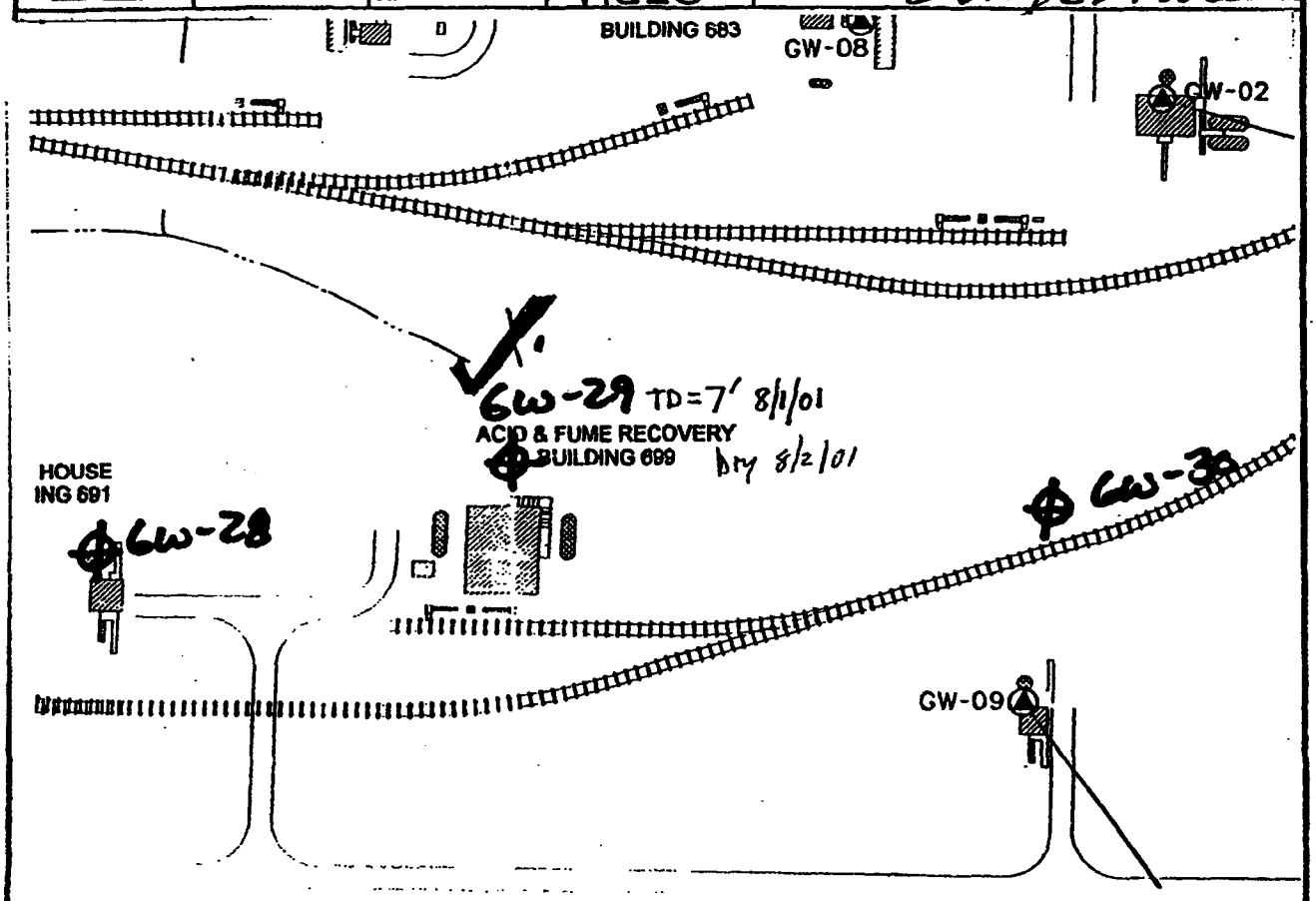
HTRW DRILLING LOG	District: USACE Nashville	Hole Number: TNT-C/GW29
Company Name: IT Corporation	Drilling Subcontractor: ProSonic	Sheet 1 of 2 Sheets
Project: PBOW	Location: TNT Area C, Bldg 699	
Name of Driller: Fred Herzog	Manufacturer's Designation of Drill: GeoProbe 66DT	
Sizes and Types of Drilling and Sampling Equipment: GeoPROBE 66DT	Northing: 619944.63 Easting: 1912604.50 NAD: 1983 NGVD: 1929	
	Surface Elevation: 675.09 Ft	
	Date Started: 8/1/01	Date Completed: 8/1/01
Overburden Thickness: 7.0' Depth to Bedrock: 7.0'	Depth Groundwater Encountered: N/A	
Depth Drilled into Rock: 0'	Depth to Water and Elapsed Time After Drilling Completed: Dry 8/6/01 0932	
Total Depth of Hole: 7.0'	Other Water Level Measurements (Specify): —	

Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
			Piezo	Tony E. Nolen



Project: PBOW	Hole Number: TNT-C/GW29

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C/GW-29

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

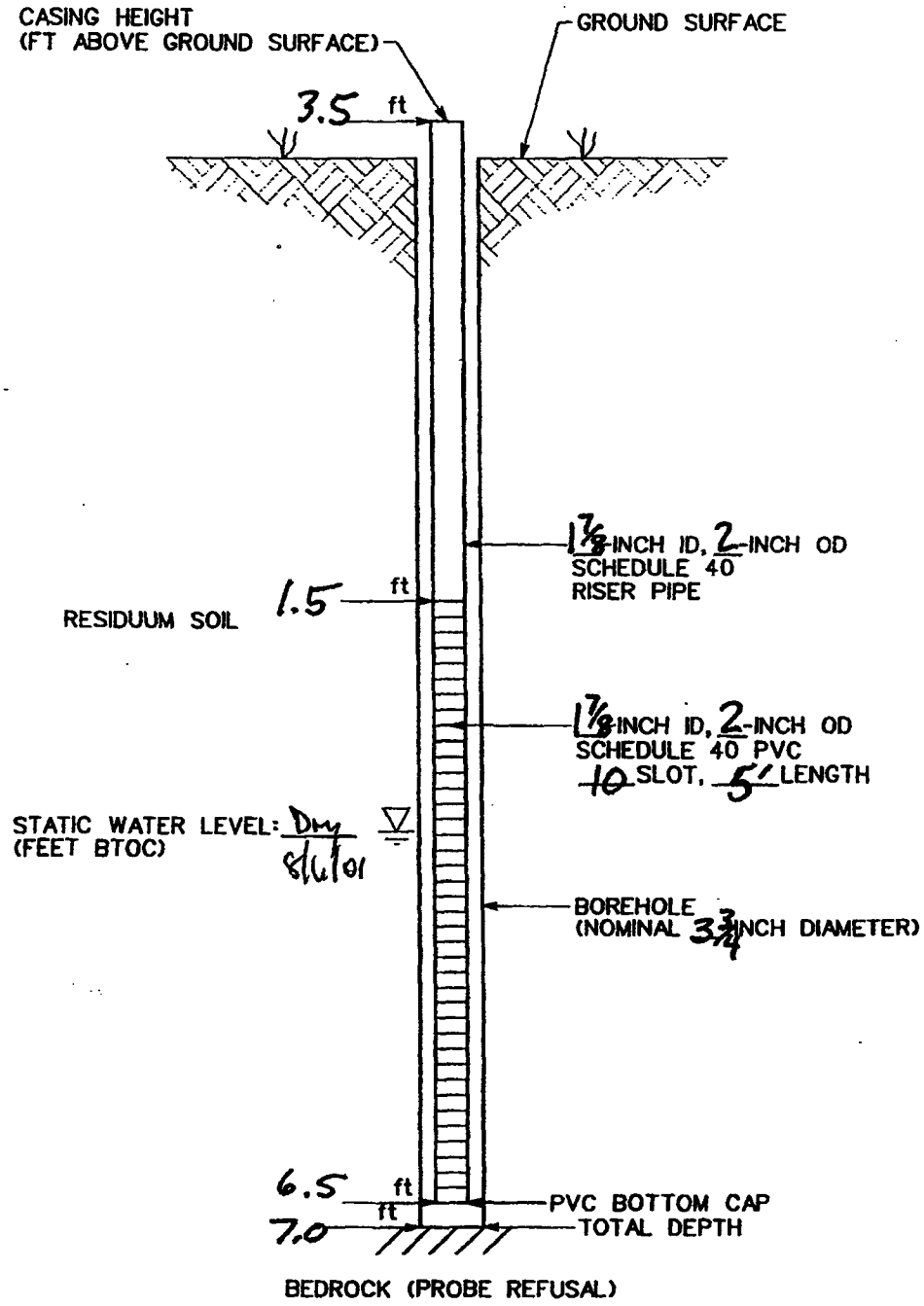
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Units	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	N/A	NA	NA	Begin DPT
	1							
	2							Inserted 2" Sch 40 PVC temp Piezometer
	3							No Lithologic Samples Collected
	4							
	5							
	6							
	7	TD = 7'						
	8							
	9							
	10							

Project: PBOW

Hole Number: TNT-C/GW29

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT-C/GW-29



NOTES:

PIEZOMETER NO.: TNT-C/GW-29

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

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DWG. NO.: \825635ES.016	INITIATOR: C. WILLIAMS	DRAFT. CHCK. BY: C. TUMLIN	DATE LAST REV.:
PROJ. NO.: 825635	PROJ. MGR.: SPANGBERG	ENGR. CHCK. BY: C. WILLIAMS	DRAWN BY:
STARTING DATE: 07/23/01	DRAWN BY: B. VANDERGRIFF		

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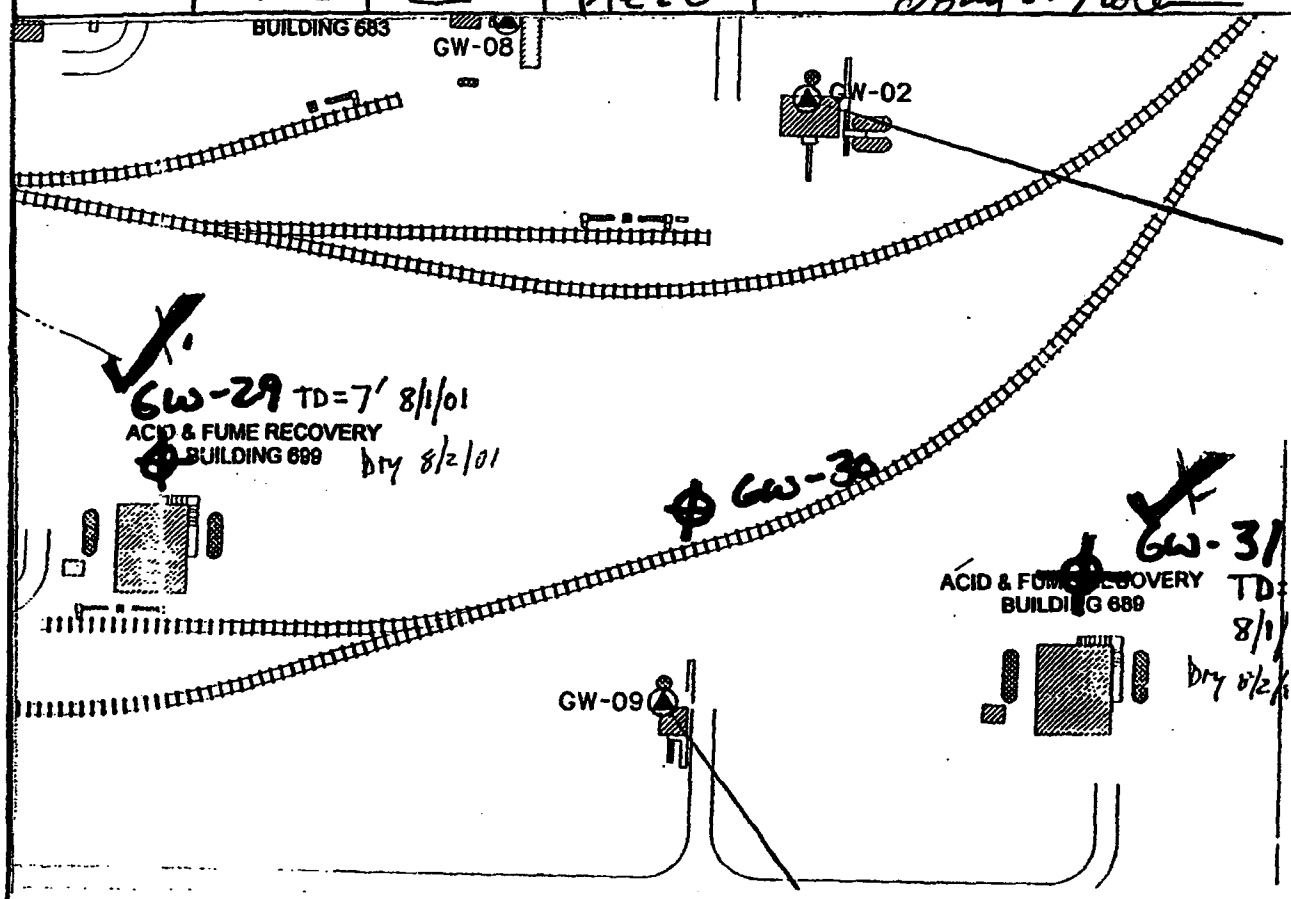
HTRW DRILLING LOG

District: USACE Nashville		Hole Number: TNT-C/GW-31	
Company Name: IT Corporation	Drilling Subcontractor: ProSonic	Sheet 1 of 2 Sheets	
Project: PBOW	Location: TNT Area C, Bldg 689		
Name of Driller: Fred Herzog	Manufacturer's Designation of Drill: ~~ProSor~~ GeoProbe 66DT		
Sizes and Types of Drilling and Sampling Equipment: GEOPROBE 66DT	Northing: 619846.54	Easting: 1913163.05	NAD 1983 / NGVD 1929
	Surface Elevation: 673.35 Ft		
	Date Started: 8/1/01	Date Completed: 8/1/01	
Overburden Thickness: 6' / Depth to Bedrock: 6'	Depth Groundwater Encountered: N/A		
Depth Drilled into Rock: 0'	Depth to Water and Elapsed Time After Drilling Completed: Dry 8/6/01 0936		
Total Depth of Hole: 6'	Other Water Level Measurements (Specify): —		

Geotechnical Samples	Disturbed	Undisturbed	Total Number of Core Boxes
	NA	NA	NA

Samples for Chemical Analysis	VOC	Metals	Other	Other	Other	Total Core Recovery
	NA	NA	NA	NA	NA	NA

Disposition of Hole	Backfilled	Monitoring Well	Other	Signature of Geologist
	—	—	Piezo	Tony E. Nole



Project: PBOW	Hole Number: GW-31

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HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNT-C GW31

Project: PBOW

Geologist: T. Nolen

Sheet 2 of 2 Sheets

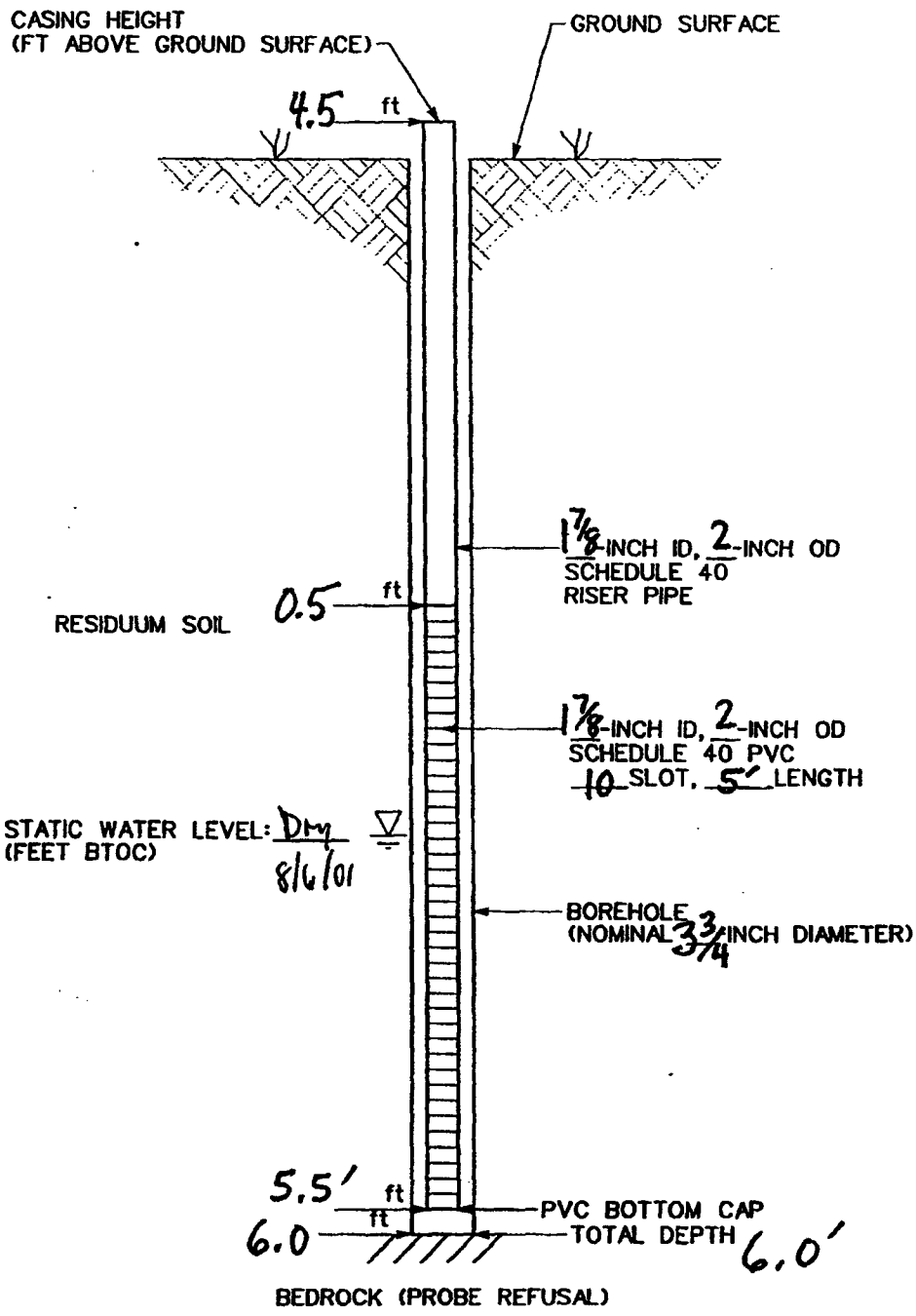
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
				NM	N/A	NA	NA	Begin DPT
	1							
								Insert 2" Sch 40 PVC Piezometer
	2							
								No Lithologic Samples Collected.
	3							
	4							
	5							
	6	TD=6'						
	7							
	8							
	9							
	10							

Project: PBOW

Hole Number: TNT-C/GW31

TYPICAL SHALLOW PIEZOMETER CONSTRUCTION DIAGRAM ABOVE GROUND COMPLETION

LOCATION: TNT-C/GW-31



NOTES:

PIEZOMETER NO.: TNT-C/GW-31

DATE INSTALLED: 8/1/01

DATE REMOVED: 8/6/01

PIEZOMETER CONSTRUCTION DIAGRAM

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STARTING DATE: 07/23/01	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WILLIAMS	DWG. NO.: \825635ES.016
DRAWN BY: B. VANDERGRIFF	DRAWN BY:	ENGR. CHCK. BY: C. WILLIAMS	PROJ. MGR.: SPANGBERG	PROJ. NO.: 825635

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APPENDIX B

SAMPLE COLLECTION LOGS

DIRECT-PUSH GROUNDWATER SAMPLE COLLECTION LOGS

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE W

Manager: Mike Spangberg

RFA / COC Number: PB080020 1 5TL

Location Code: TNTA-DP14

Sample Number: BA3014

Sample Name: PBOW-01-GW-TNTA-DP14-BA3014-(0000)

Sampling Method: DP

Sample Type: GW *Sample Purpose:* REG

Collection Date: 8-2-01

Collection Time: 10:25

Start Depth: 7.62

End Depth: 10.0' TD

Sample Matrix: WATER

Sample Team: S. Neal, D. Tandel

QC Partners:

(TB) TB080201 (ER) — (FB) —

ERPIMS Values:

Sacode: —

Lot Control#: —

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
VOLATILES3	N	A	3	40	mL	GVIAL-SRP
EXPL-HPLC-SC	N	B	1	1	L	Amb Glass

Comments: Sample collected w/ peristaltic pump and disposable plastic tubing. Performed no purging.
DP14 = GW-14

Sketch Location:

Ph: 6.66
Cond: 0.901
turb: 999.0
DO: 2.46
temp: 18.36
Dep: 28.5
SAL: 0.04
DS: 0.56

σ t: 0
ORP: -131

Logged BY / Date: [signature]

Reviewed BY / Date: [signature] 08/01/01

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE W

Manager: Mike Spangberg

RFA / COC Number: PB08-01 STL

Location Code: TNTA-DP21

Sample Number: BA3021

Sample Name: PBOW-01-GW-TNTA-DP21-BA3021-(0000)

Sampling Method: DP

Sample Type: GW *Sample Purpose:* REG

Collection Date: 8-1-01

Collection Time: 17:12

Start Depth: 9.76

End Depth: ~~[illegible]~~ 10.5' TD

Sample Matrix: WATER

Sample Team: Sheldon McLeod, Dave Findell

QC Partners:

(TB) TRIP BLANK 080101 (ER) — (FB) —

ERPIMS Values:

Sacode: —

Lot Control#: —

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
VOLATILES3	N	A	3	40	mL	CVIAL,SEP
EXPL-HPLC-SC	N	B	1	1	L	Amb.Glass

Comments: Sampled using peristaltic pump and new plastic tubing. Performed no purging. DP21 = GW-21

Sketch Location:

Ph = 7.19

Cond = 1.39 s/cm

turb = 723.0 NTU

DO = 3.34 g/L

temp = 19.50 °C

DEP = 1.9 m

SAL = 0.06 %

TDS = 0.9 g/L

σt = 0

ORP = 162 mV

Logged BY / Date: Sheldon McLeod

Reviewed BY / Date: [illegible]

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE W

Manager: Mike Spangberg

RFA / COC Number: PB08-06STL

Location Code: TNTB-DP02

Sample Number: BB3002

Sample Name: PBOW-01-GW-TNTB-DP02-BB3002-(0000)

Sampling Method: DP

Sample Type: GW *Sample Purpose:* REG

Collection Date: 8/6/01

Collection Time: 1145

Start Depth: 13.60'

End Depth: 15.10'

Sample Matrix: WATER

Sample Team: DKK/SM

QC Partners:

(TB) TB0X0601 (ER) — (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
VOLATILES3	N	A	3	40	mL	GVIAL,SEP
EXPL-HPLC-SC	N	B	1	1	L	Amb Glass

Comments:

- Collected w/ 2" ~~play~~ poly, unweighted bailer.
- Collected no water quality readings. Insufficient sample volume
- DP02 = GW-02 Depth to water = 13.60', Stick-up = 4.55 FT

Sketch Location:

TNT Area B. Collected from 2" temporary piezometer.

Logged BY / Date: David Kessler

Reviewed BY / Date: David Kessler

INTERNATIONAL TECHNOLOGY CORPORATION

Page ( )

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE W

Manager: Mike Spangberg

RFA / COC Number: PB08-0155L

Location Code: TNTB-DP03

Sample Number: BB3003

Sample Name: PBOW-01-GW-TNTB-DP03-BB3003-(0000)

Sampling Method: DP

Sample Type: GW *Sample Purpose:* REG

Collection Date: 8-1-01

Collection Time: 15:33

Start Depth: 15.28

End Depth: 18.71

Sample Matrix: WATER

Sample Team: Sheldon McLeon/David Tind

QC Partners:

(TB) TB 080101 (ER) — (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
VOLATILES3	N	A	3	40	mL	GVIAL-SEP
EXPLOSIVES-SC	N	B	1	1	L	AmberGlass-PT

Comments: Sampled using peristaltic pump and new plastic tubing. Performed no purging
DP03 = GW-03

Sketch Location:

Ph = 6.23
Cond = 0.635
turb = 999.0
DO = 2.01
temp = 18.49
Dep = -1.0
Sal = 0.03

tds = 0.40
ot = 0
ORP = 50 mV

time : 15:33

Logged BY / Date: Sheldon McLeod

Reviewed BY / Date: [signature] 08/10

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE W

Manager: Mike Spangberg

RFA / COC Number: PB08-01STL

Location Code: TNTC-DP13

Sample Number: BC3013

Sample Name: PBOW-01-GW-TNTC-DP13-BC3013-(0000)

Sampling Method: DP

Sample Type: GW *Sample Purpose:* REG

Collection Date: 8-01-01

Collection Time: 16:20

Start Depth: ~~6.84~~ 6.38 ~~2.39~~

End Depth: 2.39

Sample Matrix: WATER

Sample Team: Sheldon McLeod/David Tindell

QC Partners:

(TB) TB080101 (ER) — (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
VOLATILES3	N	AC	3	40	mL	GVIALSEP
EXPLOPLGS0	N	B	1	1	L	AmbGlass

Comments: Sampled using peristaltic pump and new plastic tubing
Performed no purging
DP13 = GW-13

Sketch Location:

Ph = 6.84

Cond = 0.790

turb = 999.0

DO = 2.49 g/L

temp = 20.5°C

Dep = 0.2

Sal = 0.03

tds = 0.50 g

ot = 0

ORP = -10

Logged BY / Date: [signature] 8-1-01

Reviewed BY / Date: [signature] 08/10/

INTERNATIONAL TECHNOLOGY CORPORATION

Page

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE W

Manager: Mike Spangberg

RFA / COC Number: PB08-06561

Location Code: TNTC-DP19

Sample Number: BC3019

Sample Name: PBOW-01-GW-TNTC-DP19-BC3019-(0000)

Sampling Method: DP

Sample Type: GW *Sample Purpose:* REG

Collection Date: 8/6/01

Collection Time: 1210

Start Depth: 7.38'

End Depth: 9.88

Sample Matrix: WATER

Sample Team: DKK/SM

QC Partners:

(TB) TB080601 (ER) — (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
VOLATILES3	N	A	3	40	mL	GVIAL-SEP
EXPL-HPLC-SC	N	B	1	1	L	AMB-GLASS

Comments: - Collected w/ 2" poly, unweighted, disposable bailer

- DP19 = GW-19

Sketch Location:

TNT Area C. Collected from 2" temporary piezometer.

pH = 6.73 DKK

Cond (mS/cm) = 2.29

Turb (NTU) = 523.0

DO (mg/L) = 6.32

Temp (°C) = 17.73

DEL =

SAL (‰) = 0.11

TDS (g/L) = 1.5

Ot = 0

ORP (mV) = 281

Logged BY / Date: David Kessler 8/6/01 *Reviewed BY / Date:* David Kessler 8/11/01

GROUNDWATER SAMPLE COLLECTION LOGS

APRIL 2002

NON-BACKGROUND GROUNDWATER SAMPLE COLLECTION LOGS

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04152002F 04152002N

Location Code: PB-TNTA-MW10

Sample Number: CB3042

Sample Name: PBOW-02-GW-PB-TNTA-MW10-CB3042-(0(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/15/02

Collection Time: 0945

Start Depth: 11

End Depth: 12

Sample Matrix: WATER

Sample Team: DK/DD

QC Partners:

(TB) ~~CB3019~~ BC 5019 DO (ER) (FB)

ERPIMS Values:

Sacode:

Lot Control#:

4/15/02

PID = 0.0 ppm

LEL = 2

CO = 0

H_2S = 0

O_2 = 20.8

Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments: - Not able to low-flow even though well recharging. Pumping rate adjusted between 150 ml/min to 425 ml/min (prior to 0915 on 4/15/01).
- Collected sample w/ pump.

Sketch Location: - Obtained consecutive water quality readings with water level dropping more than 0.5 ft. Water level above screened interval.

Logged BY / Date: David Kresh 4/15/02 *Reviewed BY / Date:* [illegible] 4/15/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: PB-TNTA-MW10

Sample Number: CB3042

4/14/02 DTW = 2.75 ft TD = 16 ft (4/14/02)

Begin remove water @ 13:35

Recharges 0.16 ft in 1 minute -- based on the recharge rate, will attemp to low flow on 4/15/02

4/15/02 DTW = 2.90 Ft, could not keep water level within 6". Pump placed at 11 Ft. Controls: CPM6 Rate: 6-8 Discharge: 3.2 Throttle 20

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/14/02	1340	2.75	-91	7.41	0.511	132	3.81	11.84	0.25
4/15/02	0915	3.68	-96	7.31	1.27	123	0.40	9.1	1.5
	0920	5.05	-105	7.41	1.27	66.1	0.00	8.0	2 ~425 ml/min (no low-flow)
	0925	5.40	-113	7.40	1.21	54.7	0.00	8.0	3
	0930	5.45	-117	7.42	1.23	55.5	0.00	8.1	3.5
	0935	5.45	-121	7.43	1.23	55.5	0.00	8.2	3.75 ~375 ml/min
	0940	5.44	-124	7.44	1.24	56.2	0.00	8.3	3.90
	10								
Sample:	0945	5.44	-125	7.44	1.24	56.4	0.00	8.3	
	1005	4.91	-132	7.46	1.26	57.2	0.00	8.6	4 gal Total

Logged BY / Date: David Kusch 4/15/02 *Reviewed BY / Date:* [illegible] 4/15/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: TNTA
RFA/COC Number:

Collection Date: 4/15/02
Collection Time: 0845
Sample Filtered (Yes / No): yes
Weather/Temp: cloudy, warm (65°), calm

Form Completed By: L. Nguyen
Sampler(s): DKK/DD
Reviewed By: David Keesh

Sample Number: PBOW 02 GW CB3042 11 12

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: TNTA-MW10
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: Good
Screen Height: 10 ft
Casing Type: Sch 40 PVC

Outside Casing Dia. (in): 2
Depth to Product (ft): None
Total Well Depth (ft): ~16 ft
Depth to Water (ft): 2.75 ft
Water Column (ft): 13.25
Elev. Ref. for Water Level:

Odor: None
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: 1
- Reading (ppm): 0.0 / LEL=26, O_2=20.8, CO=0, H_2S=0
Remarks: 10" borehole

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = 13.1 ft x 0.164 Gal/ft = 2.15 gallons DTW=2.90 4/15/02

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((10)^2 - (2)^2) = 3.94 gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height 10 ft + 2 ft) x 3.94 gal/ft) x 0.3 = 14.17 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 14.17 gal + 2.15 gal = 16.32 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
16.32	32.64	48.96		

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
4/14/02 Purge Vol 1	1340	2.75	0.511	7.61	-91	11.84	132	3.01	
Purge Vol 2									
Purge Vol 3									
Purge Vol 4			See page 2 of sample collection log (CB3042)						
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS, TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 041520021 / 041520021

Location Code: PB-TNTA-MW11

Sample Number: CB3043

Sample Name: PBOW-02-GW-PB-TNTA-MW11-CB3043-(0(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/15/02

Collection Time: 1030

Start Depth: 4

End Depth: 8

Sample Matrix: WATER

Sample Team: DK/DD

QC Partners:

(TB) ~~CB5019~~ BC 5019 (ER) (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL.SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL.SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

4/14/02
- Purge groundwater ~~sto~~ on 4/14/02 with 2" poly bailer. Very slow recharge (0.05 ft/min).
- Bailed to 12.90 ft (TD=13.20).

4/15/02 DTW = 4.00 ft

Comments:

Sketch Location:

Logged BY / Date: David Kessler 4/15/02 *Reviewed BY / Date:* [illegible] 4/15/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-TNTA-MW11**

Sample Number: **CB3043**

4/12/02 Depth to water = 3.77 ft, TD = 13.20 ft, water column ~ 9.43 ft

4/14/02 " " " ≈ 3.50 ft

Recharge rate = 0.05 ft/min – Not able to low-flow

WL is within the screen interval

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/14/02 Bailed to 12.90 ft									
		See groundwater sampling form for CB 3043							
Sample:	1030								

Logged BY / Date: David Keesler 4/15/02 *Reviewed BY / Date:* Dm Rd 4/15/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: TNTA
RFA/COC Number:

Collection Date: 4/15/02
Collection Time: 1030
Sample Filtered (Yes / No): yes
Weather/Temp: partly cloudy

Form Completed By: D. Kessler
Sampler(s): DK/DD
Reviewed By: David Kessler

Sample Number: P B O W 0 2 G W T N T A M W 1 1 C B 3 0 4 3

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: TNTA-MW11
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: good
Screen Height: 10 ft
Casing Type: Sch 40 PVC

Outside Casing Dia. (in): 2"
Depth to Product (ft): —
Total Well Depth (ft): 13.20 ft (4/12/02)
Depth to Water (ft): 3.77
Water Column (ft): 9.43
Elev. Ref. for Water Level:

Odor: None
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: /
- Reading (ppm): 0.0 / LEL 0 O2 20.8 CO2 0 H2S 0
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = 9.7 ft x 0.164 Gal/ft = 1.59 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((10)^2 - (2)^2) = 3.94 gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height 10 ft + 2 ft) x 3.94 gal/ft) x 0.3 = 4.78 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 4.78 gal + 1.59 gal = 6.37 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
6.37	12.74	19.11		

4/14/02

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:	4/14/02	Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1	1400	3.50	1.17	5.65	104	9.5	58.0	6.04	0
Purge Vol 2	1410	7.98	1.39	6.00	65	8.0	177.0	5.70	1.75
Purge Vol 3	1415	9.46	1.41	6.20	43	7.5	528.0	5.19	4
Purge Vol 4	1420	10.48	1.53	6.44	24	8.2	429.0	1.39	5.5
Purge Vol 5	1425	12.90	1.45	6.30	47	8.9	999.0	5.60	6.0
SAMPLE 4/15/02	1030	4.00	1.31	6.62	23	9.6	56.4	8.81	

After 1045 8.00

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04102002K / 04102002N

Location Code: PB-TNTC-MW3

Sample Number: CB3027

Sample Name: PBOW-02-GW-PB-TNTC-MW3-CB3027-(00-

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/10/02

Collection Time: 9:35

Start Depth: 4.0 ft

End Depth: 4.0 ft

Sample Matrix: WATER

Sample Team: JH, LN

QC Partners:

(TB) CB5013 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

PID = 0.0 ppm 4/7/02, 4/9/02
O_2 = 21.3 ppm 4/9/02.

PID = 0.3 ppm 4/10/02
O_2 = 21.4 ppm

Comments: Purged well with bailer. Collected sample the following day.

Sketch Location:

Logged BY / Date: Lien Nguyen 4/10/02 *Reviewed BY / Date:* [illegible] 4/10/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-TNTC-MW3**

Sample Number: **CB3027**

Initial DTW = 4.38 ft (4/7/02)
Initial DTW = 3.45 ft (4/9/02) – recharge rate ≈ 6ml/min. Total purge vol. ≈ 10.75 gal
DTW = 4.00 ft (4/10/02)

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
Sample:									

See associated groundwater sampling form for water quality readings during purge with bailer.

Did not collect water quality reading of sample due to inadequate sample volume.

Logged BY / Date: Lenk Nguyen 4/10/02 *Reviewed BY / Date:* Dm Dill 4/10/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: TNTC
RFA/COC Number:

Collection Date: 4/10/02
Collection Time: 0935
Sample Filtered (Yes / No): yes
Weather/Temp:

Form Completed By: Lien Nguyen
Sampler(s): JH/LN
Reviewed By: David Kusak

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PB-TNTC-MW3
Well Secure (Yes / No): Yes
Well Labeled (Yes / No): Yes
Well Condition: Good
Screen Height: 10 ft
Casing Type: PVC

Outside Casing Dia. (in): 2
Depth to Product (ft): NA
Total Well Depth (ft): 17.26
Depth to Water (ft): 4.38
Water Column (ft): 12.88
Elev. Ref. for Water Level:

Odor: None
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: 1
- Reading (ppm): 0.0 / 0.0
Remarks: Recharge rate = 0.1 ft/min
Purge vol. = 0.75 gal on 4/7/02.

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = 12.88 ft x 0.164 Gal/ft = 2.11 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((6)^2 - (2)^2) = 1.31 gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height 10 ft + 2 ft) x 1.31 gal/ft) x 0.3 = 4.72 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 4.72 gal + 2.11 gal = 6.83 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
6.83	13.6	20.5		

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1	15:40 4/7/02	4.38	2.81	8.12	-24	9.42	470.0	0.00	0 4/7/02
Purge Vol 2	9:00 4/9/02	3.45	0.361	6.38	155	8.14	67.2	1.46	0 4/9/02
Purge Vol 3	9:15	11.02	0.406	6.79	168	8.72	289.0	2.48	5 ↓
Purge Vol 4	9:40	14.98	3.860	6.61	83	9.70	655.0	0.00	10 ↓
Purge Vol 5	10:00 4/10/02	4.00	0.467	6.13	87	8.74	67.5	10.31	4/10/02
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04102002K/04102002N

Location Code: PB-TNTC-MW4

Sample Number: CB3028

Sample Name: PBOW-02-GW-PB-TNTC-MW4-CB3028-(00-

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/10/02

Collection Time: 1050

Start Depth: 7

End Depth: 11

Sample Matrix: WATER

Sample Team: DK/DD

QC Partners:

(TB) CB5013 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments: Purged water w/bailer to top of screen. Collected sample the following day.

Sketch Location:

Logged BY / Date: David Kresh 4/10/02 *Reviewed BY / Date:* [illegible] 4/10/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-TNTC-MW4**

Sample Number: **CB3028**

Static Depth to water = 3.26 Ft, TD = 21.20 Ft, water column 17.94 Ft, Top of screen = 11.20 Ft.
Very low recharge. Not able to low flow. Purged water to top of screen with 2" Teflon bailer.

4/10/02 Depth to water = 7.16.

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/9/02	1430	6.42	-108	6.84	2.21	33.0	3.42	9.2	0.75 gal
	1440	10.07	-112	6.90	2.26	178.0	2.21	8.3	1.50 gal
	1447	11.18	Water at top of screen						
	~~1450~~ DKK 1502	10.99							
4/10/02									
Sample:	1050	7.16 Ft	-27	7.16	2.03	363	5.14	9.0	

After sampling 11.49 Ft

Logged BY / Date: David Kessler 4/9/02 *Reviewed BY / Date:* DM Dill 4/10/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number:	825635	Collection Date:	4/10/02	Form Completed By:	D. Kessler
Project Name:	PBOW Groundwater	Collection Time:	1050	Sampler(s):	DKK/DD
Investigation Site:	TNTC	Sample Filtered (Yes / No):			
RFA/COC Number:		Weather/Temp:	Partly cloudy, cool (45°)	Reviewed By:	David Kessler

Sample Number: P B O W | 0 2 | G W | T N T C | B E D G W | R B 3 0 2 8 | 0 7 | 1 1

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:	TNTC-MW04	Outside Casing Dia. (in):	2"	Odor:	None
Well Secure (Yes / No):	yes	Depth to Product (ft):	—	Vapor Monitor Type:	PID / VRAE
Well Labeled (Yes / No):	yes	Total Well Depth (ft):	21.20 ft	- Vapor Monitor S/N:	1
Well Condition:	Fair	Depth to Water (ft):	3.26	- Reading (ppm):	4.0 1 LEL=2 H2S=0 CO=0 O2=20.9
Screen Height:	10 ft	Water Column (ft):	17.94	Remarks:	
Casing Type:	2" PVC	Elev. Ref. for Water Level:		Borehole Diameter = 8 inches	

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

(Purged) Removed to Sump of Scrubber

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B /7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE c ner.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardn	130.2		Alkalinity	1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04082002K / 04082002N

Location Code: PB-TNTC-MW5

Sample Number: CB3029

Sample Name: PBOW-02-GW-PB-TNTC-MW5-CB3029-(00-

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/8/02

Collection Time: 1435

Start Depth: 3.8

End Depth: 3.8

Sample Matrix: WATER

Sample Team:

QC Partners:

(TB) CB5010 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

PID = 0.0 ppm (4/7/02)

O_2 = 21.5 ppm

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments: sampled by bailing, recharge <0.1 ft/min
bailed dry on 4/7/02

Sketch Location:

Logged BY / Date: [signature] 4/8/02 *Reviewed BY / Date:* [signature] 4/8/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-TNTC-MW5**

Sample Number: **CB3029**

DTW = 3.12 ft (4/7/02)

DTW - 3.80 ft (4/8/02)

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/8/02	1435	3.80	156	5.87	0.422	35	10.35	7.73	
sample									
		See associated groundwater sampling form for water quality readings during purge.							
		~~Collected no water quality readings~~ DKK							
Sample:									

Logged BY / Date: J Hafer 4/8/02 *Reviewed BY / Date:* DM Dill 4/8/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number:	825635	Collection Date:	4/8/02	Form Completed By:	JH / LN
Project Name:	PBOW Groundwater	Collection Time:	1435	Sampler(s):	John Hefner, Lien Nguyen
Investigation Site:	Area C	Sample Filtered (Yes / No):	yes		
RFA/COC Number:		Weather/Temp:	rain 50's	Reviewed By:	David Kirch

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:	TNTC-MW5	Outside Casing Dia. (in):	2	Odor:	none
Well Secure (Yes / No):		Depth to Product (ft):	no	Vapor Monitor Type:	PID / VRAE
Well Labeled (Yes / No):		Total Well Depth (ft):	32.28	- Vapor Monitor S/N:	/
Well Condition:	ok	Depth to Water (ft):	3.12	- Reading (ppm):	0 / 21.50 = 10 cc, 0 H = 10 c
Screen Height:	25 ft	Water Column (ft):	29.16	Remarks:	Removed 1 gal, recharge rate 0.1 ft/min ~~well dry @ 23 gal~~
Casing Type:	PVC	Elev. Ref. for Water Level:			

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Well dry @ 23 gals

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = 29.16 ft x 0.164 Gal/ft = 4.78 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((8)^2 - (2)^2) = 2.46 gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height 25 ft + 2 ft) x 2.46 gal/ft) x 0.3 = 19.93 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 4.78 gal + 19.93 gal = 24.71 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
24.71	49.42	74.13		

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:	4/07/02	Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
~~Purge Vol 1~~	1630	3.12	0.870	7.59	-60	10.46	108	2.76	0
Purge Vol 2	1655	18.72	0.752	7.55	130	10.09	849	1.52	10
Purge Vol 3	1705	22.82	0.810	7.30	115	10.71	619	1.18	15
Purge Vol 4	1715	28.08	0.905	7.40	+8-13	11.31	403	~~9.71~~ 0	20
Purge Vol 5	1722	30.28	0.923	7.18	-35	11.06	409	0	22
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04082002K/04082002N

Location Code: MK-MW16

Sample Number: CB3017

Sample Name: PBOW-02-GW-MK-MW16-CB3017-(00-00)

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/8/02

Collection Time: 1238

Start Depth: 5.27 ft

End Depth: 5.27 ft

Sample Matrix: WATER

Sample Team: JH, LN

QC Partners:

(TB) CB5010 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

PID = 0.0 ppm

O_2 = 21.5 ppm

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments: sampled by bailing. recharge <0.01 ft/min
bailed dry on 4/7/02

Sketch Location:

Logged BY / Date: John Stephen 4/8/02 *Reviewed BY / Date:* [illegible] 4/8/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: MK-MW16

Sample Number: CB3017

DTW = 4.88 ft ; TD = 10.1 ft . (4/5/02)
DTW = 5.04 ft (4/7/02)
DTW = 5.27 ft (4/8/02)

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
LN 4/8/02	1238	5.27	390	4.77	0.543	14.9	7.45	8.78	~~0~~ 4/8/02
			see associated groundwater sampling form for water quality readings during purge.						
Sample:	1239	5.27	390	4.77	0.543	14.9	7.45	8.78	~~0~~

Logged BY / Date: [signature] 4/8/02 *Reviewed BY / Date:* [signature] 4/8/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Area B
RFA/COC Number:

Collection Date: 4/8/02
Collection Time: 1238
Sample Filtered (Yes / No): yes
Weather/Temp: rain 50's

Form Completed By: J.H / LN
Sampler(s): John Hofer, Liem Nguyen
Reviewed By: David Kiesh

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: MK-MW16
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: ok
Screen Height: 5 ft
Casing Type: PVC

Outside Casing Dia. (in): 2
Depth to Product (ft): NA
Total Well Depth (ft): 10.1 BTOC
Depth to Water (ft): 4.88
Water Column (ft): 5.22
Elev. Ref. for Water Level:

Odor: None
Vapor Monitor Type: PID / ~~VRAE~~ MSA
- Vapor Monitor S/N: 1
- Reading (ppm): 0 / 0 CO / 21.5 O_2 / 0 LEL / 0 H_2S
Remarks: Recharge rate = 0.01 ft/min
Removed 3 1/2 gal 4/7/02 -- purged well dry.

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.1644 gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = 5.22 ft x 0.1644 Gal/ft = 0.858 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((10)^2 - (2)^2) = ~~4.799~~ 3.936 gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height 5 ft + ~~5.22~~ 2 ft) x ~~4.799~~ 3.936 gal/ft) x 0.3 = ~~10.07~~ 8.27 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 0.86 gal + ~~10.07~~ 8.27 gal = ~~10.93~~ 9.13 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	~~°F~~	NTU	ppm	gallons
Purge Vol 1	1210	5.04	0.677	3.07	445	7.11°C	56.4	11.32	0
Purge Vol 2	1215	9.50	0.661	4.26	305	6.86°C	411.0	1.19	3
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE c[illegible]ner.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TA[illegible] Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardn[illegible]	130.2		Alkalinity	[illegible]	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WKS

Manager: Steve Downey

RFA / COC Number: No COC 04122002N 04122002K

Location Code: MK-MW17

Sample Number: CB3038

Sample Name: PBOW-02-GW-MK-MW17-CB3038-8-8

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

TB CB5018

Collection Date: 12-APR-02

Collection Time: ~~00:00~~ 13:05 CEN

Start Depth: 7.5

End Depth: 7.7

Sample Matrix: WATER

Sample Team: 5

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	N	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

ERPIMS Values:

Sacode:

Lot Control#:

Comments: Excellent low-flow well.

Sketch Location:

Logged BY / Date: Lien Nguyen 4/12/02

Reviewed BY / Date: D mm 4/14/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **MK-MW17**

Sample Number: **CB3038**

Water level = 3.70 ft

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
	12.35	–	-151	5.43	0.341	1.4	0.00	10.18	0.35
	12.45	–	-150	5.13	0.354	0.0	0.00	10.38	1.5
	12.55	–	-147	4.97	0.359	0.0	0.00	9.94	2.5
	13.00	–	-145	4.93	0.360	0.0	0.00	10.03	3.0
	13.05	–	-147	4.92	0.361	0.0	0.00	10.01	3.5
Sample:	13.05	–	-147	4.92	0.361	0.0	0.00	10.01	3.5

Logged BY / Date: J Hf 4/17/02

Reviewed BY / Date: m m N 4/14/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: TNTB
RFA/COC Number:

Collection Date: 4/12/02
Collection Time: 1305
Sample Filtered (Yes / No): yes
Weather/Temp: Partly Sunny

Form Completed By: Lien Nguyen
Sampler(s): JH / LN
Reviewed By: David Kissel

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: MK - MW17
Well Secure (Yes / No): Yes
Well Labeled (Yes / No): Yes
Well Condition: Fair
Screen Height: 10 ft
Casing Type: PVC

Outside Casing Dia. (in): 2
Depth to Product (ft): -
Total Well Depth (ft): 8.45
Depth to Water (ft): 3.52
Water Column (ft): 4.93
Elev. Ref. for Water Level:

Odor:
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: /
- Reading (ppm): /
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

Low Flow

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WKS

Manager: Steve Downey

RFA / COC Number: No COC 04122002K 04122002N

Location Code: MK-MW17
Sample Number: CB3038-MS
Sample Name: MK-MW17-GW-CB3038-MS-MS
Sampling Method: LF
Sample Type: GW. *Sample Purpose:* MS

TB-CB5018

Collection Date: 12-APR-02
Collection Time: ~~00:00~~ 13:05 LKN 4/12/0
Start Depth: ~~0~~ 7.5
End Depth: ~~0~~ 7.7
Sample Matrix: WATER
Sample Team:

Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
METALS3-W-F	N	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	ml	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

ERPIMS Values:
Sacode:
Lot Control#:

Comments:

See SCL for CB3038-MS

Sketch Location:

Logged BY / Date: Lien Nguyen 4/12/02 *Reviewed BY / Date:* [illegible]

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WKS

Manager: Steve Downey

RFA / COC Number: No COC 04122002K 04122002N

Location Code: MK-MW17

Sample Number: CB3038-MSD

Sample Name: MK-MW17-GW-CB3038-MSD-MSD

Sampling Method: LF

Sample Type: GW *Sample Purpose:* MSD

Collection Date: 12-APR-02

Collection Time: ~~00:00~~ 1305 LEN

Start Depth: ~~0~~ 7.5

End Depth: ~~0~~ 7.7 LEN 4/12/02

Sample Matrix: WATER

Sample Team:

TB-CB5018

Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
HARDNESS	N	I	1	250	mL	HDPE
METALS3-W-F	N	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE

ERPIMS Values:

Sacode:

Lot Control#:

Comments:

See SCL for CB3038

Sketch Location:

Logged BY / Date: Luck Nguyen 4/12/02

Reviewed BY / Date: D m Bill 4/14/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WKS

Manager: Steve Downey

RFA / COC Number: No COC 04122002A

Location Code: MK-MW17
Sample Number: CB3047
Sample Name: MK-MW17-GW-CB3047-FS
Sampling Method: LF
Sample Type: GW *Sample Purpose:* FS

Collection Date: 12-APR-02
Collection Time: ~~00:00~~ 1305 LKN
Start Depth: ~~0~~ 7.5
End Depth: ~~0~~ 7.7 LKN 4/12/02
Sample Matrix: WATER
Sample Team:

TB CB5017

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	N	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass

ERPIMS Values:
Sacode:
Lot Control#:

Comments:

See SCL for CB3038

Sketch Location:

Logged BY / Date: [signature] 4/12/02 *Reviewed BY / Date:* [signature] 4/14/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WKS

Manager: Steve Downey

RFA / COC Number: No COC 041220021

Location Code: MK-MW17
Sample Number: CB3046
Sample Name: MK-MW17-GW-CB3046-FD
Sampling Method: LF
Sample Type: GW *Sample Purpose:* FD

Collection Date: 12-APR-02
Collection Time: ~~00:00~~ 1305 LKN
Start Depth: ~~0~~ 7.5 LKN 4/12/02
End Depth: 0 7.7
Sample Matrix: WATER
Sample Team: 5

TB- CB5018

Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
METALS3-W-F	N	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass

ERPIMS Values:
Sacode:
Lot Control#:

Comments:

See SCL for CB3038

Sketch Location:

Logged BY / Date: [signature] 4/12/02 *Reviewed BY / Date:* [signature] 4/14/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04102002K / 04102002N

Location Code: PB-BED-MW13

Sample Number: CB3025

Sample Name: PBOW-02-GW-PB-BED-MW13-CB3025-(00-(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/10/02

Collection Time: 0840

Start Depth: 71.

End Depth: ~~[illegible]~~ 75

Sample Matrix: WATER

Sample Team: DK/DD

QC Partners:

(TB) CB5013 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2 1/2	1	L	Amb. Glass
TOC	N	F	2	40	mL	GVIAL,SEP
CYANIDE	N	G	1 2/3	500	mL	HDPE
ALKALINITY	N	H	1 1/2	1	L	HDPE
CHLORIDE	N	H	1 1/2	1	L	HDPE
NITRATE-W	N	H	1 1/2	1	L	HDPE
SULFATE	N	H	1 1/2	1	L	HDPE
TDS	N	H	1 1/2	1	L	HDPE
TSS	N	H	1 1/2	1	L	HDPE
TURB 180.1	N	H	1 1/2	1	L	HDPE
HARDNESS	N	I	1 1/2	250	mL	HDPE

Comments: - Collected sample w/ 2" Teflon bailer -
- Collected no water quality readings ~~and~~ (inadequate sample volume)

Sketch Location:

Logged BY / Date: David Kusch 4/10/02 *Reviewed BY / Date:* [illegible] 4/10/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW13**

Sample Number: **CB3025**

4/8/02 Static Depth = 35.79 Ft, TD = 75.5 Ft, Water column = 39.71 Ft. Pump placed at 68 Ft.
1500 Pumping at ~~[illegible]~~ ml/min.
- Not able to low flow well. Water level dropped > 0.5 Ft. - Began purge of well w/2" disposable bailer.

4/9/02 Depth to water = 71.20 Ft

4/10/02 Depth to water = 71.04

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/8/02	1500	35.55							Pumping @ ~~[illegible]~~ 200 ml/min
	1505	35.90	-358	11.36	10.3	8.9	0.74	11.4	
	1510	36.28	-363	11.30	10.3	14.6	0.33	11.3	Pumping @ 180 ml/min
	1515	36.83	-369	11.15	10.3	54.9	0.17	11.4	— Increased to 200 ml/min
	1550	42.85	-392	10.86	8.71	NA	0.55	11.0	4.5 gal
No flow — weighted →	1655	57.61	-369	11.20	8.96	31.4	2.26	11.4	14.5 gal
	1730	70.73	-368	11.20	9.57	63.0	2.54	11.7	19.5 gal
	1740	73.67	-366	11.22	8.98	79.6	2.68	11.7	24.5 gal — dry (≈ 1 Ft water)
Sample:	4/10/02 0840	71.04	NA	NA	NA	NA	NA	NA	NA

Water quality readings not collected due to inadequate water volume.

Logged BY / Date: David Kessler 4/8/02 *Reviewed BY / Date:* Tom Bell 4/10/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: TNTC
RFA/COC Number:

Collection Date: 4/10/02
Collection Time: 0840
Sample Filtered (Yes / No):
Weather/Temp: cloudy, cool (45°), foggy

Form Completed By: D. Kessler
Sampler(s): DKK/DD
Reviewed By: David Kessler

Sample Number: PBOW 02 GW PBBE DMW13 CB3025

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PB-BED-MW13
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes (inside)
Well Condition: Fair
Screen Height: 46 ft open hole
Casing Type: open hole

Outside Casing Dia. (in): 4" outside
Depth to Product (ft): None
Total Well Depth (ft): 75.5
Depth to Water (ft): 35.79
Water Column (ft): 39.71
Elev. Ref. for Water Level:

Odor: H_2S / petroleum
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: /
- Reading (ppm): 3.2 / LEL=2% O_2=20.9% CO=0ppm H_2S=0 ppm
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (3)^2) = 0.37 gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = 39.71 ft x 0.37 Gal/ft = 14.69 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((3)^2 - ( )^2) = 0.37 gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height open hole ft) x ____ gal/ft) x 0.3 = ____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = ____ gal + 14.69 gal = 14.69 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
14.69	29.38	44.07		

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1			(Removed 21.5 gal) - Dry						
Purge Vol 2									
Purge Vol 3			See page 2						
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS, TDS, and turbidity combined in one 1-liter HDPE c[illegible]ner.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardn[illegible]	130.2		Alkalinity	[illegible]	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04082002K/04082002N

Location Code: PB-BED-MW14

Sample Number: CB3022

Sample Name: PBOW-02-GW-PB-BED-MW14-CB3022-(00-(

Sampling Method: LF

Sample Type: GW

Sample Purpose: REG

Collection Date: 4/8/02

Collection Time: 1045

Start Depth: 37

End Depth: 37

Sample Matrix: WATER

Sample Team: DKK/DD

QC Partners:

(TB) CB5010 (ER) NA (FB)

ERPIMS Values:

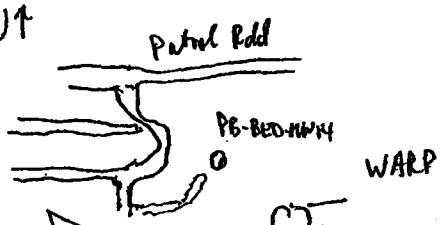
Sacode:

Lot Control#:

Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments:

Sketch Location: N↑



Logged BY / Date: David Kusch 4/8/02

Reviewed BY / Date: [illegible] 4/8/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW14**

Sample Number: **CB3022**

9/8/02 Static Depth - 17.65 Ft, TD = 52.2 Ft, water column = 34.55 Ft. Placed pump at 37 Ft.

Pumping ~ ~~270~~ 200 ml/min

- Water clear reddish brown color

Pump settings: CP114 10/5 Throttle

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
9/8/02	0945	17.65							
	0950	17.50	58	5.88	7.35	0 (6.1)	0.60	10.1	
	0955	17.59	42	6.17	7.35	5.1	0.30	10.1	
	1000	17.60	33	6.36	7.11	11.8	0.14	10.1	
	1005	17.63	27	6.48	6.97	16.9	0.11	10.0	
	1010	17.65	21	6.57	6.80	22.3	0.11	10.0	
	1015	17.66	18	6.63	6.67	25.8	0.07	10.0	
	1020	17.69	15	6.69	6.68	33.4	0.03	10.0	
	1025	17.70	13	6.73	6.57	51.4	0.03	10.0	
	1030	17.71	12	6.75	6.55	9.8 – Air	0.02	10.0	
	1035	17.72	10	6.79	6.49	9.0	0.00	10.0	
	1040	17.73	10	6.81	6.44	9.4	0.00	10.0	
Sample:	1045	17.74	10	6.79	6.42	9.4	0.00	10.0	3 gal

Logged BY / Date: David Kessler 9/8/02 *Reviewed BY / Date:* D M Neff 9/8/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: WARWP
RFA/COC Number:

Collection Date: 4/8/02
Collection Time: 1045
Sample Filtered (Yes / No): yes
Weather/Temp: cloudy, cool (50°), RAIN

Form Completed By: D. Kessler
Sampler(s): DKK/DD
Reviewed By: David Kresch

Sample Number: P B O W 0 2 - G W - P B B E D M W 14 C B 3 0 2 2 - 3 7 - 3 7

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PB-BED-MW14
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: good
Screen Height: 29 ft
Casing Type: Sch 40 PVC

Outside Casing Dia. (in): 2"
Depth to Product (ft): —
Total Well Depth (ft): 52.2 ft
Depth to Water (ft): 17.65
Water Column (ft): 34.55
Elev. Ref. for Water Level:

Odor:
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: 0.4 /
- Reading (ppm): 0.4 / LEL = 0% H_2S = 0 ppm CO = 0% O_2 = 20.8%
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

Low Flow

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

04152002T

RFA / COC Number: 04152002N

Location Code: PB-BED-MW15

Sample Number: CB3041

Sample Name: PBOW-02-GW-PB-BED-MW15-CB3041-(00-(

Sampling Method: LF

Sample Type: GW

Sample Purpose: REG

Collection Date: 4/15/02

Collection Time: 1240

Start Depth: 32.6

End Depth: 34.0

Sample Matrix: WATER

Sample Team: DKK/DD

QC Partners: BC5019

(TB) ~~EB5019~~ (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

PID = 57.4 ft (4/14/02)
LEL = 7
O_2 = 21.2
H_2S = 0
CO = 0
DTW - 21.88

- Purged groundwater w/2" ~~teflon~~ poly. bailer. After 1 gal removed, recharge rate indicates low-flow is not possible.
- Began removal of 3-5 well volumes and/or to water level reaches top of screen.

Comments: Bedrock ledge tagged @ 34.4 ft BTOC w/ WL meter. 4/15/02 DTW = 32.68 ft

Sketch Location:

Logged BY / Date: David Kusch 4/15/02 *Reviewed BY / Date:* [illegible] 4/15/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW15**

Sample Number: **CB3041**

4/14/02 Initial static WL = 21.88 ft

@11:08 → Purged 1 gallon → WL = 23.62 ft

@ 11:18 → WL = 23.62 ft

17:40 – WL = 32.05 ft

17:55 – WL – 32.00 ft

> No recovery and there is oil sheen on the water level tape.

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/14/02	1100	21.88	-314	7.47	8.56	52.7	0.0	11.78	0
	1885	32.00	-312	9.07	7.16	28.1	2.01	11.80	7
	Initial readings contain petroleum sheen. Did not take readings to prevent instrument from being ~~contaminated~~ damaged.								Total Removed 7.5 gals
	Bailed until 34.40 ft (Top of screen)								
4/15/02	1230	32.68							
After	1300	33.84	-315	9.48	7.34	67.0	3.80	14.50	
Sample:									

Logged BY / Date: David Kosch 4/15/02 *Reviewed BY / Date:* [illegible] 4/15/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Pentolite Area
RFA/COC Number:

Collection Date: 4/15/02
Collection Time: 1240
Sample Filtered (Yes / No): yes
Weather/Temp: partly cloudy, warm (70°), breezy

Form Completed By: Lien Nguyen
Sampler(s): DRK
Reviewed By: David Keach

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PB-BED-MW15
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: Good
Screen Height: 34.4 ft BTOC (open borehole)
Casing Type: PVC / Open borehole

Outside Casing Dia. (in): 4" PVC / 3" open borehole
Depth to Product (ft): None
Total Well Depth (ft): 74.40
Depth to Water (ft): 21.88
Water Column (ft): ~~52.52~~ (52.52)
Elev. Ref. for Water Level:

Odor:
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: /
- Reading (ppm): 57.4 / LEL = 7 O_2 = 21.2 CO = 0 H_2S = 0 ppm
Remarks: Distinct petroleum odor, sheen on water

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (3)^2) = 0.37 gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = 52.52 ft x 0.37 Gal/ft = 19.43 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((____)^2 - (____)^2) = ____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height ____ ft + ____ ft) x ____ gal/ft) x 0.3 = ____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = ____ gal + ____ gal = 19.43 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
19.43				

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
4/14/02 Purge Vol 1	1100	21.88	8.56	7.47	-314	11.78	52.7	0.0	0.0
Purge Vol 2	1805	32.00	7.16	9.07	-312	11.80	28.1	2.01	7
Purge Vol 3	Bailed to	34.40 ft							
Purge Vol 4									
Purge Vol 5 4/15/02									
SAMPLE	1240	32.68							

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardn	130.2		Alkalinity	1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04112002K / 04112002N

Location Code: PB-BED-MW16

Sample Number: CB3037

Sample Name: PBOW-02-GW-PB-BED-MW16-CB3037-(00-(

Sampling Method: LF

Sample Type: GW

Sample Purpose: REG

Collection Date: 4/11/02

Collection Time: 1450

Start Depth: 23

End Depth: 26

Sample Matrix: WATER

Sample Team: DK/DD

QC Partners:

(TB) CB5016 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments: - Removed ~11.5 gal to top of screen (open borehole), w/ bailer.
- Collected sample w/ 2" Teflon bailer.

Sketch Location:

Logged BY / Date: David Kessler 4/11/02 *Reviewed BY / Date:* [illegible] 4/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW16**

Sample Number: **CB3037**

4/10/02 Depth to product = 0, Depth to water = 2.57 Ft, TD = 74 Ft - open borehole. open borehole length = 49.2 Ft
Borehole begins at 24.8 Ft to 74.0 Ft.

4/11/02 Depth to water = 23.14 ~~Depth to product 23.15 Ft (0.01 Ft)~~ DTP

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/10/02	1500	14.42	-302	10.65	2.81	15.4	3.21	12.2	7
	1505	16.18	-231	9.38	1.87	6.3	3.01	10.7	8
	1510	18.14	-223	9.33	1.90	6.8	2.30	10.4	9
	1515	20.18	-153	9.69	1.81	19.3	2.01	10.2	10
	1520	23.14	-117	8.48	1.80	16.4	1.55	10.5	11
	1525	25.36	-111	8.44	1.83	14.9	1.88	11.0	11.5
	4/11/02								
Sample:	1450	23.14	-103	9.53	1.84	22.87	—	14.0	—

After collection 1515 26.57

Logged BY / Date: David Kesch 4/10/02 Reviewed BY / Date: [illegible] 4/11/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Upper Toluene Area
RFA/COC Number:

Collection Date: 4/11/02
Collection Time: 1450
Sample Filtered (Yes / No): yes
Weather/Temp: Partly sunny, warm (50°)

Form Completed By: D. Kessler
Sampler(s): DKK/DD
Reviewed By: Donald Kessler

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PB-BED-MW16
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: Good
Screen Height: 24.8 - 74
Casing Type: 3" open, 4" PVC at surface to 25.8 ft

Outside Casing Dia. (in): 4"
Depth to Product (ft): None
Total Well Depth (ft): 74
Depth to Water (ft): ~~24~~ 2.57 ft
Water Column (ft): 71.43 ft
Elev. Ref. for Water Level:

Odor: Distinct petroleum odor
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: 1
- Reading (ppm): 171 ppm / LEL=0% H2S=0 CO=0 O2=20.8
Remarks: Open borehole length = 49.2 ft

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (4)^2) = 0.66 gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = 22.23 ft x 0.66 Gal/ft = ~~15.77~~ 14.67 gallons

24.8 - 2.57 = 22.23

0.041 x (3)^2 x 49.2 = 18.15 borehole water

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((____)^2 - (____)^2) = ____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height ____ ft + ____ ft) x ____ gal/ft) x 0.3 = ____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 14.67 gal + 18.15 gal = 32.8 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
32.8	65.60	98.4		

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1	1500	14.42							
Purge Vol 2			See page 2 of 2 of CB 3.037 Collection Log						
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04112002N / 04112002K

Location Code: PB-BED-MW17

Sample Number: CB3014

Sample Name: PBOW-02-GW-PB-BED-MW17-CB3014-(00-(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/11/02

Collection Time: 1100

Start Depth: 39

End Depth: 42

Sample Matrix: WATER

Sample Team: DK/DD

QC Partners:

(TB) CB5016 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

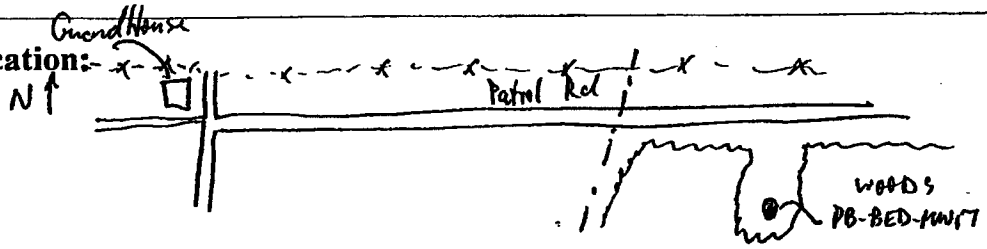
Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

In front of fan LEL= 0 O_2 = 20.9 CO = 0% H_2S = 1 ppm

Breathing Air LEL = 0% O_2 = 20.9 CO = 0% H_2S = 0 ppm

Comments: Collected sample behind/near fan.

Sketch Location:



Logged BY / Date: David Kessler 4/11/02 *Reviewed BY / Date:* [illegible] 4/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW17**

Sample Number: **CB3014**

4/11/02 · Depth to water = 31.07 ft Total Depth = 64.4 ft. water column = 33.33 ft

Placed pump at 39 ft. Pumping ~ 210 gpm

Pump controls : CPM4 10.0 5.0 Throttle 40 ft

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity ? (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
Static 31.07									
4/11/02	1010	29.26	-391	8.57	6.30	36.6	0.81	11.6	500 ml
	1015	29.15	-392	8.27	6.30	17.7	0.05	11.3	
	1020	29.00	-399	8.17	6.02	20.0	0.00	10.9	
	1025	29.00	-402	8.19	5.76	999	0.00	11.0	
	1030	29.10	-404	8.20	5.74	219	0.00	11.3	2 gal
	1035	29.55	-406	8.32	5.40	15.8	0.00	11.2	
	1040	30.10	-407	8.40	5.59	0.00	0.00	11.0	
	1045	30.55	-409	8.52	5.67	602	0.00	11.1	
	1050	30.10	-410	8.45	5.91	542	0.00	11.1	
		?							
Sample:	1100	31.00	-411	8.51	5.78	412	0.00	11.2	~3.5

*1010 water/bubbles being pumped from well. (well gurgling). Turbidity readings range from 0-999 due to bubbles. Water very clear. Depth to water (static readings) questionable to due large amount of bubbling.

Logged BY / Date: David Kusch 4/11/02 Reviewed BY / Date: DM DiU 4/11/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number:	825635	**Collection Date:**	4/11/02	**Form Completed By:**	DKK
Project Name:	PBOW Groundwater	**Collection Time:**	1100	**Sampler(s):**	DKK / DD
Investigation Site:	TNT A	**Sample Filtered (Yes / No):**	yes		
RFA/COC Number:		**Weather/Temp:**	partly sunny, warm (50°), calm	**Reviewed By:**	David Kreeds

Sample Number: P B O W 0 2 G W P B B E D M W 1 7 C B 3 0 1 4

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:	PB-BED-MW17	**Outside Casing Dia. (in):**	3"	**Odor:**	Strong H_2S
Well Secure (Yes / No):	yes	**Depth to Product (ft):**	None	**Vapor Monitor Type:**	PID / VRAE
Well Labeled (Yes / No):	yes	**Total Well Depth (ft):**	64.4 ft	**- Vapor Monitor S/N:**	#8422990 / #8451039 – IT/Fidlo
Well Condition:	Fair	**Depth to Water (ft):**	31.07 ft	**- Reading (ppm):**	84 / LEL = 0 H_2S = >50 CO = 0 O_2 = 19.0 ppm
Screen Height:	45 ft	**Water Column (ft):**	33.33 ft	**Remarks:**	Fan used to evacuate fumes
Casing Type:	open hole	**Elev. Ref. for Water Level:**			Breathing air behind fan < 5ppm H_2S

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purged Dry

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardne	130.2		Alkalinity	[illegible]	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04052002N / 04052002K

Location Code: PB-BED-MW18

Sample Number: CB3015

Sample Name: PBOW-02-GW-PB-BED-MW18-CB3015-(00-(

Sampling Method: LF

Sample Type: GW

Sample Purpose: REG

Collection Date: 4/5/02

Collection Time: 1040

Start Depth: 65

End Depth: 65

Sample Matrix: WATER

Sample Team: BKK/BD

QC Partners:

(TB) CB5008 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

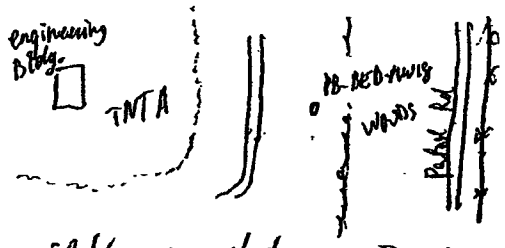
Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments:

Conducted Low-Flow

Sketch Location:

N4



Logged BY / Date: David Kessler 4/5/02 *Reviewed BY / Date:* [illegible] 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW18**

Sample Number: **CB3015**

Static = 32.58 ft. TD = 75.40 ft. (openhole at ~~24~~ 24-75.4 ft.), 42.72 water column.
Pump set at 65 ft. Pumping 250 ml/min

Bladder Pump Control Settings: CPM4 Refill 10.0 Discharge 5.0 Throttle 75 ft

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/5/02	0910	32.82							Air Line off pump
	0930	32.82	-315	8.26	22.7	140.0	7.59	8.7	Raised pump out 1
	0935	32.85	-322	8.22	21.9	142.9	7.87	9.5	Finding Flow (~.100)
	0940	33.21	-325	8.15	21.8	128.0	7.12	10.0	
	0945	32.95	-329	8.09	22.3	137.0	6.20	10.0	2 (~250 ml/min)
	0950	32.92	-334	8.05	22.6	148.0	5.64	10.1	
	0955	32.93	-336	8.03	22.9	150.0	4.75	10.1	
	1000	32.94	-342	8.02	23.4	156.0	2.56	10.0	
	1005	32.94	-352	8.01	23.8	153.0	1.55	10.2	3
	1010	32.95	-351	7.98	23.7	172.0	1.29	10.0	
	1015	32.95	-355	7.96	23.5	165.0	0.59	10.1	
	1020	32.95	-356	7.95	23.5	169.0	0.42	9.8	
	1025	32.95	-358	7.93	23.9	401.0	Shook meter 0.19	9.8	
	1030	32.95	-358	7.92	26.1	40.0	0.00	9.7	
	1035	32.95	-359	7.88	26.0	50.3	0.00	10.0	
	1040	32.95	-361	7.87	27.4	20.8	0.00	9.5	
Sample:	~~1040~~	~~32.95~~							
	1045	32.95	-364	7.91	28.2	22.0	0.00	9.6	
	1050	32.95	-365	7.69	28.7	27.0	0.00	9.4	
	1120	32.95	-367	7.48	30.5	17.2	0.00	10.1	6.5 gal total

Final sample (Bottle Time Marked 1040)

Logged BY / Date: David Kessler 4/5/02 *Reviewed BY / Date:* [illegible] 4/7/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: TNTA
RFA/COC Number:

Collection Date: 4/5/02
Collection Time: 1040
Sample Filtered (Yes / No): yes
Weather/Temp: cloudy, cold, windy (30°)

Form Completed By: D. Kessler
Sampler(s): DKK / D. Dill
Reviewed By: David Kessler

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PB-BED-MW18
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: good
Screen Height: 51.0'
Casing Type: open hole

Outside Casing Dia. (in): 2"
Depth to Product (ft): —
Total Well Depth (ft): 75.4
Depth to Water (ft): 32.58
Water Column (ft): 42.72
Elev. Ref. for Water Level:

Odor:
Vapor Monitor Type: PID / ~~VRAE~~
- Vapor Monitor S/N: H842 ~~[illegible]~~ 1 H845139
- Reading (ppm): 1.7 1 16.2 21.3 O_2 0 CO 0 H2S

Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

LOW-FLOW

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04042002N/04042002B

Location Code: PB-BED-MW19

Sample Number: CB3013

Sample Name: PBOW-02-GW-PB-BED-MW19-CB3013-(00-(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/4/02

Collection Time: 1520

Start Depth: 34

End Depth: 34

Sample Matrix: WATER

Sample Team: JH/LN

QC Partners:

(TB) CB5007 (ER) NA (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

PID = 11.6 ppm

Pump settings:
a) CPM4
b) Refill - 9.0 → 6.0
c) Throttle speed: 40-50ft

Comments: Top of pump was set @ 32 ft.
Detected H_2S gas from well - However, no instrument is available to quantify the amount of H_2S in air - green tint to water

Sketch Location:

Logged BY / Date: J Hafer 4/4/02 *Reviewed BY / Date:* D M Dill 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW19**

Sample Number: **CB3013**

Initial water level = 25.34 ft.

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume ~~(gal)~~ ml
	1431	24.02	-360	12.15	2.10	25.3	0.00	10.65	~~1000~~
	1436	24.67	-372	12.03	1.80	46.7	0.00	10.82	~~1950~~
	1441	25.11	-376	11.91	1.65	74.3	0.00	10.87	~~2900~~
	1446	25.56	-381	11.23	1.16	81.0	0.00	10.92	~~3850~~
	1452	25.68	-394	10.10	1.11	80.7	0.00	10.91	~~4350~~
	1456	25.75	-354	9.14	1.15	64.7	0.00	10.87	~~4850~~
	1501	25.71	-360	8.39	1.18	53.6	0.00	10.71	~~5350~~
	1506	25.72	-365	7.98	1.21	40.6	0.00	10.60	~~6000~~
	1511	25.68	-362	7.75	1.26	28.1	0.00	10.54	
	1516	25.62	-361	7.63	1.30	28.4	0.00	10.54	
	1519	25.65	-360	7.60	1.32	27.5	0.00	10.62	
Sample:	1535	25.43	-367	7.48	1.43	0.00	0.00	11.15	5 gals

← rate slowed to 100 ml

Logged BY / Date: J Hughes 4/4/02 *Reviewed BY / Date:* M Dill 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04042002N / 04042002B

Location Code: PB-BED-MW22

Sample Number: CB3009

Sample Name: PBOW-02-GW-PB-BED-MW22-CB3009-(00-(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/4/02

Collection Time: 1025

Start Depth: 35

End Depth: 37

Sample Matrix: WATER

Sample Team: DK/DD

QC Partners:

(TB) CB5006 (ER) NA (FB)

ERPIMS Values:

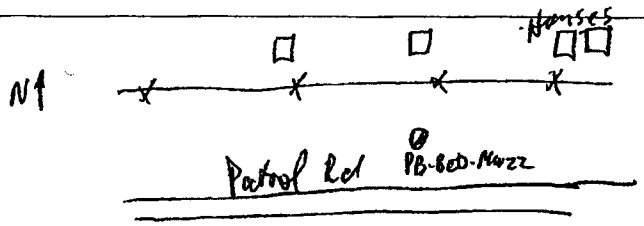
Sacode:

Lot Control#:

Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments: Conducted low-flow

Sketch Location:



Logged BY / Date: David Kresh 4/4/02 *Reviewed BY / Date:* D M Bell 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW22**

Sample Number: **CB3009**

4/4/02 Static Water = 29.80, TD = 44.46 Ft, water column ~15.49 Ft., water slightly above screen.
Pump set at 35 Ft. Pumping ~~175~~ ~195 ml/min

Bladder Pump Settings: CPM 2 ID:47 Refill: 23.0 Discharge 7.0 Throttle 20 psi (45 Ft)

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	ORP Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/4/02 ~~0910~~	0910	29.40	-330	8.51	0.93	154.0	0.74	9.8	1
	0915	29.38	-330	8.35	0.94	154.0	0.58	9.9	1.25
	0920	29.35	-335	8.22	0.94	159.0	0.40	9.9	1.5
	0925	29.40	-339	8.14	0.94	127.0	0.24	9.9	1.75
	0930	29.40	-342	8.08	0.94	91.5	0.17	10.1	2
	0935	29.40	-345	8.04	0.94	72.3	0.10	10.1	2.25
	0940	29.40	-345	7.98	0.94	52.0	0.05	10.2	2.5
	0945	29.41	-346	7.94	0.94	42.0	0.02	10.0	2.5
	0950	29.41	-346	7.90	0.94	35.0	0.00	10.0	2.5
	0955	29.41	-347	7.85	0.94	23.1	0.00	10.1	2.75
	1005	29.41	-347	7.80	0.94	18.5	0.00	9.9	2.85
	1010	29.41	-347	7.77	0.94	16.5	0.00	9.9	3
	1015	29.41	-347	7.74	0.94	15.6	0.00	9.9	3
Sample:	1020	29.41	-347	7.74	0.94	15.3	0.00	9.8	3.5
→ Sample	1025	29.41	-347	7.73	0.94	12.9	0.00	9.9	3.5
After Sample Collection:		29.38	-356	7.47	0.92	7.7	0.00	10.1	4

(was not pumping at 195 ml/min. and slowed to: ~170 ml/min)

Logged BY / Date: David Kreahn 4/4/02 *Reviewed BY / Date:* [illegible] 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04042002B

Location Code: PB-BED-MW22

Sample Number: CB3010

Sample Name: PBOW-02-GW-PB-BED-MW22-CB3010-(00-(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* FD

Collection Date: 4/4/02

Collection Time: 1025

Start Depth: 35

End Depth: 37

Sample Matrix: WATER

Sample Team: DK/DD

QC Partners:

(TB) ~~NA~~ CB5006 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass

Comments:

Sketch Location:

See page 1 of CB3009

Logged BY / Date: David Kusch 4/4/02 *Reviewed BY / Date:* D m Nell 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW22**

Sample Number: **CB3010**

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
			See page 2 of CB 3009						
Sample:									

Logged BY / Date: David Kessler 4/4/02 *Reviewed BY / Date:* [illegible] 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04042002

Location Code: PB-BED-MW22

Sample Number: CB3011

Sample Name: PBOW-02-GW-PB-BED-MW22-CB3011-(00-(

Sampling Method: LF

Sample Type: GW

Sample Purpose: FS

Collection Date: 4/4/02

Collection Time: 1025

Start Depth: 35

End Depth: 37

Sample Matrix: WATER

Sample Team: DK/DD

QC Partners:

(TB) CB5007 (ER) (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass

Comments:

Sketch Location:

See page 1 of CB3009

Logged BY / Date: David Kressler 4/4/02 *Reviewed BY / Date:* [illegible] 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW22**

Sample Number: **CB3011**

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
			See page 2 of CB3009						
Sample:									

Logged BY / Date: David Kuech 4/4/02 *Reviewed BY / Date:* [illegible] 4/7/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: ~~Fat~~ Downgradient/Reinjection
RFA/COC Number: 04042002 N+B

Collection Date: 4/4/02
Collection Time: 1025
Sample Filtered (Yes / No): Yes
Weather/Temp: Partly Sunny, Cold 35°

Form Completed By: DKK
Sampler(s): DKK / Don Dill
Reviewed By: David Kessler

Sample Number: P B O W - 0 2 - G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PB-BED-MW22
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: Good
Screen Height: 15 ft
Casing Type: PVC

Outside Casing Dia. (in): 2"
Depth to Product (ft): —
Total Well Depth (ft): 44.46
Depth to Water (ft): 29.00
Water Column (ft): 15.46
Elev. Ref. for Water Level:

Odor:
Vapor Monitor Type: ~~IT~~ - PID / ~~VRAE~~
- Vapor Monitor S/N: 84606 / 85335
- Reading (ppm): 35.6 / 100 ppm O2 = 21.9 / 0 ppm H2S = >50
Remarks: High/Distinct H_2S odor readings dropping

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

Conducted Low Flow

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE co r.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardne	130.2		Alkalinity		1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

04122002H

RFA / COC Number: 04112002N

Location Code: PB-BED-MW23

Sample Number: CB3040

Sample Name: PBOW-02-GW-PB-BED-MW23-CB3040-(00-(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/10/02

Collection Time: 8:25

Start Depth: 71.28

End Depth: 71.28

Sample Matrix: WATER

Sample Team:

QC Partners:

(TB) CB5018 (ER) (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type	
METALS3-W-F	Y	A	1	500	mL	HDPE	4/10/02
METALS3-W	N	B	1	500	mL	HDPE	4/10/02
EXPLOSIVES	N	C	1	1	L	Amb. Glass	4/10/02
VOLATILES3	N	D	3	40	mL	GVIAL,SEP	4/10/02
SEMIVOLATILES3	N	E	4	1	L	Amb. Glass	4/11/02
TOC	N	F	3	40	mL	GVIAL,SEP	4/10/02
CYANIDE	N	G	1	500	mL	HDPE	4/10/02
ALKALINITY	N	H	1	1	L	HDPE	4/10/02
CHLORIDE	N	H	1	1	L	HDPE	4/10/02
NITRATE-W	N	H	1	1	L	HDPE	~~4/12/02~~ 4/12/02
SULFATE	N	H	1	1	L	HDPE	4/10/02
TDS	N	H	1	1	L	HDPE	4/10/02
TSS	N	H	1	1	L	HDPE	4/10/02
TURB 180.1	N	H	1	1	L	HDPE	~~4/12/02~~ 4/12/02
HARDNESS	N	I	1	250	mL	HDPE	4/10/02

LEL = 100 ppm
O_2 = 13.2 ppm
H_2S = 2.12 ppm
CO = 13 ppm.
4/9/02
PID = 66.5 ppm

O_2 = 21.7 ppm
PID = 20.4 ppm (4/10/02)

Comments: Strong PAH odor

Sketch Location:

Logged BY / Date: 4/10/02 Reviewed BY / Date: 4/14/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW23**

Sample Number: **CB3040**

DTW = 16.82 ft. (4/8/02)
DTW = 71.50 ft (4/9/02)
DTW = 71.28 ft (4/10/02)

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
Sample:									6 gal

Water quality readings not recorded.

Logged BY / Date: [signature] 4/10/02 *Reviewed BY / Date:* [signature] 4/14/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Pentolite
RFA/COC Number:

Collection Date: 4/10/02
Collection Time: 0825
Sample Filtered (Yes / No): yes
Weather/Temp: partly sunny, cool (45°)

Form Completed By: Lien Nguyen
Sampler(s): JH/LN
Reviewed By: David Kreasle

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PB - BED - MW23
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: New
Screen Height: 20 ft
Casing Type: PVC

Outside Casing Dia. (in): 2"
Depth to Product (ft): NA
Total Well Depth (ft): 75.60
Depth to Water (ft): 58.78
Water Column (ft): 16.82
Elev. Ref. for Water Level:

Odor: Strong petroleum odor
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: 1
- Reading (ppm): 66.5 / O_2 = 13.2 CO = 13 H_2S = 2.12 LEL = 10
Remarks: Recharge rate ≈ 0.1 l/min
Total Vol purge (today) = 6 gals. (4/9/0

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = 16.82 ft x 0.164 Gal/ft = 2.76 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((6)^2 - (2)^2) = 1.31 gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height 20 ft + 16.82 ft) x 1.31 gal/ft) x 0.3 = 6.61 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 6.61 gal + 2.76 gal = 9.37 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									6 gal

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS, TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04092002K / 04092002N

Location Code: PB-BED-MW27

Sample Number: CB3012

Sample Name: PBOW-02-GW-PB-BED-MW27-CB3012-(00-(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/9/02

Collection Time: 0900

Start Depth: 85

End Depth: 88

Sample Matrix: WATER

Sample Team: DKK / DD

QC Partners:

(TB) CB5012 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

4/2/02
H_2S conc. @ the well head > 50 ppm
PID = 137 ppm

4/4/02 PTW = ~43.46 ft. Could not find.

4/7/02 = ~43.46 ft.
1040-1420 = Bailed dry. Removed 12 gals

4/8/02 = Depth to water (from PCE) ~~= 10~~ Dry >100 Ft

4/9/02 = Depth to water (from PCE) = 85.13 Ft

Comments: Due to windy ~~cold~~ conditions during purge and sample collection, breathing air remained below 5 ppm H_2S.

Sketch Location:

Logged BY / Date: David Kresch 4/9/02 *Reviewed BY / Date:* [illegible] 4/8/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW27**

Sample Number: **CB3012**

4/2/02 Initial Static water level = 43.46 ft

4/4/02 Static water level = 43.46 ft (Assumed) TD = 111.35 ft. → could not get static.

4/7/02 Assumed static 43.46 ft (Did not measure). Took no water quality readings due to oily, ~~[illegible]~~ water. (Chain of ruling instrument). Bailed dry. Removed 62 gal.

4/8/02 = Depth to water > 100 ft

4/9/02 - Depth to water = ≈ 85.1 ft

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
Sample:									

Collected no water quality readings due to oily, black ~~gro~~ groundwater.

Logged BY / Date: David Kessler 4/9/02 Reviewed BY / Date: [illegible] 4/9/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Downgradient
RFA/COC Number:

Collection Date: 4/9/02
Collection Time: 0900
Sample Filtered (Yes / No):
Weather/Temp: cloudy, cool (60°) sprinkles

Form Completed By: D. Kessler
Sampler(s): DKK/DD
Reviewed By: David Kessler

Sample Number: PBOW 02 GW PBBE DMW27 CB3012 85 88

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PB-BED-MW27
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: good
Screen Height: open hole
Casing Type: —

Outside Casing Dia. (in): Borehole 6"
Depth to Product (ft): Sheen
Total Well Depth (ft): 111.35 ft
Depth to Water (ft): 43.46
Water Column (ft): 67.89
Elev. Ref. for Water Level:

Odor: slight petroleum, H_2S
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: /
- Reading (ppm): 85-0 1 > LEL 5-CO >50 H_2S 20.8-O_2
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (6)^2) = 1.48 gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = 67.89 ft x 1.48 Gal/ft = 100.5 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((6)^2 - ( )^2) = _____ gal/ft

open borehole

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
100.5	201.0	301.5		

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1	1040 – 1420	~43.	Not	recorded. Water black, oily – Sheen present.					
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE co[illegible]r.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardne	130.2		Alkalinity		1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04052002N/04052002H

Location Code: IT-ABG-BEDGW-01

Sample Number: CB3016

Sample Name: PBOW-02-GW-IT-ABG-BEDGW-01-CB3016

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/5/02

Collection Time: 1510

Start Depth: 15.3

End Depth: 15.3

Sample Matrix: WATER

Sample Team: DKK/DD

QC Partners:

(TB) CB5008 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
OLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments:

Sketch Location:

Logged BY / Date: David Kreston 4/5/02 *Reviewed BY / Date:* Jim Dill 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **IT-ABG-BEDGW-01**

Sample Number: **CB3016**

4/5/02 Depth to water = 3.54 Ft. TD = 20.0 Ft. Water column = 16.46 Ft
Pump set at 15.3 Ft (intake) (Top of pump 13.3)

(pumping ~ 375 ml/min)

Control settings = CPM4 Refill: 10 Discharge: 5 Throttle ~ 25 Ft

PURGE RECORD:

Initial 4/5/02	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
	1430	3.56	-181	6.95	1.16	118.0	0.54	8.1	
	1435	3.56-3.61	-184	6.98	1.16	289.0	0.00	8.1	~1.75
	1440	"	-186	6.98	1.18	124.0	0.00	8.1	
	1445	"	-187	6.96	1.17	60.1	0.00	8.1	~2.5
	1450	3.56-3.61	-187	6.97	1.17	52.8	0.00	8.1	
	1455	3.56-3.61	-188	6.96	1.17	46.7	0.00	8.3	
	1500	"	-188	6.96	1.17	48.2	0.00	8.2	~3.5
	1505	"	-188	6.95	1.17	46.6	0.00	8.2	
Sample:	1510	3.56	-188	6.95	1.17	46.6	0.00	8.2	

After collection 1530 -186 6.92 1.16 46.8 0.00 8.4

Logged BY / Date: David Kessler 4/5/02 *Reviewed BY / Date:* D M Nell 4/7/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Additional Burn Ground
RFA/COC Number:

Collection Date: 4/5/02
Collection Time: 1510
Sample Filtered (Yes / No): yes
Weather/Temp: Cloudy, cold (32°)

Form Completed By: D. Kessler
Sampler(s): DK / DD
Reviewed By: David Kessler

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: ABG-BEDGW-001
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: Good
Screen Height: 15.0
Casing Type: Sch 40 PVC

Outside Casing Dia. (in): 2
Depth to Product (ft): —
Total Well Depth (ft): 20.0
Depth to Water (ft): 3.54
Water Column (ft): 16.46
Elev. Ref. for Water Level:

Odor: None
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: 1
- Reading (ppm): 0.7 / 0=LEL 20.8% O_2 0=CO 0=H_2S
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: NA

Location Code: IT-AA1-BEDGW-001

Sample Number: CB3036

Sample Name: PBOW-02-GW-IT-AA1-BEDGW-001-CB303(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: Did not collect

Collection Time:

Start Depth:

End Depth:

Sample Matrix: WATER

Sample Team:

QC Partners:
(TB) NA (ER) (FB)

ERPIMS Values:
Sacode:
Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments: Did not sample. H_2S readings 5-10ppm on concrete pad (w/ 10-15 mph wind). > 50 ppm in protective casing.

Sketch Location:

Logged BY / Date: David Keach 4/12/02 *Reviewed BY / Date:* [illegible] 4/14/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **IT-AA1-BEDGW-001**

Sample Number: **CB3036**

4/12/02 Product not detected. Depth to water ~31.03 Ft, TD=67.44 Ft, Water column = 36.41 Ft.
- Removed 1 gallon water. Depth to water = 27.8 Ft? (Well gurgling, H_2S fumes strong >50 ppm).
1225 Static water presently at 32.28 Ft. Pump set at 57 Ft - Pumping at ~225 ml/min 100-200 ml/min

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/12/02	1225	32.28							
	1230	30.70 ?	-364	9.48	10.7	99.5	0.59	13.1	225 ml
	1235	27.35 ?	-367	9.13	10.3	138-560	0.00	12.0	
	1240	?	-383	8.66	9.90	233-999	0.00	12.0	3 gal
	1245								
Sample:									

Water level incorrect due to severe bubbling. Could not determine depth to water. Because turbidity increasing and bubbling, determine that water level is being drawn down. Will switch over and remove 3 well volumes.

1305 Decided to abandon well. H_2S readings standing up wind (10-15 mph) only on concrete pad (3x3') range between 5-10 ppm. In protective casing H_2S readings >50 ppm.

Removed 3 gal

Logged BY / Date: David Keesh 4/12/02 Reviewed BY / Date: [illegible] 4/14/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Acid Area #1
RFA/COC Number:

Collection Date: Did not sample
Collection Time:
Sample Filtered (Yes / No):
Weather/Temp:

Form Completed By: BKK
Sampler(s):
Reviewed By: David Kessler

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: AAI-BEDGW-001
Well Secure (Yes / No): yes
Well Labeled (Yes / No): No
Well Condition: Good
Screen Height: 15 ft
Casing Type: Sch 40 PVC

Outside Casing Dia. (in): 2
Depth to Product (ft): None Detected
Total Well Depth (ft): 69.64
Depth to Water (ft): 31.03
Water Column (ft): 36.61
Elev. Ref. for Water Level:

Odor: Petroleum Odor
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: /
- Reading (ppm): 6.7 / LEL=1%, H_2S=0, O_2=20.9, CO=0
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

Did not sample

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE co r.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardne	130.2		Alkalinity		1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04102002K / 04102002N

Location Code: IT-AA2-BEDGW-001

Sample Number: CB3030

Sample Name: PBOW-02-GW-IT-AA2-BEDGW-001-CB303(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/10/02

Collection Time: 0940

Start Depth: 18.7

End Depth: 23.7

Sample Matrix: WATER

Sample Team: DK/DD

QC Partners:

(TB) CB5013 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments: Acid Area #2. Collected sample w/ 2" Teflon Bailer.

Sketch Location:

Logged BY / Date: David Kressler 4/10/02 *Reviewed BY / Date:* Ann Bell 4/10/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **IT-AA2-BEDGW-001**

Sample Number: **CB3030**

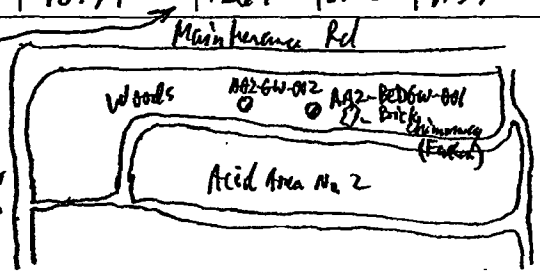
4/9/02 Depth to water = 14.49 Ft, TD = 45.64 Ft, water column = 31.15 Ft. Pump placed at 36 Ft
Pumping at ~120 ml/min — Can not conduct low flow. Must remove 3 volumes (24 gal)

1255 Removed 17 gals. Bailed dry. ~1 Ft water in bailer. Recharging but slow.
4/10/02 Depth to water = 18.74 Ft

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/9/02	1125	15.40	-191	7.73	1.33	61.5	0.55	10.3	~0.25
	1130	18.40	-222	7.96	1.34	118.0	0.12	10.4	~900 ml/min
	1135	22.25	-227	8.29	1.33	213.0	0.00	10.3	~800 ml/min
	1145	26.09	-310	8.41	1.32	325.0	0.00	10.3	~600 ml/min
	1150	28.64	-322	8.52	1.32	354.0	0.00	10.4	650 ml/min
	1155	30.35	-330	8.60	1.31	370.0	0.00	10.4	650 ml
	1200	30.94	-334	8.62	1.30	371	0.00	10.4	~625 ml
	1205	31.80	-331	8.62	1.29	712	0.00	10.4	
	1210	32.78	-321	8.54	1.27	746	0.00	10.5	8 gal
Bailer →	1235	37.00	-227	7.86	1.33	738	2.22	10.7	11 gal
	1245	40.84	-235	7.77	1.34	449	2.15	10.6	15 gal
	1255	44.56	-229	7.67	1.34	999	1.23	10.6	17 gal
	4/10/02								
Sample:	0940	18.74	-267	8.55	1.33	338.0	4.31	10.4	

Collected water quality readings after sample collected
Depth after sample = 26.77'



Water black in color. Many fine black particulates.

Logged BY / Date: David Kessler 4/9/02

Reviewed BY / Date: [signature] 4/10/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number:	825635	Collection Date:	4/10/02	Form Completed By:	D. Kessler
Project Name:	PBOW Groundwater	Collection Time:	0940	Sampler(s):	DKK, DD
Investigation Site:	Acid Area 2	Sample Filtered (Yes / No):	yes		
RFA/COC Number:		Weather/Temp:	Partly sunny, cool (45°)	Reviewed By:	David Kessler

Sample Number: PBOW 02 GW AA2B EDGW CB3030 18 2B

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:	AA2-BEDGW-001	Outside Casing Dia. (in):	2	Odor:	
Well Secure (Yes / No):	yes	Depth to Product (ft):	—	Vapor Monitor Type:	PID / VRAE
Well Labeled (Yes / No):	yes	Total Well Depth (ft):	~~45~~. 45.64	- Vapor Monitor S/N:	1
Well Condition:	Good	Depth to Water (ft):	14.49	- Reading (ppm):	19.5 / 0=LEL 0=H2O CO=0 20.9 O2
Screen Height:	15	Water Column (ft):	31.15	Remarks:	Organic Odor
Casing Type:	Sch 40 PVC	Elev. Ref. for Water Level:			

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = 31.15 ft x 0.164 Gal/ft = 5.12 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((6)^2 - (2)^2) = 1.31 gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height 15 ft + 2 ft) x 1.31 gal/ft) x 0.3 = 6.68 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 6.68 gal + 1.31 gal = 7.99 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
7.99	15.98	23.97		

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2			Removed 17 gallons w/ bailer						
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04102002N / 04112002N

Location Code: IT-AA3-BEDGW-001

Sample Number: CB3033

Sample Name: PBOW-02-GW-IT-AA3-BEDGW-001-CB303:

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/10/02

Collection Time: 17:00

Start Depth: 48 ft

End Depth: 48 ft

Sample Matrix: WATER

Sample Team: J Hofer, L. Nguyen

QC Partners:

(TB) CB5016 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

PID = 30.7 ppm
LEL <100%
CO = 0
H_2S = 340
O_2 = 20.5

Pump settings
CPM - 4
refill - 6.0
discharge 9.0
Throttle - ~70

Comments: Low-flow sampled w/ 2.14 ft of drawdown, @ 350-400 ml/m. Well would not maintain <0.5 ft of drawdown @ 100 ml/min, however constant drawdown established w/ 350-400 ml/min rate all parameters stablized for 15 minutes (3 5-min readings).

J. Hofer

Sketch Location:

Groundwater remained above the screened interval during purge and sample collection.

Logged BY / Date: Lenk Nguyen 4/10/02

Reviewed BY / Date: [illegible] 4/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **IT-AA3-BEDGW-001**

Sample Number: **CB3033**

Initial water level = 26.78 ft.

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
	1623	28.64	-356	8.08	2.33	36.7	0.00	12.00	5.0
	1628	28.73	-355	8.15	2.31	41.0	0.00	12.08	5.5
	1633	28.78	-356	8.14	2.31	31.0	0.00	11.95	6.0
	1638	28.80	-355	8.19	2.31	33.8	0.00	11.87	6.5
	1643	28.79	-351	8.37	2.30	30.3	0.00	11.87	7.0
	1648	28.84	-357	8.33	2.30	40.6	0.00	11.76	7.5
	1653	28.89	-357	8.33	2.29	34.5	0.00	11.78	8.0
Sample:	1700	28.92	-358	8.31	2.31	56.7	0.00	11.97	

Logged BY / Date: [signature] 4/10/02 *Reviewed BY / Date:* D.M. Dill 4/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04112002K

Location Code: IT-AA3-BEDGW-001

Sample Number: CB3034

Sample Name: PBOW-02-GW-IT-AA3-BEDGW-001-CB3034

Sampling Method: LF

Sample Type: GW

Sample Purpose: FD

Collection Date: 4/10/02

Collection Time: 1700

Start Depth: 48 ft

End Depth: 48 ft

Sample Matrix: WATER

Sample Team: J. Hofer, L. Nguyen

QC Partners:

(TB) CB3016 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass

Comments: see REG collection logs (CB3033 pages 1 and 2)

Sketch Location:

Logged BY / Date: Linh Nguyen 4/10/02

Reviewed BY / Date: [illegible] 4/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04112002A

Location Code: IT-AA3-BEDGW-001

Sample Number: CB3035

Sample Name: PBOW-02-GW-IT-AA3-BEDGW-001-CB303!

Sampling Method: LF

Sample Type: GW *Sample Purpose:* FS

Collection Date: 4/10/02

Collection Time: 1700

Start Depth: 48ft

End Depth: 48ft

Sample Matrix: WATER

Sample Team: J. Hofer, L. Nguyen

QC Partners:

(TB) CB5015 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass

Comments: see R&G collection log (CB3033) page 1 and 2.

Sketch Location:

Logged BY / Date: Lien K Nguyen 4/10/02

Reviewed BY / Date: D m Bill 4/11/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number:	825635	Collection Date:	4/10/02	Form Completed By:	J. Hofer, L. Nguyen
Project Name:	PBOW Groundwater	Collection Time:	1700	Sampler(s):	JH / LN
Investigation Site:	Acid Area #3	Sample Filtered (Yes / No):	yes		
RFA/COC Number:		Weather/Temp:	sunny high 50's	Reviewed By:	David Kersh

Sample Number: P B O W - 0 2 - G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:	IT-AA3-BEDGW-001	Outside Casing Dia. (in):	2	Odor:	None
Well Secure (Yes / No):	Yes	Depth to Product (ft):	NA	Vapor Monitor Type:	PID / VRAE
Well Labeled (Yes / No):	Yes	Total Well Depth (ft):	53.0	- Vapor Monitor S/N:	/
Well Condition:	Good	Depth to Water (ft):	26.78	- Reading (ppm):	30.7 / LEL 100% / CO=0 / H_2S-350 / O_2=20.5
Screen Height:	10	Water Column (ft):	26.22	Remarks:	in well ↗
Casing Type:	PVC	Elev. Ref. for Water Level:	TOC		breathing zone below 5 ppm H_2S

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = 26.22 ft x 0.164 Gal/ft = 4.3 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((6)^2 - (2)^2) = 1.312 gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height 10 ft + 2 ft) x 1.312 gal/ft) x 0.3 = 10.78 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 10.78 gal + 4.3 gal = 15.08 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
~~Purge Vol 1~~	1550	27.31	2.15	8.07	-338	14.16	178	0.00	1
~~Purge Vol 2~~			See Sample Collection Log						
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE co r.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardne	130.2		Alkalinity		1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04122002K 04122002N

Location Code: IT-MNTA-BEDGW-001

Sample Number: CB3039

Sample Name: PBOW-02-GW-IT-MNTA-BEDGW-001-CB3(

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/12/02

Collection Time: 950

Start Depth: 54 ft

End Depth: 54 ft

Sample Matrix: WATER

Sample Team: J. Hofer, L. Nguyen

QC Partners:

(TB) CB5018 (ER) (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

PID = 40 ppm (Before opening well)
H_2S = 30 (")
LEL = 3 (")
O_2 = 21.1 (")
CO = 0 (")

LEL = 38 (Down wind @ the well opening)
H_2S = 278 "
O_2 = 21.0 "
CO = 0.0 "
PID = 102 ppm "

Immediately ~~down~~ up wind (behind the fan).
H_2S = 4

Comments: In front of fan: H_2S = 111 ; LEL=14 ; O_2 = 21.8 ; CO = 0

Pump settings: a) CPM 3 ; b) Recharge/discharge : 14.5/5.5 ; c) throttle speed : 80 4/12/02

Sketch Location:

- Not able to conduct Low flow. Reverted to removing 3-5 well volumes.
- Pumped groundwater from well for a total of 4 hours. Parameters stabilized after 4 hrs, collected sample as documented in WP.

Logged BY / Date: Linh Nguyen 4/12/02

Reviewed BY / Date: D M 04/17/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **IT-MNTA-BEDGW-001**

Sample Number: **CB3039**

- DTW = 30.4 ft. (4/11/02) DTW = 34.06 ft (4/12/02)
- Purging rate @ ≈ 200 ml/min (4/11/02); Purge rate ≈ 300 ml/min (4/12/02)
- Pump intake is at 54 ft
- * Water level meter is malfunctioned.

- Not able to conduct low-flow sampling.
- Reverted to removal of 3-5 well volumes.
- ~~Pumped well for 4 hours removing a total of 18 gals.~~
- Parameters stabilized (except turbidity (3 readings))

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
4/11/02	1500	*	-365	6.62	9.20	175	0.0	14.99	0.5
	1510	*	-368	6.64	8.50	192	0.0	14.68	1.0
	1515	*	-370	6.65	9.06	166	0.0	14.38	1.5
	1525	*	-371	6.64	9.63	91.2	0.0	14.06	2.0
	1535	*	-373	6.62	9.54	81.0	0.0	13.76	2.5
	1540	*	-373	6.61	9.53	117.0	0.0	13.62	2.75
	1545	*	-373	6.59	9.46	127.0	0.0	13.51	3.00
	1550	*	-373	6.59	9.41	72.0	0.00	13.37	3.25
	1555	~~*~~ 34.45	-374	6.60	9.37	64.0	0.00	13.18	4.00
	1600	34.60	-375	6.60	9.40	229.0	0.00	13.06	4.50
	1605	34.55	-377	6.60	9.40	212.0	0.00	12.98	5.50
	1610	34.65	-378	6.60	9.21	169.0	0.00	13.03	6.00
	1643	38.80	-380	6.59	8.82	548.0	0.00	13.08	7.00
	1653	40.10	-382	6.60	8.78	461.0	0.00	13.34	8.00
	1703	40.70	-383	6.61	8.89	401.0	0.00	13.36	9.00

Sample: (Continued) on page 1 of 2 Groundwater Sampling Form

Logged BY / Date: Lien Nguyen 4/12/02 *Reviewed BY / Date:* [illegible] 4/14/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Maintenance Shop Area
RFA/COC Number:

Collection Date: 4/12/02
Collection Time: 0950
Sample Filtered (Yes / No): yes
Weather/Temp: partly sunny (45°)

Form Completed By: Lien Nguyen
Sampler(s): LN/JH
Reviewed By: David Kesler

Sample Number: P B O W 0 2 G W C B 3 0 3 9

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: MNTA-BEDGW-601
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: good
Screen Height: 15
Casing Type: PVC

Outside Casing Dia. (in): 2
Depth to Product (ft): NA
Total Well Depth (ft): 64
Depth to Water (ft): 30.40
Water Column (ft): 33.60
Elev. Ref. for Water Level:

Odor: H_2S
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: 1
- Reading (ppm): 102 / LEL=38 H_2S=278 CO=0.0 O_2=21.0
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = 33.60 ft x 0.164 Gal/ft = 5.51 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((6)^2 - (4)^2) = 1.312 gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height 15 ft + 2 ft) x 1.32 gal/ft) x 0.3 = 6.69 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 5.51 gal + 6.69 gal = 12.2 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
12.2	24.4	36.6		

	Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
	Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
4/11/02	Purge Vol 1	1735	45.33	9.28	6.60	-384	12.65	251.0	0.00	12.0
	Purge Vol 2	1745	46.85	9.26	6.61	-384	12.65	259.0	0.00	12.5
	Purge Vol 3	1755	48.05	9.25	6.63	-385	13.08	234.0	0.00	13.0
4/12/02	Purge Vol 4	0845	39.65	9.27	5.63	-370	11.96	68.2	0.00	14.0
	Purge Vol 5	0910	39.00	9.28	5.82	-379	12.08	90.9	0.00	14.5
	~~SAMPLE~~ DKK	0925	38.80	9.25	5.91	-372	12.30	65.1	0.00	15.75

Continued

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

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Page 2 of 2

GROUNDWATER SAMPLING FORM

IT CORPORATION
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Project Number:	825635	Collection Date:		Form Completed By:	
Project Name:	PBOW Groundwater	Collection Time:		Sampler(s):	
Investigation Site:		Sample Filtered (Yes / No):			
RFA/COC Number:		Weather/Temp:		Reviewed By:	

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:	MNTA BEDGW-001	Outside Casing Dia. (in):		Odor:	
Well Secure (Yes / No):		Depth to Product (ft):		Vapor Monitor Type:	PID / VRAE
Well Labeled (Yes / No):		Total Well Depth (ft):		- Vapor Monitor S/N:	/
Well Condition:		Depth to Water (ft):		- Reading (ppm):	/
Screen Height:		Water Column (ft):		Remarks:	
Casing Type:		Elev. Ref. for Water Level:			

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

4/12/02

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1	9:40	39.55	9.14	5.95	-377	12.07	87.7	0.00	17.0
Purge Vol 2	9:45	39.85	9.15	5.96	-378	12.07	63.3	0.00	17.5
~~Purge Vol 3~~ sample	9:50	40.30	9.12	5.97	-378	12.11	4.9	0.00	18
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE co[illegible]r.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardne[illegible]	130.2		Alkalinity	[illegible]	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04152002N

Location Code: TNTA-BEDGW-001

Sample Number: CB3044

Sample Name: PBOW-02-GW-TNTA-BEDGW-001-CB3044-

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/15/02

Collection Time: 1125

Start Depth: 70.6

End Depth: 80.6

Sample Matrix: WATER

Sample Team: DK/DD

QC Partners:

(TB) ~~CB~~5019 (ER) (FB)

BC

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
OLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

4/14/02 PID Not measured

LEL > 10

CO = 0

O_2 = 20

H_2S > 50

DTProduct = 57.89

DTW = Not measured due to excessive free product in well. (could not find water)

estimate water level at ~73 ft (15-11 ft product) (72.45 ft water)

Comments: Removed ~~2~~ 3 gallons of free product from well.

Sketch Location:

Logged BY / Date: David Kessler 4/15/02 *Reviewed BY / Date:* DM 4/15/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: TNTA-BEDGW-001

Sample Number: CB3044

4/14/02 Depth to product - 57.89 Ft, Depth to water = ~73.00 Ft, TD = ~~88~~ 85.45 Ft

~~Depth of~~ product column - 15.11 Ft, ~~Dep~~ water column = 12.45 Ft.

4/15/02 Instead of putting indicator into petroleum saturated PVC riser, used measured ~~string~~ string and bailer.

Depth to product 70.50 Ft. Depth to water = 70.60 Ft.

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
Sample:									

Water quality readings not recorded due to petroleum product in well. (~15 Ft) DKK

Logged BY / Date: David Kreach 4/15/02 Reviewed BY / Date: [illegible] 4/15/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: TNTA
RFA/COC Number:

Collection Date: 4/15/02
Collection Time: 1125
Sample Filtered (Yes / No): yes
Weather/Temp: partly cloudy, warm (70°), breezy

Form Completed By: D. Kessler
Sampler(s): DKK/DD
Reviewed By: David Kessler

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: TNTA-BEDGW001
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: Excellent
Screen Height: ~~15~~ ft ~~[illegible]~~ 15 Ft
Casing Type: PVC; Sch 40

Outside Casing Dia. (in): 2
Depth to Product (ft): 57.89 (~15.11 Ft)
Total Well Depth (ft): UN ~~[illegible]~~ 85.45
Depth to Water (ft): ~73
Water Column (ft): 12.45
Elev. Ref. for Water Level:

Odor: H_2S / Hydrocarbon
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: NA /
- Reading (ppm): NA / LEL 70, CO = 0, O_2 = 20, H_2S > 50
Remarks: PID not measured due to rain, removed 3

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Bailed

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2		Water Quality readings not recorded due to petroleum product							
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B /7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04052002N/04052002K

Location Code: IT-TNTB-BEDGW-001

Sample Number: CB3019

Sample Name: PBOW-02-GW-IT-TNTB-BEDGW-001-CB30

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/5/02

Collection Time: 1520

Start Depth: 19 ft

End Depth: 19 ft

Sample Matrix: WATER

Sample Team: JH, LN

QC Partners:

(TB) CB5008 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

PID = 18.9
LEL = 3
H_2S = 87
CO - 0
O_2 - 21.5

Settings:

a) CPM 4
b) Refill/Recharge : 9-6
c) Throttle speed : 40ft

Comments:

Sketch Location:

Logged BY / Date: Lien Nguyen 4/5/02 *Reviewed BY / Date:* D M Dill 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **IT-TNTB-BEDGW-001**

Sample Number: **CB3019**

DTW = 2.97 ft

Initial purge rate 300 ml/min, begin purging @ 1415

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
	1420	2.98	-292	7.92	0.761	5.9	0.00	8.95	0.4
	1425	2.98	-308	7.80	0.804	4.6	0.00	9.49	0.8
	1430	2.99	-315	7.71	0.915	3.0	0.00	9.62	1.2
	1435	3.01	-322	7.54	2.490	1.9	0.00	9.88	1.6
	1440	3.01	-324	7.47	2.620	1.7	0.00	9.79	2.0
	1445	3.02	-324	7.41	2.730	1.7	0.00	9.69	2.4
	1450	3.01	-325	7.35	2.810	1.5	0.00	9.68	2.8
	1455	3.02	-326	7.30	2.870	1.3	0.00	9.62	3.2
	1500	3.02	-327	7.28	2.910	1.2	0.00	9.50	3.6
	1505	3.03	-329	7.25	2.960	1.2	0.00	9.83	4.0
	1510	3.05	-332	7.23	3.020	1.4	0.00	10.47	4.4
	1515	3.05	-333	7.21	3.050	1.1	0.00	10.52	4.8
	1520	3.04	-334	7.20	3.070	1.1	0.00	10.41	5.2
Sample:	1550	3.07	-340	7.16	3.18	2.2	0.00	10.52	—

300 ml/min = 0.08 gal/min → 0.4 gal/5 min

Total purge Volume = 5.2 gal

Logged BY / Date: [signature] 4/5/02 *Reviewed BY / Date:* [signature] 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04052002K

Location Code: IT-TNTB-BEDGW-001

Sample Number: CB3020

Sample Name: PBOW-02-GW-IT-TNTB-BEDGW-001-CB30

Sampling Method: LF

Sample Type: GW *Sample Purpose:* FD

Collection Date: 4/5/02

Collection Time: 1520

Start Depth: 19 ft

End Depth: 19 ft

Sample Matrix: WATER

Sample Team: JH, LN

QC Partners:

(TB) CB5008 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass

Comments:

Sketch Location:

See page 1 of CB3019

Logged BY / Date: Lien Nguyen 4/5/02

Reviewed BY / Date: [illegible] 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04052002A

Location Code: IT-TNTB-BEDGW-001

Sample Number: CB3021

Sample Name: PBOW-02-GW-IT-TNTB-BEDGW-001-CB30

Sampling Method: LF

Sample Type: GW *Sample Purpose:* FS

Collection Date: 4/5/02

Collection Time: 1520

Start Depth: 19ft

End Depth: 19ft

Sample Matrix: WATER

Sample Team: JH, CN

QC Partners:

(TB) CB5009 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass

Comments:

Sketch Location:

See page 1 of CB3019

Logged BY / Date: [signature] 4/5/02

Reviewed BY / Date: [signature] 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **IT-TNTB-BEDGW-001**

Sample Number: **CB3021**

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
Sample:									

See page 2 of CB3019

Logged BY / Date: Lien Nguyen 4/5/02 *Reviewed BY / Date:* D.M. Dill 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 0405200 2N / 0405200 K

Location Code: IT-TNTB-BEDGW-002

Sample Number: CB3018

Sample Name: PBOW-02-GW-IT-TNTB-BEDGW-002-CB30

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/5/02

Collection Time: 10:30

Start Depth: 19'

End Depth: 19'

Sample Matrix: WATER

Sample Team: J. Hofer, L. Nguyen

QC Partners:

(TB) CB5008 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

PID = 0.0 ppm

O_2 = 21.5 ppm

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments: Pump set at 17 ft (Top of pump)

Sketch Location:

Logged BY / Date: Lien Nguyen 4/5/02 *Reviewed BY / Date:* D. Gill 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **IT-TNTB-BEDGW-002**

Sample Number: **CB3018**

DTW = 5.61 ft.

Initial flow rate = 250 ml/min ≈ 0.07 gal/min ≈ 0.35 gal/5 min

Total purge volume = 2.5 gal.

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
	1010	5.63	-344	8.77	0.700	0.0	0.0	10.10	.75
	10:15	5.64	-348	8.61	0.697	0.0	0.0	10.65	1.10
	10:20	5.65	-350	8.56	0.699	0.0	0.0	10.67	1.45
	10:25	5.64	-351	8.55	0.698	0.0	0.0	10.71	1.80
	10:30	5.64	-352	8.56	0.698	0.0	0.0	10.67	2.10
				LKW	4/5/02				
Sample:	10.45	5.64	-355	7.41	0.696	0.0	0.0	10.94	2.5

Logged BY / Date: Linh Nguyen

Reviewed BY / Date: [illegible] 4/7/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04102002K / 04102002N

Location Code: TNTB-BEDGW-003

Sample Number: CB3024

Sample Name: PBOW-02-GW-TNTB-BEDGW-003-CB3024-

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/10/02

Collection Time: 11 50

Start Depth: 37.76 ft

End Depth: 37.76 ft

Sample Matrix: WATER

Sample Team: J. Hofer, L. Nguyen

QC Partners:

(TB) CB5013 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

PID = 1.4 ppm (4/7/02)
LEL = 9 (4/7/02)
CO = 1 (4/7/02)
O_2 = 20.9 (4/7/02)
H_2S - 0 (4/7/02)

PID = 0.0 ppm 4/10/02)
LEL = 2 ppm
O_2 = 20.8 ppm

Comments: Purged well dry and collect water samples by bailer the next day.

Sketch Location:

Logged BY / Date: Lien Nguyen 4/16/02 *Reviewed BY / Date:* [illegible] 4/16/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **TNTB-BEDGW-003**

Sample Number: **CB3024**

DTW = 20.28 ft (4/7/02)
DTW = 39.54 ft (4/8/02)
DTW = 38.38 ft (4/9/02)
DTW = 37.76 ft (4/10/02)

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
		No reading due to inadequate water volume.							
Sample:									

Logged BY / Date: Lien Nguyen 4/10/02

Reviewed BY / Date: D m [illegible] 4/11/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Area B
RFA/COC Number:

Collection Date: 4/10/02
Collection Time: 1150
Sample Filtered (Yes / No): yes
Weather/Temp: Sunny, (50°F)

Form Completed By: Lien Nyugen
Sampler(s): JH/LN
Reviewed By: David Krosch

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: TNTB-BEDGW-003
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: excellent
Screen Height: 10'
Casing Type: PVC

Outside Casing Dia. (in): 2
Depth to Product (ft): NA
Total Well Depth (ft): 41.23
Depth to Water (ft): 20.28
Water Column (ft): ~~41.23~~ 20.95
Elev. Ref. for Water Level: ~~20~~

Odor: none
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: 1
- Reading (ppm): 1.4 LEL=9 CO=1 O_2 = 20.9 H_2S = 0
Remarks: 0.4 ft/5min (recharge rate)
Total purge volume (to dry) = 5 gallons.

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = 20.95 ft x 0.164 Gal/ft = 3.44 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((6)^2 - (2)^2) = 1.31 gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height 10 ft + 2 ft) x 1.31 gal/ft) x 0.3 = 4.72 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 3.44 gal + 4.72 gal = 8.16 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1	14:15	20.28	5.61	12.26	-62	12.10	26.4	1.31	0 4/8/02
Purge Vol 2	14:35	35.83	5.01	12.01	-75	11.78	999.0	0.0	4 4/8/02
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04082002K/04082002K

Location Code: TNTB-BEDGW-004

Sample Number: CB3023

Sample Name: PBOW-02-GW-TNTB-BEDGW-004-CB3023-

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/8/02

Collection Time: 10:50

Start Depth: 23 ft

End Depth: 23 ft

Sample Matrix: WATER

Sample Team: JH, LN

QC Partners:

(TB) CB5010 (ER) NA (FB)

ERPIMS Values:

Sacode:

Lot Control#:

PID = 0.0 ppm

O_2 = 21.5 ppm

Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb Glass
TOC	N	E	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments: low flow sampled, 250 ml/min

Sketch Location:

Logged BY / Date: JH 4/8/02 *Reviewed BY / Date:* [illegible] 4/8/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **TNTB-BEDGW-004**

Sample Number: **CB3023**

DTW = 6.88 ft, pump set w/ intake @ 23 ft, final pump rate set @ 250 ml/min h

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
	1002	6.95	-53	6.60	0.354	255	0.00	10.21	
	1010	6.93	-63	6.67	0.354	194	0.00	10.12	
	1020	7.00	-75	6.70	0.354	217	0.00	10.34	
	1030	7.01	-71	6.68	0.343	120	0.00	10.32	
	1035	7.00	-77	6.68	0.339	97.1	0.00	10.36	
	1040	7.00	-81	6.67	0.336	83.8	0.00	10.40	
	1045	7.01	-83	6.66	0.334	64.8	0.00	10.42	
	1050	7.00	-84	6.65	0.333	66.7	0.00	10.44	
Sample:	1115	7.0	-84	6.68	0.335	46.7	0.00	10.47	~3.5 gal

Logged BY / Date: J Hofer 4/8/02 *Reviewed BY / Date:* DM 4/8/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: 04092002K / 0409200N

Location Code: TNTC-BEDGW-001

Sample Number: CB3026

Sample Name: PBOW-02-GW-TNTC-BEDGW-001-CB3026-

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 4/9/02

Collection Time: 12:48

Start Depth: 83.0 ft

End Depth: 83.0 ft

Sample Matrix: WATER

Sample Team: J. Hafer, L. Nguyen

QC Partners:

(TB) CB5012 (ER) (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	3	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

LEL > 100 ppm PID = 87.4

H_2S > 500 ppm

O_2 = 9.3 ppm

CO = 4 ppm

Pump settings:

a) CPM4

b) Refill 6 discharge 9

c) Throttle speed : 110 ft.

Comments:

Sketch Location:

Logged BY / Date: Lien Nguyen 4/9/02 *Reviewed BY / Date:* [illegible] 4/10/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **TNTC-BEDGW-001**

Sample Number: **CB3026**

DTW - 57.02 ft
purge rate 100 ml/min
Total purge volume ≈ 2.5 gals.
Pump one set @ 83 ft (@ pump intake)

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume ~~mL~~ (gal)
	1138	57.30	-331	6.88	3.32	0.0	0.0	11.52	2.00
	1143	57.30	-335	6.88	3.32	0.0	0.0	11.46	2.5
	1148	57.29	-337	6.88	3.32	0.0	0.0	11.46	3.0
	1158	57.30	-340	6.88	3.29	0.0	0.0	11.45	3.5
	1203	57.32	-342	6.90	3.27	0.0	0.0	11.48	4.5
	1208	57.34	-344	6.91	3.25	0.0	0.0	11.48	5.0
	1213	57.33	-345	6.91	3.23	0.0	0.0	11.48	5.5
	1218	57.34	-347	6.91	3.20	0.0	0.0	11.50	6.0
	1223	57.37	-349	6.90	3.15	0.0	0.0	11.53	6.5
	1233	57.32	-351	6.88	3.11	0.0	0.0	11.59	8.0
	1238	57.31	-352	6.87	3.06	0.0	0.0	11.60	8.6
	1243	57.31	-352	6.86	3.03	0.0	0.0	11.56	9.2
	1248	57.30	-351	6.86	3.01	0.0	0.0	11.55	9.8
Sample:	1304	57.32	-343	6.94	3.06	12.4	0.0	11.50	—

Sampling started @ 1248

Logged BY / Date: Frank Nguyen 4/9/02

Reviewed BY / Date: [illegible] 4/10/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WKS

Manager: Steve Downey

RFA / COC Number: No COC 04092002A

Location Code: TNTC-BEDGW-001
Sample Number: CB3045
Sample Name: TNTC-BEDGW-001-GW-CB3045-FS
Sampling Method: LF
Sample Type: GW *Sample Purpose:* FS

(TB) CB5011

Collection Date: 09-APR-02
Collection Time: 16:00
Start Depth: 10
End Depth: 10
Sample Matrix: WATER
Sample Team: 5

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	N	A	1	500	mL	HDPE
METALS3-W	N	B	1	500	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass

ERPIMS Values:
Sacode:
Lot Control#:

Comments:

See SCL of CB3026

Sketch Location:

Logged BY / Date: [signature] 4/9/02

Reviewed BY / Date: [signature] 4/10/02

JULY 2002

FOURTH QUARTER BACKGROUND GROUNDWATER SAMPLE COLLECTION LOGS

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

PB071002STLC - WATER Qua

RFA / COC Number: PB071002STLK

Location Code: IT-MW01

Sample Number: CC3009

Sample Name: PBOW-02-GW-IT-MW01-CC3009-00-00

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 7/10/02

Collection Time: 0900

Start Depth: 7

End Depth: 10

Sample Matrix: WATER

Sample Team: DKK/JH

QC Partners:

(TB) CC5001 (ER) — (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

Containers

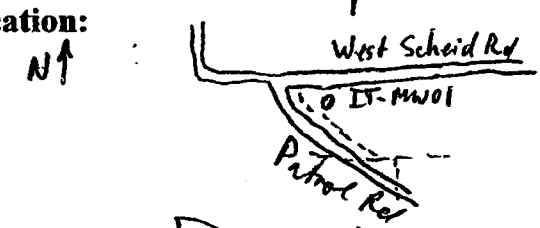
	Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
	METALS3-W	N	A	1	~~500~~ 250	mL	HDPE
	METALS3-W-F	N	B	1	~~500~~ 250	mL	HDPE
	EXPLOSIVES	N	C	1	1	L	Amb. Glass
	VOLATILES3	N	D	3	40	mL	GVIAL,SEP
	SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
	NITRATE-W	N	F	1	1	L	HDPE
a	TOC	N	F	3	40	mL	GVIAL,SEP
	CYANIDE	N	G	1	~~1000~~ 500	mL	HDPE
x	ALKALINITY	N	H	1	1	L	HDPE
x	CHLORIDE	N	H	1	1	L	HDPE
x	SULFATE	N	H	1	1	L	HDPE
x	TDS	N	H	1	1	L	HDPE
x	TSS	N	H	1	1	L	HDPE
x	TURB 180.1	N	H	1	1	L	HDPE
x	HARDNESS	N		1	250	mL	HDPE

x Water Quality Parameters

Comments: Background well (overburden). Collected with peristaltic pump due to debris in riser at 2 ft below TOC.

* TCL VOC samples collected from pipetting gw from tubing.

Sketch Location:



Logged BY / Date: David Kuesch 7/10/02 *Reviewed BY / Date:* David Kuesch 7/10/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **IT-MW01**

Sample Number: **CC3009**

7/9/02 Depth to water = 7.37 Ft, TD = 11.95 Ft, water column = 4.58 Ft
pumping rate 100 ml/min. ~~Bar~~ Pumped dry.
7/10/02 DTW = 7.85 Ft.

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
	1325	7.59 -150ml/min							
	1330	7.81 -100ml/min	-38	6.46	0.531	7.6	3.04	19.46	500ml
	1335	7.95 -100ml	-32	6.41	0.506	7.8	0.29	19.37	900ml -200ml/min
	1340	8.28	-67	6.35	0.481	7.9	0.14	18.71	~1gal
	1345	8.54	-99	6.23	0.458	10.3	0.00	18.56	
	1350	8.90	-113	6.16	0.447	10.1	0.00	17.98	-300ml/min
	1355	9.28	-106	6.03	0.442	8.1	0.00	17.72	~2gal
	1400	9.68	-107	6.09	0.448	6.9	0.00	17.43	
	1410	10.43	-113	6.25	0.476	6.9	0.00	16.86	~3gal
	1420	10.77	-100	6.51	0.483	3.2	0.00	16.04	
	1425	11.23	-92	6.55	0.509	4.8	0.00	16.30	3.75gal - slow out
	1430	11.44	-112	6.61	0.497	4.1	0.00	16.61	4.0gal
	1435	11.78	-105	6.66	0.575	7.1	0.00	16.49	4gal
	1436 - dry								
Sample:	0900	7.98	-8	6.28	0.590	3.7	5.08	17.76	

7/10/02

Removed ~4 gal

Logged BY / Date: David Keach 7/9/02 *Reviewed BY / Date:* David Keach 7/10/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number:	825635	Collection Date:	7/10/02	Form Completed By:	D. Kessler
Project Name:	PBOW Groundwater	Collection Time:	0900	Sampler(s):	
Investigation Site:	Background	Sample Filtered (Yes / No):			D. Kessler / J. Hofer
RFA/COC Number:	PB071002STL-SV	Weather/Temp:	Cloudy, warm (70), windy	Reviewed By:	David Kessler

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:	IT-MW01	Outside Casing Dia. (in):	2"	Odor:	None
Well Secure (Yes / No):	yes	Depth to Product (ft):	None	Vapor Monitor Type:	~~HNU~~ PID / VRAE
Well Labeled (Yes / No):	yes	Total Well Depth (ft):		- Vapor Monitor S/N:	~~AO~~ / 85384 - Findlay
Well Condition:	Good	Depth to Water (ft):	7.37	- Reading (ppm):	0.0 / LEL=0 H_2S=0.0 CO_2=0 O_2=20.8 ppm
Screen Height:		Water Column (ft):	11.95	Remarks:	
Casing Type:	PVC	Elev. Ref. for Water Level:			Water column = 4.58

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.163 gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = 4.58 ft x 0.163 Gal/ft = 0.747 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((8)^2 - (2)^2) = 2.46 gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height ____ ft + 4.58 ft) x 2.46 gal/ft) x 0.3 = 3.38 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 3.38 gal + 0.75 gal = 4.13 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
4.13	8.26	12.39	16.52	20.65

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

Could not low flow. See page 2 of collection log for readings.

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: PB071202STL<K (Water Qual)

Location Code: IT-BG8-BEDGW-001

Sample Number: CC3001

Sample Name: PBOW-02-GW-ITBG8-BEDGW-001-CC3001-

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 7/12/02

Collection Time: 0420

Start Depth: ~~5.5~~ DKK 6.0

End Depth: ~~6.5~~ 6.3

Sample Matrix: WATER

Sample Team: DK/JH

QC Partners:

(TB) CC5005 (ER) — (FB) —

ERPIMS Values:

Sacode:

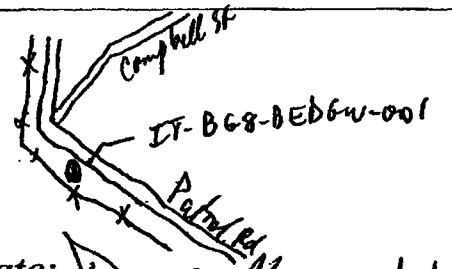
Lot Control#:

Containers

Analytical Suite	Fit	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	250	mL	HDPE
METALS3-W	N	B	1	250	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	2	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments:

Sketch Location:



Logged BY / Date: David Kessler 7/12/02 *Reviewed BY / Date:* David Kessler 7/12/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **IT-BG8-BEDGW-001**

Sample Number: **CC3001**

7/12/02 Depth to water = 5.47 ft, TD = 20 Ft, water column ~ 14.53 Ft

Settings: CPM4 Refill 8.0 7.0 purge rate 300 ml/min

throttle 20 ft, 10 psi

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
	0830	5.74	43	7.03	3.31	152	4.44	14.19	0.30 gal
	0835	5.82	-5	7.05	3.30	26.1	0.90	13.61	1
	0840	5.74	-89	7.11	3.30	39.5	0.55	13.34	1.4
	0845	5.73	-202	7.13	3.58	34.3	1.35	13.29	1.8
	0850	5.73	-219	7.17	3.53	15.4	0.84	13.29	2.2
	0855	5.75	-230	7.18	3.61	12.6	0.83	13.30	2.6
	0900	5.74	-242	7.20	3.56	13.4	0.61	13.24	3.0
	0905	5.78	-243	7.20	3.65	7.4	0.45	13.31	3.4
	0910	5.75	-250	7.20	3.68	7.0	0.45	13.38	3.8
	0915	5.77	-256	7.21	3.71	8.0	0.45	13.34	4.2
Sample:	0920	5.73	-258	7.21	3.68	10.3	0.41	13.45	4.6

Removed 5 gal

Logged BY / Date: David Keesh 7/12/02 *Reviewed BY / Date:* David Keesh 7/12/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number:	825635	Collection Date:	7/12/02	Form Completed By:	D. Kessler
Project Name:	PBOW Groundwater	Collection Time:	0920	Sampler(s):	D. Kessler / J. Hofer
Investigation Site:	Background	Sample Filtered (Yes / No):	yes		
RFA/COC Number:	PBOW1202STL	Weather/Temp:	partly sunny, warm (70°)	Reviewed By:	David Kessler

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:	IT-BG8-BEDGW-001	Outside Casing Dia. (in):	2	Odor:	None
Well Secure (Yes / No):	yes	Depth to Product (ft):	None	Vapor Monitor Type:	PID / VRAE
Well Labeled (Yes / No):	yes	Total Well Depth (ft):	20	- Vapor Monitor S/N:	4842992 / 85384 - Findlay
Well Condition:	Good	Depth to Water (ft):	5.47	- Reading (ppm):	0.0 / LEL=0 H_2O=0 CO=0 O_2=21.0
Screen Height:	15 ft	Water Column (ft):	14.53	Remarks:	
Casing Type:	PVC	Elev. Ref. for Water Level:			

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

Low Flow

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE co[illegible]r.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardne	130.2		Alkalinity		1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

PB07 10 STL C-WATER Quad

RFA / COC Number: PB07 10 STL K

Location Code: PB-BED-MW20

Sample Number: CC3003

Sample Name: PBOW-02-GW-PB-BED-MW20-CC3003-00-0

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 7/10/02

Collection Time: 1600

Start Depth: 14.2

End Depth: 14.3

Sample Matrix: WATER

Sample Team: DKK/JH

QC Partners:

(TB) CC5001 (ER) — (FB) —

ERPIMS Values:

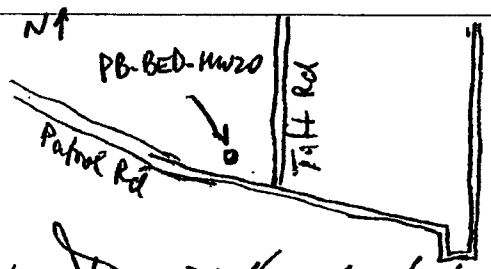
Sacode:

Lot Control#:

Analytical Suite	Flt	Frtn	Containers Qty	Size	Units	Type
METALS3-W-F	Y	A	1	250	mL	HDPE
METALS3-W	N	B	1	250	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	2	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments:

Sketch Location:



Logged BY / Date: David Kresh 7/10/02 *Reviewed BY / Date:* David Kresh 7/10/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW20**

Sample Number: **CC3003**

7/10/02 DTW = 13.94 ft TD = 45.5 ft, water column = 31.56 ft. pump set at 32 ft

pump rate 200 ml/min. Settings: CPM4

Refill = 10.0

5.0

Throttle = 20 psi

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	*Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
	1505	14.10	-33	6.79	52.5	17.0	0.58	12.17	
	1510	14.16	-44	6.80	51.6	51.3	0.86	12.01	
up rate 300 ml/min	1515	14.17	-48	6.81	51.1	65.8	1.03	12.09	1 gal
	1520	14.19	-52	6.82	50.3	41.9	0.73	12.86	1.5 gal
200 ml/min	1525	14.20	-54	6.82	50.0	50.9	0.61	13.26	
	1530	14.20	-55	6.82	50.7	77.5	0.00	12.74	~2.0 gal
	1535	14.22	-56	6.81	50.5	98.6	0.00	12.77	~2.5 gal
	15.40	14.26	-58	6.78	52.7	20.6	0.00	12.77	~3.0 gal
	15.45	14.26	-58	6.75	52.0	26.7	0.00	13.77	sun on tubing
	15.50	14.26	-57	6.73	52.9	—	0.00	13.85	
Sample:	1600	14.26	-57	6.73	52.9	—	0.00	13.85	3.5 gal

*Note: Bubbles collecting in flow-through cell causing high turbidity values. Visual of water below 10 NTU.

Logged BY / Date: David Kressler 7/10/02 Reviewed BY / Date: David Kressler 7/10/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number:	825635	Collection Date:	7/10/02	Form Completed By:	D. Kess
Project Name:	PBOW Groundwater	Collection Time:	1600	Sampler(s):	D. Kessler / J. Hofer
Investigation Site:	Background	Sample Filtered (Yes / No):	yes		
RFA/COC Number:	PBOTTDSTL-2	Weather/Temp:	Partly sunny, warm, windy	Reviewed By:	David Kessler

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:	PB-BED-MW20	Outside Casing Dia. (in):	2	Odor:	None
Well Secure (Yes / No):	yes	Depth to Product (ft):	None	Vapor Monitor Type:	PID / VRAE
Well Labeled (Yes / No):	yes	Total Well Depth (ft):	45.5	- Vapor Monitor S/N:	H842992 / 85384 - Finding Total Source
Well Condition:	good	Depth to Water (ft):	13.94	- Reading (ppm):	0.0 / LEL=0 H_2S=0.0 CO=0 O_2=20.8%
Screen Height:	No screen - open	Water Column (ft):	31.56	Remarks:	
Casing Type:	PVC (-surface)	Elev. Ref. for Water Level:			

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1		low	flow						
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS, TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: PB071202 STL-C (WATER QC)

Location Code: PB-BED-MW24

Sample Number: CC3004

Sample Name: PBOW-02-GW-PB-BED-MW24-CC3004-00-0

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 7/12/02

Collection Time: 1405

Start Depth: 26.6

End Depth: 26.8

Sample Matrix: WATER

Sample Team: DK/JH

QC Partners:

(TB) CC5005 (ER) — (FB) —

ERPIMS Values:

Sacode:

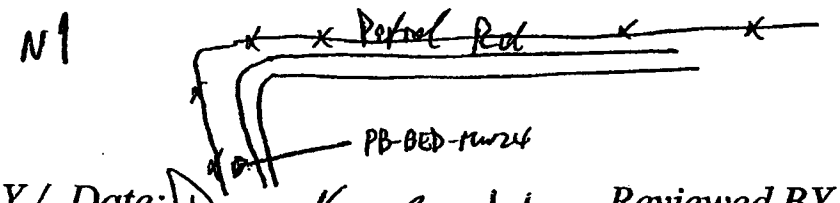
Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	250	mL	HDPE
METALS3-W	N	B	1	250	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	2	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments: Removed 4.5 gal

Sketch Location:



Logged BY / Date: David Kessler 7/12/02 *Reviewed BY / Date:* David Kessler 7/12/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW24**

Sample Number: **CC3004**

7/12/02 Depth to water ~ 26.51 Ft, TD = 42.78 Ft, water column = 16.27 Ft

Pump rate 250 ml/min, dropping to 200, 170, 110. Increased to 200 ml/min. at 1325. Remained at 200 ml/min.

CPM4, Refill 10.0, 5.0, throttle 25 psi, 55 Ft (Throttle should be set so that gauge should be 10-20 Ft lower deeper than pump in well.)

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
	1255	26.67	-296	6.68	1.64	54.4	3.04	13.27	0.25
	1300	~26.67	-301	6.59	1.66	112.6	0.00	13.20	0.50
	1305	~26.7	-305	6.40	1.68	386.0	0.00	13.39	0.75
	1310	~26.7	-321	6.35	1.74	179.0	0.15	13.27	1.0
	1315	~26.7	-326	6.37	1.73	146	0.9	13.49	1.25
	1320	~26.67	-336	6.45	1.69	197	0.49	13.40	1.5
	1325	~26.67	-344	6.54	1.67	209	0.13	13.53	1.75
	1330	~26.7	-348	6.60	1.65	474	0.04	13.44	
	1335	~26.7	-352	6.62	1.60	648	0.00	12.96	2.5
	1340	~26.7	-354	6.63	1.56	851	0.00	12.87	
	1345	~26.7	-357	6.64	1.62	~~999~~ 392	0.00	12.92	3.0
	1350	~26.7	-357	6.65	1.92	250	0.00	12.90	
	1355	~26.7	-357	6.66	1.90	314	0.00	12.98	
	1400	~26.7	-358	6.66	1.89	330	0.00	12.89	3.5
Sample:	1405	~26.7	-358	6.66	1.88	350	0.00	12.93	

bbl well

gray/black

250 ml/m

200 ml

170 ml/m

110

1310 - gauged water level based on first intermittent ton at 24.1 Ft. Did not change (drop) throughout sampling.

- visible gas venting from well.
- Water gray to black in color, gurgling, bubbling sound in well.
- PID 84.1 ppm H_2S > 500 ppm

Removed 11.5 gal

Logged BY / Date: David Kresh 7/12/02 *Reviewed BY / Date:* David Kresh 7/12/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number:	825635	Collection Date:	7/12/02	Form Completed By:	D. Kessler
Project Name:	PBOW Groundwater	Collection Time:	1405	Sampler(s):	D. Kessler / J. Horton
Investigation Site:	Background	Sample Filtered (Yes / No):	yes		
RFA/COC Number:	PB071202STL-2	Weather/Temp:	partly cloudy, warm (75°)	Reviewed By:	David Kreach

Sample Number: P B O W - 0 2 - G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number:	PB-BED-MW24	Outside Casing Dia. (in):	2	Odor:	Hydrocarbon/sulfide odor
Well Secure (Yes / No):	yes	Depth to Product (ft):	None	Vapor Monitor Type:	PID / VRAE
Well Labeled (Yes / No):	yes	Total Well Depth (ft):	42.78	- Vapor Monitor S/N:	H8429921 85384 - Finding
Well Condition:	Excellent	Depth to Water (ft):	26.51	- Reading (ppm):	84.1 LEL = >100 H2S = 0 CO = 0 O2 = 21.0
Screen Height:	~~NO~~ 15 ft	Water Column (ft):	16.27	Remarks:	
Casing Type:	PVC	Elev. Ref. for Water Level:			

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

Low Flow Site page 2 of collection log.

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS, TDS, and turbidity combined in one 1-liter HDPE cor
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity		1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: PB071102STL<K (water qua

Location Code: PB-BED-MW25

Sample Number: CC3005

Sample Name: PBOW-02-GW-PB-BED-MW25-CC3005-00-0

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 7/11/02

Collection Time: 1415

Start Depth: 15

End Depth: 16

Sample Matrix: WATER

Sample Team: DK/JH

QC Partners:

(TB) CC5002 (ER) — (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

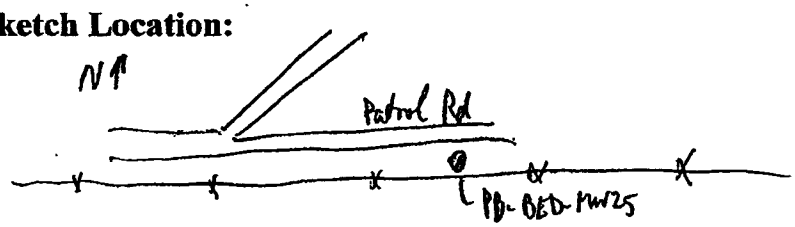
Containers

	Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
	METALS3-W-F	Y	A	1	250	mL	HDPE
	METALS3-W	N	B	1	250	mL	HDPE
	EXPLOSIVES	N	C	1	1	L	Amb. Glass
	VOLATILES3	N	D	3	40	mL	GVIAL,SEP
	SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
X	TOC	N	F	2	40	mL	GVIAL,SEP
	CYANIDE	N	G	1	500	mL	HDPE
X	ALKALINITY	N	H	1	1	L	HDPE
X	CHLORIDE	N	H	1	1	L	HDPE
X	NITRATE-W	N	H	1	1	L	HDPE
X	SULFATE	N	H	1	1	L	HDPE
X	TDS	N	H	1	1	L	HDPE
X	TSS	N	H	1	1	L	HDPE
X	TURB 180.1	N	H	1	1	L	HDPE
X	HARDNESS	N	I	1	250	mL	HDPE

X - water quality parameters sent to North Canton - STL

Comments: Static = 15.87 ft, TD = 40.60 ft, water column = 24.73 ft, pump at 35 ft

Sketch Location:



Logged BY / Date: David Kresch 7/11/02 *Reviewed BY / Date:* David Kresch 7/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW25**

Sample Number: **CC3005**

7/11/02 Depth to water = 15.87 ft, TD = 40.60 ft, water column = 24.73 ft. Pump set at 35 ft.

Pump Rate 400 ml/min BPM4 Refill: 10.0
5.0

Throttle: 20-25 psi

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
7/11/02	1020	~~16~~ 15.95	-164	7.04	1.62	0.8	1.26	13.37	
	1025	15.96	-222	6.94	1.73	1.1	0.17	13.11	1 gal
	1030	15.96	-248	6.94	1.78	0.8	0.02	13.07	1.5
	1035	15.96	-265	6.97	1.81	1.0	0.00	13.06	2
	1040	15.97	-277	7.06	1.83	1.3	0.00	12.99	2.5
	1045	15.97	-285	7.10	1.84	1.5	0.00	12.92	3.0
	1050	15.97	-291	7.14	1.85	1.7	0.00	12.85	3.5
	1055	15.97	-295	7.17	1.85	1.6	0.00	12.89	4.0
	1100	15.97	-298	7.19	1.86	1.8	0.00	12.92	4.5
	1105	15.97	-300	7.20	1.86	1.7	0.00	12.91	5.0
	1110	15.97	-302	7.17	1.86	1.9	0.00	12.93	5.5
Sample:	1115	15.97	-302	7.19	1.86	1.9	0.00	12.92	6.0

Removed ~8 gal w/ sample water

Logged BY / Date: David Kresch 7/11/02 *Reviewed BY / Date:* David Kresch 7/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: PB071102STL<K (water qual)

Location Code: PB-BED-MW25

Sample Number: CC3005-MS

Sample Name: PBOW-02-GW-PB-BED-MW25-CC3005-MS-

Sampling Method: LF

Sample Type: GW *Sample Purpose:* MS

Collection Date: 7/11/02

Collection Time: 1115

Start Depth: 15

End Depth: 16

Sample Matrix: WATER

Sample Team: DK/JH

QC Partners:

(TB) CC5002 (ER) — (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

Containers

	Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
	METALS3-W-F	Y	A	1	250	mL	HDPE
	METALS3-W	N	B	1	250	mL	HDPE
	EXPLOSIVES	N	C	1	1	L	Amb. Glass
	VOLATILES3	N	D	3	40	mL	GVIAL,SEP
	SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
X	TOC	N	F	2	40	mL	GVIAL,SEP
	CYANIDE	N	G	1	500	mL	HDPE
X	ALKALINITY	N	H	1	1	L	HDPE
X	CHLORIDE	N	H	1	1	L	HDPE
X	NITRATE-W	N	H	1	1	L	HDPE
X	SULFATE	N	H	1	1	L	HDPE
X	TDS	N	H	1	1	L	HDPE
X	TSS	N	H	1	1	L	HDPE
X	TURB 180.1	N	H	1	1	L	HDPE
X	HARDNESS	N	I	1	250	mL	HDPE

* water quality parameters sent to STL in North Canton, OH

Comments:

Sketch Location:

Logged BY / Date: David Kuesh 7/11/02 *Reviewed BY / Date:* David Kuesh 7/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW25**

Sample Number: **CC3005-MS**

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
Sample:									

See page 2 of sample collection Log CC3005

Logged BY / Date: David Kusch 7/1/02 *Reviewed BY / Date:* David Kusch 7/1/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: PB071102STLK (water qlty)

Location Code: PB-BED-MW25

Sample Number: CC3005-MSD

Sample Name: PBOW-02-GW-PB-BED-MW25-CC3005-MSD

Sampling Method: LF

Sample Type: GW *Sample Purpose:* MSD

Collection Date: 7/11/02

Collection Time: 1115

Start Depth: 15

End Depth: 16

Sample Matrix: WATER

Sample Team: DK/JW

QC Partners:

(TB) CC5002 (ER) — (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

Containers

	Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
	METALS3-W-F	Y	A	1	250	mL	HDPE
	METALS3-W	N	B	1	250	mL	HDPE
	EXPLOSIVES	N	C	1	1	L	Amb. Glass
	VOLATILES3	N	D	3	40	mL	GVIAL,SEP
	SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
*	TOC	N	F	2	40	mL	GVIAL,SEP
	CYANIDE	N	G	1	500	mL	HDPE
*	ALKALINITY	N	H	1	1	L	HDPE
*	CHLORIDE	N	H	1	1	L	HDPE
*	NITRATE-W	N	H	1	1	L	HDPE
*	SULFATE	N	H	1	1	L	HDPE
*	TDS	N	H	1	1	L	HDPE
*	TSS	N	H	1	1	L	HDPE
*	TURB 180.1	N	H	1	1	L	HDPE
*	HARDNESS	N	I	1	250	mL	HDPE

* water quality parameter sent to STL North Canton, OH

Comments:

Sketch Location:

See page 1 of sample collection log CC3005

Logged BY / Date: David Kersh 7/11/02 *Reviewed BY / Date:* David Kersh 7/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW25**

Sample Number: **CC3005-MSD**

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
Sample:									

See page 2 of Sample collection Log CC3005

Logged BY / Date: David Kuesh 7/11/02

Reviewed BY / Date: David Kuesh 7/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: PB07~~02~~11 02STL DKK

Location Code: PB-BED-MW25

Sample Number: CC3006

Sample Name: PBOW-02-GW-PB-BED-MW25-CC3006-00-0

Sampling Method: LF

Sample Type: GW *Sample Purpose:* FD

Collection Date: 7/11/02

Collection Time: 1115

Start Depth: 15

End Depth: 14

Sample Matrix: WATER

Sample Team: DKH

QC Partners:

(TB) CC5002 (ER) (FB)

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	250	mL	HDPE
METALS3-W	N	B	1	250	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass

Comments:

Sketch Location:

See page ~~2~~ 1 DKH of sample collection log CC3005

Logged BY / Date: David Kessler 7/11/02 *Reviewed BY / Date:* David Kessler 7/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW25**

Sample Number: **CC3006**

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
Sample:									

See page 2 of sample collection Log CC3005 Reg

Logged BY / Date: David Kiesh 7/11/02

Reviewed BY / Date: David Kiesh 7/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: PB071102ACCL

Location Code: PB-BED-MW25

Sample Number: CC3007

Sample Name: PBOW-02-GW-PB-BED-MW25-CC3007-00-0

Sampling Method: LF

Sample Type: GW *Sample Purpose:* FS

Collection Date: 7/11/02

Collection Time: 1115

Start Depth: 15

End Depth: 16

Sample Matrix: WATER

Sample Team: DK/JN

QC Partners:

(TB) CC5003 (ER) — (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	250	mL	HDPE
METALS3-W	N	B	1	250	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
SEMIVOLATILES3	N	D	2	1	L	Amb. Glass
VOLATILES3	N	E	3	40	mL	GVIAL,SEP

Comments:

Sketch Location:

See page 1 of sample collection log CC3005

Logged BY / Date: David Kussler 7/11/02 *Reviewed BY / Date:* David Kussler 7/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW25**

Sample Number: **CC3007**

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
		See page 2 of sample collection log CC3005							
Sample:									

Logged BY / Date: David Kusch 7/11/02

Reviewed BY / Date: David Kusch 7/11/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Background
RFA/COC Number: PBOW11025TL-E

Collection Date: 7/11/02
Collection Time: 1115
Sample Filtered (Yes / No): yes
Weather/Temp: partly sunny, warm (70°), breezy

Form Completed By: D. Kessler
Sampler(s): D. Kessler / J. Hofer
Reviewed By: D. Kessler

Sample Number: P B O W 0 2 - G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PB-BED-MW25
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: Excellent
Screen Height: 10 ft
Casing Type: PVC

Outside Casing Dia. (in): 2
Depth to Product (ft): None
Total Well Depth (ft): 40.60 ft
Depth to Water (ft): 15.87 ft
Water Column (ft): 24.73 ft
Elev. Ref. for Water Level:

Odor: None
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: #842992 / 85384 - Finder
- Reading (ppm): 0.0 PID=0, H2S=0.0, CO=0, O2=21.0%
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

Low flow
See page 2 of sample collection log (CC 3005)

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number: Not Sampled

Location Code: PB-BED-MW26

Sample Number: CC3008

Sample Name: PBOW-02-GW-PB-BED-MW26-CC3008-00-0

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date:

Collection Time:

Start Depth:

End Depth:

Sample Matrix: WATER

Sample Team: DK/JH

QC Partners:

(TB) — (ER) — (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
METALS3-W-F	Y	A	1	250	mL	HDPE
METALS3-W	N	B	1	250	mL	HDPE
EXPLOSIVES	N	C	1	1	L	Amb. Glass
VOLATILES3	N	D	3	40	mL	GVIAL,SEP
SEMIVOLATILES3	N	E	2	1	L	Amb. Glass
TOC	N	F	2	40	mL	GVIAL,SEP
CYANIDE	N	G	1	500	mL	HDPE
ALKALINITY	N	H	1	1	L	HDPE
CHLORIDE	N	H	1	1	L	HDPE
NITRATE-W	N	H	1	1	L	HDPE
SULFATE	N	H	1	1	L	HDPE
TDS	N	H	1	1	L	HDPE
TSS	N	H	1	1	L	HDPE
TURB 180.1	N	H	1	1	L	HDPE
HARDNESS	N	I	1	250	mL	HDPE

Comments:

Not Sampled. Insufficient Water

Sketch Location:

7/9/02 - Water column 0.81 Ft purge
7/12/02 - water column 0.21 Ft sampling day possible

Logged BY / Date: David Kresch 7/12/02 *Reviewed BY / Date:* David Kresch 7/12/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: **PB-BED-MW26**

Sample Number: **CC3008**

7/9/02 Depth to water = 59.54', TD = 60.35 Ft., water column = 0.81 Ft

7/12/02 Depth to water = 60.14', TD = 60.35 Ft, water column 0.21 Ft

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
	1511	60.08	-58	6.74	54.2	999	5.75	16.71	200 ml.
	Dry								
Sample:	Not Sampled								

Logged BY / Date: David Kuesh 7/9/02 *Reviewed BY / Date:* David Kuesh 7/12/0

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Background
RFA/COC Number:

Collection Date: Not Sampled
Collection Time:
Sample Filtered (Yes / No):
Weather/Temp:

Form Completed By: D. Kessler
Sampler(s): D. Kessler / J. Hofer
Reviewed By: David Kreek

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: PBBED-MW26
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: excellent
Screen Height: 15 ft
Casing Type: PVC

Outside Casing Dia. (in): 2
Depth to Product (ft): None
Total Well Depth (ft): 60.35
Depth to Water (ft): 59.54
Water Column (ft): 0.81 ft
Elev. Ref. for Water Level:

Odor: None
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: 4842952 / 85384 - Total Safety
- Reading (ppm): 3.1 / LEL > 100% H_2S = 0 ppm CO = 0 O_2 = 17.1%
Remarks:

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ Gal/ft = _____ gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft

Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height _____ ft + _____ ft) x _____ gal/ft) x 0.3 = _____ gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = _____ gal + _____ gal = _____ gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1			NO						
Purge Vol 2			purged well dry						
Purge Vol 3									
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS, TDS, and turbidity combined in 1-liter HDPE cont
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	3	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

RFA / COC Number PB071102STLK

Location Code: MK-MW20

Sample Number: CC3002

Sample Name: PBOW-02-GW-MK-MW20-CC3002-00-00

Sampling Method: LF

Sample Type: GW *Sample Purpose:* REG

Collection Date: 7/11/02

Collection Time: 0830

Start Depth: 12

End Depth: 15

Sample Matrix: WATER

Sample Team: DK/JH

QC Partners:

(TB) CC5002 (ER) — (FB) —

ERPIMS Values:

Sacode:

Lot Control#:

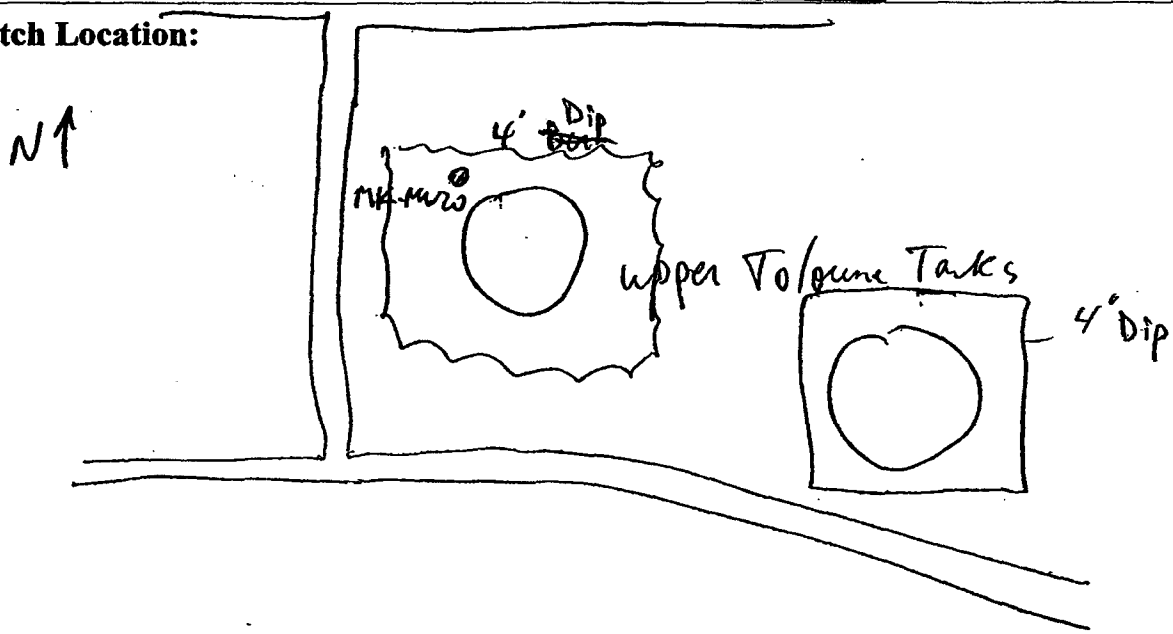
Containers

Analytical Suite	Flt	Frtn	Qty	Size	Units	Type
GRO - 8015B	N	A	3	40	mL	GVIAL,SEP
DRO - 8015B	N	B	2	1	L	Amb.B.R.
~~VOLATILES~~ DKK BTEX	N	D	3	40	mL	GVIAL,SEP

Comments: Collected sample w/ disposable Teflon Bailer.

Maintance Rd

Sketch Location:



Logged BY / Date: David Kesch 7/11/02

Reviewed BY / Date: David Kesch 7/11/02

INTERNATIONAL TECHNOLOGY CORPORATION

Sample Collection Log

Project: 825635 PLUM BROOK ORDNANCE WK

Manager: Steve Downey

Location Code: MK-MW20

Sample Number: CC3002

7/10/02 Depth to water = 6.15 Ft, TD = 22.84 Ft. water column = 16.69 Ft
pumping at 120ml/min. Water level dropped > 0.5 Ft. — Can not low flow well.
1130 Increase flow rate to ~~200~~ 250 ml/min, then

7/11/02 DTW = 11.84 Ft

PURGE RECORD:

Initial	Time(24hr)	DepthtoWater (ft)	Eh (mV)	pH (SU)	Conductivity (mS/cm)	Turbidity (NTU)	DissOxygen (ppm)	Temperature (C)	Purge Volume (gal)
7/10/02	1128	7.00	-192	6.77	1.72	13.5	1.28	19.03	— Pump stopped
300 ml/min	1200 ~~1135~~	8.59	-255	6.69	2.56	35.1	0.15	13.79	~0.5 gal
	1205	9.27	-261	6.60	2.31	27.0	0.06	14.08	1.0 gal
	1210	9.87	-266	6.63	2.14	31.4	0.07	14.09	1.3 gal
	1215	10.41	-273	6.71	1.98	48.7	0.07	14.67	1.5
increased 475 ml/min	1220	11.09	-272	6.74	1.92	39.7	0.36	14.22	2.5 gal
	1225	12.09	-277	6.76	1.94	28.4	0.12	14.37	
	1235	13.76	-294	6.80	2.23	18.7	0.18	13.47	~4 gal
	1245	15.43	-305	6.84	2.40	27.3	0.09	13.12	~5 gal
	1250	16.25	-310	6.84	2.53	27.8	0.10	13.47	
	1300	17.13	-280	6.90	2.85	33.9	—	15.50	~6 gal
unable battery ing low rate <100 ml/min	1310	17.72	-281	6.92	2.88	31.5	0.49	15.39	~6.5 gal
Sample: 7/11/02	0830	NC	NC	NC	NC	NC	NC	NC	

6.5 gal Removed

NC - Not Collected.

Logged BY / Date: David Kessler 7/10/02 *Reviewed BY / Date:* David Kessler 7/11/02

GROUNDWATER SAMPLING FORM

IT CORPORATION
A Member of The IT Group

Project Number: 825635
Project Name: PBOW Groundwater
Investigation Site: Upper Toluene Tanks
RFA/COC Number: PB071102STLK

Collection Date: 7/11/02
Collection Time: 0830
Sample Filtered (Yes / No):
Weather/Temp: partly sunny, warm

Form Completed By: David Kessler
Sampler(s): D. Kessler / J. Hofer
Reviewed By: David Kessler

Sample Number: P B O W 0 2 G W

MONITORING WELL INFORMATION [use top of casing (TOC) for all measurements]

Well Number: MK-MW 20
Well Secure (Yes / No): yes
Well Labeled (Yes / No): yes
Well Condition: poor 3" concrete pad heave
Screen Height: 10? Assume 10
Casing Type: PVC

Outside Casing Dia. (in): 2
Depth to Product (ft): None
Total Well Depth (ft): 22.84
Depth to Water (ft): 6.15
Water Column (ft): 16.69
Elev. Ref. for Water Level:

Odor: ~~None~~ Sewage odor / Sulfur
Vapor Monitor Type: PID / VRAE
- Vapor Monitor S/N: ~~#842997~~ / 85384 - Findlay
- Reading (ppm): 0.0 / LEL=30 H_2S=0 CO=0 O_2=20.9
Remarks: Could not low-flow. Sampled to assess possible product indicated by ICI during Feb 2002 gw measurements.

MONITORING WELL PURGE CALCULATIONS AND PURGE RECORD

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where d is casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = 16.69 ft x 0.164 Gal/ft = 2.74 gallons

Volume of Water in Filter Pack: Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole dia. in inches & d is casing dia. in inches = 0.041 x ((5)^2 - (2)^2) = 0.861 gal/ft
Filter Pack Volume (gal) = ((Screen Height + lesser of 2 ft or water column) x gal/ft) x porosity (0.3) = ((Screen Height 10 ft + 2 ft) x 0.861 gal/ft) x 0.3 = 3.09 gallons

Purge Well Volume: Purge Well Volume = Filter Pack Volume + Well Volume = 3.09 gal + 2.74 gal = 5.83 gal

1 x Purge Well Volume (gal.)	2 x Purge Well Volume (gal.)	3 x Purge Well Volume (gal.)	4 x Purge Well Volume (gal.)	5 x Purge Well Volume (gal.)
5.83	11.66	17.49	23.32	29.15

Purge Cycle	Time (24 hr)	Depth to Water	Conductivity	pH	Eh	Temperature	Turbidity	Diss. O_2	Purge Volume
Units:		Feet	umhos/cm	Standard Units	ppm	°F	NTU	ppm	gallons
Purge Vol 1									
Purge Vol 2									
Purge Vol 3			See page 2 of Collection log						
Purge Vol 4									
Purge Vol 5									
SAMPLE									

SAMPLE ANALYTICAL INFORMATION

Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)	Requested Analysis	Method	Sample Container(s)
Nitroaromatics	Mod. 8330	2 - 1 Liter Amber Glass	Dissolved TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Chloride	325.3	1 - 1 Liter HDPE See Note A
TCL Volatile Organics	5030 / 8260B	3 - 40 mL Glass Vials	Total Cyanide	9010A/9012	1 - 1 Liter HDPE	Sulfate	375.3	A. Sample for alkalinity, chloride, sulfate, TSS. TDS, and turbidity combined in one 1-liter HDPE container.
TCL SVOCs	3510C / 8270C	2 - 1 Liter Amber Glass	Total Organic Carbon	9060	1 - 250 mL Amber Glass	Tot. Suspended Solids	160.2	
Total TAL Metals	3005A/6010B / 7470A	1 - 500 mL HDPE	Nitrate	353.2		Total Dissolved Solids	160.1	
Hardness	130.2		Alkalinity	310.1	1 - 1 Liter HDPE See Note A	Turbidity	180.1	

APPENDIX C

MONITORING WELL HTRW DRILL LOGS
WELL CONSTRUCTION DIAGRAMS

HTRW DRILLING LOG

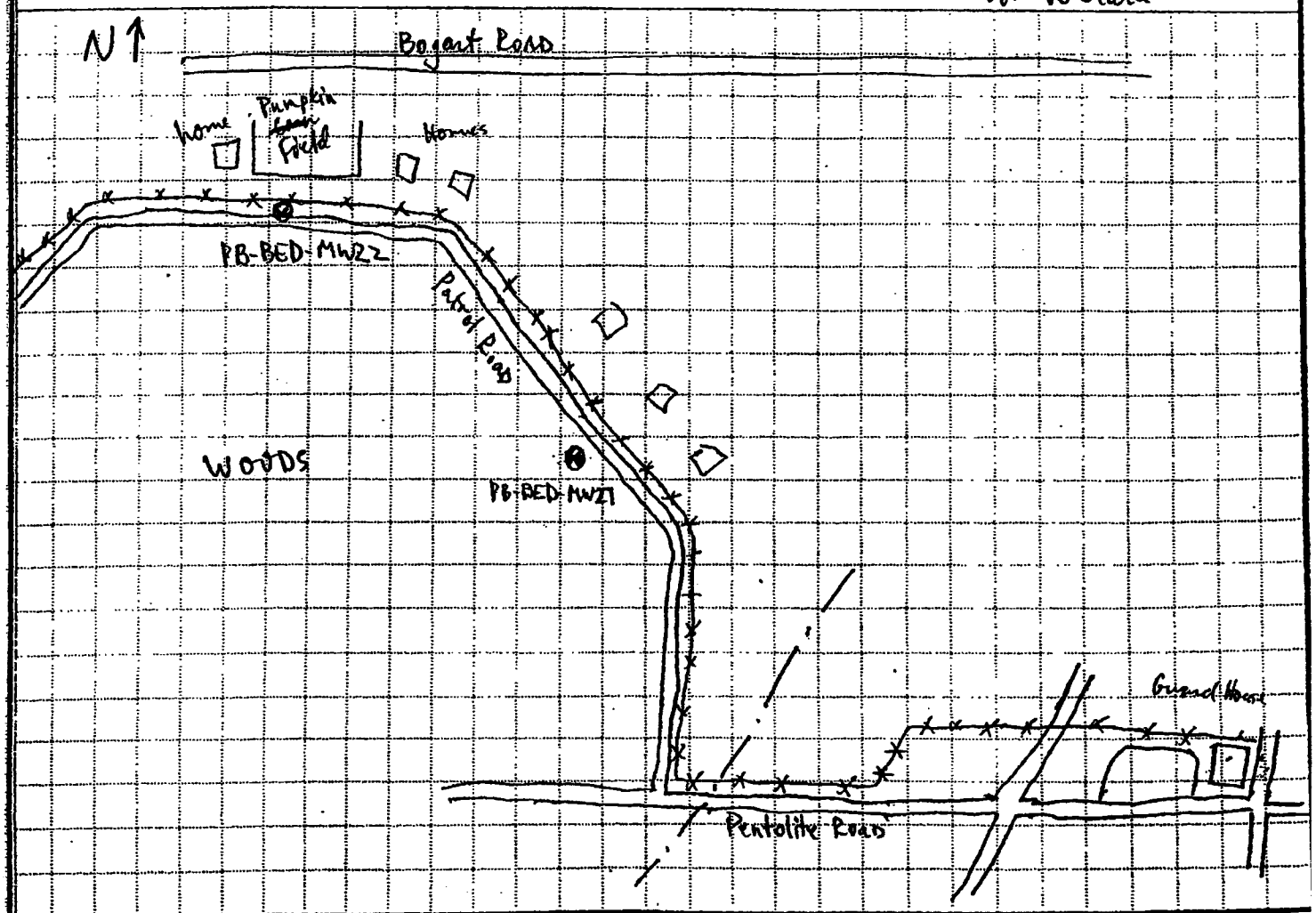
DISTRICT: Nashville, TN	HOLE NUMBER: PB-BED-MW22	
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Boart Longyear	SHEET 1 OF 6 SHEETS
3. PROJECT: PBOW	4. LOCATION: NASA Plum Brook Station, Sandusky, OH	
5. NAME OF DRILLER: Paul Dickinson / Paul Schadell	6. MANUFACTURER'S DESIGNATION OF DRILL: BK81 / Contera C2-250	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID/8" OD HSA with 1.4" ID Stainless Steel split-spoons. Borehole reamed with 8¼" ID/12" OD HSA. Bedrock cut with 8" OD tricone rotary bit. Installed 6" ID/6⅝" OD black steel casing. Bedrock cored with PQ bit. Cores 3" OD, borehole 6" OD. ~~Installed 2" PVC monitoring well BKK~~ Slot.	8. HOLE LOCATION: See Sketch	
	9. SURFACE ELEVATION: 627.22 Ft	
	10. DATE STARTED: 8/24/01	11. DATE COMPLETED: 9/10/01
12. OVERBURDEN THICKNESS: 19.5 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: 4.7 Ft (overburden), ~40 Ft Bedrock	
13. DEPTH DRILLED INTO ROCK: 23.5 Ft	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 43 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	6

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	X	NA	David Kessler / Reed Rodoris

LOCATION SKETCH/COMMENTS — SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	PB-BED-MW22

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW22

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 6 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Uns	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. / Blows	Recovery (ft)	Remarks
		Grass						
		ORGANICS (grass, roots) 0.2			NA			Began drilling 8/24/01
	1	Fill: Loose, Dark brown (10YR 3/3), very fine grain, SAND, trace silt (10%), very well sorted, dry)	SP	0		2/3/ 5/8 1530	1.5/ 2.0	Blow Counts w/ 140 lb Hammer; Background/Breathing 0.0 ppm = PID
	2	Fill: (Loose, dark yellowish brown (10YR 4/6), very fine grain, SAND, trace silt (5%), very well sorted, dry, mottled (brownish yellow, light/dark brown) (moist at 4.7 ft))		0	NA	2/2/ 5/9 1535	1.7/ 2.0	VRAE: CO = 0 ppm; LEL = 0%; H_2S = 0 ppm; O_2 = 21.0 %
	4	Medium dense, olive brown (2.5Y 4/3), homogeneous, vfg, SAND, very well sorted, wet	SP	0	NA	5/7/ 12/25 1538	1.8/ 2.0	▽ Encountered (overburden) groundwater at 4.7 ft
	6	Dense, dark olive gray (5Y 3/2), homogeneous, vfg, SAND very well sorted, trace of pebbles (2%), rounded (black/gray), wet 7.4		0	NA	8/13/ 20/27 1544	2.0/ 2.0	
	8	Stiff, dark gray (2.5Y 4/1), homogeneous, SILT, little sand (15%), high plasticity, trace pebbles (8mm), ~~wet~~, trace light pink "specks" (2) saturated	mh	0	NA	8/9/ 6/5	2.0/ 2.0	
	10							

Project: PBOW

Hole Number: PB-BED-MW22

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW22

Project: PBOW | Geologist: D. Kessler | Sheet 3 of 6 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. / Blows	Recovery (ft)	Remarks
	10	Very stiff, dark gray (2.5Y 4/1), homogeneous. SILT, trace to little sand (10%), ~~trace~~ high plasticity black spot (manganese?), trace light pink spots (3mm), wet trace clay (5%)	ML	0	NA	5/6/ 17/22 1555	2.0/ 2.0	
	12	As above, 3% black spots, ~~trace~~ few sand pockets (2)		0	NA	7/8/ 9/12 1558	2.0/ 2.0	
	14	As above, 5% black spots,		0	NA	3/4/ 6/6 1603	2.0/ 2.0	
	16	As above Trace rock pebbles (black, dark gray) 2-4 mm, rounded. NO sand, wet		0	NA	2/4/ 6/5 1613	2.0/ 2.0	
	18	Hard, ~~[illegible]~~, as above, rounded pebbles increase in number 15%, moist		0	NA	5/6 50 for 6" 1621	1.5/ 1.5	
	20	Spoon refusal @ 19.5 Ft						

Project: PBOW | Hole Number: PB-BED-MW22

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW22

Project: PBOW

Geologist: D. Kessler/S. McLeod

Sheet 4 of 6 Sh.

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	20	Very Hard, dark gray, LIMESTONE	NA	NA	NA	NA	NA	Began cutting with 8" rotary bit at 19.5 ft Recirculated w/ water Distinct H_2S odor URAE: CO = 0 ppm LEL = 0 % H_2S = 0 ppm O_2 = 20.9 %
	21							
	22	Soft zone 22 to 22.3 ft (22 – 22.3)						
	23							
	24					Began Coring 9/10/01		Drilled to 24.5' w/ 8" OD roller bit. 6" ID/6 5/8" OD casing installed to 24.5'
	25	gray, hard, massive limestone, no bedding, no weathering				HFCS	Run 1	Depth - 24.5-31' Run - 6.5' Rec - 4' Start time : 10:20 End " - 10:45 PID - NA MSA - 20.7 - O_2 0 - H_2S 0 - CO 0 - LEL
	26				BOX 1 24.5-28.5	26.5		
	27					27.5		
	28					28.5		
	29							
	30							

Project: PBOW

Hole Number: PB-BED-MW22

HTRW DRILLING LOG

(continuation sheet)

PB-BED-MW22

Project: PBOW | Geologist: S. M. Ford | Sheet 5 of 6 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Uhc	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. Frass	Recovery (ft)	Remarks
	30							
	31	gray, hard, massive ls. no bedding, no weathering			BOX 3 31-34	31.4	Run 2	Run 5' Rec - 5' End time: 11:27 depth - 31-36' MSA - 0 - H_2S 0 - LEL 0 - CO 20.7 - O_2
	32					32.2		
						32.3		
	33					33.3		
	34				BOX 3 34-36	34.5		
	35					35.5		
	36	very hard. gray, mass. dm. no weathering, no bedding				35.8	Run 3	Run - 4' Rec - 3' Run 36-40
	37				Box # 4	37.0		
	38					38		
	39					39		
	40				Box # 5	40		Pull pump 11:40

Project: PBOW | Hole Number: PB-BED-MW22

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW22

Project: PBOW

Geologist: E.M. Lund

Sheet 6 of 6 Sheets

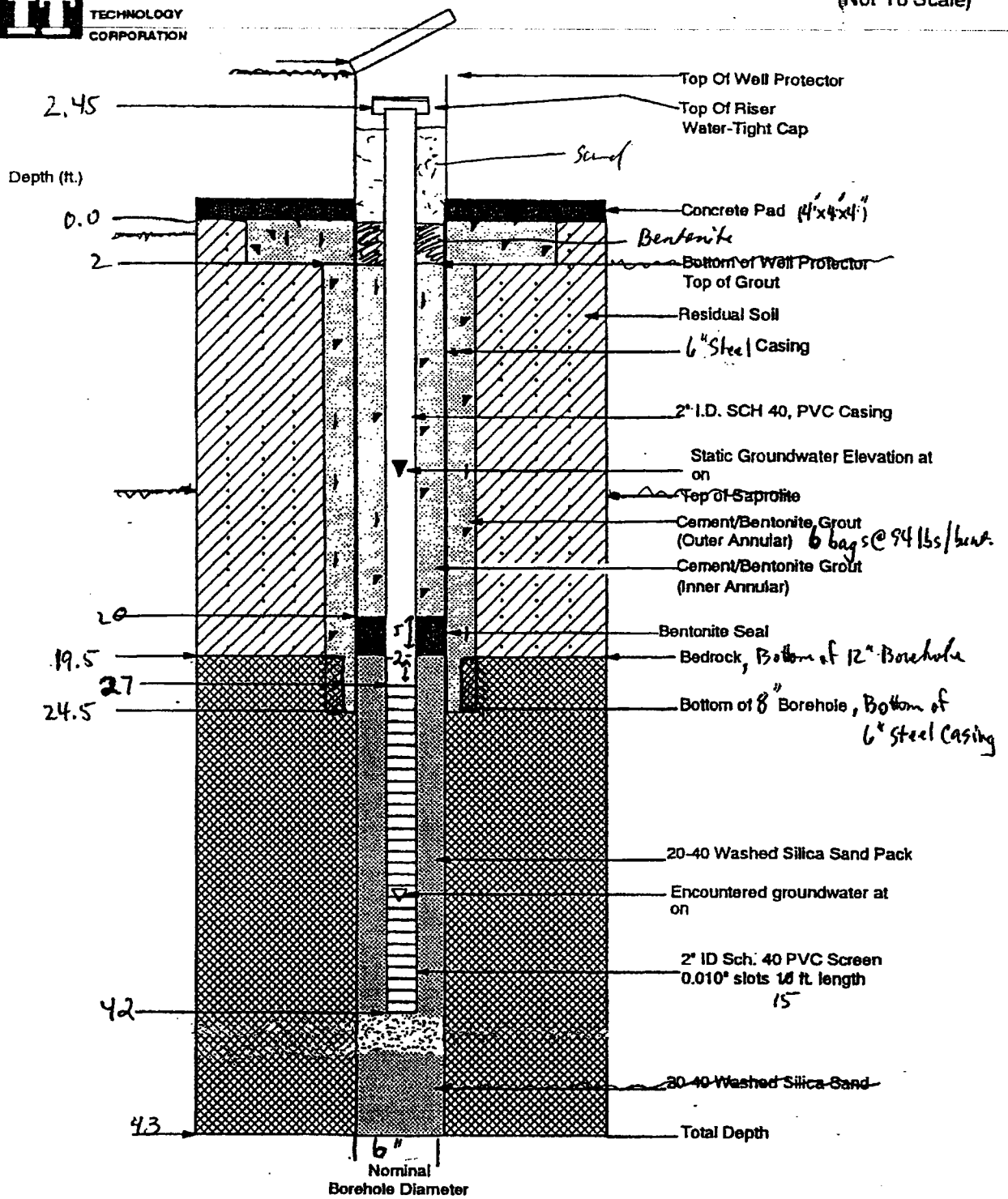
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		gray, massive, hard, limestone, w/no bedding, no weathering, hc. odor, visible			Box 5		Run 4	Depth -40-43' Run - 3' Rec - 3'
	41					40.7		End time 13:25
					Box 6			MSA: 20.7% O_2 0-CO 0-H_2S 0-LEL
	42					41.8		
						42.3		SET WELL MW 22
	43					43.0		
		Total Depth: 43 Ft						
	44							
	45							
	46							
	47							
	48							
	49							
	50							

Project: PBOW

Hole Number: PB-BED-MW22

INTERNATIONAL TECHNOLOGY CORPORATION

(Not To Scale)



Notes:

Well No.: PB-BED-MW22

Date Installed: 9-10-01

Elevation Top of Casing: 629.67 ft.

Well Construction Diagram
prepared for:
Plum Brook Ordnance Works
Sandusky, OHIO

BWMWA23DWC.DRW/9/5-28-03

HTRW DRILLING LOG

DISTRICT: Nashville, TN	HOLE NUMBER: PB-BED-MW23	SHEET 1 OF 9 SHEETS
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Boart Longyear	
3. PROJECT: PBOW	4. LOCATION: NASA Plum Brook Station, Sandusky, OH	
5. NAME OF DRILLER: Paul Dickinson / Todd Schmolfeldt	6. MANUFACTURER'S DESIGNATION OF DRILL: BK81 / Cantera C2-250	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID/8" OD HSA with 1.4" ID Stain-less Steel split-spoons. Borehole reamed with 8¼" ID/12" OD HSA. Bedrock cut with 8" OD tricone rotary bit. Installed 6" ID/6⅝" OD black steel casing. Bedrock cored with PQ bit. Cores 3" OD, borehole 4" OD. Installed 2" PVC monitoring well.	8. HOLE LOCATION: See Sketch	
	9. SURFACE ELEVATION: 631.11 Ft	
	10. DATE STARTED: 8/25/01	11. DATE COMPLETED: 9/~~02~~/01 06
12. OVERBURDEN THICKNESS: 26.3 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: 7.1 Ft (overburden)	
13. DEPTH DRILLED INTO ROCK: 47.7 Ft	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: ~~15.8 Ft~~ 58.8 Ft 9/08/01 1430	
14. TOTAL DEPTH OF HOLE: 74 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

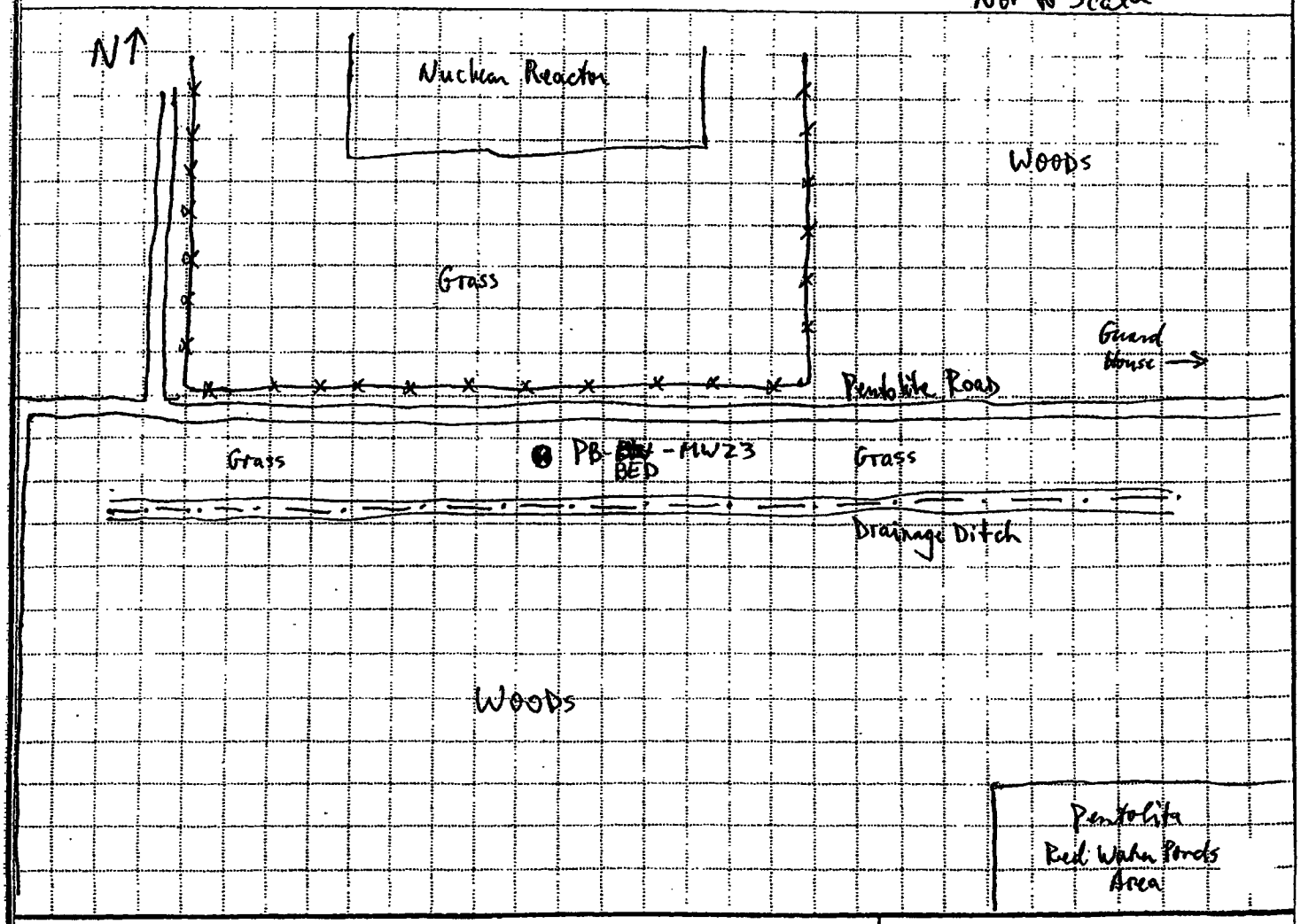
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	X	NA	David Kessler / [illegible]

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	PB-BED-MW23

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW23

Project: PBOW | Geologist: D. Kyssler | Sheet 2 of 9

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. / Blows	Recovery (ft)	Remarks
		Grass						
		Fill: Soft, very dark grayish brown (2.5Y 3/2), sandy SILT with organics, moist 0.3			NA	2/4	1.5	Began drilling 8/25/01 1230
	1	Fill: Loose, (10YR 4/6) dark yellowish brown, homogeneous, vfg, silty SAND, silt (40%), dry 1.2	Sm	0		6/7	2.0	Backg
		color change 1.0-1.2 ft; (2.5Y 3/3) dark olive brown						
	2	Fill: Loose, (10YR 5/6) yellowish brown, homogeneous vfg. SAND. trace silt (5%), very well sorted, dry 2.0	SP					
			SP ml		NA	5/5	1.4	
	3	Fill: Stiff, (10YR 4/6) dark yellowish brown, mottled (tan, black), sandy SILT, low plasticity, dry 2.8		0		7/8	2.0	
		Fill: Loose, (2.5Y 4/4) olive brown, mottled, (whitish brown) 30%, vfg, SAND, trace silt, moist 3.4	SP			1235		
	4	Stiff, (10YR 5/2) grayish brown, mottled (brown), silty CLAY, little sand (10%), high plasticity, moist	ch		NA	4/5	2.0	
	5	Sand content begins increasing at 5 ft		0		8/9	2.0	
		Sand layer 5.8-6.0; very fine grain (10YR 3/6) dark yellowish brown 5.8				1238		
	6	6.0	SP					
		Medium stiff (10YR 5/2) grayish brown, mottled (browns), high plasticity, silty CLAY with sand, moist.	ch		NA	4/4	1.9	
	7	Loose, (2.5Y 3/3) dark olive brown, homogeneous, vfg, SAND, trace silt (10%), very well sorted, wet	SP	0		6/6	2.0	Encountered ▽ overburden groundwater at 7.1 ft
						1242		
	8	8.3			NA			
	9	Medium stiff, (2.5Y 4/1) dark gray, homogeneous, high plasticity, clayey SILT little sand (20%), vfg sand, black manganese spots (2), wet	mh	0		2/3	2.0	
						2/2	2.0	
	10					1245		

Project: PBOW | Hole Number: PB-BED-MW23

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW23

Project: PBOW

Geologist: D. Kessler

Sheet 3 of 9 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	10	Soft, (2.5Y 4/1) dark gray, homogeneous, high plasticity, clayey SILT, trace sand<5%, black manganese spots (2), pink spots (<5%), wet (5-8mm) ↳(3mm)	mh	0	NA	2/2 2/5 1249	2.0/ 2.0	
	11							
	12	As above		NM	NA	1/3 4/5 1251	2.0/ 2.0	
	13							
	14	As above	mh	NM	NA	1/3 4/3 1253	2.0/ 2.0	
	15							
	16	As above		NM	NA	1/2 4/5 1303	2.0/ 2.0	
	17							
	18	As above		NM	NA	1/2 3/4 1307	2.0/ 2.0	
	19							
	20							

Project: PBOW

Hole Number: PB-BED-MW23

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW23

Project: PBOW | Geologist: D. Kessler | Sheet 4 of 9 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Use	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. / Blows	Recovery (ft)	Remarks
	20	Soft, (2.5 y 4/1) dark gray, homogeneous, high plasticity, clayey SILT, trace sand (10%), black manganese spots, light pink spots (3 mm) (5-8 mm) trace pebbles (5 mm), rounded	mh	NM	NA	1/1/ 2/4 1314	2.0/ 2.0	
	22	As above, stiff, pebbles and granules increase w/depth	mh	NM	NA	3/5/ 7/9 1318	2.0/ 2.0	
	24	As above, hard, pebbles and granules 30-40%,		NM	NA	5/7/ 27/32 1336	2.0/ 2.0	Bent spoon Limestone pebbles in shoe 28x60mm, 22x22x22 mm
	26	As above, pebbles/granules 45%		NM	NA	50 for 3" 1354	0.3/ 0.3	Bottom of 12" OD Borehole
	27	Spoon Refusal @ 26.3 ft LIMESTONE, dark gray, soft, fossiliferous (bracks), very slight weathering	NA	NA	NA	NA	NA	Began cutting rock w/ 8" OD tricone roller bit. Flushed with recirculated water. Competent drilling VRAE: CO = 0 ppm LEL = 0% H_2S = 0 ppm O_2 = 21.2 % Occasional faint H_2S odor. 8" OD Borehole to 30 ft 6" Casing Set at 30 ft
	30							

Project: PBOW | Hole Number: PB-BED-MW23

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW23

Project: PBOW

Geologist: R. Poderis

Sheet 5 of 9 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. Fracs	Recovery (ft)	Coring Starts at 30' 9/6/01 Remarks
	30	limestone, grey, hard, massive, not weathered natural hydrocarbon odor			Box #1 1			Depth 30-33 Start time 730 end 915 LEL 0 9/6/01 CO 0 H_2S 0 O_2 20.7 PID 0.0 Run 3' recovery 1' Run #1
	31					Photo RSP 1 #1		
	32							
	33				Run 2 33			33
		Some						Depth 33-38 Start time 930 end 945 Run 5' recovery 5' Run #2
	34	@ nat. hydrocarbon odor. not vis. visible throughout			Box # 2	33.5		
	35					35.5		
						36		
	36				Photo 2			945 LEL 0 CO 0 H_2S 0 O_2 20.7 PID 1.6
	37							
	38				Run 3 38			38
								Depth 38-43 Start 945 end 1000 Run 5' recovery 5' Run #3
	39				Box 3 + Box 4 (Box 3 = 38-41.5')	38.5		
	40							

Project: PBOW

Hole Number: PB-BED-MW23

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW-23

Project:

Geologist: R. Podenis

Sheet 6 of 9 Sheet

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	40							
	41				Box 4 48.5 - 44.5			
	42							
	43				43 Run #4			depth 43-48
		massive gry limestone oil seeps from core				44.2 44.5		run 5' recovery 4' start 1000 end 1110
	44							
	45					46		
						47.2		
	46				Box 5 44.5 - 48	47.8		
	47							
	48				48 Run 5			48-53
		some				48.8 48.9		run 5' recov 5' end 1130
	49				Box 6 48 - ~~53~~ 51	50.4 50.6 51.8		
	50							

Project: PBOW

Hole Number: PB-BED-MW23

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW23

Project: PBOW

Geologist: R Podeni's

Sheet 7 of 9 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ USDA	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. Fracture	Recovery (ft)	Remarks
	50	gray massive hard limestone mod. hc odor + oil seeps						LEL Q CO Q H_2S Q O_2 20.6 PID 0.0
	51				51	52		
					Box 7 (51-54')			Box 7 51-54
	53					53		
						Run 6		depth 53-58 run 5' recovery 5' end time 1200 start time 1130
	54				54	54		
					Box 8 (54-57.5')	55 56		Box 8 54-57.5
	57.5				57.5	57.5		
	58					58		
						Run 7		depth 58-63 run 5' recov 5' stes 1200 end 1210
					Box 9 (57.5-60')			
	60							

Project: PBOW

Hole Number: BED MW-23

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED MW-23

Project: PBOW

Geologist: RPiden's

Sheet 8 of 9 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	60	Massive gray limestone, hard			Box 10 (60-63')	61.5		Box 9 57.5-60.0 Box 10 60-63
	61							
	62							
	63				63 Run 8 63			63 depth 63-68 run 5' recov 5' end 1230
	64	Same						
	65				Box 11 (63-66.5')	64.7		Box 60-66 Box 11 63-66.5
	66				66.5			
	67				Box 12	67		
	68				(66.5-69.5')			depth 68-73 run 5' Box 12 66.5-69.5 recov. 5' end 1 pm
	69				69.5			
	70							

Project: PBOW

Hole Number: MW-23

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB BED MW 23

Project: PBOW

Geologist: RPaden

Sheet 9 of 9 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
70		gray limestone, hard, massive hc odor			Box 13 (69.5-74')	70.5		
	1							
	2							Box 13 DEDICK 69.5-74
	3				74			
								(Stop and pump test) 1 PM
	4	Total Depth = 74 ft						slowly recharging 230 pm
	5							
	6							
	7							
	8							
	9							
8	0							

Project

Hole Number:

INTERNATIONAL TECHNOLOGY CORPORATION

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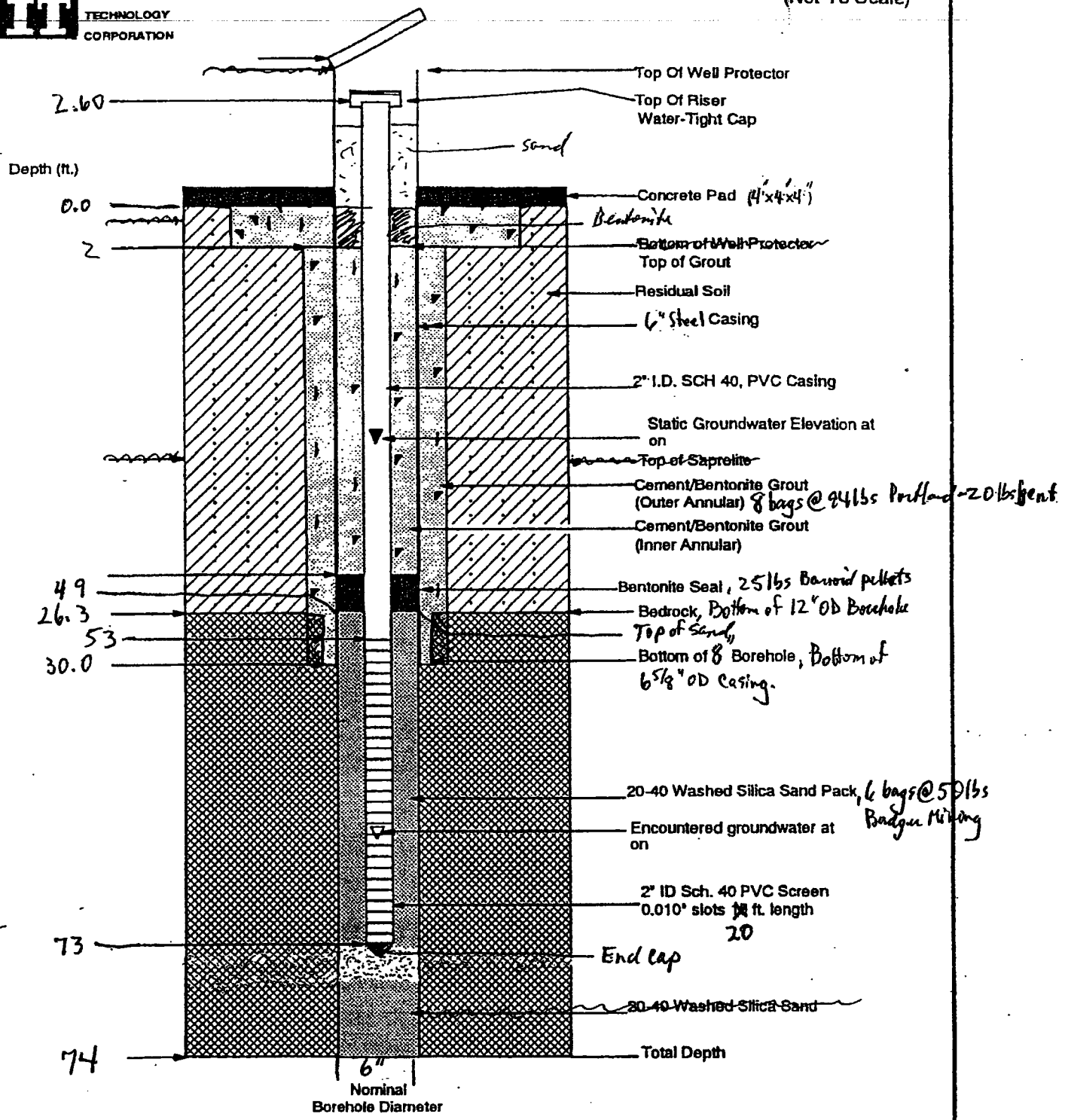


Notes:

Well No.: PB-BED-MW23
Date Installed: 9/8/01
Elevation Top of Casing: 633.71 ft

Well Construction Diagram
prepared for:
Plum Brook Ordnance Works
Sandusky, OHIO

BWMWA23DWC.DRW/l/5-28-03

HTRW DRILLING LOG

DISTRICT: Nashville, TN	HOLE NUMBER: PB-BED-MW2	SHEET 1 OF 6
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Boart Longyear	
3. PROJECT: PBOW	4. LOCATION: NASA Plum Brook Station, Sandusky, O	
5. NAME OF DRILLER: Paul Dickinson	6. MANUFACTURER'S DESIGNATION OF DRILL: BK81	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" ID/8" OD HSA with 1.4" ID Stain-less Steel split-spoons. Borehole reamed with 8 1/4" ID/12" OD HSA. Bedrock cut with 8" OD tricone rotary bit. Installed 6" ID/6 5/8" OD black steel casing. Bedrock cored with PQ bit. Cores 3" OD, borehole 6" OD. Installed 2" PVC monitoring well.	8. HOLE LOCATION: See Sketch	
	9. SURFACE ELEVATION: 644.20 Ft	
	10. DATE STARTED: 8/26/01	11. DATE COMPLETED: 9/13/01
12. OVERBURDEN THICKNESS: 17.3 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: 7.0 Ft (overburden), Bedrock unknown	
13. DEPTH DRILLED INTO ROCK: 24.2 Ft	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 26.5 Ft @ 1 hr	
14. TOTAL DEPTH OF HOLE: 41.5 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

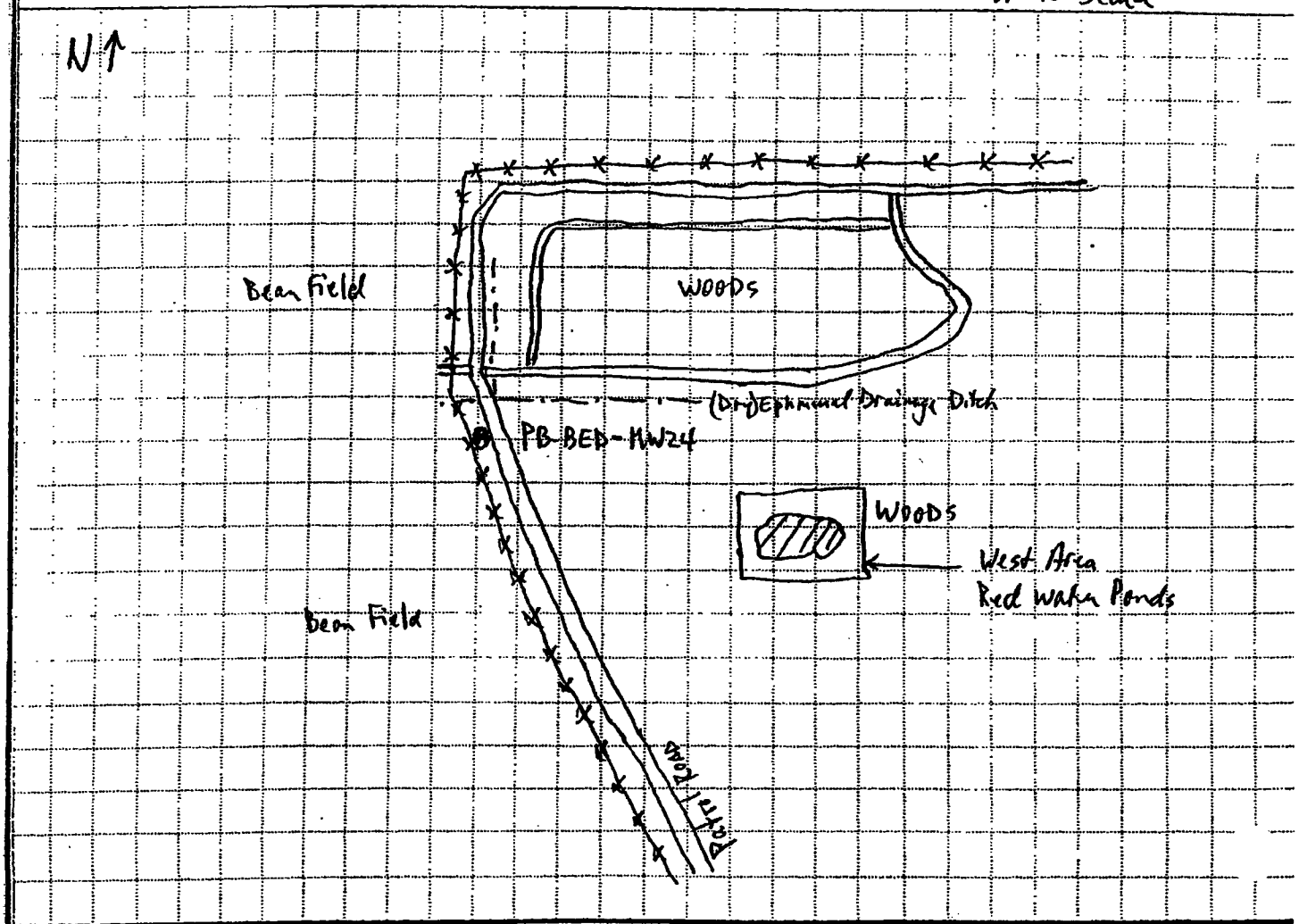
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	6

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	X	NA	David Kessler

LOCATION SKETCH/COMMENTS

SCALE: Not To Scale



PROJECT	HOLE NO.
PBOW	PB-BED-MW24

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW24

Project: PBOW | Geologist: D. Kessler | Sheet 2 of 6

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Litho	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Grass						
		Stiff, (10YR 3/2) very dark grayish br. homogeneous, sandy SILT (30% sand), organics (roots), dry 0.8	ML	0.0	NA	3/4/ 6/10	1.5/ 2.0	Began drilling 8/26/01 0910
	1	Stiff, (10YR 5/6) yellowish brown, mottled (30%-gray), vfg, sandy SILT, very well sorted, organics (roots), dry	ML			0900		Breathing Air/ Background: PID = 0.0 ppm
	2							
	3	As above (no organics) 4.2		0.0	NA	6/8/ 10/7	1.4/ 2.0	VRAE: CO = 0 ppm LEL = 0% H_2O = 0 ppm O_2 = 20.7%
	4					0915		
	5	Stiff, (2.5Y 5/2) gray brown, mottled (50% - dark yellow), ~~vfg~~, high plasticity, SILT, little clay (10%), trace vfg sand, even-parallel bedding planes, moist		0.0	NA	8/7/ 8/9	2.0/ 2.0	
	6					0920		
	7	As above		0.0	NA	4/3/ 7/10	2.0/ 2.0	▽ Encountered (overburden) groundwater at 7.0 ft
	8					0925		
	9	Very stiff, (2.5Y 5/3) light olive br, mottled (20%), SILT, trace clay, even-parallel bedding, wet		0.0	NA	5/7/ 12/14	2.0/ 2.0	Mottling along vertical fractures
	10					0927		

Project: PBOW | Hole Number: PB-BED-MW24

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW24

Project: PBOW | Geologist: D. Kessler | Sheet 3 of 6 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	Unified Class	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No: Blows	Recovery (ft)	Remarks
	10	Stiff, (2.5Y 4/1) dark gray, homogeneous, high plasticity, SILT, trace clay, rounded pebbles (light gray), 1-5mm, wet		~~NM~~ NM	NA	3/5/ 6/8 0930	2.0/ 2.0	Brown staining along horizontal fractures
	12	As above, granules/pebbles increase 10%, 1-10mm		NM	NA	3/4/ 5/5 0935	2.0/ 2.0	
	14	As above		NM	NA	3/5/ 6/8 0938	2.0/ 2.0	
	16	As above, granules/pebbles 30%		NM	NA	7/8 50 for 3" 0945	1.3/ 1.3	Limestone pebble in shoe, 20x15mm Bottom of 12" OD Borehole
	17.3	Spoon refusal @ 17.3 Ft LIMESTONE, gray, calcareous, fossils, fine grained, very fine grain pyrite <5%, trace calcite, clear quartz "spot" 5x5mm.	NA	NM	NA	NA	NA	Began cutting with 8" rotary bit Faint H_2S odor Breathing Air: PID=0.0 ppm CO=0 ppm LEL=0% H_2S=0 ppm O_2=20.8%
	20							

Project: PBOW | Hole Number: PB-BED-MW24

HTRW DRILLING LOG (continuation sheet)

Hole Number: PB-BED-MW24

Project: PBOW | Geologist: D. Kessler | Sheet 4 of 6 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (%)	Remarks
	20	LIMESTONE, gray, average to hard	NA	NM	NA	NA	NA	Hardness based on cutting speed.
	21	21.5						Bottom of 8" OD Borehole at 21.5 Ft
		LIMESTONE, gray, hard, massive bedding, slightly weathered, calcareous, slightly fractured, fossils (bryozoans)				Fracs		Bottom of 6 5/8" OD Steel casing at 21.5'
	22	Limey shale layer 21.9-22.0 ft soft.			~~21.0~~ Limey shale	21.9 22.0		Began coring 9/13/01 0925
	23				Box #1			C-1 (21.5-26.5') End: 0933 Start: 0925. 5 Ft Run
	24	Large coral 23.6-23.9' (0.3' x 0.3') infill		0.4		24.6		5 Ft Recovery 0
	25				25.2			Breathing Air/Backgrd PID: 0.0 ppm VRAE: CO = 0 ppm LEL = 0% H_2S = 0 ppm O_2 = 20.9%
	26				Box #2	25.6 26.5		
	27	As above, massive, slightly fractured.						C-2 (26.5-31.5') End: 0955 Start: 0944
	28				28.5			HC odor drilling 5 Ft Run
	29				Box #3	29.3		5 Ft Recovery 0 Loss HC odor
	30							

Project: PBOW | Hole Number: PB-BED-MW24

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW24

Project: PBOW

Geologist: D. Kessler

Sheet 5 of 6 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. Frac's	Recovery (ft)	Remarks
	30							C-2 (cont)
					Box #3	30.8		
	31							
		LIMESTONE, gray, hard to very hard, massive bedding, slight to fresh weathering, calcareous, slightly fractured, fossils (brachs/stromalites) corals				31.5		
								C-3 (31.5-36.7')
	32				32.4			
								End: – start: –
	33				Box #4			
								5 Ft Run
								5.2 Ft Recovery
	34			32.7				0.2 Ft GAIN
								HC staining on core
	35					35.0 white shale filled		Strong odor
								Can hear water gurgling after pumping gas
	36				36.3			
					Box #5			36.7
	37	As above						C-4 (36.7-41.5')
						37.7		
	38							End: 1052 start: 1039
						38.2		
								5 Ft Run
	39							4.8 Ft Recovery
								0.2 Ft Loss
						39.6		
	40							

Project: PBOW

Hole Number: PB-BED-MW24

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW24

Project: PBOW

Geologist: D. Kessler

Sheet 6 of 6 Sheets

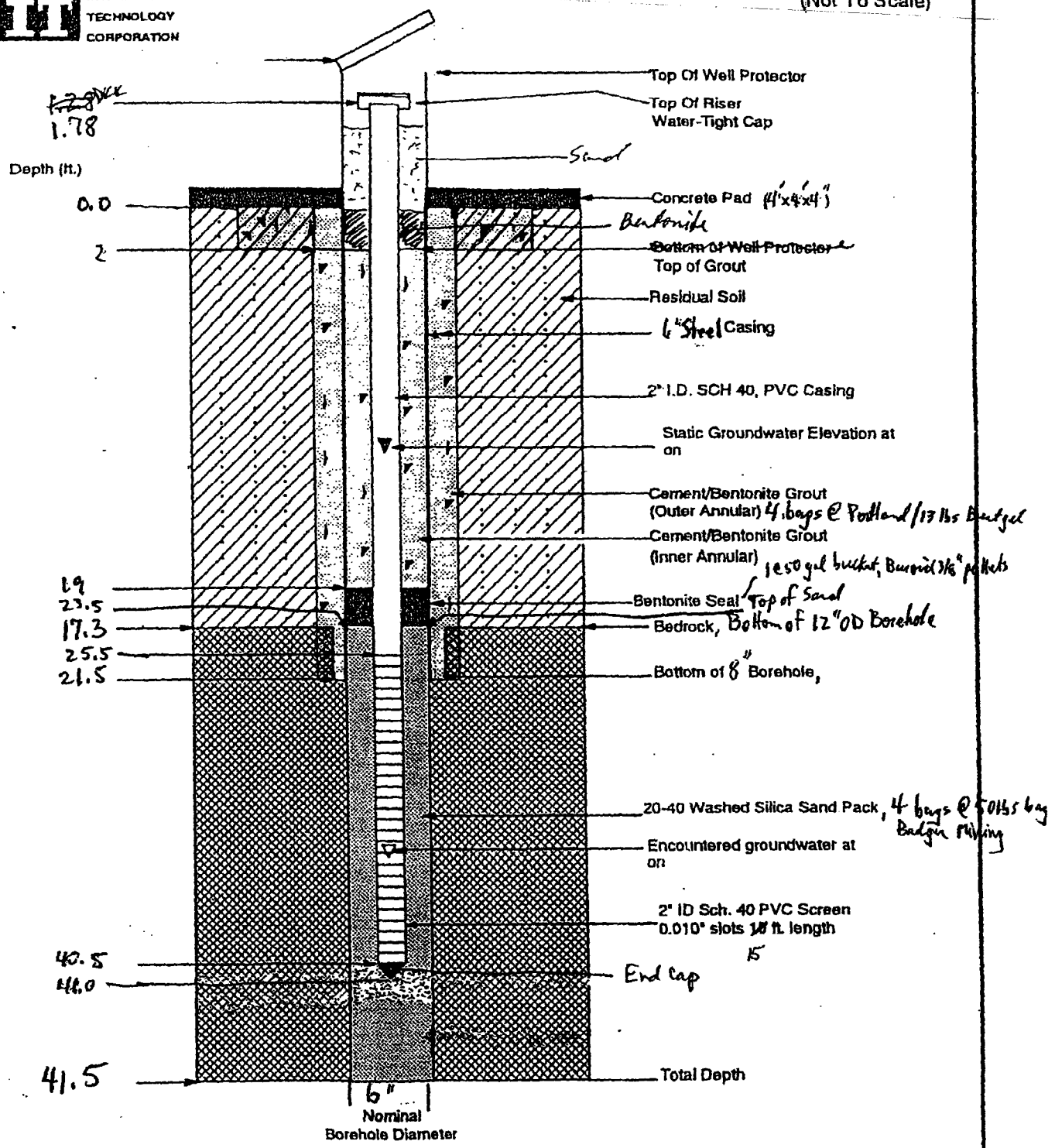
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ USDA	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. Fracs	Recovery (ft)	Remarks
	40	LIMESTONE, gray, very hard, massive, fresh weathering, calcareous, fossils (bracks/stromalites corals)		20.1	40.6 Box # 6			C-4 (con't) 14C staining on core.
	41					41.5		
		Total Depth - 41.5 ft						pumped borehole H07, H10 > 3.5', H11 > 4.5' Can hear water gurgling during recharge.
	42							
	43							
	44							
	45							
	46							
	47							
	48							
	49							
	50							

Project: PBOW

Hole Number: PB-BED-MW24

INTERNATIONAL TECHNOLOGY CORPORATION

(Not To Scale)



Notes:

Well No.: PB-BED-MW24
Date Installed: 9/13/01
Elevation Top of Casing: 645.98 Ft

Well Construction Diagram
prepared for:
Plum Brook Ordnance Works
Sandusky, OHIO

BWMWA23DWC.DRW

HTRW DRILLING LOG

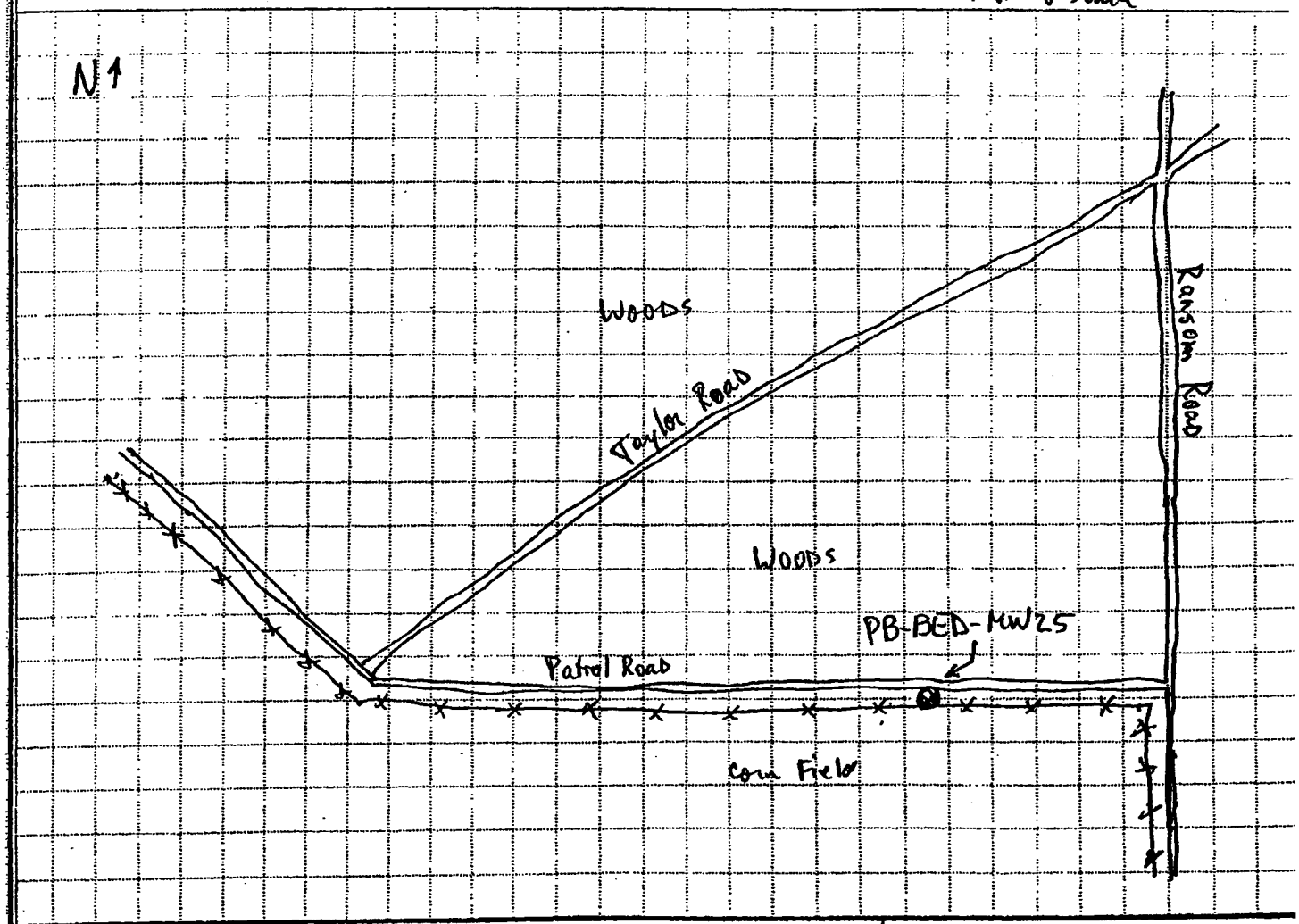
DISTRICT: Nashville, TN	HOLE NUMBER: PB-BED-MW25	SHEET 1 OF 5
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Boart Longyear	
3. PROJECT: PBOW	4. LOCATION: NASA Plum Brook Station, Sandusky, OH	
5. NAME OF DRILLER: Paul Dickinson	6. MANUFACTURER'S DESIGNATION OF DRILL: BK81	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" ID/8" OD HSA with 1.4" ID Stain-less Steel split-spoons. Borehole reamed with 8 1/4" ID/12" OD HSA. Bedrock cut with 8" OD tricone rotary bit. Installed 6" ID/6 5/8" OD black steel casing. Bedrock cored with PQ bit. Cores 3" OD, borehole 6" OD. Installed 2" PVC monitoring well.	8. HOLE LOCATION: See Sketch	
	9. SURFACE ELEVATION: 681.99 Ft	
	10. DATE STARTED: 8/26/01	11. DATE COMPLETED: 9/11/01
12. OVERBURDEN THICKNESS: 8.8 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: 4.8 Ft (overburden)	
13. DEPTH DRILLED INTO ROCK: 29.7 Ft	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 38.5 Ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	4

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	X	NA	David Kessler

LOCATION SKETCH/COMMENTS — SCALE: Not To Scale



PROJECT: PBOW — HOLE NO. PB-BED-MW25

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW25

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 5 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	*Analytical Sample No.	Blows	Recovery (ft)	Remarks
		Grass/Weeds							
		Fill: Very loose (10YR 3/3) dark brown, mottled (light brown), silty SAND, organics (roots) dry) 0.6	Sm		NA		1/1	1.4/	Began Drilling 8/26/01 1455
	1	Fill: (Loose, (10YR 6/6) brownish yellow, homogeneous, vfg, SAND, very well sorted, dry)	SP	0			4/7	2.0	With 4¼ I.D/8" OD augers Borehole reamed w/ 12" OD augers to 10 Ft Background/Breathing PID = 0.0 ppm
							1455		VRAE:
	2	As above	SP	0	NA		2/6	1.8/	CO = 0 ppm LEL = 0% H_2O = 0.0 ppm
	3						4/4	2.0	O_2 = 20.9% (strong breeze)
							1458		
	4	As above, color changing to (10YR 4/4) dark yellowish brown silt content in SAND 5% at 4.8 Ft	SP	0	NA		3/5	2.0/	▽ Encountered overburden groundwater at 4.8 Ft
	5						6/4	2.0	
							1459		
	6	As above 4-6 Ft interval		0	NA		2/11	2.0/	
	7						1/12	2.0	
		7.3							
		Medium dense, (10YR 3/2) very dark grayish brown, homogeneous, vfg, SAND, some silt (25%), very well sorted, wet, black shale fragments 7.7-8.0 Ft (10%), trace gravel, very coarse to 8.8	Sm				1504		
	8			0	NA		5/7	1.6/	
	9	Weathered SHALE, dark brown, very soft, thinly laminated		0			8/50 for 6"	2.0	Black coal (ash?) laminations? (2) 9.1 and 9.4 Ft
	10	Spoon refusal @ 10.0 Ft					1512		

Project: PBOW

Hole Number: PB-BED-MW25

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW25

Project: PBOW

Geologist: D. Kessler

Sheet 3 of 5 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No: PBMW5	Recovery (ft)	Remarks
	10	SHALE, highly weathered, dark brown, thinly laminated, soft	NA	0	NA	NA	NA	Bottom of 12" OD augers at 10 ft Description from cuttings
	11							
	12							
	13							
	14	Dry						Shale from bottom of augers - dry 4 1/4" ID/8" OD auger refusal
	15	8" OD Auger Refusal @ 15 ft SHALE, soft, dark brown,						
	16							
	17							
	18							More competent w/ depth.
	19							Detected solid competent shale cuttings at ~20 ft
	20							

Project: PBOW

Hole Number: PB-BED-MW25

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW25

Project: PBOW.

Geologist: D. Kessler

Sheet 4 of 5 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Use	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	20	SHALE, dark brown, average hardness	NA	NM	NA	NA	NA	
	21	21.5						Began drilling 8/27/01 to 23.3 ft w/ 8" rotary bit
		LIMESTONE						
	22							
	23							Drilled to 23.3 ft w/ 8" rotary bit. 6" steel casing at 23.3 ft
		LIMESTONE, light gray, hard, massive bedding, slightly weathered, calcareous, moderately fractured,				Fracs		Began drilling 9/4/01
	24					24.2 24.3		C-1 (23.3-28.3')
	25	25.1 – 25.7 ft; many corals white nodules		0.0	Box # 1	24.7 (iron stained edges)		End: — Start: —
	26					26 26.3 26.35		5 ft Run 5 ft Recovery 0 Loss
					rounded	highly weathered		
	27	27.3 – 28.3; pitted 30%, highly weathered zone 27.3 – 27.6'			27.3	27.3 rounded edges		
	28				Box # 2	28		
		LIMESTONE, as above				28.5		C-2 (28.3 – 33.5')
	29					29.3 (rounded edges)		End: 1020 Start: 1000
	30							

Project: PBOW

Hole Number: PB-BED-MW25

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW25

Project: PBOW

Geologist: D. Kessler

Sheet 5 of 5 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. Freq	Recovery (ft)	Remarks
	30	LIMESTONE, light gray, hard, massive bedding, slightly weathered, calcareous, moderately fractured, fossils				30.2 (rough)		5 Ft Run
	31				31			5.2 Ft Recovery
		31.5			Box # 3	31.5		0.2 Ft Gain
	32	SHALE, very dark gray, soft, thinly bedded, highly weathered, pyrite vugs(2) 31.5-31.9; decomposed 32.4-32.5; clay/silt filled		NM		32.4		Breathing Air/Background PID = 0.0 ppm CO = 0 ppm LEL = 0 ppm H_2S = 0 ppm O_2 = 21.0%
		33						
	33	Limey SHALE, very dark gray, moderately hard, thinly bedded, moderately weathered, fossils (brachs/corals), calcareous, moderately to highly fractured pryite vug 35.6 Ft				32.8		C-3 (33.5-38.5')
	34				34.8			End: 1048 Start: 1035
						34.9		
	35				Box # 4	35.3		HC odor
						35.7		5 Ft Run
	36					36		5 Ft Recovery
						36.3		
						36.4 (clay filled, rounded edges)		
						36.75		0 Loss
		37						
	37	LIMESTONE, light gray, hard, massive, slightly weathered, fossils (brachs/corals), calcareous, moderate to slightly fractured.				37.5		
	38							
		Total Depth = 38.5 Ft						
	39							
	40							

Project: PBOW

Hole Number: PB-BED-MW25

INTERNATIONAL TECHNOLOGY CORPORATION

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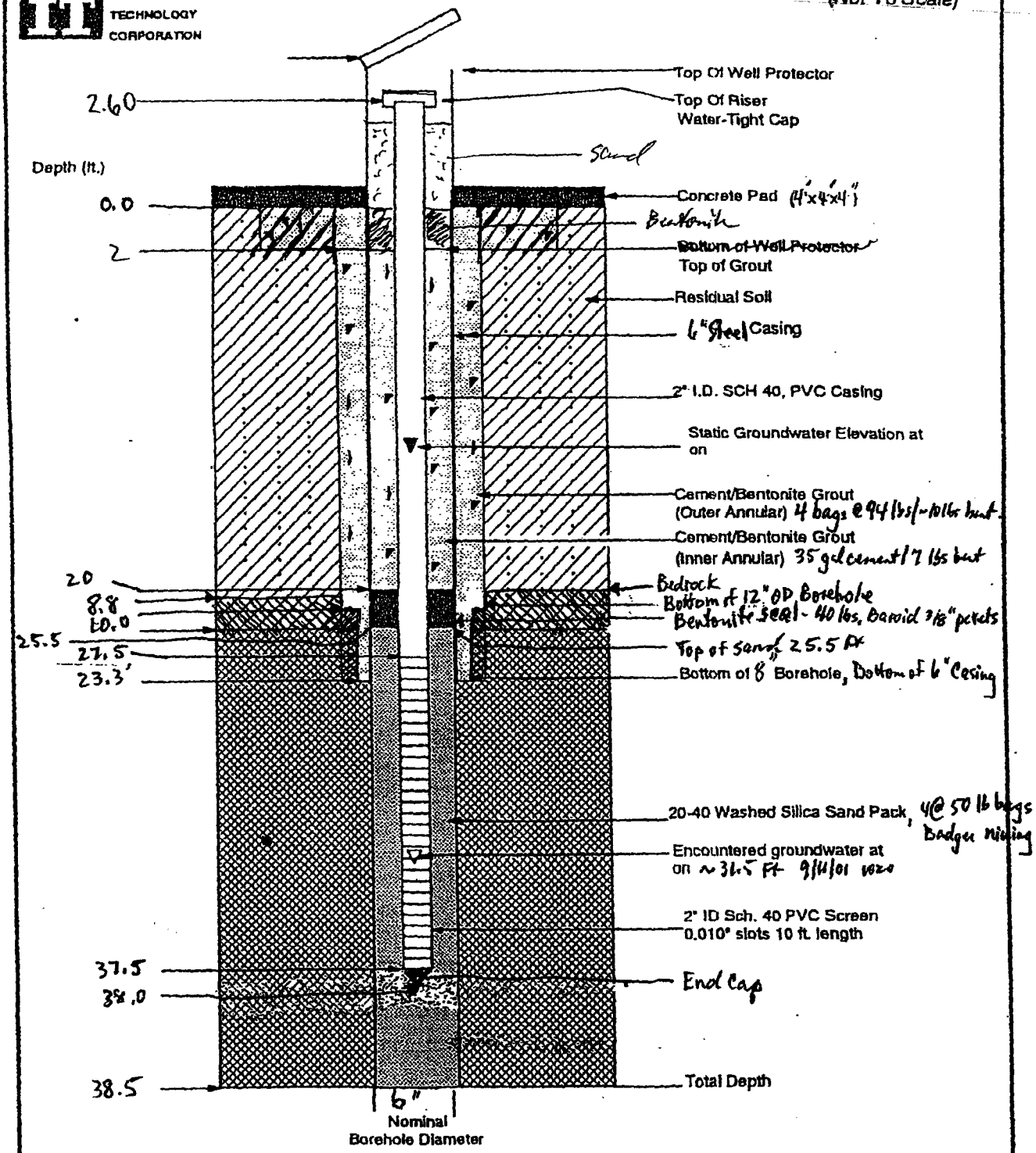


Notes:

Well No.: PB-BED-MW25

Date Installed: ~~9/14/01~~ 9/12/01

Elevation Top of Casing: 684.59 ft.

Well Construction Diagram
prepared for:
Plum Brook Ordnance Works
Sandusky, OHIO

BWMWA23DWC.DRW/WE

HTRW DRILLING LOG

DISTRICT	Nashville, TN
HOLE NUMBER	PB-BED-MW26
SHEET	1 OF 7
1. COMPANY NAME	IT Corporation
2. DRILL SUBCONTRACTOR	Boart Longyear
3. PROJECT	PBOW
4. LOCATION	NASA Plum Brook Station, Sandusky, OH
5. NAME OF DRILLER	Paul Dickinson
6. MANUFACTURER'S DESIGNATION OF DRILL	BK81
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4¼" ID/8" OD HSA with 1.4" ID Stain-less Steel split-spoons. Borehole reamed with 8¼" ID/12" OD HSA. Bedrock cut with 8" OD tricone rotary bit. Installed 6" ID/6⅝" OD black steel casing. Bedrock cored with PQ bit. Cores 3" OD, borehole 6" OD. Installed 2" PVC monitoring well.
8. HOLE LOCATION	See Sketch
9. SURFACE ELEVATION	674.61 Ft
10. DATE STARTED	8/27/01
11. DATE COMPLETED	9/10/01
12. OVERBURDEN THICKNESS	6.5 Ft
13. DEPTH DRILLED INTO ROCK	52.0 Ft
14. TOTAL DEPTH OF HOLE	58.5 Ft
15. DEPTH GROUNDWATER ENCOUNTERED	Not encountered (overburden), Bedrock ~ ~~47.0~~ 47.0 Ft
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

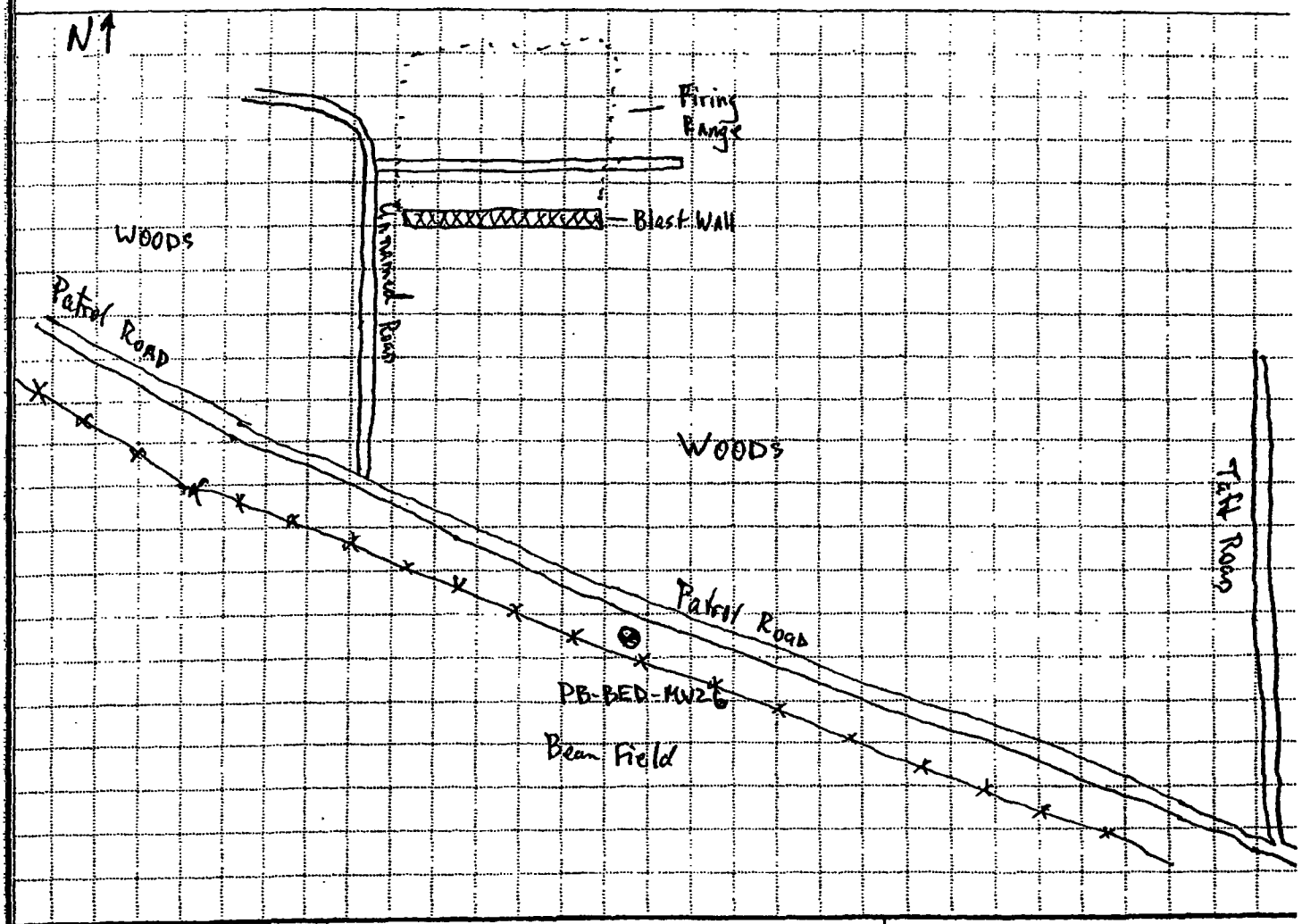
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	9

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	X	NA	David Kosch

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	PB-BED-MW26

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW26

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 7 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Uhc	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. / Blows	Recovery (ft)	Remarks
		Grass/Weeds						
		Medium stiff, (10YR 2/1) black, homogeneous, medium plasticity, ~~stiff~~ SILT, organics (roots), vfg sand (15%), moist 0.7			NA	3/4/	1.3/	Began drilling 8/27/01 1140
	1	Stiff, (10YR 4/6) dark yellowish brown, mottled (50%) (light brown/gray), clayey SILT, vfg sand (20%), dry shale fragments 5%	ml	0.0		5/7	2.0	Breathing Air/Background PID = 0.0 ppm CO = 0 ppm LEL = 0% H_2S = 0 ppm O_2 = 20.9%
	2					1142		
		As above 2.5			NA	2/4/	1.7/	
	3	Medium dense, (10YR 5/3) brown, mottled gray, dark brown (10%), vfg, SAND, silt (20%), dry 3.8	SM	0.0		6/7	2.0	
		Medium stiff, (10YR 5/6) yellowish br, mottled (5% gray), platy bedding, silty CLAY, shale fragments, black oxidized specks (15%), moist medium plasticity.				1146		
	4				NA	2/2/	1.9/	
	5		cl	0.0		5/7	2.0	
						1148		
	6	As above, moist 6.5			NA	5/7/	2.0/	Bedrock
	7	SHALE, very severe (decomposed) weathering, (2 GLEY 5 PB 6/1) bluish gray, relic bedding, thinly bedded, soft, dry	NA	0.0		12/48	2.0	Rock crumbles in hand
						1154		
	8			NM	NA	NA	NA	Discontinued split spoon sampling
	9							
	10							Bottom of 12" Borehole

Project: PBOW

Hole Number: PB-BED-MW26

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW26

Project: PBOW

Geologist: D. Kressler

Sheet 3 of 7 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. Blows	Recovery (ft)	Remarks
	10	SHALE, dark brown, thinly bedded, severely (highly) weathered dry	NA	~~NM~~ NM	NA	NA	NA	Described from cuttings w/ 8" OD augers. Color change ~10 ft
	11							
	12							
	13							
	14							
	15							
	16							
	17							▽ Water encountered ~17 ft
	18							
	19							
	20							

Project: PBOW

Hole Number: PB-BED-MW26

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW26

Project: PBOW | Geologist: D. Kessler | Sheet 4 of 7 Sheets

Elev (ft)	Depth (ft) Pgs	Description of Materials	USCS Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	20	SHALE, dark brown	NA	NM	NA	NA	NA	
	21							Cuttings ~~begin~~ became dry ~~with~~ at ~ 21 Ft
	22							
	23							Strange, sweet, organic odor from cuttings PID = 0.0 ppm Borehole 0.0 ppm
	24	SHALE, bluish gray, hard, micro-laminated, slightly broken, fresh weathering						Description from rock core knocked out of auger (24.3-24.5')
		8" OD Auger Refusal @ 24.5 Ft						
	26	SHALE, hard, competent						PID = 0.0 ppm H_2S = 0.0 ppm (Still strange odor) Natural HC
	27							Drilled to 27.5 Ft w/ 8" rotary bit. Set 6 5/8" steel casing at 27.5 Ft.
	28	SHALE, very dark brown, moderately hard, thinly laminated, slight weathering, pyrite vug at 30.1 Ft, wavy limestone layers 28.2-28.3', 29.4-29.5', 29.7-29.75', ~~29~~ 30.3-30.4', 30.65-30.75',		0.0	Box # 1 photo	Fracs 28.8 29.1 29.8		Began coring 9/8/01 1700 C-1 (27.5-32.5) Breathing air: PID = 0.0 ppm CO = 0 ppm O_2 = 21.1% LEL = 0% H_2S = 0 ppm

Project: PBOW | Hole Number: PB-BED-MW26

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW26

Project: PBOW

Geologist: D. Kessler

Sheet 5 of 7 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. FTACS	Recovery (ft)	Remarks
	30	SHALE, very dark brown, moderately hard, thinly laminated, slight weathering, Lm layers wavy, continuous 30.95-31', 32.35-32.45'.			Box #1 (clay filled) 30.8	30.1		End: 1715 Start: 1702
	31				Box #2 photo 32.6	30.8 (clay filled) 31.4 (clay filled) 32.2		5 Ft Run 5.1 Ft Recovery 0.1 Ft Gain
	32							C-2 (32.6-37.5') End: 1745 Start: 1735
	33	As above, unbroken, pyrite in vugs, wavy Lm layer at 32.5-32.6'						
	34				Box #3 photo 36.4	36.4		HC odor while drilling
	35							5 Ft Run 5 Ft Recovery 0 Loss
	36					Vertical Frac (Not water bearing)		
	37				Box #4	37.5		
	38	As above, unbroken (except from pieces of vertical frac			Box #4 photo 39.5	Vertical Fracture		C-3 (37.5-43.0') End: 1816 Start: 1804
	39							
	40							

Project: PBOW

Hole Number: PB-BED-MW26

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW26

Project: PBOW | Geologist: D. Kessler | Sheet 6 of 7 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No: Fracs	Recovery (ft)	Remarks
	40	SHALE, very dark brown,				40.2 fr. clay filled vertical		(C-3 cont)
						40.6		5.5 Ft Run
				NM		40.7 (clay filled)		5.5 Ft Recovery
	41				Box #5			0 Loss
		41.5						
		LIMESTONE, gray, hard, massive, slightly weathered, 1 vug, calcareous			photo	42.1 horizontal 42.3 vertical		HC odor
	42							
					43.0			
	43					Frac 43.1		Began drilling 9/10/01 0835
						43.55-43.6		C-4 (43-48.4')
	44	As above. 43.55-43.6' frac rounded edges ~~smoked~~		NM				
		44.0 – 45.6'; pitted LM (30%) 5% vugs 45.1-45.3 - Honeycombed			Box #6			5 Ft Run 5.4 Ft Recovery
	45	46.3-47'; pitted, vugs				45.3		0.4 Ft Gain
					photo			
	46				46.4			
	47	47			Box #7	47		☒ Possible Bedrock water at 47'
		SHALE, dark gray, soft, thinly laminated, highly weathered, intensely fractured (fell apart) (decomposed).			photo			
	48							48.4
						Fracs		C-5 (48.4-53.4')
		As above						
	49	49.5						
		Limy SHALE, highly weathered				pyrite		End 1103 start 1048
	50							

Project: PBOW | Hole Number: PB-BED-MW26

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW26

Project: PBOW

Geologist: D. Kessler

Sheet 7 of 7 Sheets

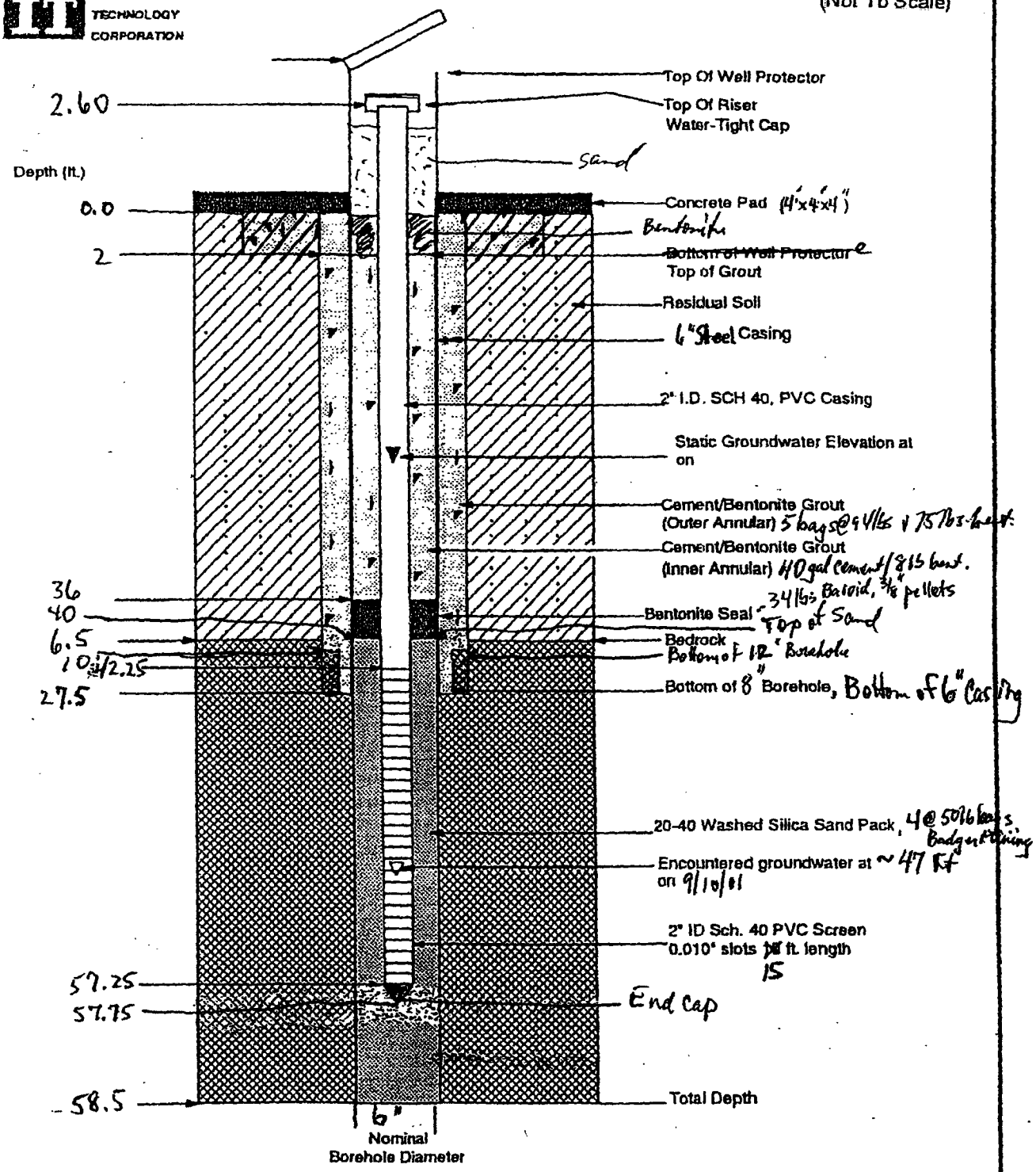
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	50	Limey SHALE, dark gray, moderately hard, thinly bedded, moderately weathered, Fossils (brachs, corals), calcareous moderate to highly fractured (not yet broken)			50.5	FFACC		HC odor
	51			NM	Box # 8	51		5 Ft Run 5.2 Ft Recovery 0.2 Ft Gain
	52				photo			
						Pyrite		Pumped well Recharge: 1225 @ 3 min = 0.1' 1228 @ 3 min = 0.1' 1231 @ 3 min = 0.1' 1245 @ 14 min = 0.1' 1256 @ 11 min = 0.8' 1312 @ 16 min = 0.1'
	53	~~Breaking to more~~ Limey SHALE ~~Shaly LIMESTONE~~, dark gray, soft to moderately hard, thinly bedded ~~MASSIVE~~ DKE, moderately weathered fossils, (brachs, corals, crinoids), 2 pyrite filled vugs, unbroken			53.6			C-6 (53.6 - 58.5)
	54			NM	Box # 9 (rounded edges)	54.3		End: 1408 Start: 1355
	55				photo			4.9 ~~5~~ Ft Run 4.85 Ft Recovery 0.05 Ft Loss
	56							
	57							
	58							
	58.5	Total Depth = 58.5 Ft						
	59							
	60							

Project: PBOW

Hole Number: PB-BED-MW26

INTERNATIONAL TECHNOLOGY CORPORATION

(Not To Scale)



Notes:

Well No.: PB-BED-MW2C
Date Installed: 9/10/01
Elevation Top of Casing: 677.21 ft

Well Construction Diagram
prepared for:
Plum Brook Ordnance Works
Sandusky, OHIO

BW\MWA23DWC.DRW/1/5-2

HTRW DRILLING LOG

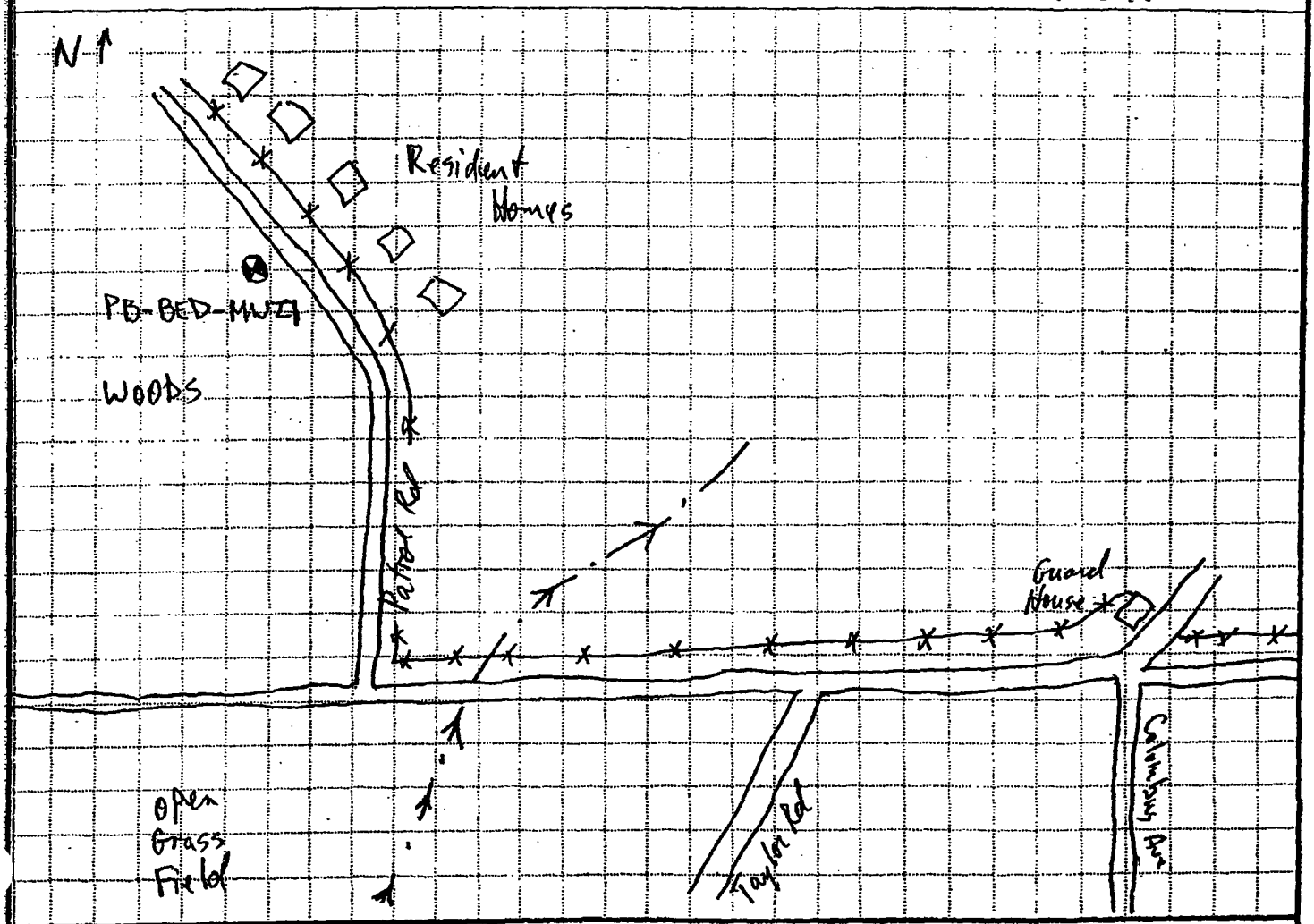
DISTRICT: Nashville, TN	HOLE NUMBER: PB-BED-MW21	SHEET 1 OF 12 SHEETS
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Boart Longyear	
3. PROJECT: PBOW	4. LOCATION: NASA Plum Brook Station, Sandusky, OH	
5. NAME OF DRILLER: Paul Dickinson / Todd Schmalfeldt	6. MANUFACTURER'S DESIGNATION OF DRILL: BK81 / Cantera CZ-250	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID/8" OD HSA with 1.4" ID Stain-less Steel split-spoons. Borehole reamed with 8¼" ID/12" OD HSA. Bedrock cut with 8" OD tricone rotary bit. Installed 4" ID/6 5/8" OD black steel casing. Bedrock cored with PQ bit. Cores 3" OD, borehole 6" OD. ~~Installed 2" PVC monitoring well block~~	8. HOLE LOCATION: See Sketch	
	9. SURFACE ELEVATION: ~~627.14 ft~~ 625.24 Ft	
	10. DATE STARTED: 8/23/01	11. DATE COMPLETED: 9/8/01
12. OVERBURDEN THICKNESS: 18.8 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: 4.2 Ft (Overburden)	
13. DEPTH DRILLED INTO ROCK: ~~105 feet~~ 86.2 Ft	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: ~~103.15~~ 104.9 / 1hr	
14. TOTAL DEPTH OF HOLE: 105 feet	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	24

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	76 feet

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	X	NA	David Kessler / Sheldon [illegible]

LOCATION SKETCH/COMMENTS — SCALE: Not to Scale



PROJECT: PBOW	HOLE NO: PB-BED-MW21

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW21

Project: PBOW | Geologist: D. Kessler | Sheet 2 of 12 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	~~Analysis~~ ~~Sample No.~~ Blows	Recovery (ft)	Remarks
		Grass						
		SAND, very dark grayish brown, organics 0.3			NA			Began drilling 8/23/01 1430
	1	Fill: (SAND, trace silt (5%), medium dense, yellowish brown (10YR 5/8), homogeneous till 0.9 Ft. At 0.9 Ft, becomes mottled with (10YR 7/6) yellow, vfg, very well sorted, dry)		0		3/5 / 8/10	1.5 / 2.0	Breathing Air: CO = 0ppm LEL = 0% H_2S = 0ppm O_2 = 20.9%
	2		SP					
	3	Fill: (SAND, some clay (35%), clay content increases w/ depth, dry)		0		3/4 / 7/10	2.0 / 2.0	Water pocket at 2.5 Ft
	4	4						
	5	SILT, some sand (30%), grayish brown (10YR 5/2), mottled (5%) with strong brown (7.5YR 5/8), high plasticity, sand vfg, wet		0		2/2 / 4/7	1.8 / 2.0	Encountered groundwater ▽ 4.2 Ft
		sand content decreases w/ depth	MH					
	6					1650		
	7	Medium stiff, SILT, same color as above, sand content 5%, wet		0		2/3 / 4/6	2.0 / 2.0	
	8							
	9	Stiff, SILT, dark gray (10YR 4/1), homogeneous, high plasticity, wet		0		2/3 / 6/6	2.0 / 2.0	
	10							

Project: PBOW | Hole Number: PB-BED-MW21

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW21

Project: PBOW

Geologist: D. Kessler

Sheet 3 of 12 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. / Blows	Recovery (ft)	Remarks
	10	Stiff, dark gray (10YR 4/1), homogeneous, SILT, high plasticity, wet		0	NA	3/5/8/8	2.0/2.0	
	11							
	12					1705		
	13	As above	mh	0		2/3/6/8	2.0/2.0	
	14					1708		
	15	As above		0		2/4/6/9	2.0/2.0	
	16					1711		
	17	As above		0			2.0/2.0	
	18					1730		Drilled to 18.8 ft w/ 12" OD HSA
		As above, with rounded pebbles (3 mm), broken shale fragments				2/50 for 3"	0.8/0.8	
	19	Spoon Refusal @ 18.8 Ft Auger Refusal @ 18.8 Ft SHALE bedrock, very dark gray / black						Began drilling 8/24/01 0840 w/ 8" OD Tricone Roller Bit for casing.
	20	20 Ft						

Project: PBOW

Hole Number: PB-BED-MW21

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW27

Project: PBOW

Geologist: D. Kessler

Sheet 4 of 12 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ UHS	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	20	LIMESTONE, weathered, fractured, soft, gray	NA	NM	NA	NA	NA	Drilling w/ 8" OD Tricone Roller bit to set 6" steel casing.
	21	LIMESTONE, hard, gray (21')						Observing only chips of bedrock
		(21.5')						Background/ Breathing Air: PID: 0.0 ppm
	22	Shaley LIMESTONE, greenish gray, soft, thinly bedded (22.5')						VRAE:
		LIMESTONE, gray, hard, competent						CO = 0 ppm
	23							LEL = 0%
								H_2S = 0 ppm
	24							O_2 = 20.9 ppm
	25							
								Drilled to 26.5' with 8" Tricone Roller Bit. 6 5/8" OD casing set at 26.5 ft.
	26	(26.5)						
			NA		NA	NA	NA	
	27							
	28							
								Began casing 9/7/01
	29	massive limestone, gray, hard, no weathering, no bedding			BOX 1 29-33			start time - 10:30 End " - 11:00
	30							

Project: PBOW

Hole Number: PB-BED-MW27

130

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED mw27

Project: PBOW

Geologist: McLeod

Sheet 5 of 12 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uifie	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	31							Run - 5' Rec - 5' Depth 29-34' PID - 0.0 MSA - 0 - comb 20.3 - O_2 0 - H_2S 0 - CO
	32							
	33					33		
	34					34	Run 2	Run 5' Rec - 5'
	35	Massive limestone gray, no weathering, no bidding, hard nat. hydrocarbs. odor			BOX 2 33-37	35 35.5		Depth 34-39 End time : 11:15 PID - 0.0 MSA - 0 - comb 20.4 - O_2 0 - H_2S 0 - CO
	36							
	37					37.0		
	38					38		
	39	gray massive limestone w/fracture ~ 42'-43'	1		BOX 3 37-41		Run 3	Run 5' Rec. 5' Depth - 39-44
	40					40		

Project: PBOW

Hole Number: PB-BED mw27

HTRW DRILLING LOG (continuation sheet)

Hole Number: PB-BED-mw27

Project: PBOW

Geologist: S McLeod

Sheet 6 of 12 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
						40.5		End time - 11:30
	41							
						41.5		
	42							fracture
					BOX 4 41-44'			
	43					43.0		
	44	light-gray, massive limestone, hydrocarbon odor no bedding, no weathering				44	Run 4	Run - 5' Rec - 5' Depth - 44-49
	45					45		End time - 11:45
								stop - pump to check for water - none detected
	46				BOX 5 44-48'	46		
								PID - 0.0
	47					47		MSA - 0 - combl 0 H_2S 0 CO
	48					48		20.7 O_2
	49					49	Run 5	PID - 0.0 MSA - 0 - combl 20.6 O_2 0 CO 0 H_2S
	50					50		

Project: PBOW

Hole Number: PB-BED-mw27

HTRW DRILLING LOG (continuation sheet)

Hole Number: PB-BED-MW27

Project: PBOW

Geologist: S. McLeod

Sheet 7 of 12 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uthe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		same as above			BOX 6 48-51			Run 5' Rec. 5 End time 13:18 Depth - 49-54
	51					51.5		Start - 13:00 PID - 0.0
	52				BOX 7 51-54			
	53					53.5		
	54					54		mech
		gray, massive limestone no weath., no bedding hard					Run 6	Run - 5 Rec - 5 End: 13:30 Depth - 54-59
	55				BOX 8 54-57.5	55.5		mech
	56							PID - 0.0 MSA - 0 comb 20.8 O_2 0 - H_2S 0 CO
	57							
						57.5		
	58				BOX 9 57.5-59			
						58.5		mech
	59	gray massive limestone no weath, no bedding hard					Run 7	Run 5' Rec 5' Depth - 59-64 End time 13:45
	60							

Project: PBOW

Hole Number: PB-BED-MW27

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW27

Project: PBOW

Geologist: S Mojed

Sheet 8 of 12 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
					BOX 10 63-63	0015		PID - 0.0 MSA - 0 - comb. 20.8 - O_2 0 - H_2S 0 - CO
	61					61		1
	62					62		2
	63							3
	64				BOX 11 63-65		Run 8	4
		gray massive limestone w/ hydrocarbon odor hard						Run 5' Rec - 5' Depth - 64-69 End time - 14:00
	65							5
								PID - 0.0 MSA. 0 comb 20.8 O_2 0 - H_2S 0 - CO
	66				BOX 12 65-69	66		6
	67					67		7
								Stop and pump for water - the water came up very little ~0.4 30 to 75
	68							8
	69						Run 9	9
								Start - 16:30 End - 16:00 Run 6' Rec. 5.5
	70							10

Project: PBOW

Hole Number: PB-BED-MW27

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB BED-MW2

Project: PBOW

Geologist: S M Gurd

Sheet 9 of 12 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ USM	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		gray, massive, hard nat. hc. odor no bedding, no weathering				70.5		PID-0.0 MSA-0 Comb 0-H_2S 0-CO 20.8-O_2
	71				BOX 13 69-72.5			Depth- 69-75'
	72							
						72.5		
	73							
					BOX 14 72.5- 74.5			
	74							
						74.5		
	75	massive, gray, hard limestone, no weathering, no bedding					run 10	depth-75-80 end time-9:46 run-5' rec.-5'
					BOX 15 74.5- 78.5			
	76							
	77					77		
	78							
						78.5		
	79				BOX 16 78.5- 81.5			
	80					80		

Project: PBOW

Hole Number: PB BED-MW2

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW21

Project: PBOW

Geologist: S. McLeod

Sheet 10 of 12 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	81	gray, massive, hard limestone, no bed, no weath.				81.5	run 11	Depth - 80-85 run - 5' rec - 5' End time: 10:00 PID - 0.0 MSA 0 Combs 0 - H_2S 20.7 - O_2 0 - CO
	82					82		
					BOX 17 81.5-85.5	82.3		
	83					83.5		
	84							
	85					85	run 12	depth. 85-90 Run 5' Rec. 5' End time: 10:20
		Same as above w/ minor fracture breaks				85.5		
	86				BOX 18 85.5-89			
	87					87		Photo of all three runs left to right (Run 10-12)
	88				BOX 19 88-90	88.5		
	89					89.5		Drillers to put together pump (10:25)
	90							

Project: PBOW

Hole Number: PB-BED-MW21

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW 27

Project: PBOW

Geologist: E.M. Jewell

Sheet 11 of 12 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		gray, massive, limestone hard, no weath. no bedding			BOX20 90-92		Run 13	Depth: 90-95 Run - 5' Rec - 5' End time: 13:10 Start: 12:50 PID - 0.0 MSA - 0% LEL 0 - CO 20.4 - O_2 0 - H_2S
	91							1
						91.5		
	92							2
					BOX21 92-95	92.5		
	93							3
	94							4
						94.5		
	95							5
		Same as above w/ hydrocarbon visibility and odor.			BOX22 95-98		Run 14	Depth - 95-100 Run - 5' Rec: 5' End time: 13:25 1-3' section 1-2' section PID - 0.0 MSA - 0% LEL 0 - CO 20.3 - O_2 0 - H_2S
	96							6
	97							7
	98					98		8
					BOX23 98-100.5			
	99							9
	100					100		10

Project: PBOW

Hole Number: PB-BED-MW27

HTRW DRILLING LOG

(continuation sheet)

Hole Number: PB-BED-MW27

Project: PBOW

Geologist: S. McLeod

Sheet 12 of 12 Sheets

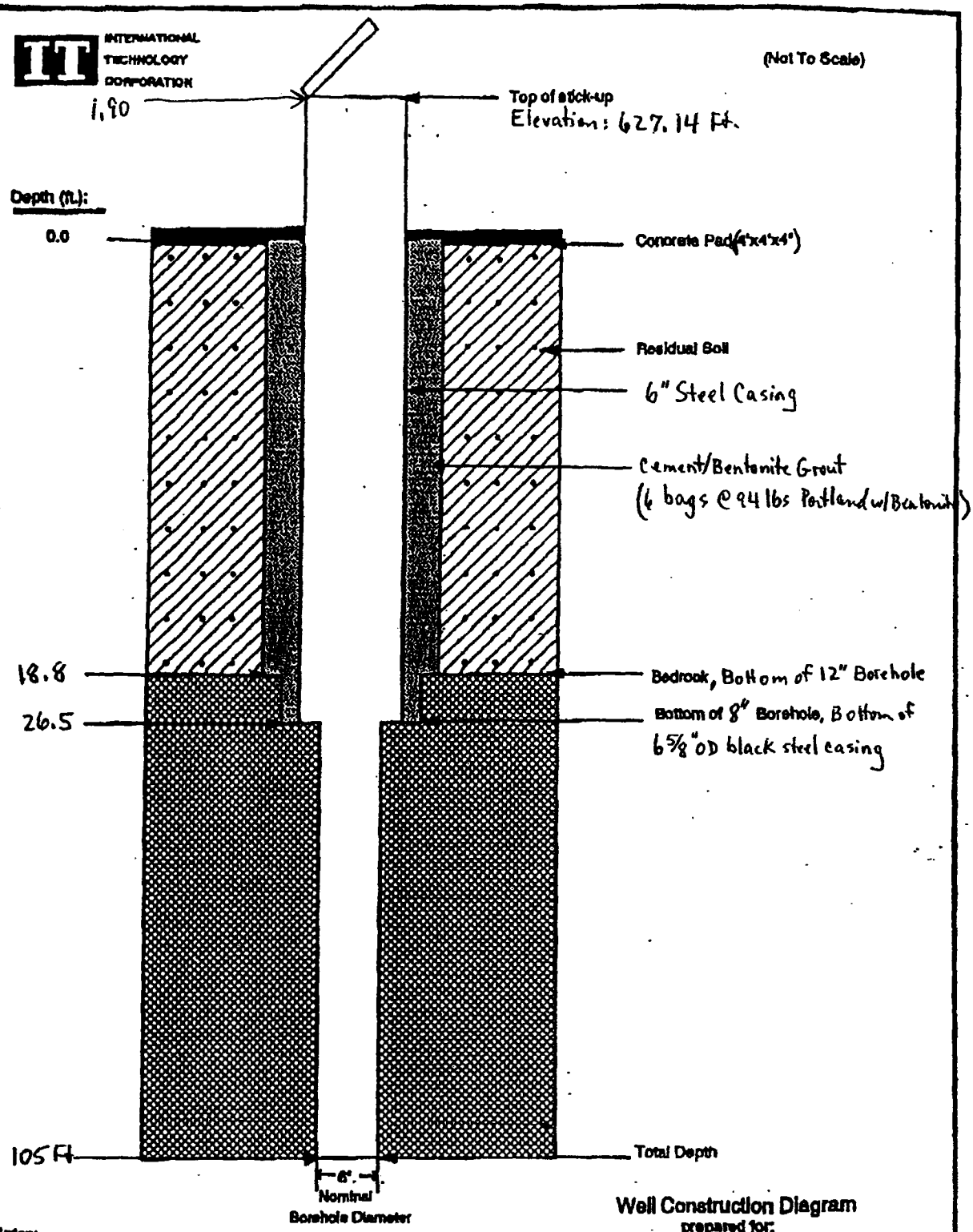
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		gray, mas. limestone w/no bedding, no weathering					Run 15	Depth-100-105 Run-5' Rec-5' End: 13:45
	101					101.5		PID-0.0
	102				BOX 24 101.5-105	102		MSA-0-LEL 0-CO 20.3-O_2 0-H_2S
	103							2' piece section 3' piece section
	104							
	105	Total Depth-105 Ft						
	106							
	107							
	108							
	109							
	110							

Project: PBOW

Hole Number: PB-BED-MW27

INTERNATIONAL TECHNOLOGY CORPORATION

(Not To Scale)



Well Construction Diagram
prepared for:

Plum Brook Ordnance Works
Sandusky, Ohio

Notes:

Well No.: PB-BED-MW27

Date Installed: 9/8/01

Elevation Top of Casing: 627.14 Ft
(outer edge of protective casing with lid open)

HTRW DRILLING LOG

DISTRICT	Nashville, TN
HOLE NUMBER	TNTA-BEDGW-001
SHEET / SHEET:	1 OF 10
1. COMPANY NAME	IT Corporation
2. DRILL SUBCONTRACTOR	Boart Longyear
3. PROJECT	PBOW
4. LOCATION	NASA Plum Brook Station, Sandusky, O
5. NAME OF DRILLER	Paul Dickinson / Tod Schmalfeldt
6. MANUFACTURER'S DESIGNATION OF DRILL	BK81 / Centera C2-250
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4¼" ID/8" OD HSA with 1.4" ID Stainless Steel split-spoons. Borehole reamed with 8¼" ID/12" OD HSA. Bedrock cut with 8" OD tricone rotary bit. Installed 6" ID/6⅝" OD black steel casing. Bedrock cored with PQ bit. Cores 3" OD, borehole 6" OD. Installed 2" PVC monitoring well.
8. HOLE LOCATION	See Sketch
9. SURFACE ELEVATION	636.99 Ft
10. DATE STARTED	9/24/01
11. DATE COMPLETED	9/13/01
12. OVERBURDEN THICKNESS	8.5 Ft
15. DEPTH GROUNDWATER ENCOUNTERED	Groundwater not encountered (overburden)
13. DEPTH DRILLED INTO ROCK	77.5 Ft
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	86 ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

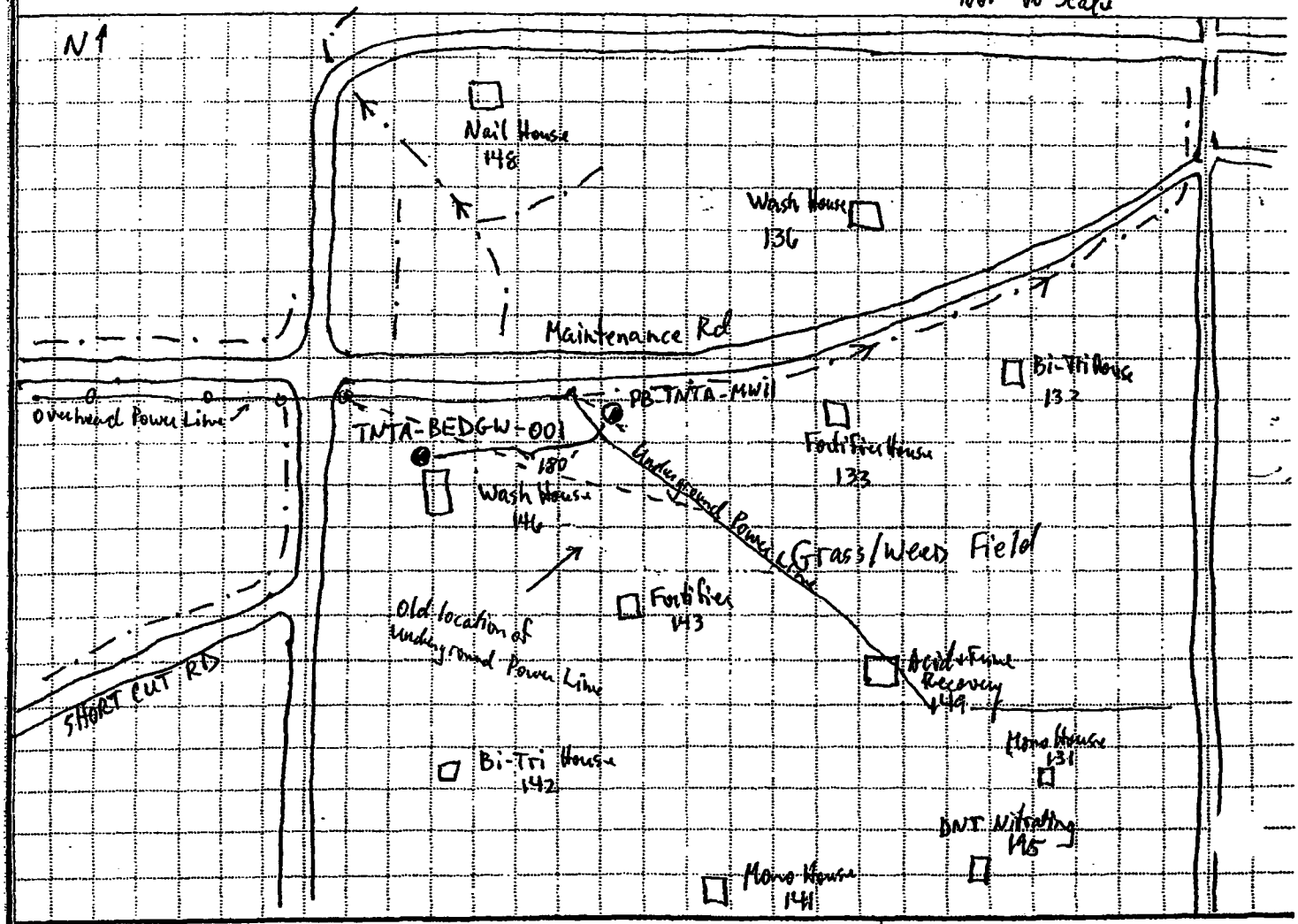
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	9

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	X	NA	David Kessler / [illegible]

LOCATION SKETCH/COMMENTS

SCALE: Not To Scale



PROJECT	PBOW	HOLE NO.	TNTA-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTA-BEDGW-001

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. / Blows	Recovery (ft)	Remarks
		Weeds						
		Loose, (10YR 3/2) very dark grayish brown SAND, trace silt, organics weeds (roots), dry 0.4	SP		NA	5/5	1.4	Began drilling 8/4/01 1429
	1	Fill: (Loose, (10YR 5/4) yellowish brown, homogeneous, very fine grain, SAND, very well sorted, organics (roots), dry) 1.0		0.0		5/5	2.0	
	2	Fill: (Loose, whitish gray, sandy GRAVEL, very fine grain, 30% sand, very fine grain to 20 mm gravel pebbles, dry)	gr			1630		Old Road bed, parking Area
	3	Fill: (Loose, (10YR 3/3) dark brown, mottled (brownish yellow, black), very fine grain, SAND, very well sorted 1", 2", 4" black ash layers, moist, ~~dry~~ 1/4" dark gray, clay layers (wavy) in black sand ~~3.5-4.0~~ ft 3.3-3.7	SP	0.0	NA	4/4 / 5/5	1.7 / 2.0	Background Breathing Air: PID = 0.0 ppm Black sand (ash) ~~sa~~ is carbon from burning
	4	4.4				1632		VRAE:
	5	Stiff, (10YR 4/1) dark gray, homogeneous, silty CLAY, low plasticity, blocky bedding, dry		0.0	NA	1/3 / 7/12	1.8 / 2.0	CO = 0 ppm LEL = 0% H_2S = 0 ppm O_2 = 21.3%
	6					1634		
	7	Consistency increasing w/ depth	Cl	0.0	NA	4/8 / 12/20	2.0 / 2.0	
	8	As above, shale bedding (laminations) visible at 8.5 ft.				1642		wet pockets w/in bedding
	9	As above, 8.5		0.0	NA	3/20 / 23/50 for 4"	1.7 / 1.7	Bedrock 8.5"
	10	SHALE, dark gray, soft, very thinly laminated, severely weathered, dry	NA			1647		Almost clay

Project: PBOW

Hole Number: TNTA-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TMTA-BEDGW-001

Project: PBOW

Geologist: D. Kessler

Sheet 3 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	10	SHALE, severely weathered, very soft, very thin laminations, dry	NA	0.0	NA	25/ 50 for 5"	0.9/ 0.9	10
	11	Spoon Refusal @ 10.9	NA	NA	NA	NA	NA	10.9 Began with 4¼" ID augers
		SHALE, gray, dry						
	12							
	13							
	14							
								Bottom of 12" OD Borehole at 15 Ft
	15							15
	16							
	17							
	18							
	19							
	20							

Project: PBOW

Hole Number: TMTA-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTA-BEDGW-001

Project: PBOW

Geologist:

Sheet 4 of 10 Sheet

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	20	SHALE, gray, dry	NA	0.0	NA	NA	NA	
	21							
	22							
	23							
	24							
	25	4¼" ID Auger Refusal @ 25 ft	NA		NA	NA	NA	Began drilling 9/5/01 0930 w/ 8" OD rotary bit
	26	SHALE, gray, soft						Breathing Air / Background: PID: 0.0 ppm VOAE: CO: 0 ppm LEL: 0% H2S: 0 ppm O2: 20.7%
	27			1.5				
	28							
	29							
	30							

Project: PBOW

Hole Number: TNTA-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTA-BEDGW-001

Project: PBOW

Geologist: D. Kessler

Sheet 5 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	30	SHALE, gray, soft	NA		NA	NA	NA	Background/ Breathing Air: PID: 0.0 ppm VRAE: CO = 0 ppm LEL = 1% H_2S = 0 ppm O_2 = 20.8%
	31			0.6				
	32							
	33							
	34							
	35							Using water to circulate cuttings from borehole. No water loss.
	36							
	37							Strange, sweet organic odor 1.6 ppm
	38							Clay Slug attempt to wash out. (2-3 Ft length)
	39							
	40							

Project: PBOW

Hole Number: TNTA-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTA-BEDGW-001

Project: PBOW

Geologist: D. Kessler

Sheet 6 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/USDA	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	40	SHALE, gray, soft	NA		NA	NA	NA	Large 2 ft slug of silty CLAY with pebbles surges to top of ~~well~~ borehole. pebbles subrounded gray, brown
	41							
	42							
	43							Drill Rod begins chatter at 43.5'
	44							Chattering stops at 44 ft
	45							
	46							SHALE ?
	47	SHALE, gray, soft						still no coreable bedrock.
	48							No rock cuttings, only silty clay nodules gathered from water.
	49							
	50							

Project: PBOW

Hole Number: TNTA-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTA-BEDGW-001

Project: PBOW

Geologist: D. Kessler

Sheet 7 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ USM	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	50	SHALE, gray, soft		NM	NA	NA	NA	
	51	shaley LIMESTONE, average hardness, dark gray, moderately weathered, pyrite, fossils						Described from cuttings
	52							
	53							
	54							Bottom of 8" Borehole, Bottom of 6" steel casing 55 ft
	55					FRACS		9/13/01 coring
						55.8		Run 55-60 Run 5' 60' Recov 4' Start 10 AM End 10 40
	56					56.6		
	57	v. hard, massive, gry, limestone		NM	Box 1 55-58	Run 1 ~~57.8~~ 58 ~~58.6~~		~~55-60~~
	58							
	59							
	60					60		

Project: PBOW

Hole Number: TNTA-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTA-BEDGW001

Project: PBOW

Geologist: RPodor.

Sheet 8 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	60	LIMESTONE, gray, very hard, massive bedding			60.3	Run 2 Fracs		Run 60-65
					60.7			
					61			
	61				61.3			
					61.4			
					62			
	62	as above				Run 2		Run 60-65 Run 5' Recov 5'
				NM	62.9	Box 2 ~~60~~ DKK		PID 0.0 1.00
	63				63.5	58-62		
	64				64			
	65	as above				Run 3		Run 65-70 Run 5' Recov 5'
						Box 3 ~~63-65~~ DKK 65		
	66			NM	66	Box 4 ~~65-69~~ DKK		Box 3 62-65
	67					67.5		Box 4 65-69
	68					68.3		
	69							
	70							

Project: PBOW

Hole Number: TNTA-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTA BED GW 001

Project: PBOW

Geologist: R Podesta

Sheet 9 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	70	as above			Run 4			Run 70-75 Start 1145 Run 5' Recov 5'
	71	LIMESTONE, gray, very hard, massive bedding			Box 5 69-72			PID 0.0
					71.4			
	72				71.9			
	73			NM	~~72.8~~ ~~72.9~~			
	74				73.8 73.9 ~~74~~			
	75							
					Run 5			Run 75-80 Start 1200 Run 5' Recov 5'
	76			NM	Box 6 ~~73-76~~ Box 7 76-79.5	76.2 76.8		Box 6 72-76'
	77					77.5		
	78					78.2		
	79					79		
	80							

Project: PBOW

Hole Number: TNTA BED GW 001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTABED CW001

Project: PBOW

Contractor: R Parker's

Sheet 10 of 10 Sheets

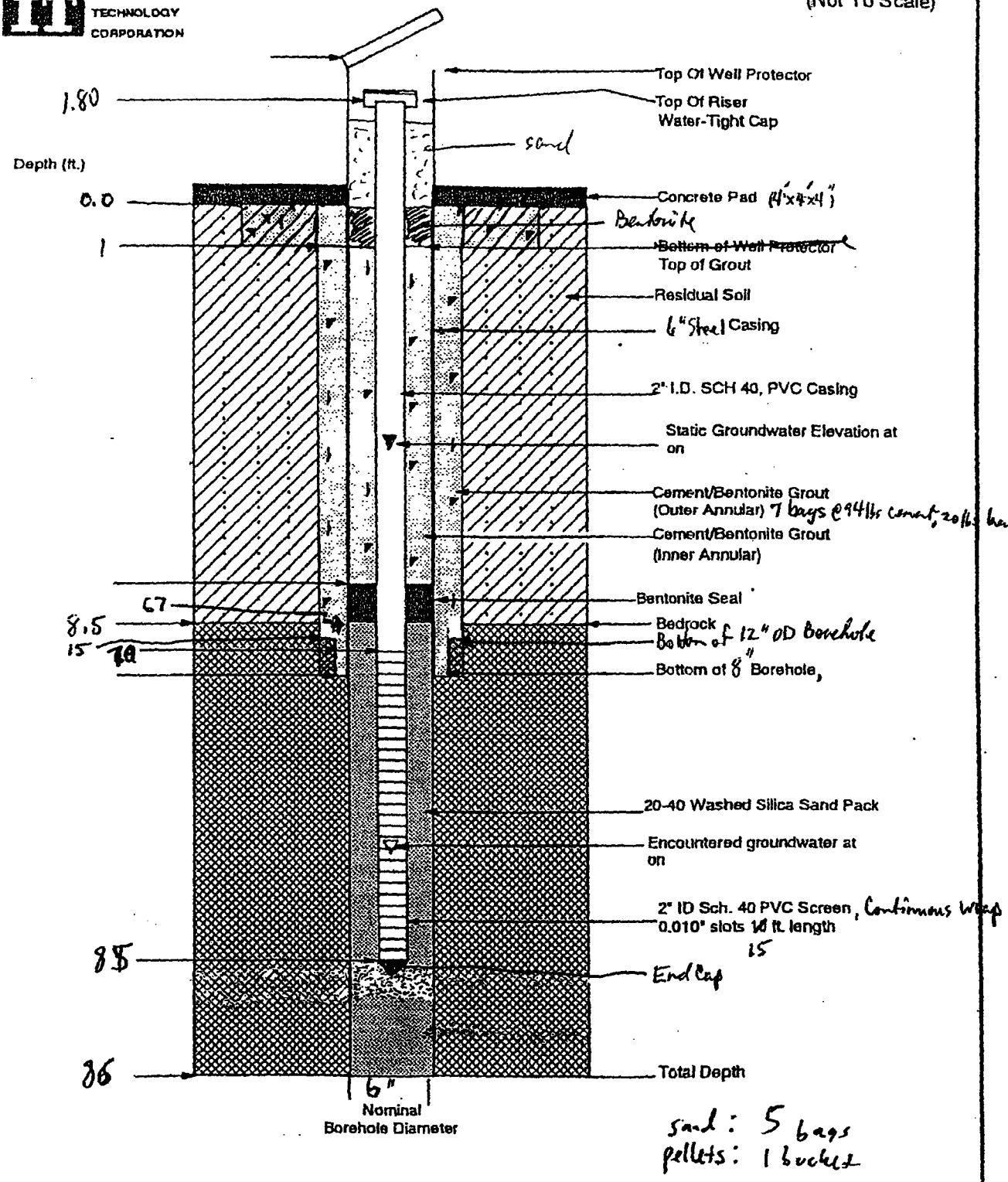
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uses	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	70				Run 6	FRACS		Run 8-85
								Run 5'
								Recov 5'
	71	as above		80.8	80.8			
				81.5	79.5			Box 7
		LIMESTONE, gray, very hard, massive bedding						79.5-83
	72			NM	82.7			
	73				83.1			
					83.6			
	74				84.1			Box 9
								83-85
	75							85
								set at 85
								15' sump
	76							~~70-79~~ 85-70'
		Total Depth = 86 ft						
	77							
	78							
	79							
	80							

Project: PBOW

Hole Number: TNTA-BED-W001

INTERNATIONAL TECHNOLOGY CORPORATION

(Not To Scale)



sand: 5 bags
pellets: 1 bucket

Notes:

Well No.: TNTA-BEDGW-001
Date Installed: 9/13/01
Elevation Top of Casing: 638.79 ft

Well Construction Diagram
prepared for:
Plum Brook Ordnance Works
Sandusky, OHIO

BWMWA23DWC.DRW/W

HTRW DRILLING LOG

DISTRICT: Nashville, TN	HOLE NUMBER: TNTB-BEDGW-00	SHEET 1 OF 6

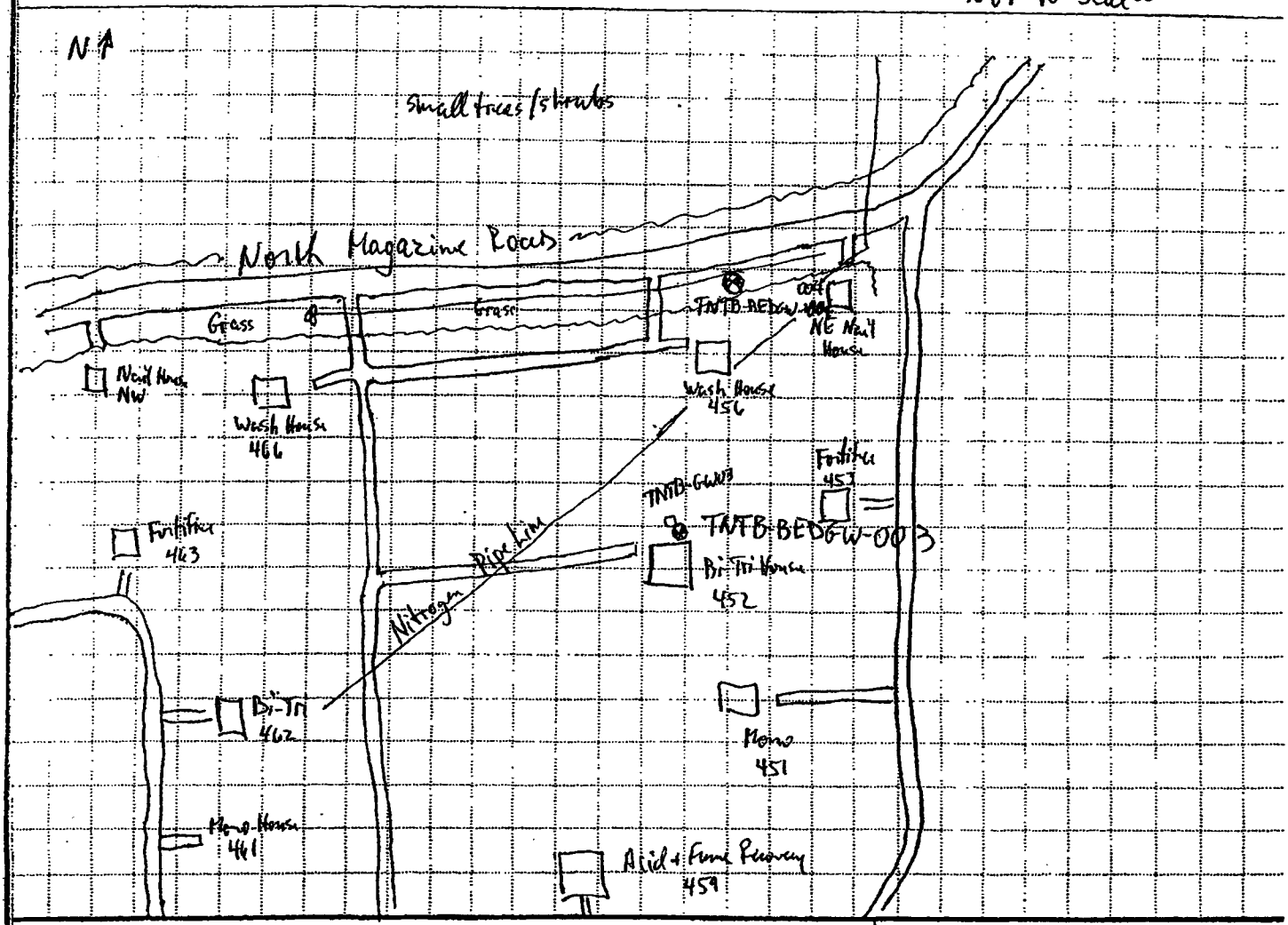
1. COMPANY NAME: IT Corporation
2. DRILL SUBCONTRACTOR: Boart Longyear
3. PROJECT: PBOW
4. LOCATION: NASA Plum Brook Station, Sandusky, OH
5. NAME OF DRILLER: Paul Dickinson
6. MANUFACTURER'S DESIGNATION OF DRILL: BK81
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID/8" OD HSA with 1.4" ID Stain-less Steel split-spoons. Borehole reamed with 8¼" ID/12" OD HSA. Bedrock cut with 8" OD tricone rotary bit. Installed 6" ID/6⅝" OD black steel casing. Bedrock cored with PQ bit. Cores 3" OD, borehole [illegible] OD. Installed 2" PVC monitoring well.
8. HOLE LOCATION: See Sketch
9. SURFACE ELEVATION: 681.34 Ft
10. DATE STARTED: 8/30/01
11. DATE COMPLETED: 9/8/01
12. OVERBURDEN THICKNESS: ~~14.8 Ft~~ 4.3 Ft
13. DEPTH DRILLED INTO ROCK: 28.5 Ft
14. TOTAL DEPTH OF HOLE: 43.3 Ft
15. DEPTH GROUNDWATER ENCOUNTERED: 11.3 Ft (overburden). Bedrock gw suspected at 40.9 Ft
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	5

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	X	NA	David Kessler

LOCATION SKETCH/COMMENTS — SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	TNTB-BEDGW-003

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTB-BEDGW-003

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 6 Sh

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Weeds						
		Fill: Black, silty SAND, dry 0.1						Began drilling 8/30/01 1135 with 4¼" ID HSA
		Fill: (Loose, 10YR/4/6) dark yellowish brown, homogeneous, SAND, very fine grain, very well sorted, dry)			NA	2/2	1.5	
	1		SP	0.0		3/3	2.0	Background/Breathing PID=0.0ppm CO=0ppm LEL=1% H_2S=0 ppm O_2=21.0%
						1140		
	2				NA	2/2	1.0	
		As above						
	3		SP	0.0		1/2	2.0	
						1142		
	4	4.3						
		Loose, (10YR 2/2) very dark brown, mottled (50% - black, yellow, rust), very fine grain, shaley SAND, little silt (20%), 30% shale, broken, thinly laminated, severely weathered, dry			NA	stat 2/3 DCM 3/4 6/6 7/5	0.5	Began very weathered decomposed shale
	5		SM	0.0			2.0	
						1144		
	6				NA	5/9 DCM 14/17	1.4	
	7	As above		0.0			2.0	
			SM			6/6 7/5		
						1152		
	8				NA	stat 5/9 14/17 9/17 7/17	2.0	
		As above Moist at 9 ft	SM	0.0			2.0	
	9							
	10					1155		

Project: PBOW

Hole Number: TNTB-BEDGW-003

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTB-BEDGW-003

Project: PBOW

Geologist: D. Kessler

Sheet 3 of 6 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. / Blows	Recovery (ft)	Remarks
	10	Medium dense, (10YR 2/2) very dark brown, mottled (black, yellow, rust), 50% mottled, very fine grain, shaley SAND, 40% shale, trace sand 10%, moist 11	Sm	0.0	NA	9/4/ 7/7	1.5/ 2.0	
	11	Medium dense, (10YR 3/1) very dark gray, very fine grain, SAND, trace silt (<5%) shale 40%, black shale, broken, wet				1158		▽ Encountered overburden groundwater at 11.3 Ft
	12		SP	NM	NA	5/12/ 13/17	1.8/ 2.0	
	13	As above, silt content increases with depth. 14				1200		
	14	~~As above,~~ As above, silt 20%, shale 30%, SAND 50%, wet 14.8	Sm	NM	NA	9/12/ 26/40	1.6/ 2.0	
	15	SHALE, black, broken, thinly laminated. (5Y 5/6) olive, 1% pocket of silt, friable, wet	NA			1204		Bedrock Bottom of 12" borehole at 15 Ft
	16			NM	NA	50 for 5" 1234	0.4/ 0.4	
		Spoon Refusal @ 16.4 Ft	NA	NA	NA	NA	NA	
	17	SHALE						
	18	4¼" ID Auger Refusal @ 18 Ft	NA	NA	NA	NA	NA	
		SHALE						Fractured (Dry) at 18.5'
	19							
	20							

Project: PBOW

Hole Number: TNTB-BEDGW-003

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTB-BEDGW-003

Project: PBOW

Geologist: D. Kessler

Sheet 4 of 6 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	20	SHALE, black/dark brown, moderately weathered, moderately hard chips, 10% stained, thinly laminated	NA	NM	NA	NA	NA	
	21							
	22							Bottom of 8" OD Borehole Bottom of 6" Steel Casing @ 23 Ft
	23					Fracs		C-1 (23-28') End: 1619 Start: 1548
	24				~~Box #1~~ KK			
	25			NM				5 Ft Run 0 Ft Recovery
	26							Borehole open to 28 Ft. Cuttings washed away. Coreborrel lined w/ very dark brown, SILT
	27							No water lost
	28	SHALE, black/very dark brown, moderately hard, thinly bedded, slightly broken, moderately weathered, pyrite in lamination 28.2'; pyrite vugs 7mm to 25mm		0.0	Box #1	28.5 28.6 28.65 28.8 28.4 29.45		C-2 (28-33') End: 1700 Start 1645
	29							5 Ft Run 4 Ft Recovery
	30							

Project: PBOW

Hole Number: TNTB-BEDGW-003

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTB-BEDGW-003

Project: PBOW | Geologist: D. Kessler | Sheet 5 of 6 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/USDA	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. FTRC5	Recovery (ft)	Remarks
	30	SHALE, black/very dark brown, moderately hard, thinly bedded, slightly broken, moderately weathered, pyrite in vugs		NM	Box # 1 photo 27	30 30.7 30.8		(C-2 cont'd) 5 Ft Run 4 Ft Recovery 1 Ft Loss Obtained portion of lost broken bar
	33	SHALE, As above 33-33.9 Ft, Intensely fractured			Box # 2	33 Instrusse 33.9 34.1 vertical also 34.8		C-3 (33-38') End: 1815 Start: 1759 5 Ft Run 5 Ft Recovery 0 Loss
	35.1	LIMESTONE, gray, hard, massive, slightly weathered, fossils (brachs, corals), 5% vugs (quartz filled), unbroken			photo 26 35.9	35		
	37	37-38 Ft; pitted, highly weathered			Box # 3 photo 25 38	36 37.5		
	38	As above, intensely pitted 38-38.5',			Box # 4 photo 24	38.2 38.6		Began Coring 9/8/01 0857 C-4 (38-43) End: 0911 Start: 0857
	39	39-39.4'; wavy, continuous, shale laminations				39 39.4		
	40							

Project: PBOW | Hole Number: TNTB-BEDGW-003

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTB-BEDGW-003

Project: PBOW

Geologist: D. Kessler

Sheet 6 of 6 Sheets

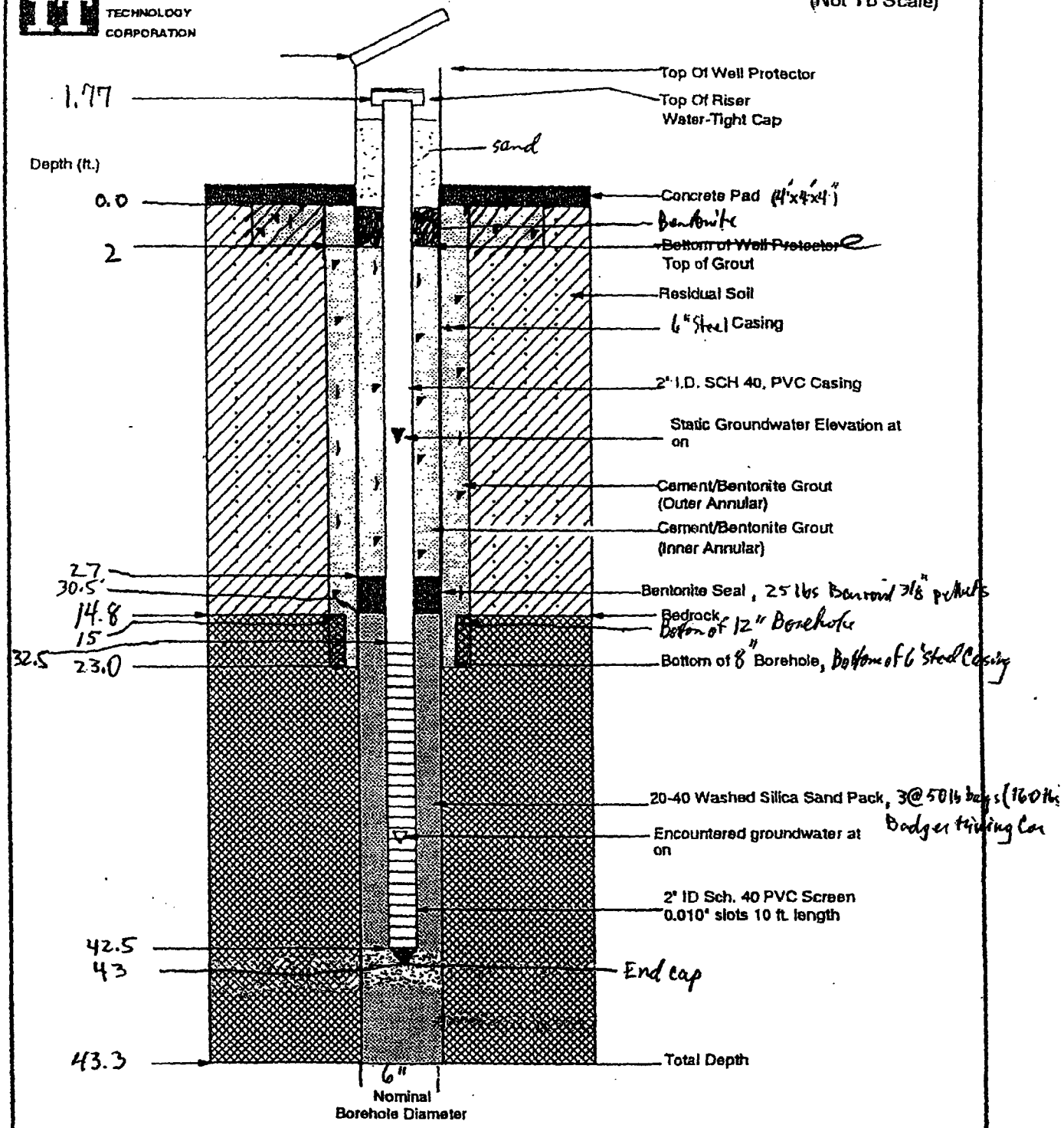
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. FTRCS	Recovery (ft)	Remarks
	40	LIMESTONE		40.1		40.1		C-4 (cont'd) (38-43.3)
		40.9		NM	Box # 4	41.0, 41.3 Intense		5.3 Ft Run
	41	SHALE, gray, highly weathered/decomposed thinly laminated, very soft.				41.6		5.3 Ft Recovery
					41.8			0 Loss
	42	42.5 pyrite vugs (8) 40.9-42.7 highly weathered/decomposed			Box # 5	41.9, 42 Intense		pumped borehole
		Moderately hard ~~clay~~ SHALE 42.6-42.9			Photo 23	42.4, 42.9 Intense		
	43				43.3	43.3		
		Total Depth = 43.3 Ft						
	44							
	45							
	46							
	47							
	48							
	49							
	50							

Project: PBOW

Hole Number: TNTB-BEDGW-003

INTERNATIONAL TECHNOLOGY CORPORATION

(Not To Scale)



Notes:

Well No.: TNTB-BEDGW-003
Date Installed: 9/8/01
Elevation Top of Casing: 683.11 ft

Well Construction Diagram
prepared for:
Plum Brook Ordnance Works
Sandusky, OHIO

BWMWA23DWC.DRW/8/5-28-83

HTRW DRILLING LOG

DISTRICT	Nashville, TN
HOLE NUMBER	TNTB-BEDGW-004
SHEET / SHEETS	1 OF 4
1. COMPANY NAME	IT Corporation
2. DRILL SUBCONTRACTOR	Boart Longyear
3. PROJECT	PBOW
4. LOCATION	NASA Plum Brook Station, Sandusky, O
5. NAME OF DRILLER	Paul Dickinson
6. MANUFACTURER'S DESIGNATION OF DRILL	BK81
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 1/4" ID/8" OD HSA with 1.4" ID Stain-less Steel split-spoons. Borehole reamed with 8 1/4" ID/12" OD HSA. Bedrock cut with 8" OD tricone rotary bit. Installed 6" ID/6 5/8" OD black steel casing. Bedrock cored with PQ bit. Cores 3" OD, borehole 4" OD. Installed 2" PVC monitoring well.
8. HOLE LOCATION	See Sketch
9. SURFACE ELEVATION	666.78 Ft
10. DATE STARTED	8/28/01
11. DATE COMPLETED	9/7/01
12. OVERBURDEN THICKNESS	4.9 Ft
15. DEPTH GROUNDWATER ENCOUNTERED	Overburden groundwater not encountered/Bedrock unknown
13. DEPTH DRILLED INTO ROCK	21.2 Ft
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	4.8 Ft BGS 9/7/01 0855
14. TOTAL DEPTH OF HOLE	26.1 Ft
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	9.69 btw

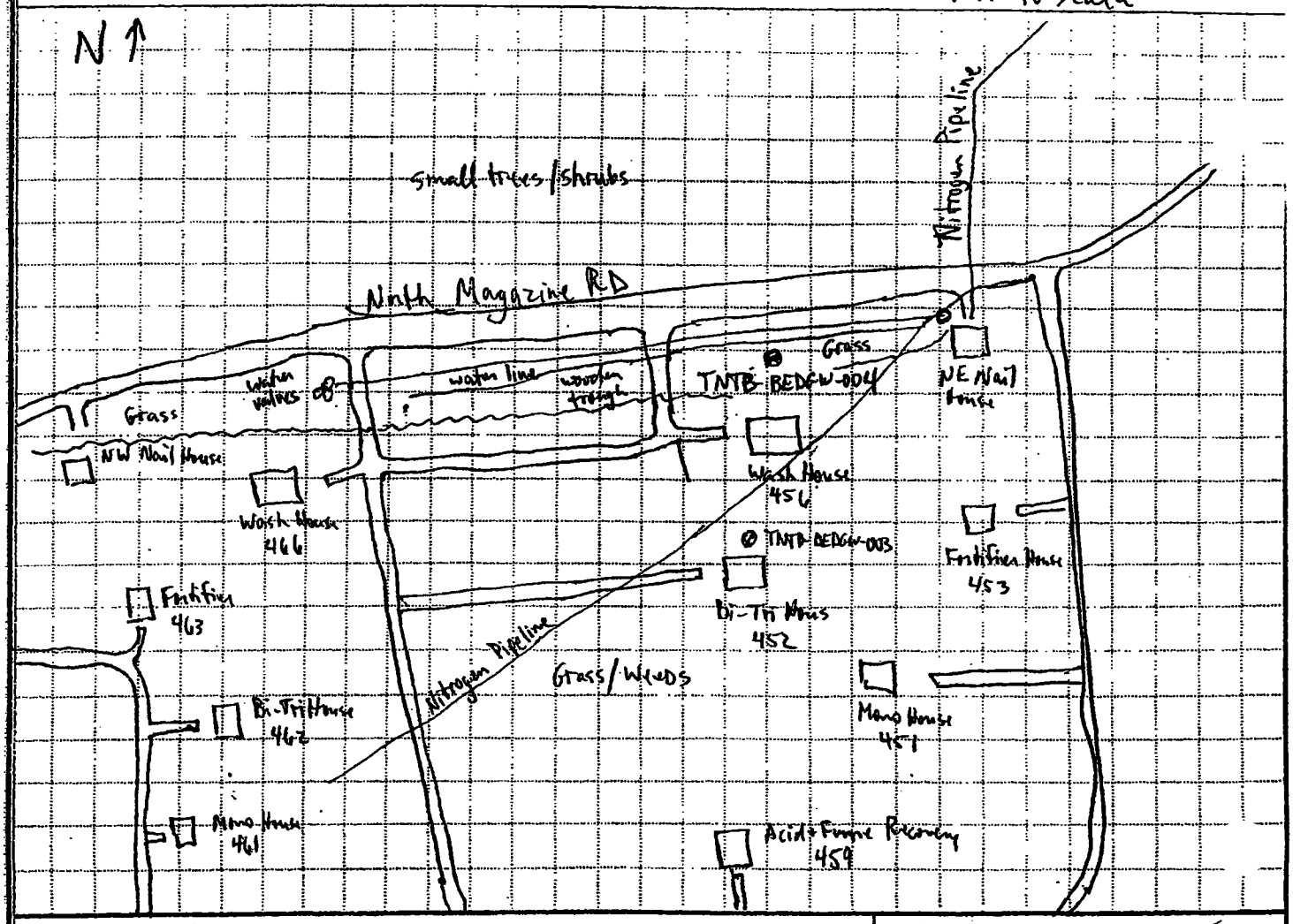
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	4

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	X	NA	David Kessler

LOCATION SKETCH/COMMENTS

SCALE: Not To Scale



PROJECT PBOW

HOLE NO. TNTB-BEDGW-004

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTB-BEDGW-004

Project: PBOW | Geologist: D. Kessler | Sheet 2 of 4 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Uhc	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. Blows	Recovery (ft)	Remarks
		Grass						
		Fill: Stiff. (10YR 2/1) black, mottled (3%- brown), clayey SILT, some sand (20%), organics (roots) trace pebbles, dry 0.4	ml	0.0	NA	3/4/ 5/7 1746	1.4/ 2.0	Began drilling 8/29/01 1245 w/ 4¼" ID augers
1		Fill: (Stiff, (10YR 5/2) grayish brown, mottled (yellowish brown)-50%), clay SILT, some sand (20%), vfg, very well sorted, low plasticity, dry)						
2		As above	ml	0.0	NA	4/4/ 5/7 1752	1.8/ 2.0	thinly laminated, very weathered decomposed, former Shale
3								
4				0.0	NA	8/27/ 50 for 2" 1757	1.2/ 1.2	Began drilling 8/30/01 0745 Advanced 12" Borehole to 4.9 Ft
5	4.9	SHALE, dark gray, broken, thinly lam. dry 5.2'						
		Spoon Refusal @ 5.2 Ft						Continued drilling with augers.
6		SHALE						
		4¼" ID Auger Refusal @ 6.3 Ft		0.0	NA	100 for 7" 1800	0.7/ 0.7	Attempted spoon
		SHALE, dark gray, broken, thin lam, dry						
7		Spoon Refusal @ 6.2 Ft						Breathing Air/ Background PID = 0.0ppm VRAE = CO = 0 ppm LEL = 0% H_2S = 0 ppm O_2 = 20.9%
8		SHALE, very dark brown/black, slightly weathered, average hardness						
9								Organic odor in borehole PID = 30.8ppm
10								

Project: PBOW | Hole Number: TNTB-BEDGW-004

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTB-BEDGW-004

Project: PBOW

Geologist: D. Kessler

Sheet 3 of 4 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/USDA	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		SHALE, very dark brown/black, slight weathering, average hardness	NA	NM	NA	NA	NA	Bottom of 8"OD Borehole. Bottom of 6" steel Casing
	11					~~Fracs~~		Cut w/ 6" roller bit during clean-out.
	12	SHALE, very dark brown, moderately hard, thin lamination, moderate weathering, pyrite in pits/laminations (2%), highly fractured				Fracs 11.8 12.1		Began coring w/ PQ bit 9/6/97 1705
	13				Pyrite	12.1 12.4 12.9 13.1 (1") 13.2		C-1 11.5-16.5' End Time: 1712 Start Time: 1705
	14			0.0	Box #1	13.7 13.9 (1/4")		5 Ft Run 4.5 Ft Recovery 0.5 Ft Loss
	15	Large vug filled w/ pyrite 14.4-14.5 Ft				14.3		
					15.3	15.3		Breathing Air PID: 0.0 ppm CO: 0 ppm LEL: 0% H_2S: 0 ppm O_2: 21.7%
	16				Box #2	15.7 vertical 16.3		
		16.8			16.5			
	17	LIMESTONE, greenish gray, hard, massive, slightly weathered, fossils (brachs/corals) in pits/rugs (10%), moderately fractured			Box #2	16.7 (mech) 16.7 17.1 (mech) 17.5 (mech)		C-2 16.5-21.5 Ft End: 1749 Start: 1740
	18					17.7 (mech) Frac 18		5 Ft Run 5.3 Ft Recovery 0.3 Ft Gain
	19				Box #3	19.2 (mech) 19.6 Frac		
	20							

Project: PBOW

Hole Number: TNTB-BEDGW-004

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTB-BEDGW-004

Project: PBOW

Geologist: D. Kessler

Sheet 4 of 4 Sheets

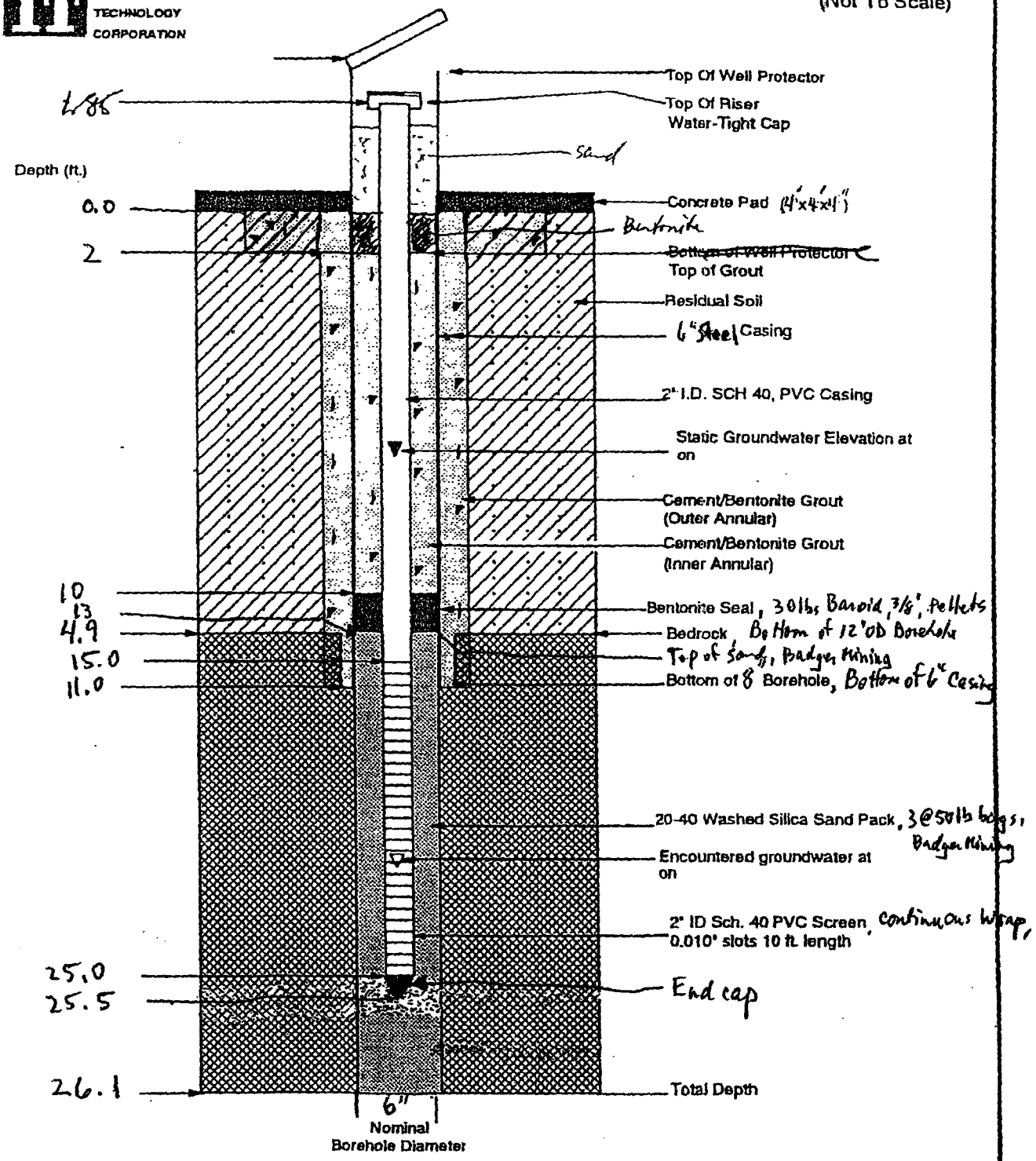
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No: Fracs	Recovery (ft)	Remarks
	20	LIMESTONE, greenish gray, hard, massive, slightly weathered, fossils (brachs, corals) in pits/vugs (10%)				20.2		(C-2 cont)
	21				Box #3	20.8 filled w/shale 21.3 (Mech)		
				0.5				
	22					21.7		C-3 21.5-26.1 Ft
					~~22.7~~	22.7		End 1817 start 1808
	23	23.2			~~23.2~~	23.2		
		SHALE, gray, soft, very thinly laminated, highly weathered				23.6 23.6 Frac 24 (mech)		4.6' Run 4.6' Recovery 0 Loss
	24				Box # 4			
	25					25.1 25.4		
		25.7				25.7		
		LIMESTONE, gray, hard 26				26.0		
	26	SHALE						
		Total Depth = 26.1 Ft						
	27							
	28							
	29							
	30							

Project: PBOW

Hole Number: TNTB-BEDGW-004

INTERNATIONAL TECHNOLOGY CORPORATION

(Not To Scale)



Notes:

Well No.: TNTB-BEDGW-004
Date Installed: 9/7/01
Elevation Top of Casing: 668.63 ft

Well Construction Diagram
prepared for:
Plum Brook Ordnance Works
Sandusky, OHIO

BWMWA23DWC.DRW/jjs

26.1
13
13.1

HTRW DRILLING LOG

DISTRICT: Nashville, TN	HOLE NUMBER: TNTC-BEDGW-00	
1. COMPANY NAME: IT Corporation	2. DRILL SUBCONTRACTOR: Boart Longyear	SHEET 1 OF 10
3. PROJECT: PBOW	4. LOCATION: NASA Plum Brook Station, Sandusky, OH	
5. NAME OF DRILLER: Paul Dickinson / Rudd Schmalzle	6. MANUFACTURER'S DESIGNATION OF DRILL: BK81 for overburden Centera C2-250 for coring	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID/8" OD HSA with 1.4" ID Stain-less Steel split-spoons. Borehole reamed with 8¼" ID/12" OD HSA. Bedrock cut with 8" OD tricone rotary bit. Installed 6" ID/6⅝" OD black steel casing. Bedrock cored with PQ bit. Cores 3" OD, borehole 6" OD. Installed 2" PVC monitoring well.	8. HOLE LOCATION: See Sketch	
	9. SURFACE ELEVATION: 664.04 Ft	
	10. DATE STARTED: 8/28/01	11. DATE COMPLETED: 9/12/01
12. OVERBURDEN THICKNESS: 14.5 Ft	15. DEPTH GROUNDWATER ENCOUNTERED: 8.8 Ft (overburden)	
13. DEPTH DRILLED INTO ROCK: ~~86 Ft~~ 71.5 Ft	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: NA	
14. TOTAL DEPTH OF HOLE: 86 ft.	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): NA	

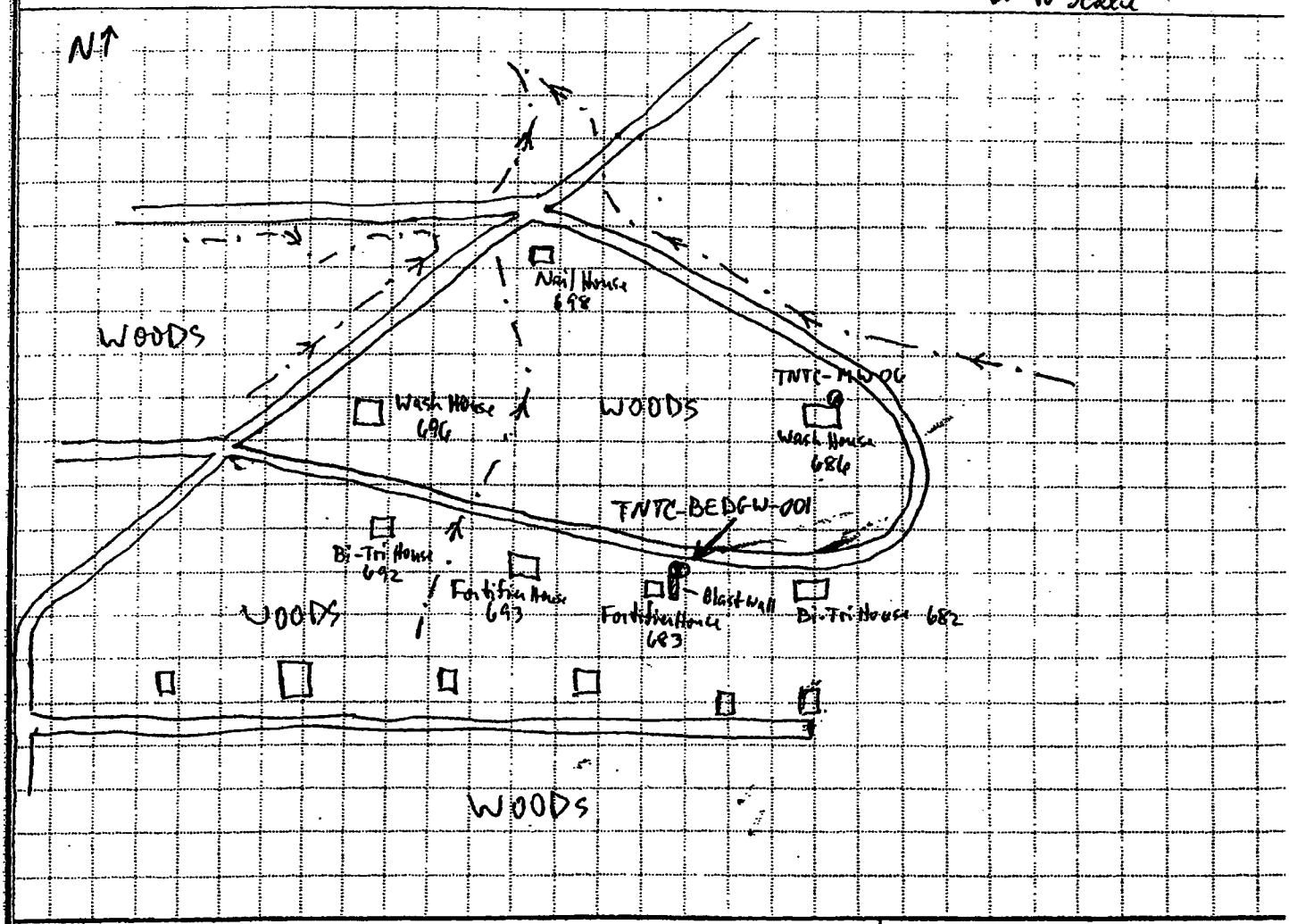
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	NA	NA	9

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NA	NA	NA	NA	NA	100 %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	X	NA	David Kesch / Reed Roberts

LOCATION SKETCH/COMMENTS

SCALE: Not to Scale



PROJECT	HOLE NO.
PBOW	TNTC-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTC-BED6W-001

Project: PBOW

Geologist: D. Kessler

Sheet 2 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
		Weeds						
	1	Fill: Loose, (10YR 4/3) brown, homogeneous, SAND, trace silt, organics (roots), vfg, very well sorted, dry 0.5	SP	0.0	NA	2/2 5/4	1.4 2.0	Began drilling 8/28/01 1640 with 4¼" ID augers
	2	Fill: (color grading to yellowish brown (10YR 5/6)) No SILT				1640		Background/ Breathing Air: PID = 0.0 ppm
	3	As above	SP	0.0	NA	2/4 5/5	1.6 2.0	VRAE: CO = 0 ppm LEL = 0% H_2S = 0 ppm O_2 = 21.1 %
	4					1644		
	5	As above Fill: (color grading to (10YR 5/8) yellowish brown)	SP	0.0	NA	3/5 5/5	2.0 2.0	
	6							
	7	At 7.6 Ft; color changing to (10YR 4/3) brown, moist	SP	0.0	NA	4/3 5/5	2.0 2.0	
	8							
	9	At 9.5-10 Ft; color changing to (5Y 4/2) olive gray, dark red/ blackish red nodules at 9.6 Ft; trace silt begins	SP	0.0	NA	5/4 5/5	2.0 2.0	▽ Encountered overburden groundwater at 8.8 Ft PID = 0.0 ppm at nodules
	10							

Project: PBOW

Hole Number: TNTC-BED6W-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTC-BEDGW-001

Project: PBOW

Geologist: D. Kessler

Sheet 3 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Line	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. / Blows	Recovery (ft)	Remarks
	10	Medium dense, (5Y 4/2) olive gray, homogeneous, SAND, trace silt, very fine grain, very well sorted, wet, 11.3	sp	NM	NA	5/8/ 17/29	2.0/ 2.0	
	11	Medium dense, (2.5Y 4/1) dark gray homogeneous, very fine grain SAND and GRAVEL, coarse grain to 30 mm size, limestone, wet 13	gm	NM	NA	1658 8/17/ 9/32	2.0/ 2.0	
	12	Very stiff, (10YR 5/1) gray, homogeneous, low plasticity, silty CLAY, coarse grain shale fragments (35%), wet 14.5	cl	NM	NA	1700 10/11/ 12/30	1.5/ 2.0	Bedrock ?: Decomposed severely weathered SHALE
	13	Very stiff, (10YR 5/N) gray, homogeneous, high plasticity, silty CLAY, irregular bedding, dry	ch	NM	NA	1707 8/12/ 29/32	2.0/ 2.0	
	14	As above		NM	NA	1713 17/29/ 33/42	1.5/ 2.0	
	15	As above				1722		
	16							
	17							
	18							
	19							
	20							

Project: PBOW

Hole Number: TNTC-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTC-BEDGW-001

Project: PBOW

Geologist: D. Kessler

Sheet 4 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. / Blows	Recovery (ft)	Remarks
	21	Very hard, (1GLEY 5/N) gray, homogeneous high plasticity, silty CLAY, occasional laminated bedding planes, dry, 20% shale fragments	ch	NM	NA	10/16/50 for 3" 1729	1.3/1.3	Decomposed shale. Very hard clay in shoe tip.
	22	Spoon Refusal @ 21.3 Ft		NM	NA	NA	NA	Began advancing only 4¼" ID augers.
	23		ch					
	24							
	25	Very hard, (1GLEY 5/N), gray, homogeneous, high plasticity, silty CLAY, ~~wet~~ dry		NM	NA	16/50 for 3" 1745	0.9/0.9	Augers turning/advancing fairly easily attempted spoon. End of Day
	25.8	Spoon Refusal @ 25.8 Ft		NM	NA	NA	NA	Began drilling 8/29/01 0930 with 4¼" ID augers. 8¼" ID / 12" OD augers drilled to 25 Ft
	27	Very hard, (1GLEY 5/N) gray, homogeneous, high plasticity, silty CLAY, dry	ch					Decomposed shale
	28							
	29							
	30							

Project: PBOW

Hole Number: TNTC-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTC-BEDGW-001

Project: PBOW

Geologist: D. Kessler

Sheet 5 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/URS	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	30	Very hard, (10YR 5/N) gray, homogeneous, high plasticity, silty CLAY, thinnly laminated bedding, dry	ch	NM	NA	100 for Ø 4"	0.8/ 0.4	30.4
	31							Augers advancing easily.
	32							Decomposed, (severely weathered) shale
	33							
	34							
	35	As above	ch	NM	NA	50 for 3"	0.3/ 0.3	35 / 35.3
	36							
	37							
	38							
	39							Sweet, organic odor 0.8 ppm = PID
	40							

Project: PBOW

Hole Number: TNTC-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTC-BEDGW-001

Project: PBOW

Geologist: D. Kresslin

Sheet 6 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Uhs	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. Blows	Recovery (ft)	Remarks
	40	Very hard, (10YR5/N) gray, homogeneous, high plasticity, silty CLAY, very thinly laminated bedding, dry, friable, 80% shale relict	ch	0.8	NA	100 for 6"	0.5/ 0.5	40.5
	41							Could not core material with wet or dry coring method
	42							
	43							
	44							Augers cut easily
	45	As above	ch	2.2	NA	100 for 4" 0831	0.3/ 0.3	String organic odor 45.3
	46							
	47							
	48							
	49							
	50							

Project: PBOW

Hole Number: TNTC-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTC-BEDGW-001

Project: PBOW

Geologist: D. Kessler

Sheet 7 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	50	Very hard, light gray, homogeneous, very thinly laminated bedding, SHALE, very friable, dry limestone pebble (20x20x30 mm)	NA	1.8	NA	100 for 7" 0847	0.7/ 0.7	50.6
	51							Augers difficulty cutting 51-51.5 ft
	52							
	53							
	54							
	55	As above, limestone pebble (18x20x28 mm)		NM	NA	100 for 7" 0910	0.7/ 0.7	Layers of limestone shale. Shale layers much thicker. Will stop 4¼" ID auger drilling. Shale competent
	56							
	57					Run 1		Bottom of 8 ¼" OD Borehole at 57.2' Bottom of Isolation casing at 57.2
	58	~~massive, very hard gray limestone~~ grey, weathered limey shale from 57-58.0 then grey massive very hard limestone		SH ~~NM~~ LS		1 Fracs 58.5 58.8 59.3 59.6		Run 1 Began Coring 8/11/01 57-62 Run 5' Recov 5'
	59							
	60							

Project: PBOW

Hole Number: TNTC-BEDGW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTC-BEDW-001

Project: PBOW

Geologist: R Podoris

Sheet 8 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Lithe	Field Screening Results (ppm)	Geotech Sample or Core Box No.	Analytical Sample No: Fracs	Recovery (ft)	Remarks
	60							Box 1 57-62
	61					61.0 61 61.5		Start 900 end 510
	62	Massive very hard limestone				Run 2		Run 62-67 Run 5' Rcov 5'
	63					63		
						63.7		Box 2 62-65
	64					64.5 64.8		Box 3 65-67
	65							Start 510 end 530
	66					66.5		
	67							67
						Run 3 9-11-01 67.4 67.8 68.1		67-72 Run 5' Rcov 5' Box 4 67-69.5
	68							
	69					69.5 69.6 69.5		Box 5 69.5- Start 830 end 846
	70							

Project: PBOW

Hole Number: TNTC-BEDW-001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTC-BED GW001

Project: PBOW

Geologist: R. Podeni's

Sheet 9 of 10 Sheets

Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ Unit	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No.	Recovery (ft)	Remarks
	76							
	1					70.8		Box 5 69-74
	2							72
		Massive very hard gray limestone			Run 4	72.4		72-77 5' recov 5' run pull 905
	3				Box 6 74-76	72.8		
						73.8		
	4					73.9		
						74.5		Box 6 74-76
	5					75.5		
						76		
	6					76.4		
						76.6		
	7							77
					Box 7 76-78.5			Began Coring 9/12/01 Box 7 76-78.5
	8				Box 8 78.5-82	76		
						76.5		Box 8 78.5-82
	9					78		Run 77-82
						78.5		
	80							

Project: PBOW

Hole Number: TNTC-BEDGW001

HTRW DRILLING LOG

(continuation sheet)

Hole Number: TNTC-GW001

Project: PBOW

Geologist: RPodoris

Sheet 10 of 10 Sheets

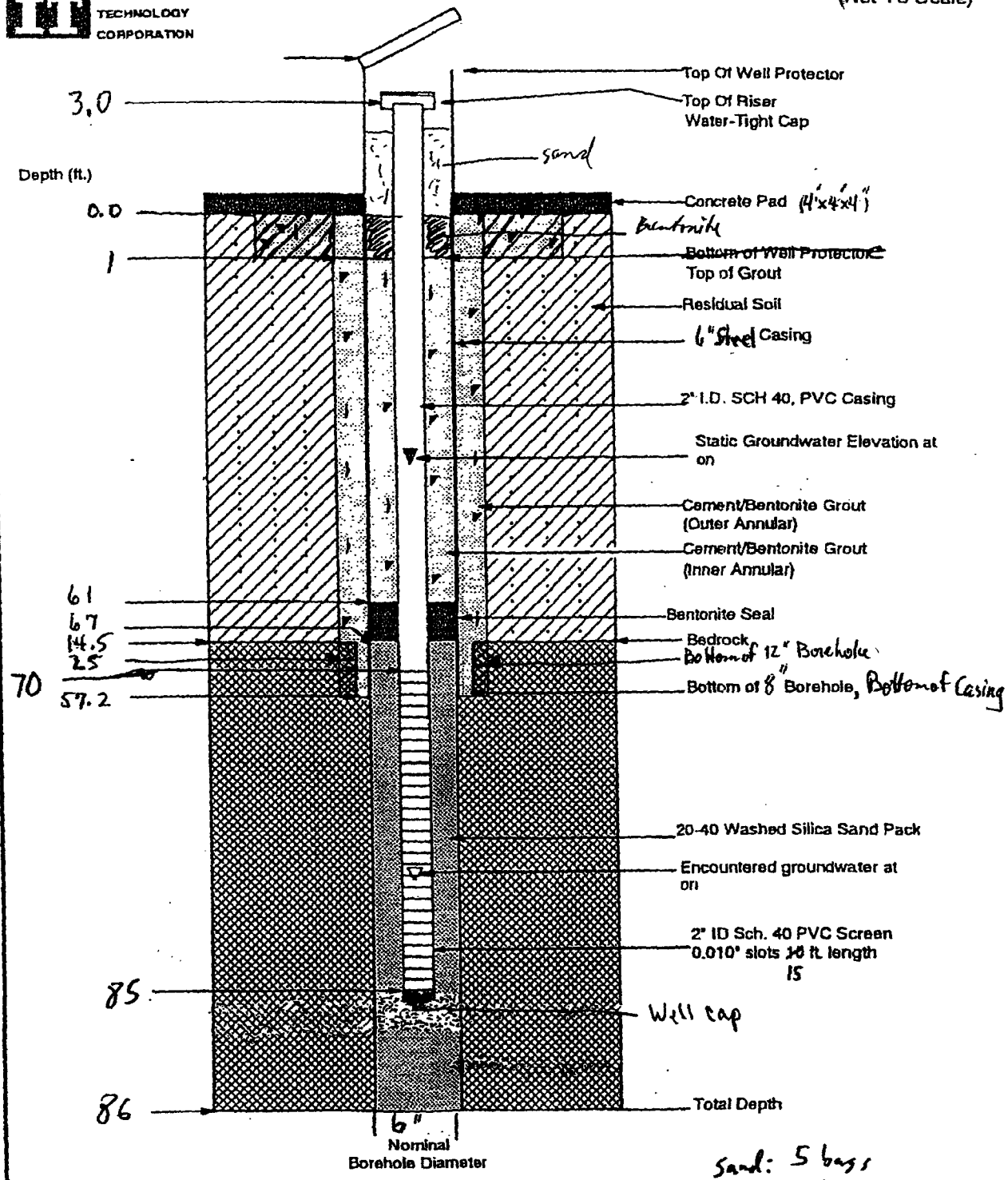
Elev (ft)	Depth (ft) bgs	Description of Materials	USCS/ USRS	Field Screening Results (ppm)	Geotech. Sample or Core Box No.	Analytical Sample No. FTUCS	Recovery (ft)	Remarks
	80							
	1					81.5		~~Marking Tuffs~~
	2							82
		Massive gray lithophysae, very hard with vesicular calcite deposits in fractures.						82-86
	3					83		
	4				Box 9 82-86	84		vertical fracture
						84.7		Box 9 82-86
	5							Clean
	6							86
		Total Depth = 86 Ft						See walkab 85, 1' sand
	7							
	8							
	9							
	0							

Project: PBOW

Hole Number: TNTC-BEDGW-001

INTERNATIONAL TECHNOLOGY CORPORATION

(Not To Scale)



sand: 5 bags
bent: 1 bucket

Notes:

Well No.: TNTC-BEDGW-001
Date Installed: 9/12/01
Elevation Top of Casing: 667.04 ft

Well Construction Diagram
prepared for:
Plum Brook Ordnance Works
Sandusky, OHIO

BWMWA23DWC.DRW/7/5-28-03

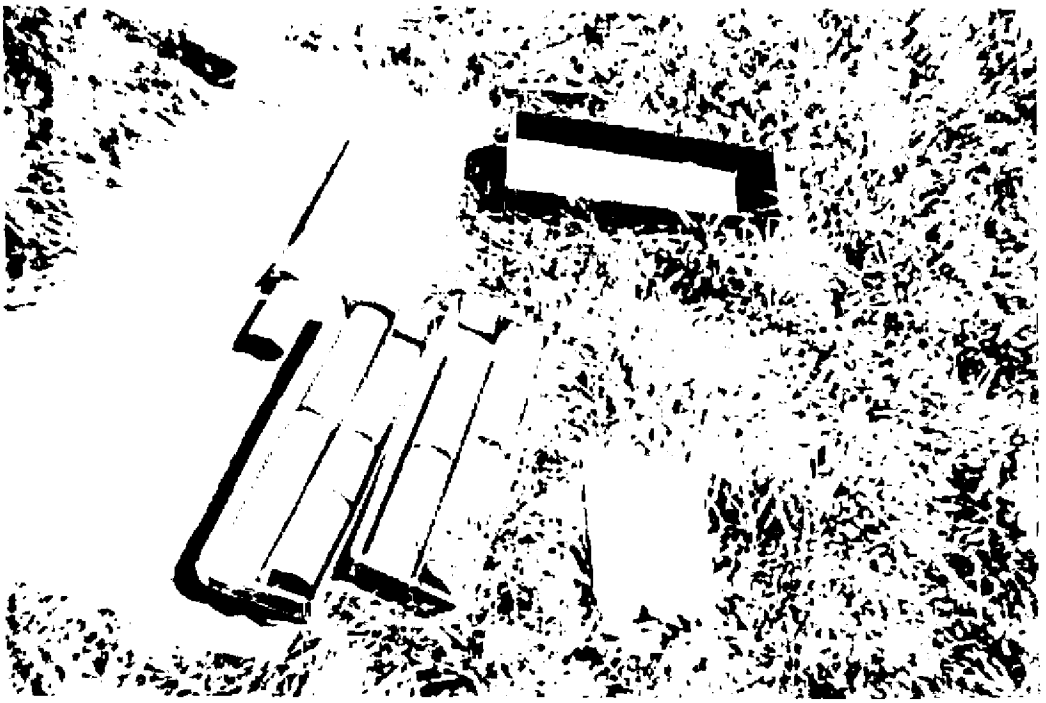
APPENDIX D

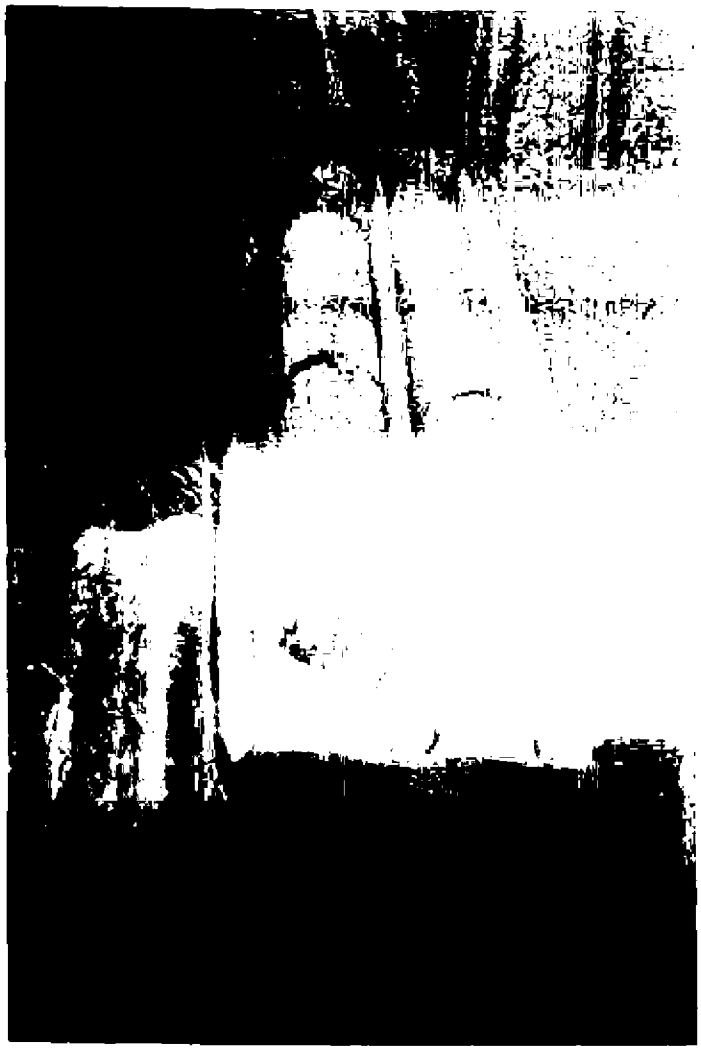
PHOTOGRAPHS

PB-BED-MW22
Box 1 of 6; 24.5 - 28. 5 feet
Missing Box

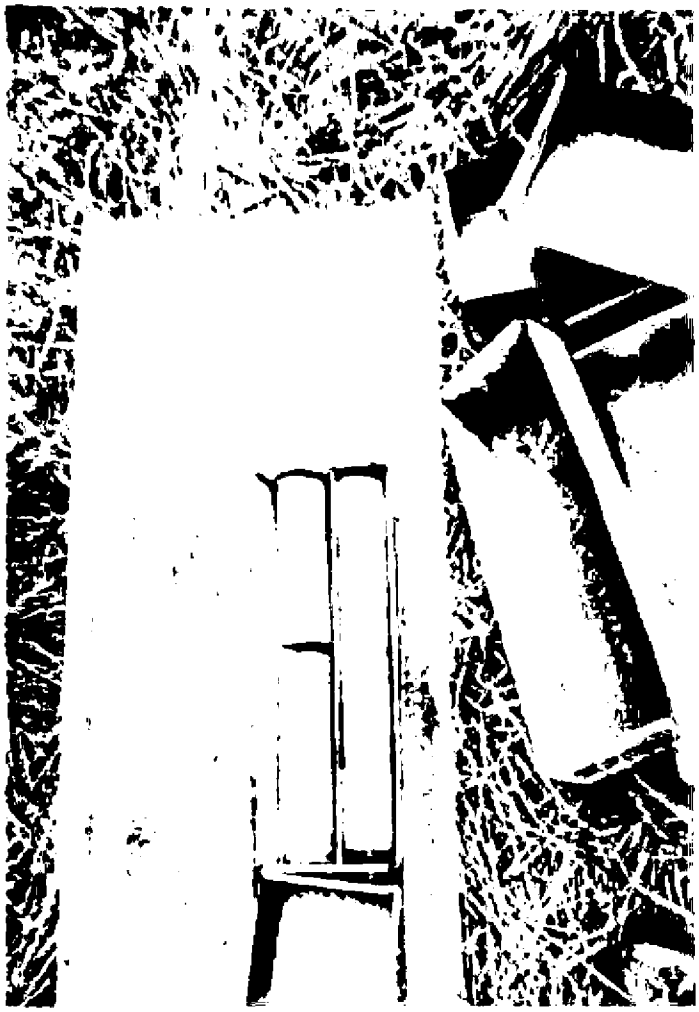
PB-BED-MW22
Box 2 of 6; 31-34 feet (ft)
Run #2 (31-36 ft); Run 5 feet, Recovered 5 feet, Lost 3 ft
9/10/01 (#1 SL27)

PB-BED-MW-22
Unknown Boxes and Depths
9/10/01 (#1 SL26)

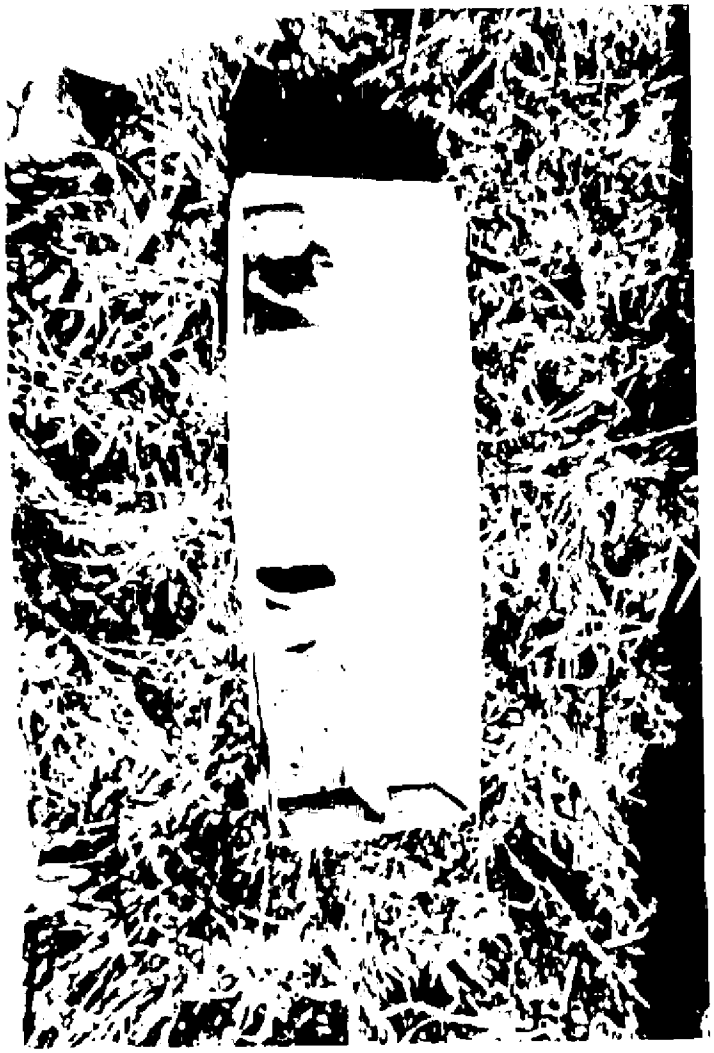




PB-BED-MW22
Unknown Boxes and Depths
9/10/01 (#1 SL20)

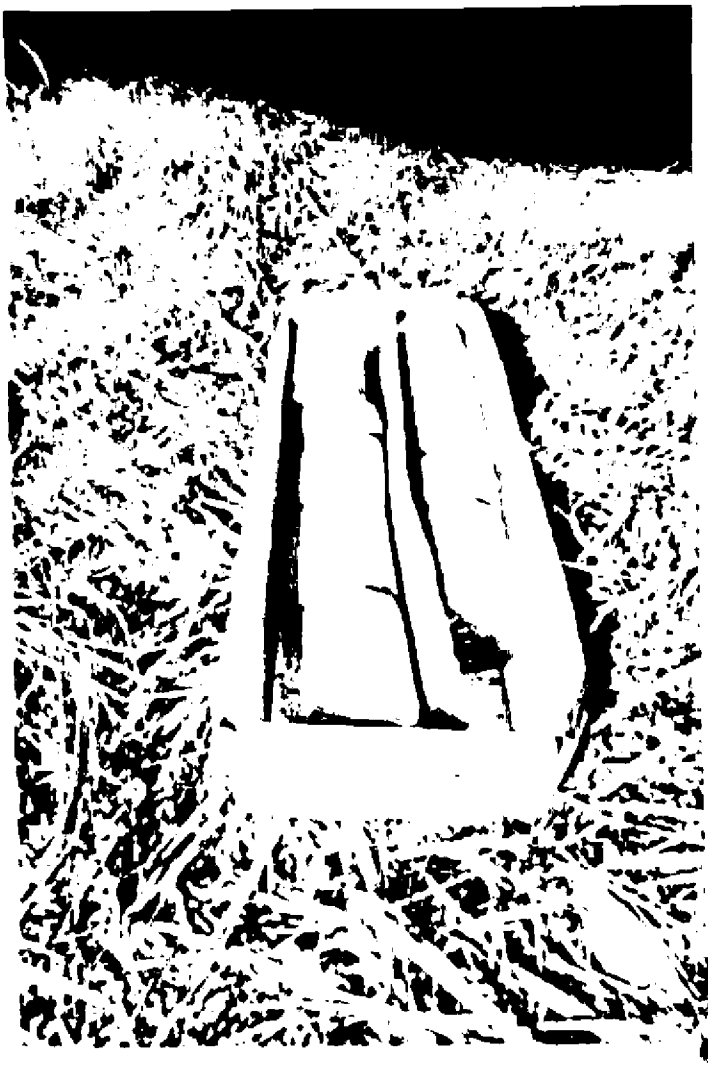


PB-BED-MW22
Unknown Boxes and Depths
9/10/01 (#1 SL28)

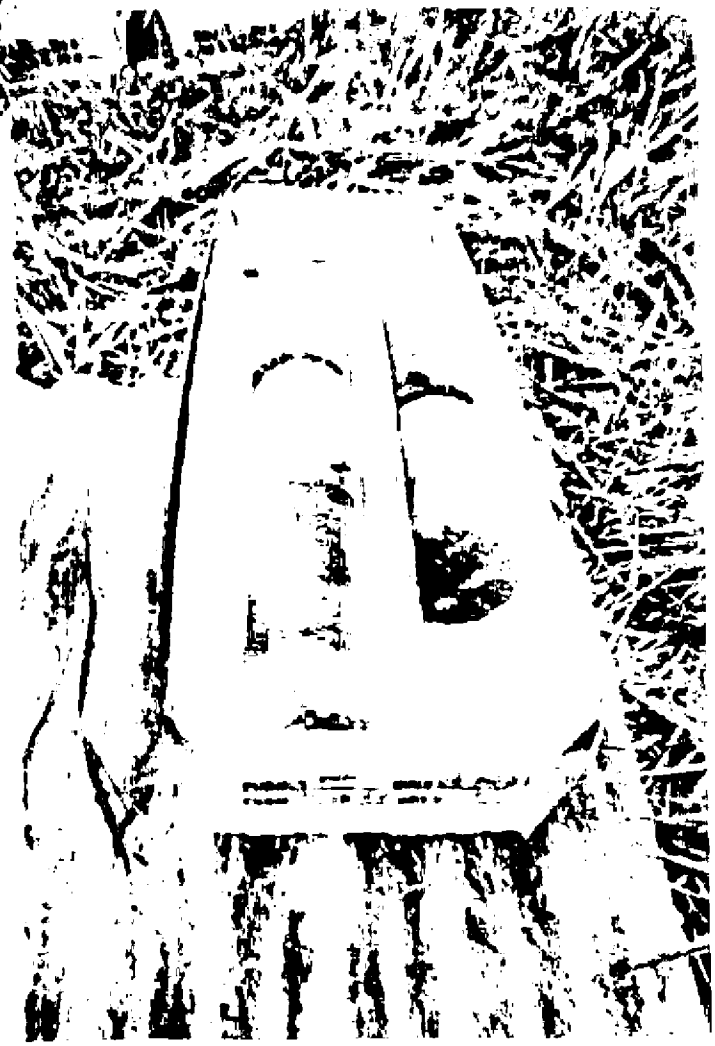


PB-BED-MW23
Box 1 of 13; 30-31 feet
9/6/01 (#7, SL28)

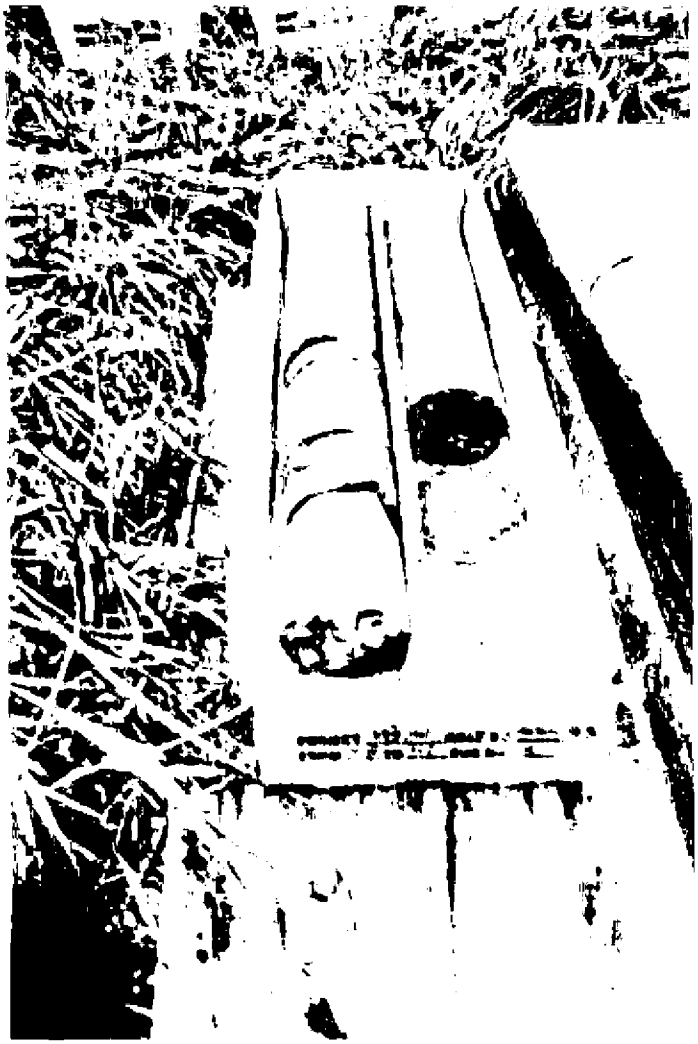
PB-BED-MW23
Box 2 of 13; 33-38 feet
9/6/01 (#7, SL27)



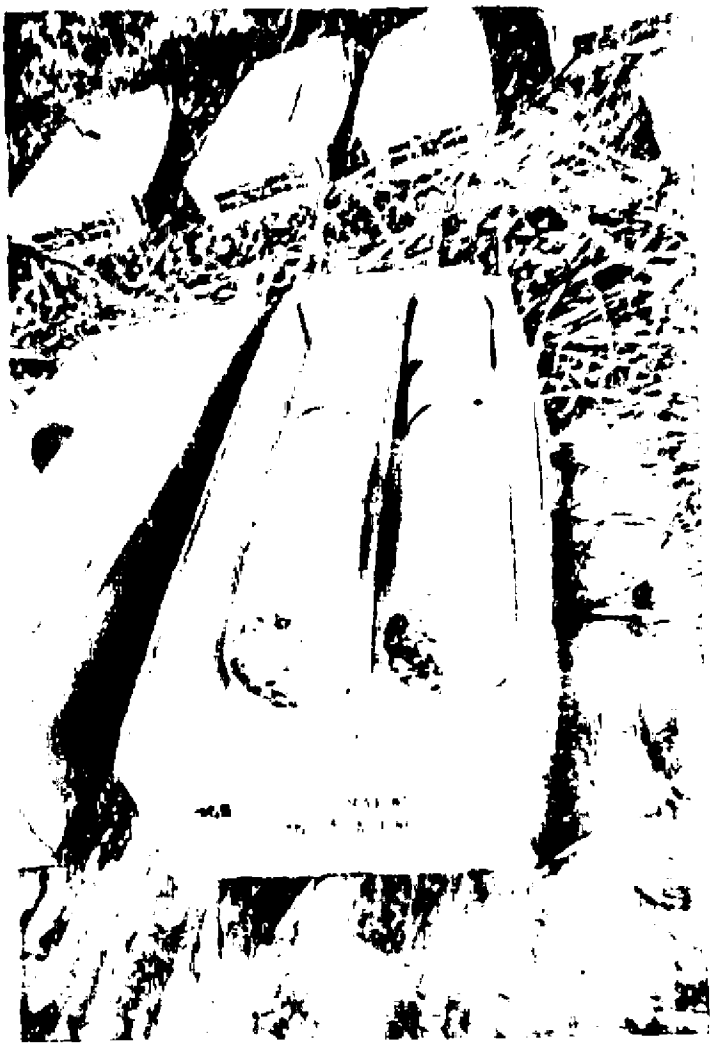
PB-BED-MW23
Box 3 of 13; 38-41.5 feet
9/6/01 (#7, SL26)



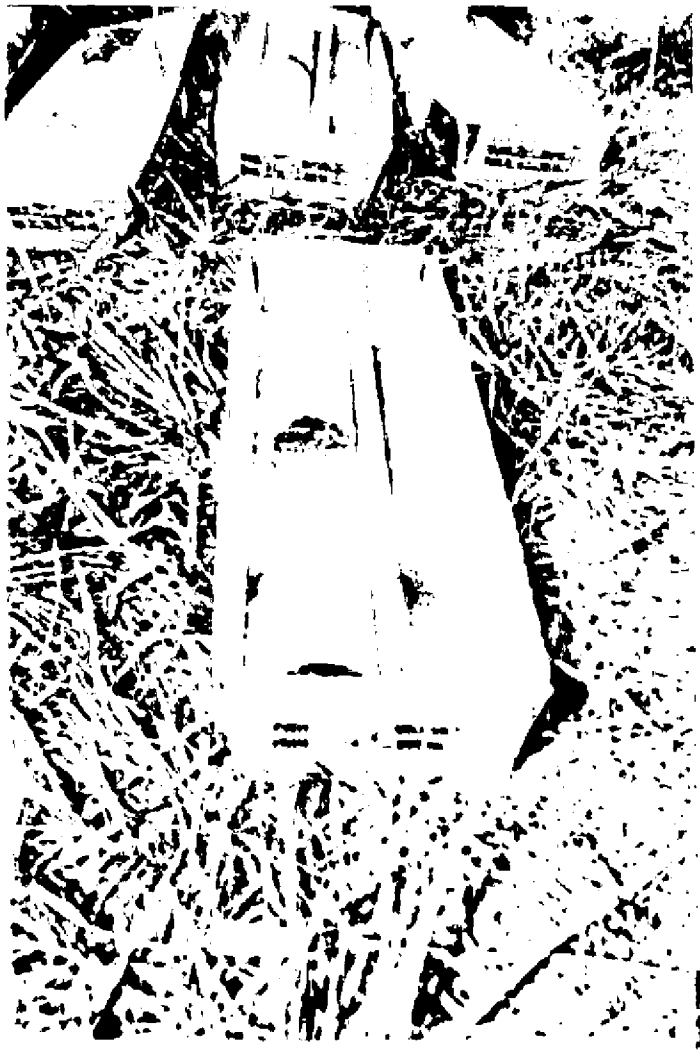
PB-BED-MW23
Box 4 of 13; 41.5-44.5 feet
9/6/01 (#7, SL25)



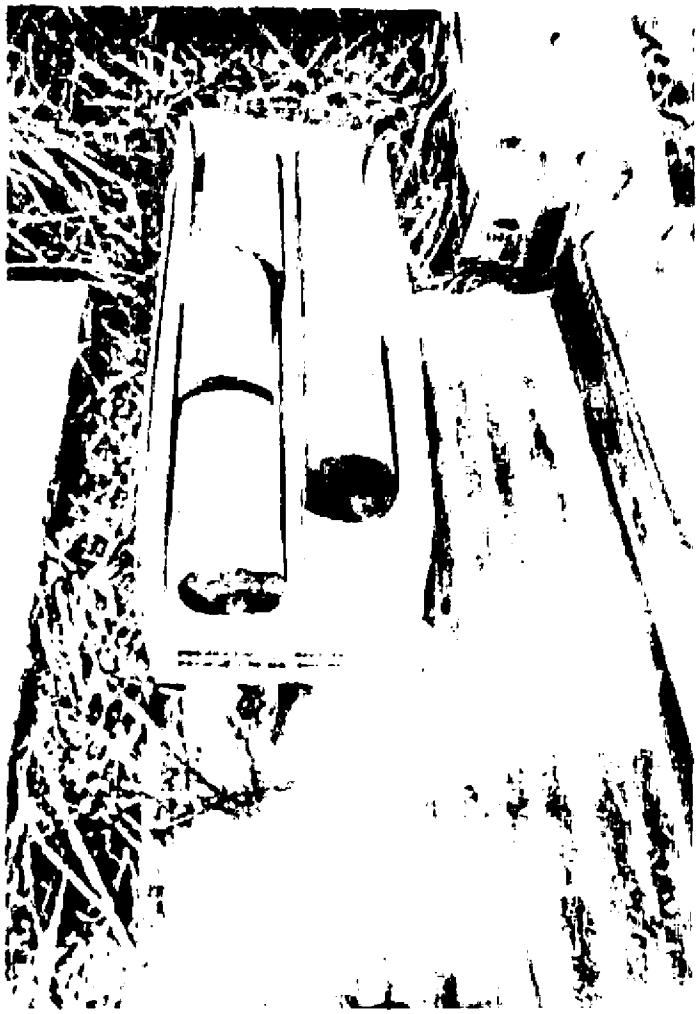
PB-BED-MW23
Box 6 of 13; 48-51 feet
9/6/01 (#7, SL24)



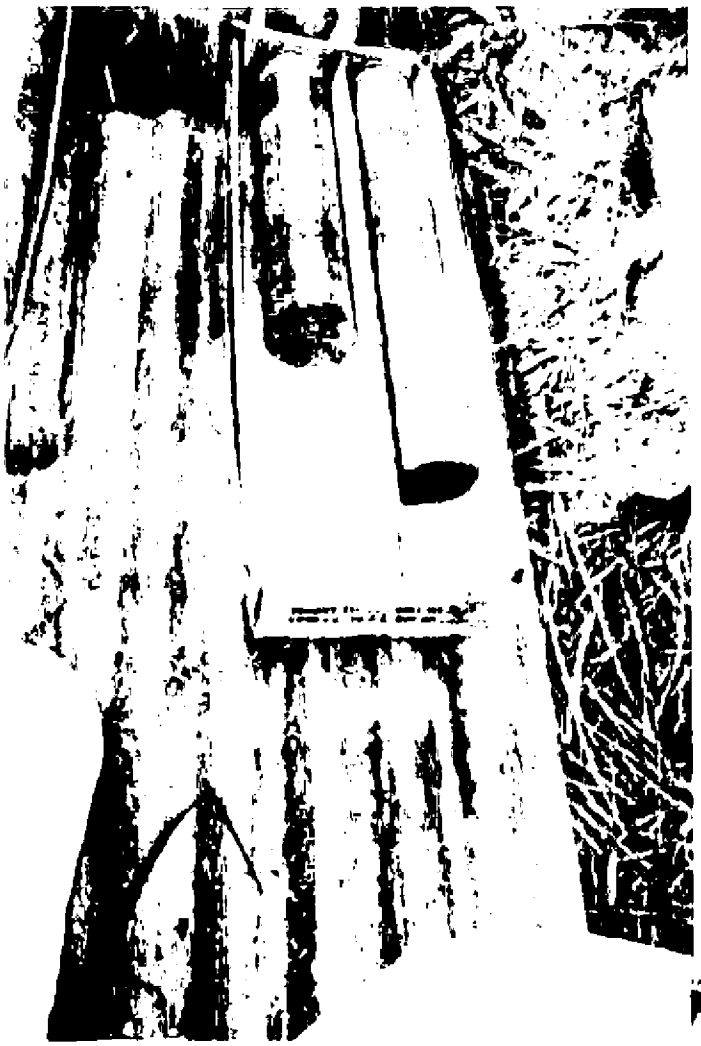
PB-BED-MW23
Box 7 of 13; 51-54 feet
9/6/01 (#7, SL22)



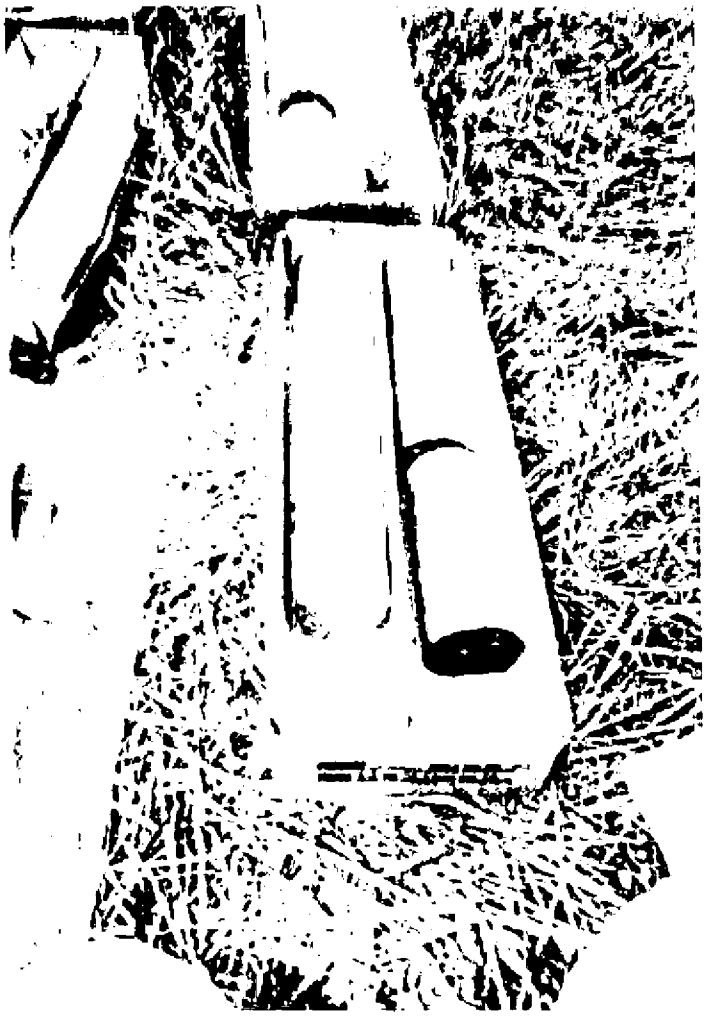
PB-BED-MW23
Box 8 of 13; 54-57.5 feet
9/6/01 (#7, SL23)



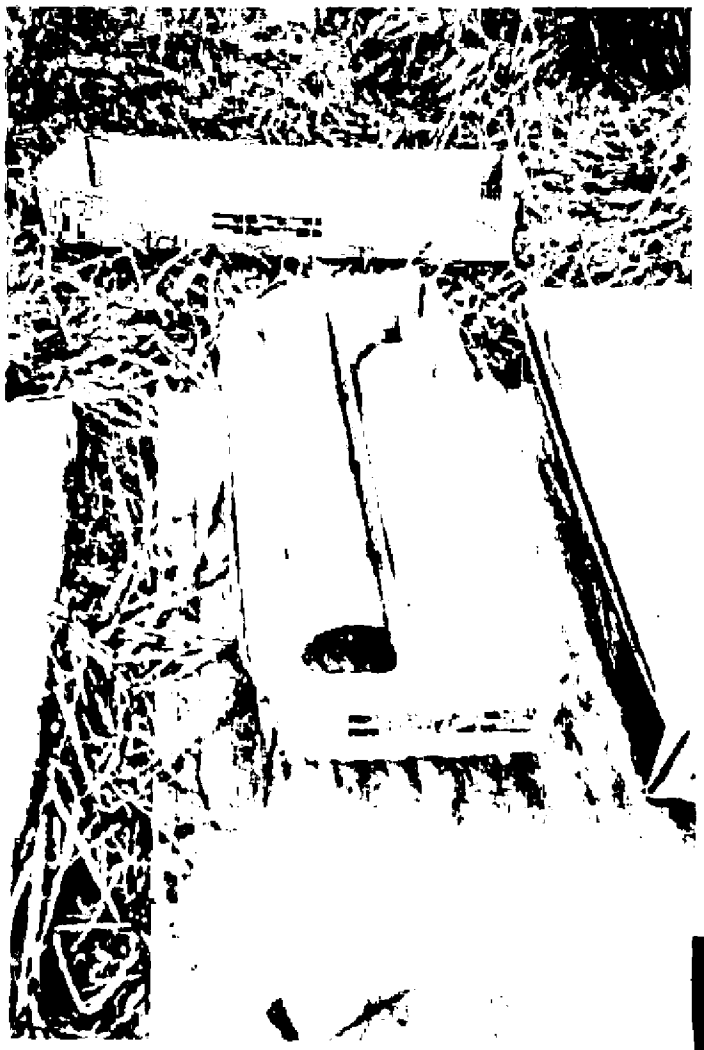
PB-BED-MW23
Box 9 of 13; 57.5-60 feet
9/6/01 (#7, SL21)



PB-BED-MW23
Box 10 of 13; 60-63 feet
9/6/01 (#7, SL20)

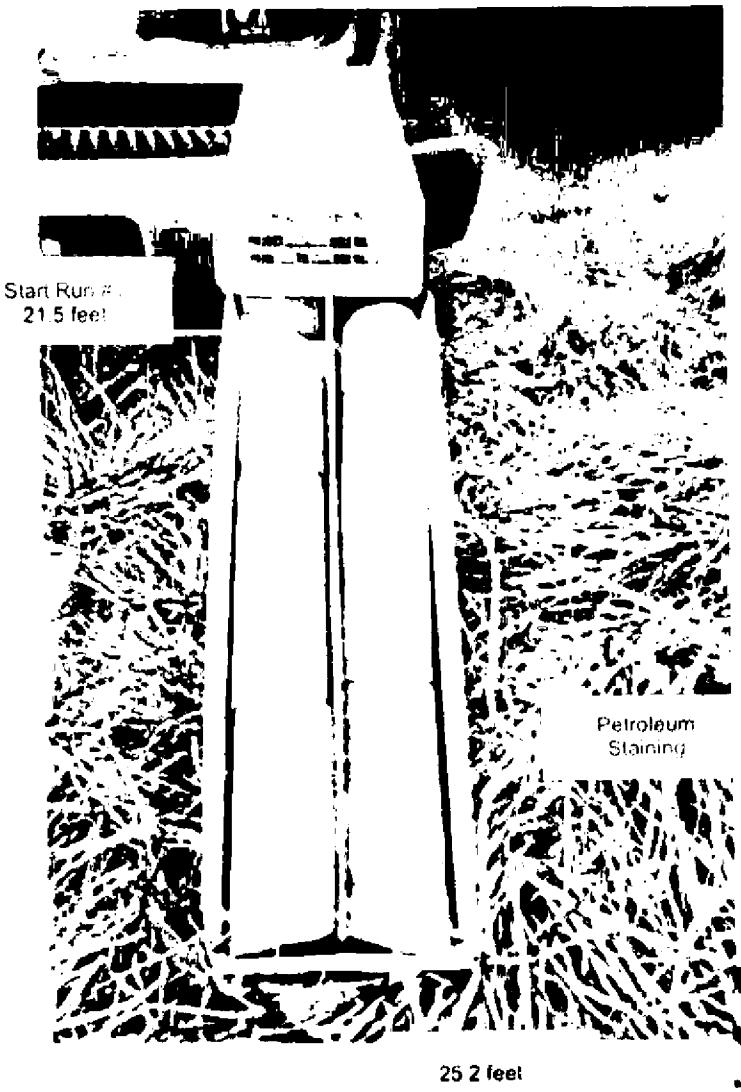


PB-BED-MW23
Box 11 of 13; 63-66.5 feet
9/6/01 (#7, SL19)

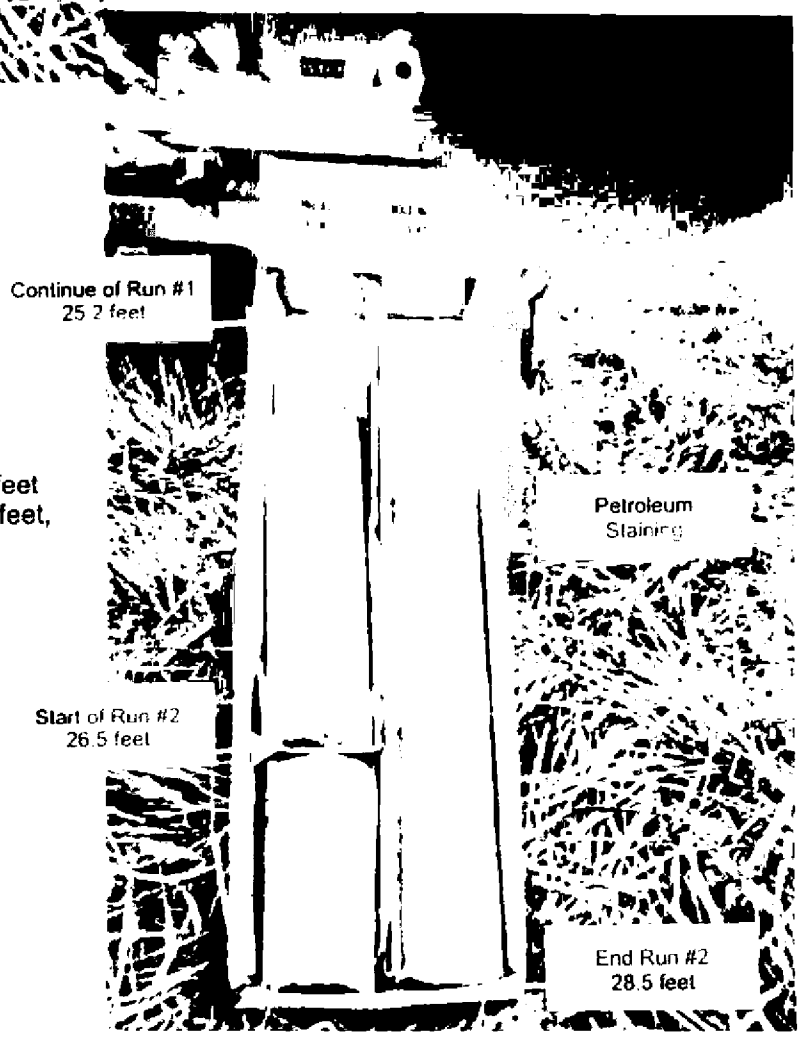


PB-BED-MW23
Box 12 of 13; 66.5-69.5 feet
9/6/01 (#7, SL18)

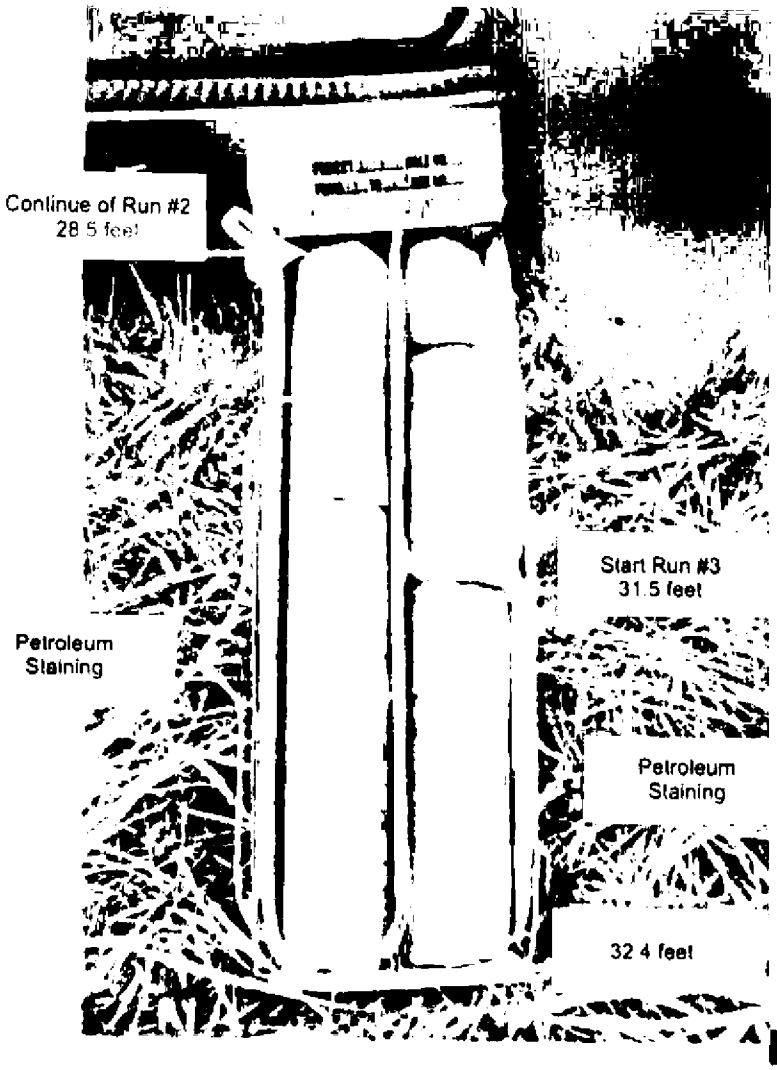
PB-BED-MW23
Box 13 of 13; 69.5-74 feet
9/6/01 (#7, SL17)



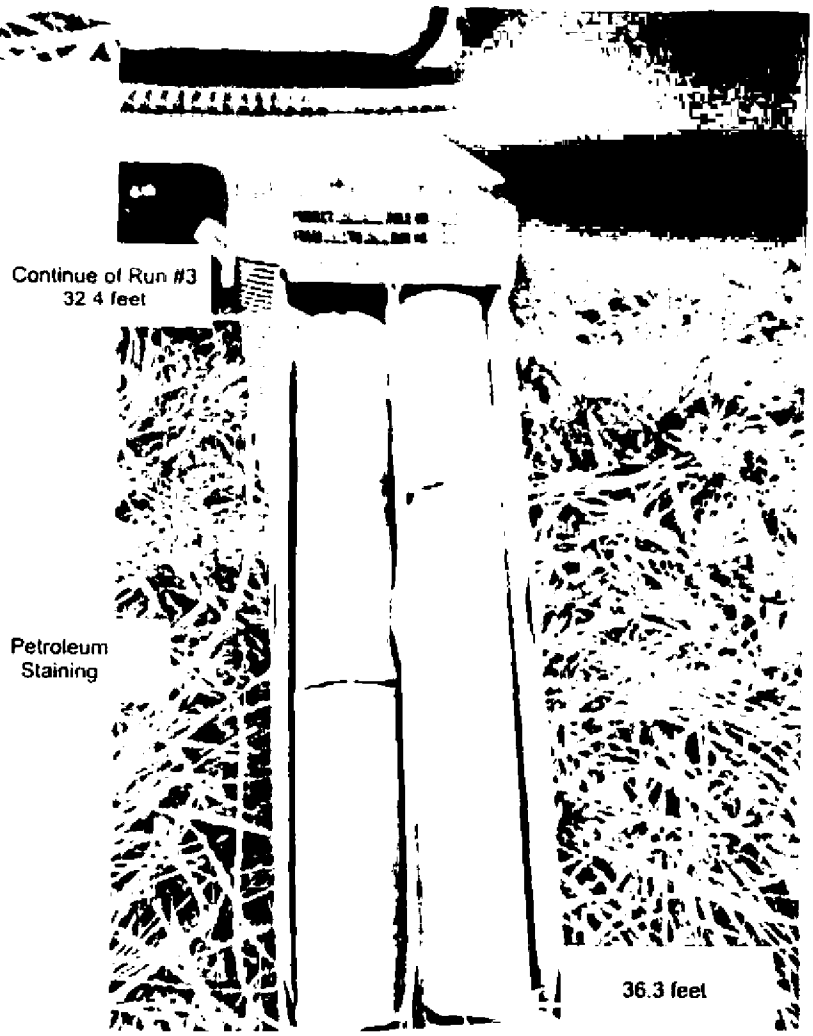
PB-BED-MW24
Box 1 of 6; 21.5-25.2 feet
Run #1 (21.5 - 26.5 feet); Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/13/01 (#2 SL9)



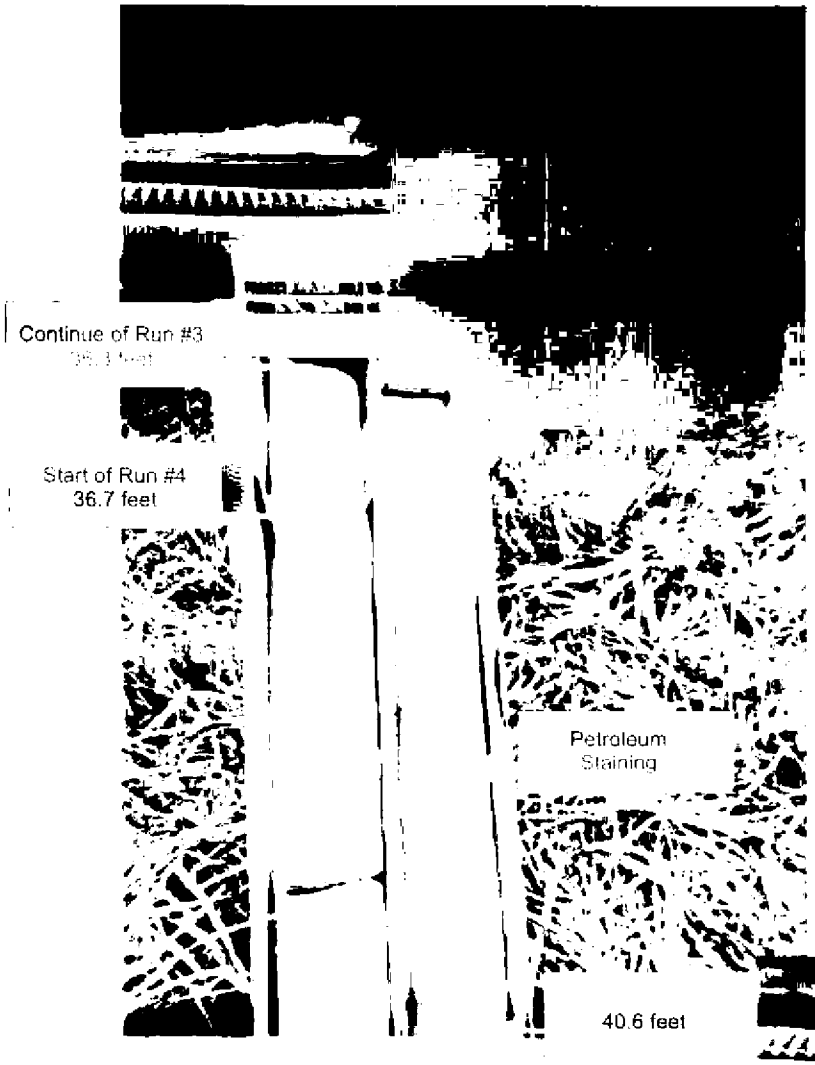
PB-BED-MW24
Box 2 of 6; 25.2-28.5 feet
Continue of Run #1; 25.2 - 26.5 feet
Run #2 (26.5 - 31.5 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/13/01 (#2 SL8)



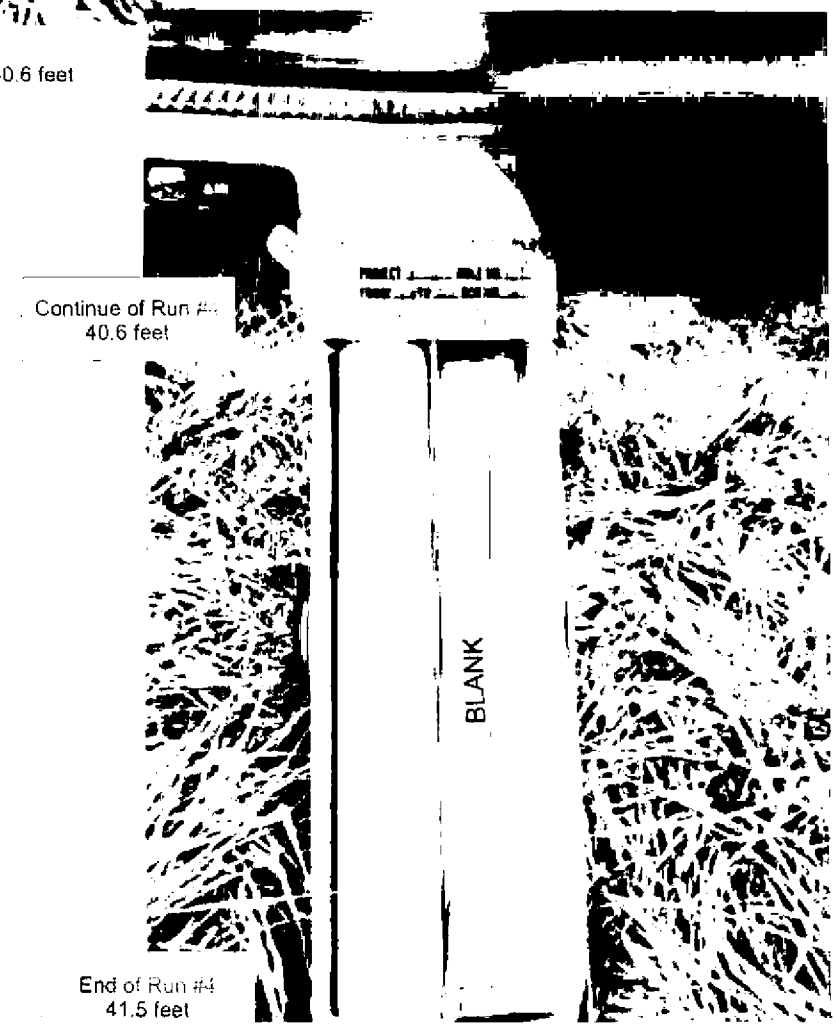
PB-BED-MW24
Box 3 of 6; 28.5-32.4 feet
Continue of Run #2; 28.5 - 31.5 feet
Run #3 (31.5 - 36.7 feet), Run 5 feet,
Recovered 5.2 feet, Gained 0.2 feet
9/13/01 (#2 SL4)



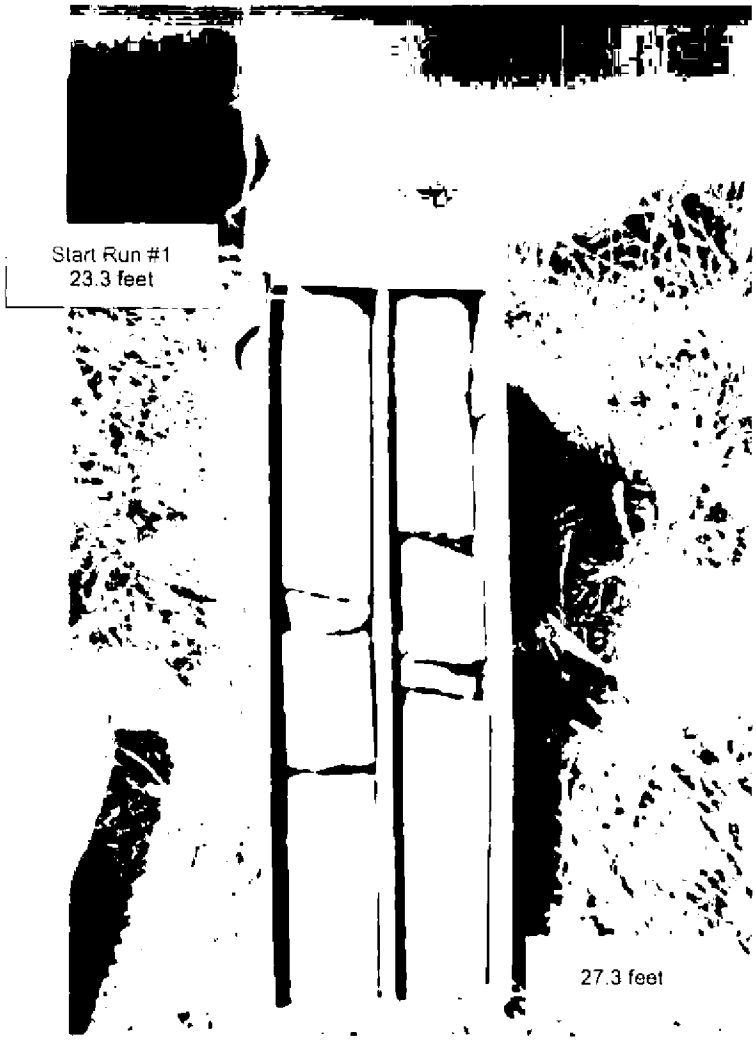
PB-BED-MW24
Box 4 of 6; 32.4-36.3 feet
Continue of Run #3; 32.4 - 36.3 feet
9/13/01 (#2 SL6)



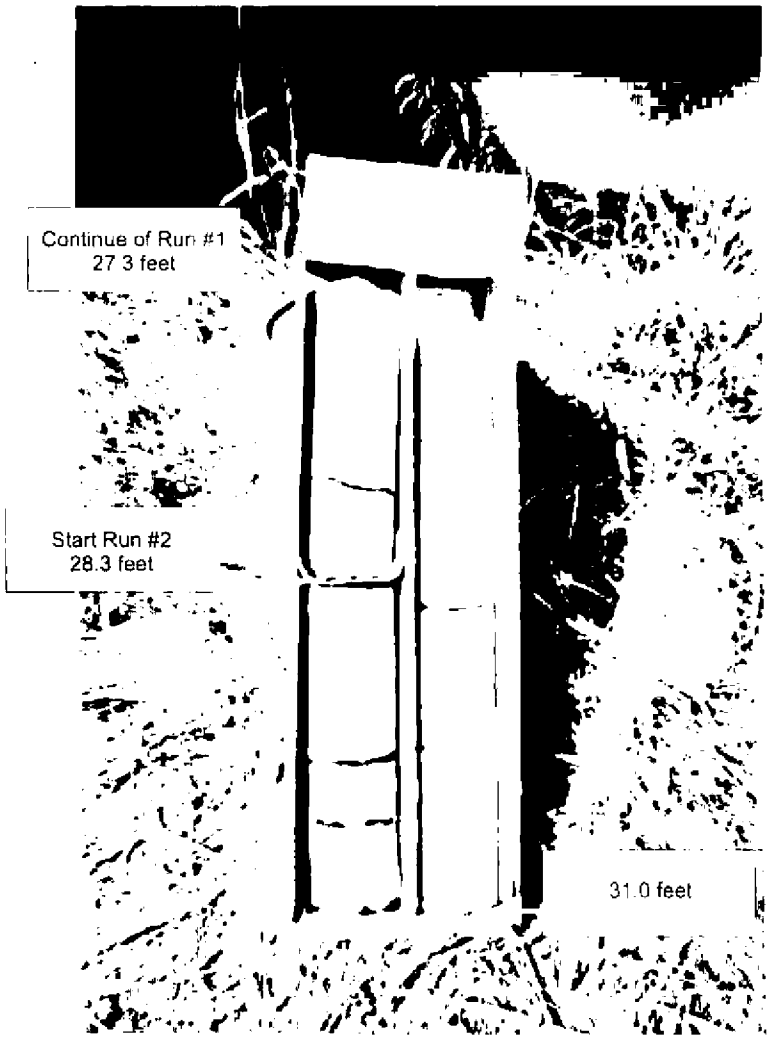
PB-BED-MW24
Box 5 of 6; 36.3-40.6 feet
Continue of Run #3; 36.3 - 36.5 feet
Run #4 (36.7 - 41.5 feet), Run 5 feet,
Recovered 4.8 feet, Lost 0.2 feet
9/13/01 (#2 SL7)



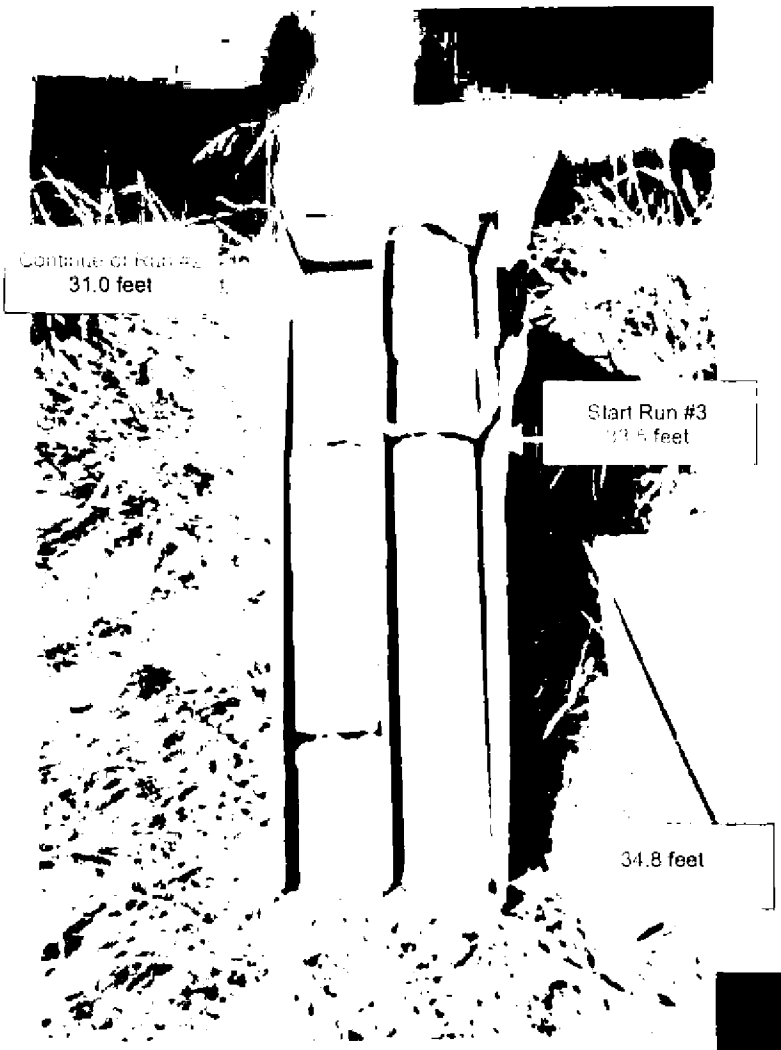
PB-BED-MW24
Box 6 of 6; 40.6-41.5 feet
Continue of Run #4; 40.6 - 41.5 feet
Total Depth at 41.5 feet
9/13/01 (#2 SL5)



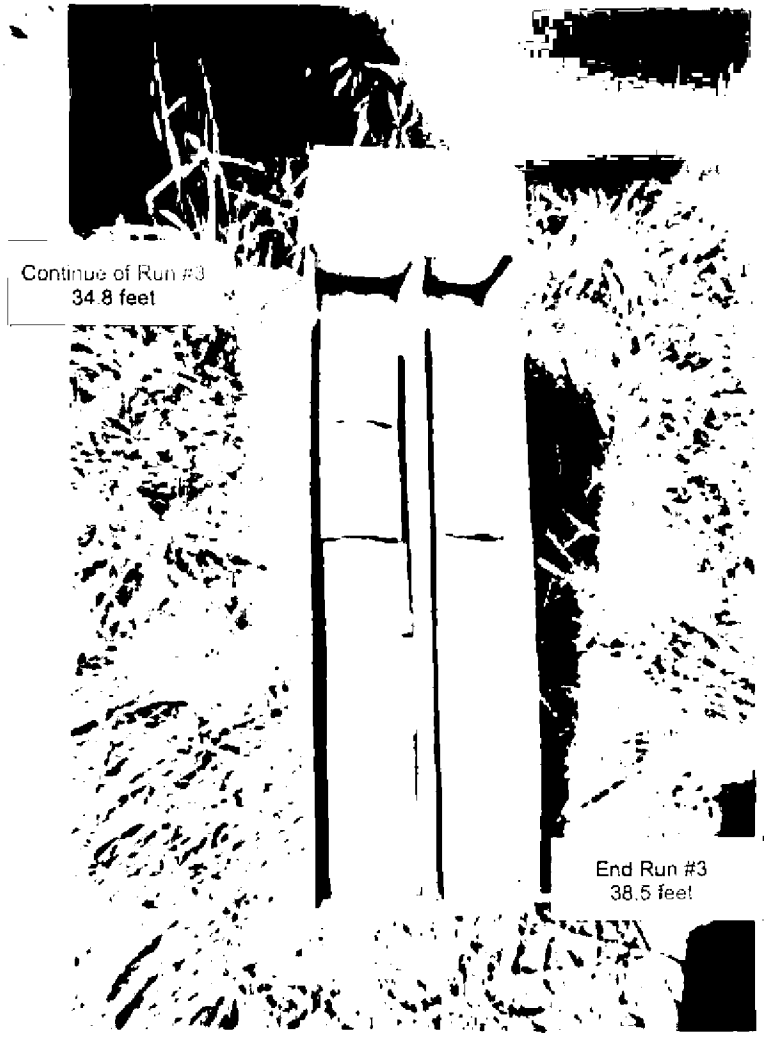
PB-BED-MW25
Box 1 of 4; 23.3-27.3 feet
Run #1 (23.3 - 28.3 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/11/01 (#2 SL13)



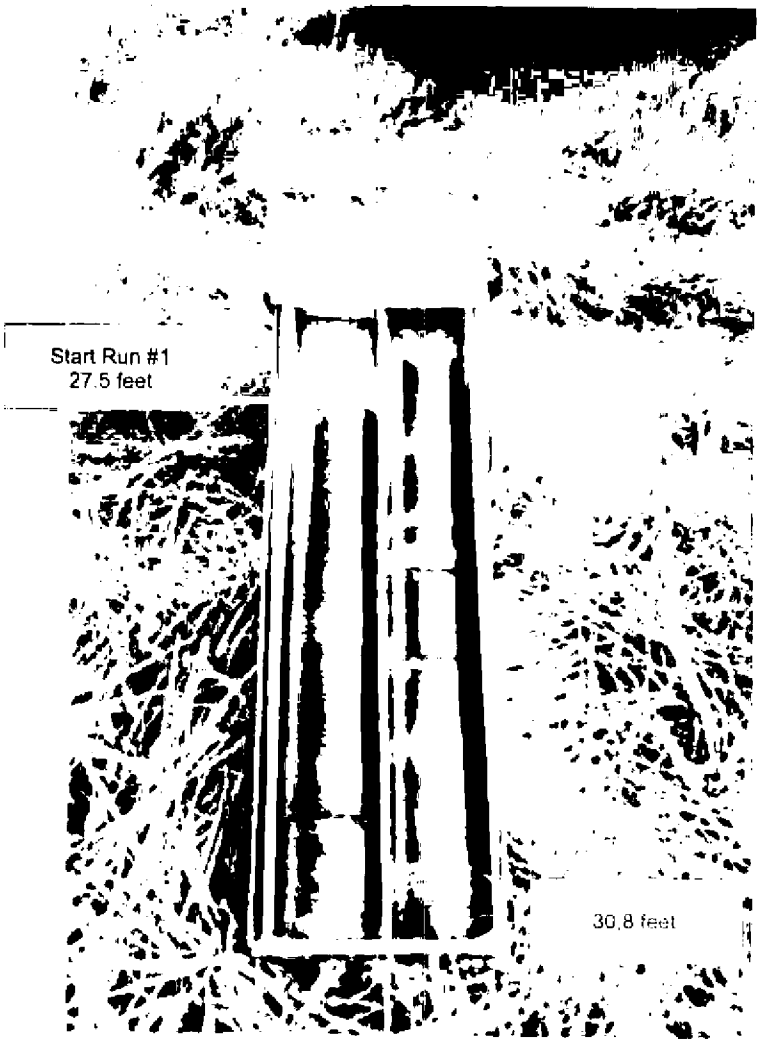
PB-BED-MW25
Box 2 of 4; 27.3-31.0 feet
Continue of Run #1; 27.3 - 28.3 feet
Run #2 (28.3 - 33.5 feet), Run 5 feet,
Recovered 5.2 feet, Gained 0.2 feet
9/11/01 (#2 SL12)



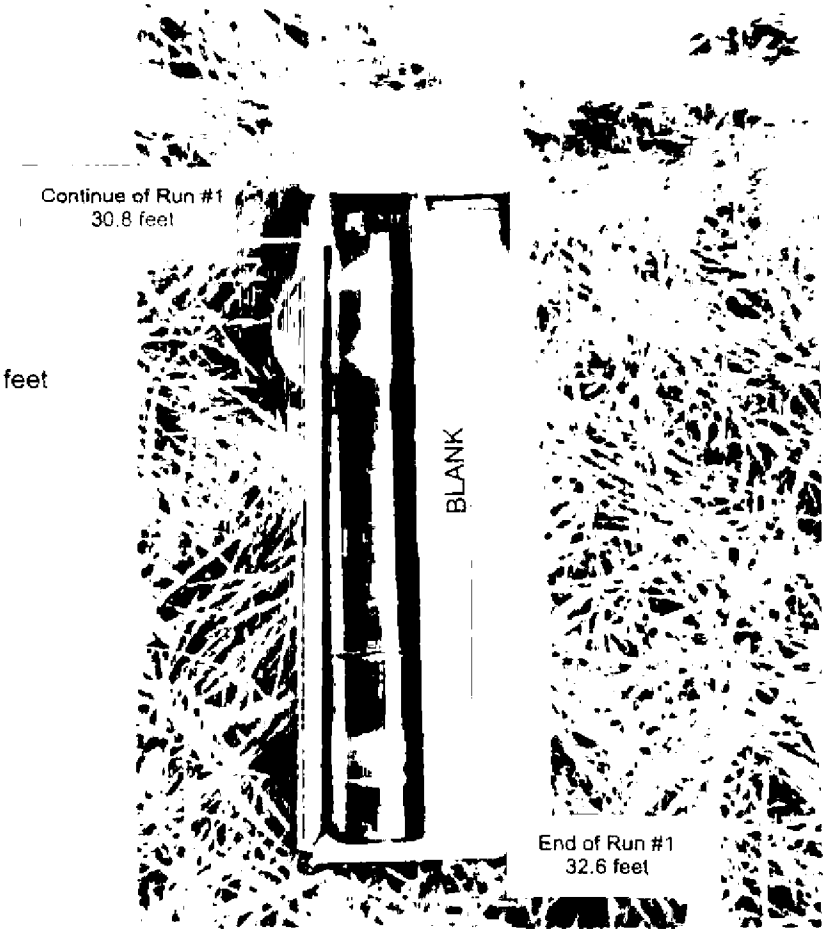
PB-BED-MW25
Box 3 of 4; 31.0-34.8 feet
Continue of Run #2; 31.0 - 33.5 feet
Run #3 (33.5 - 38.5 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/11/01 (#2 SL10)



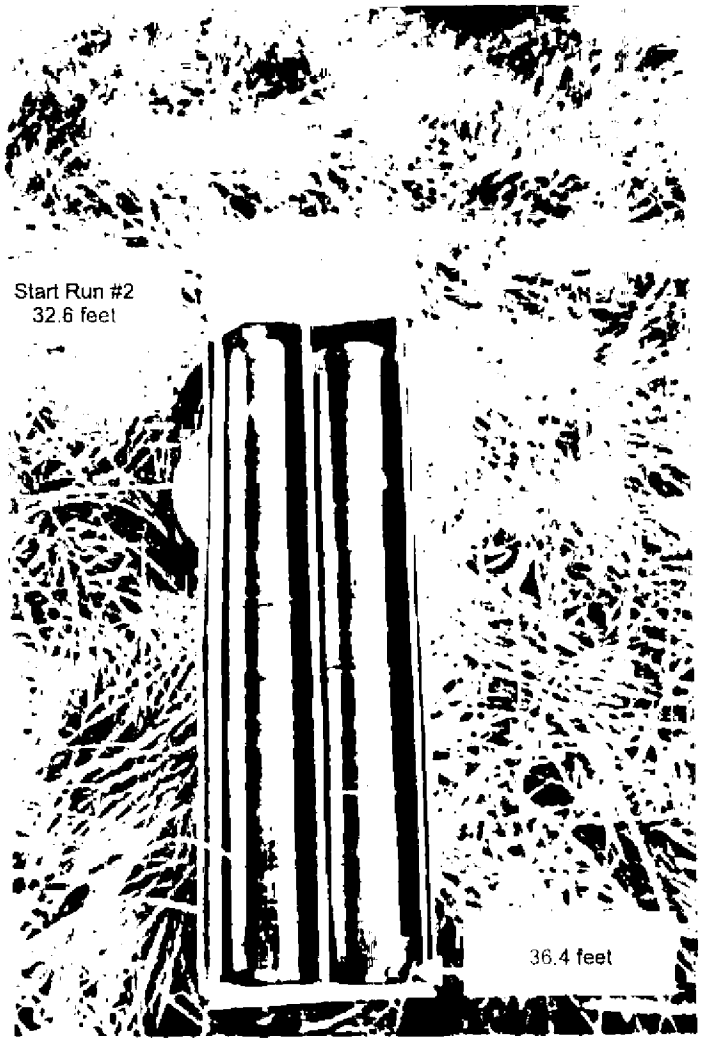
PB-BED-MW25
Box 4 of 4; 34.8 ft-38.5 feet
Continue Run #2; 34.8 - 38.5 feet
Total Depth at 38.5 feet
9/11/01 (#2 SL11)



PB-BED-MW26
Box 1 of 9; 27.5-30.8 feet
Run #1 (27.5 - 32.5 feet), Run 5 feet
Recovered 5.1 feet, Gained 0.1 feet
9/8/01 (#2 SL22)

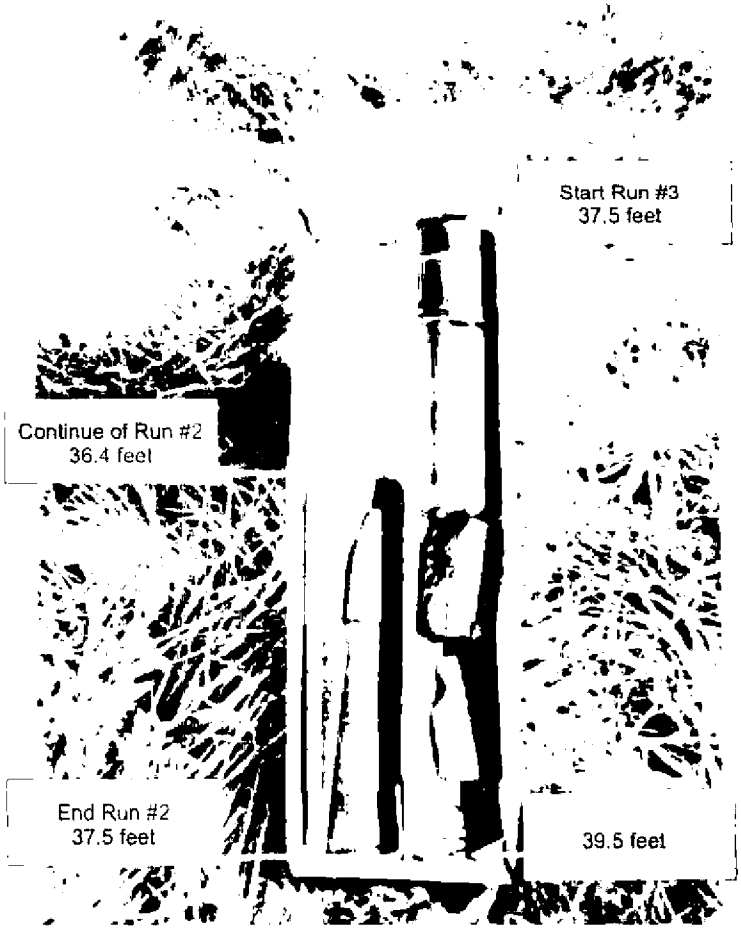


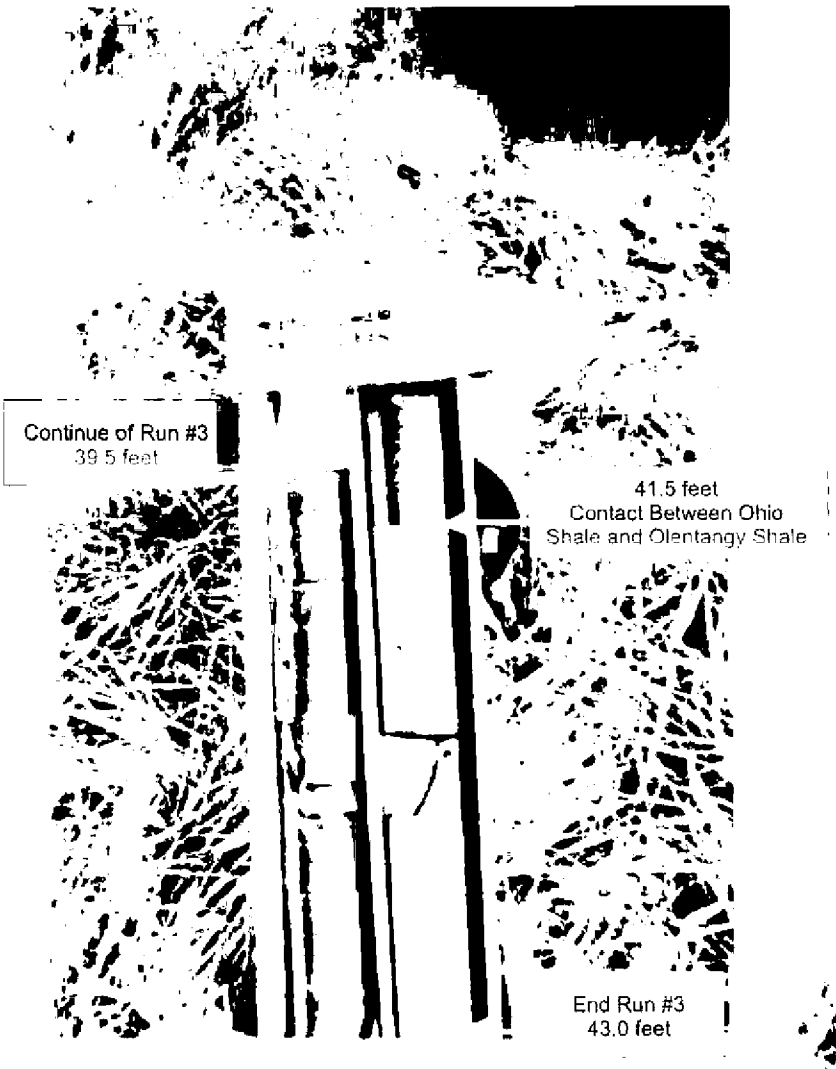
PB-BED-MW26
Box 2 of 9; 30.8-32.6 feet
Continue of Run #1; 30.8 feet - 32.6 feet
9/8/01 (#2 SL21)



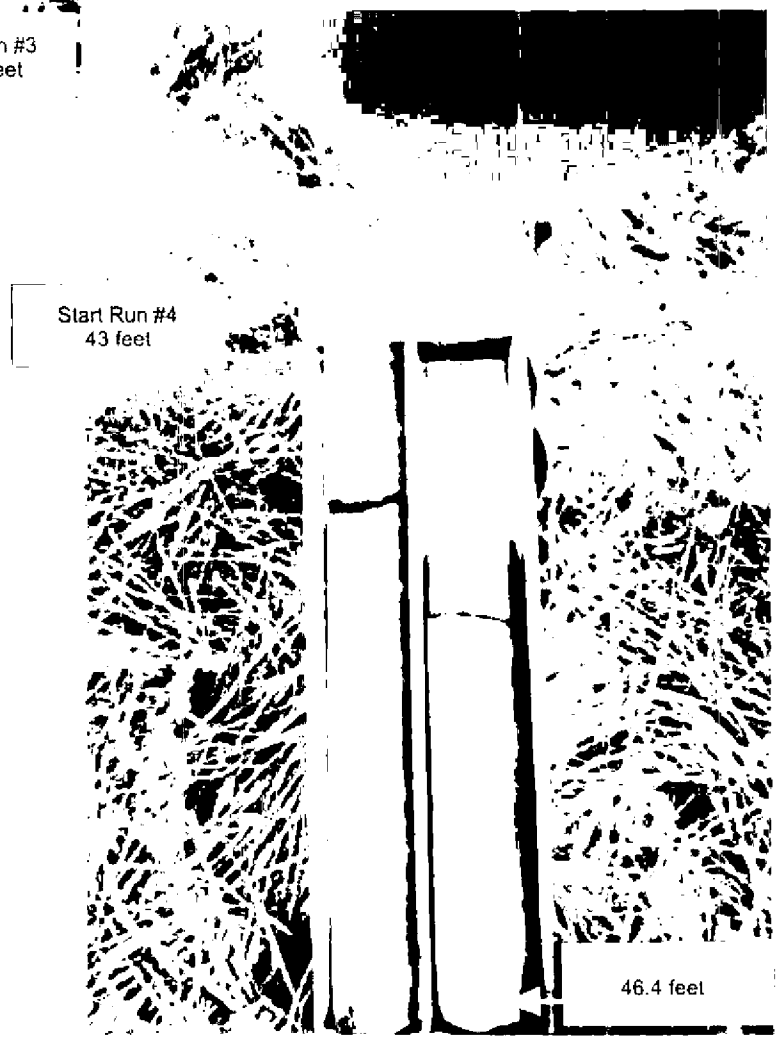
PB-BED-MW26
Box 3 of 9; 32.6-36.4 feet
Run #2 (32.6 - 37.5 feet), Run 5 feet
Recovered 5 feet, Lost 0 feet
9/8/01 (#2 SL20)

PB-BED-MW26
Box 4 of 9; 36.4-39.5 feet
Continue of Run #2; 36.4 - 37.5 feet
Run #3 (37.5 - 43.0 feet), Run 5.5 feet,
Recovered 5.5 feet, Lost 0 feet
9/8/01 (#2 SL19)

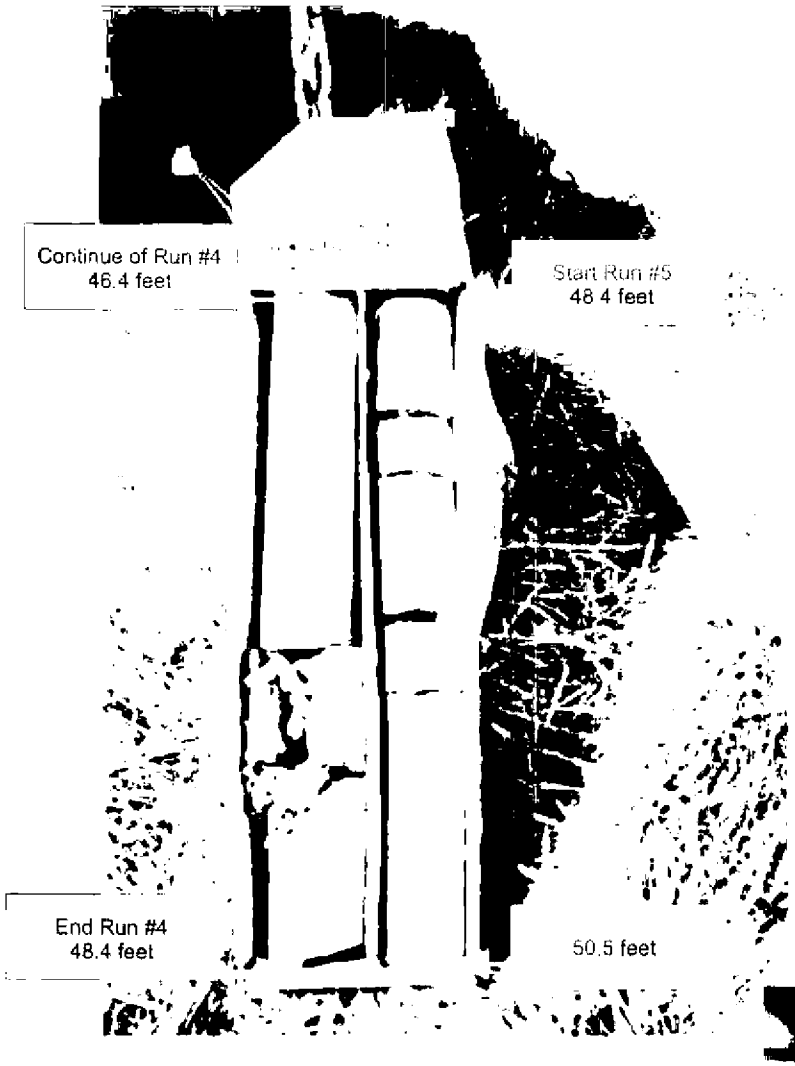




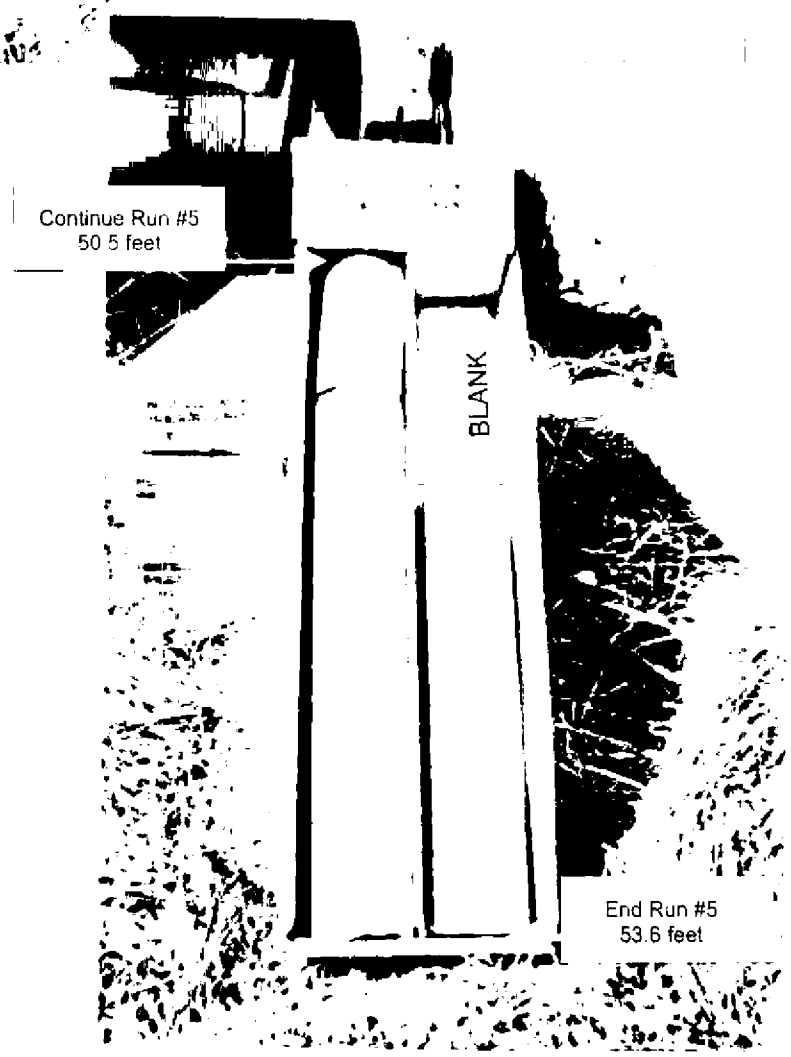
PB-BED-MW26
Box 5 of 9; 39.5-43.0 feet
Continue of Run #3; 39.5 - 43.0 feet
9/8/01 (#2 SL18)



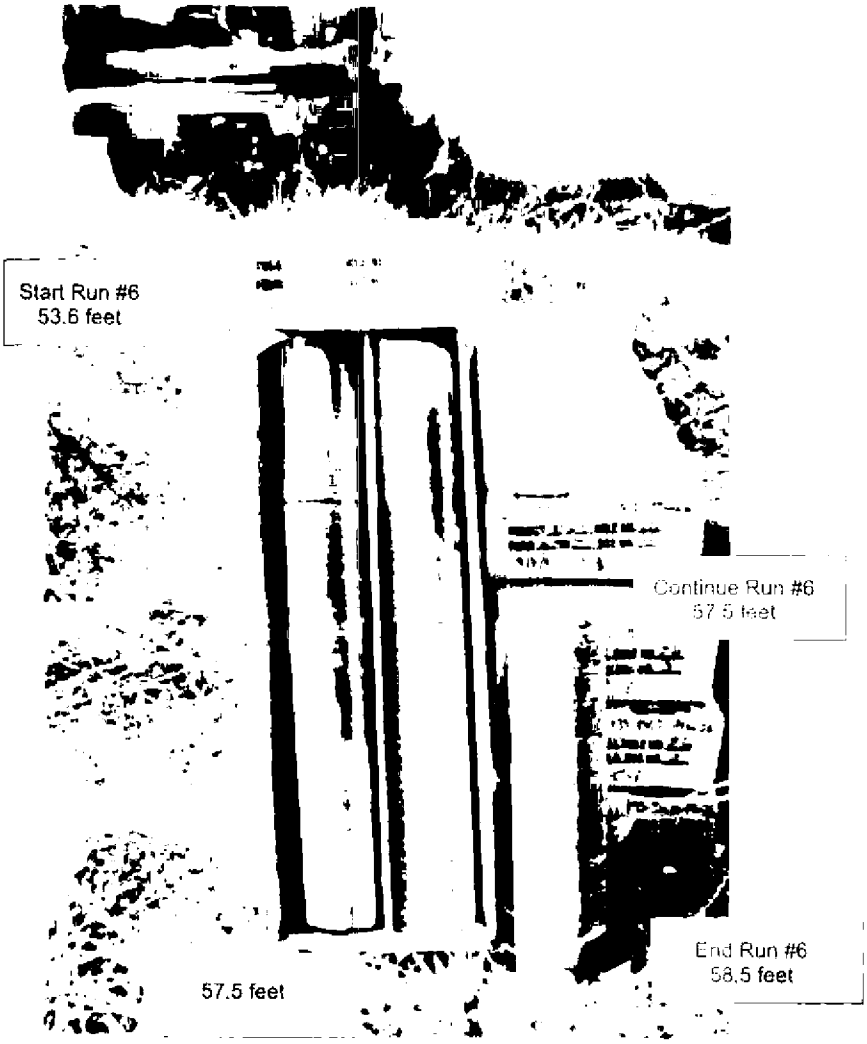
PB-BED-MW26
Box 6 of 9; 43.0-46.4 feet
Run #4 (43 - 48.4 feet), Run 5 feet,
Recovered 5.4 feet, Gained 0.4 feet
9/10/01 (#2 SL17)



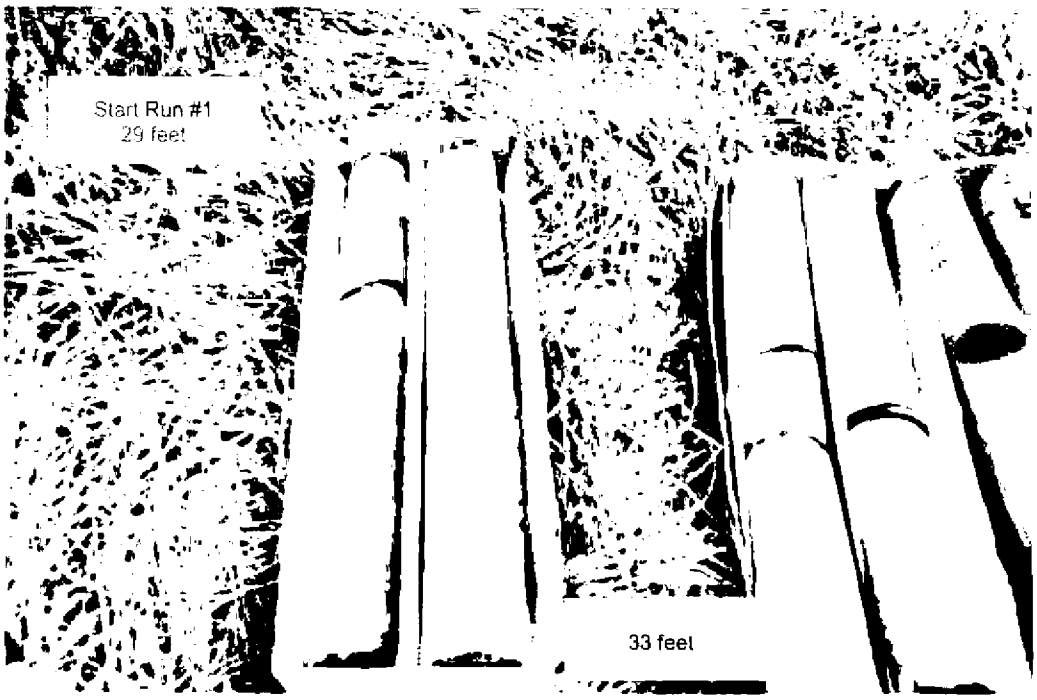
PB-BED-MW26
Box 7 of 9; 46.4-50.5 feet
Continue of Run #4; 46.4 - 48.4 feet
Run #5 (48.4 - 53.6 feet), Run 5 feet,
Recovered 5.2 feet, Gained 0.2 feet
9/10/01 (#2 SL16)



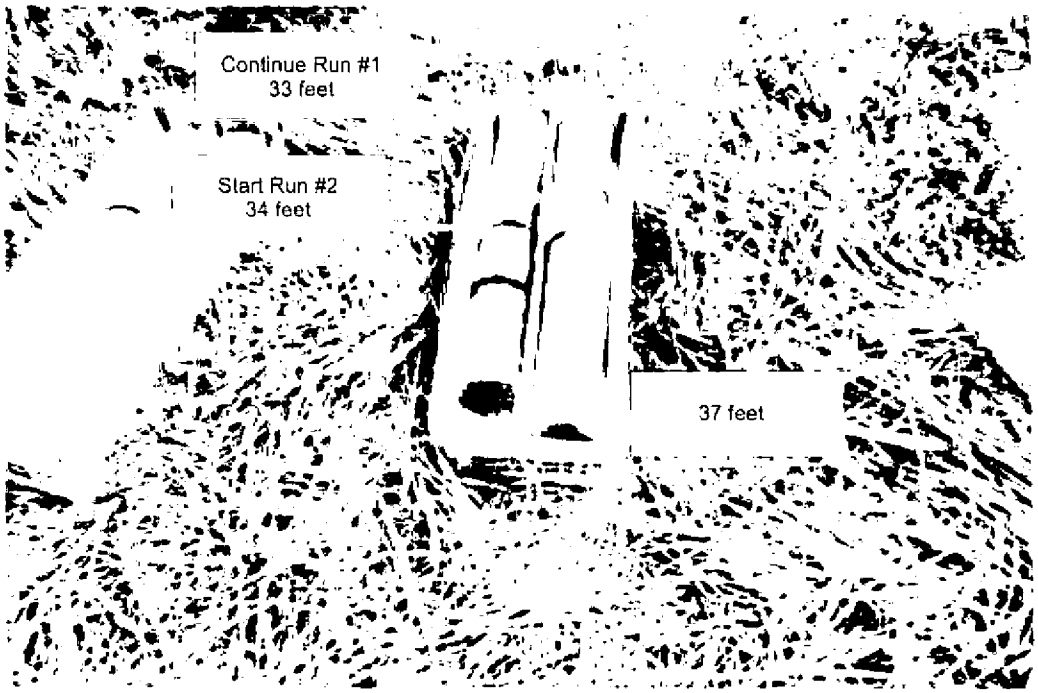
PB-BED-MW26
Box 8 of 9; 50.5-53.6 feet
Continue of Run #5; 50.5 - 53.6 feet
9/10/01 (#2 SL15)



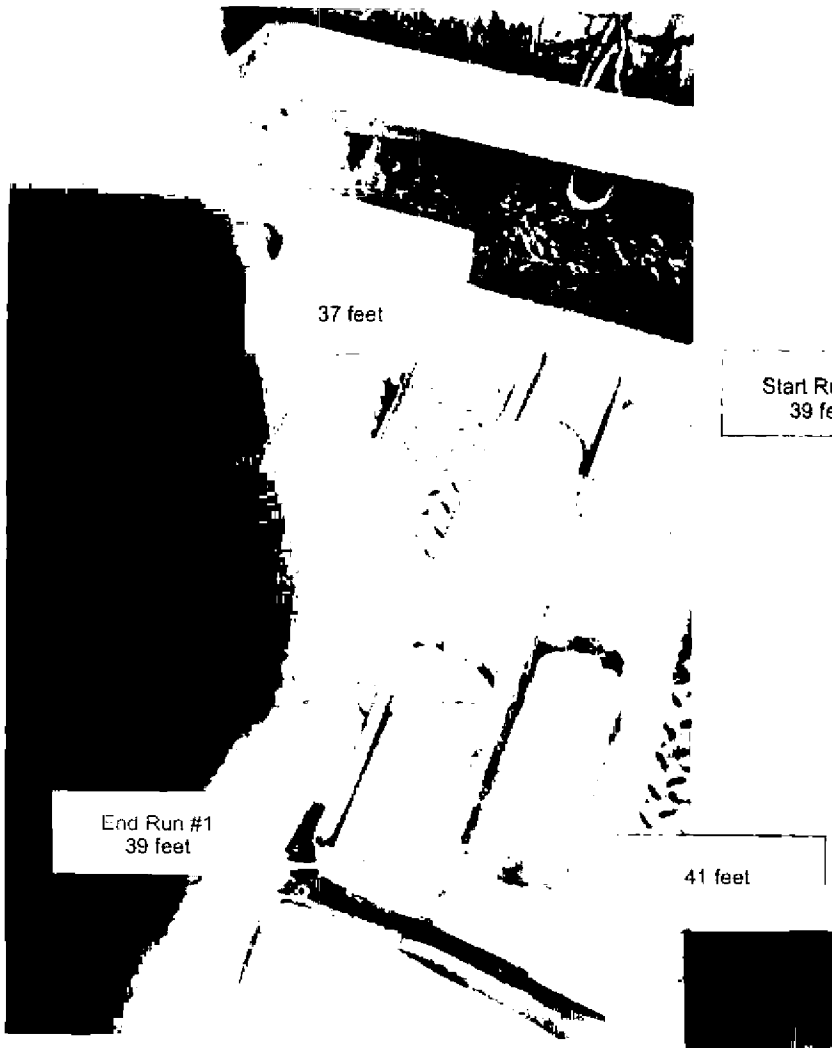
PB-BED-MW26
Box 9 of 9; 53.6-58.5 feet
Run #6 (53.6 - 58.5 feet), Run 4.9 feet,
Recovered 4.85 feet, Lost 0.05 feet
Total Depth at 58.5 feet
9/10/01 (#2 SI14)



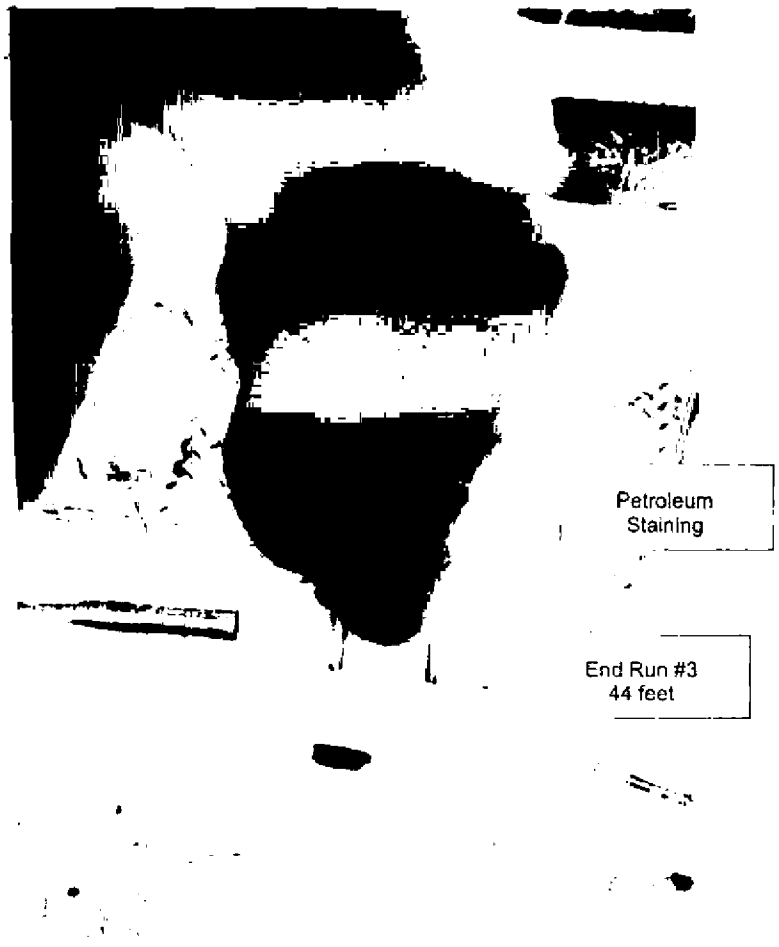
PB-BED-MW27
Box 1 of 24; 29-33 feet
Run #1 (29 - 34 feet), Run 5 feet, Recovered 5 feet, Lost 0 feet
9/7/01 (#7 SL16)



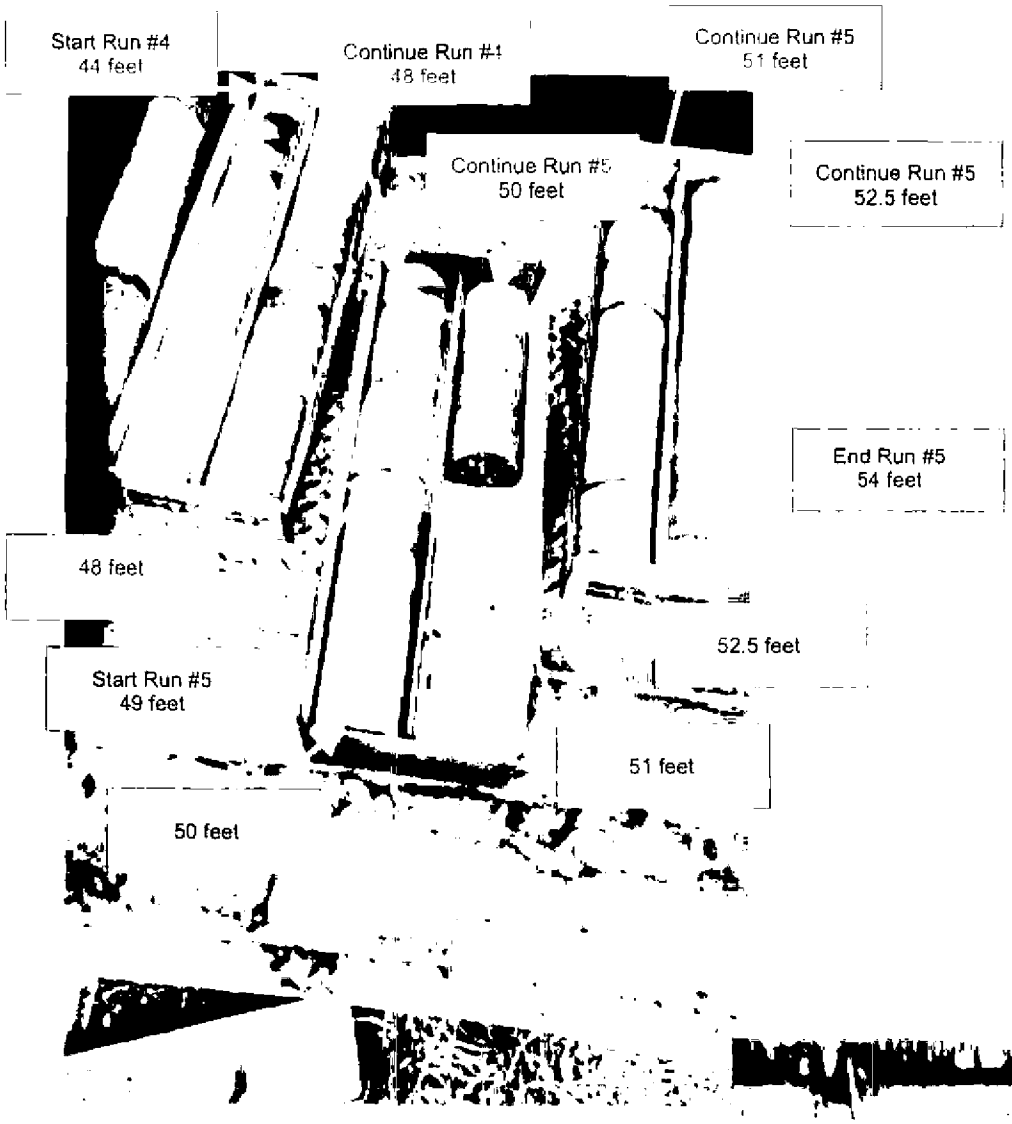
PB-BED-MW27
Box 2 of 24; 33-37 feet
Continue of Run #1; 33 - 34 feet
Run #2 (34 - 39 feet), Run 5 feet, Recovered 5 feet, Lost 0 feet
9/7/01 (#7 SL15)



PB-BED-MW27
Box 3 of 24; 37-41 feet
Continue of Run #2; 37 - 39 feet
Run #3 (39 - 44 feet), Run 5 feet
Recovered 5 feet, Lost 0 feet
9/7/01 (#7 SL14)

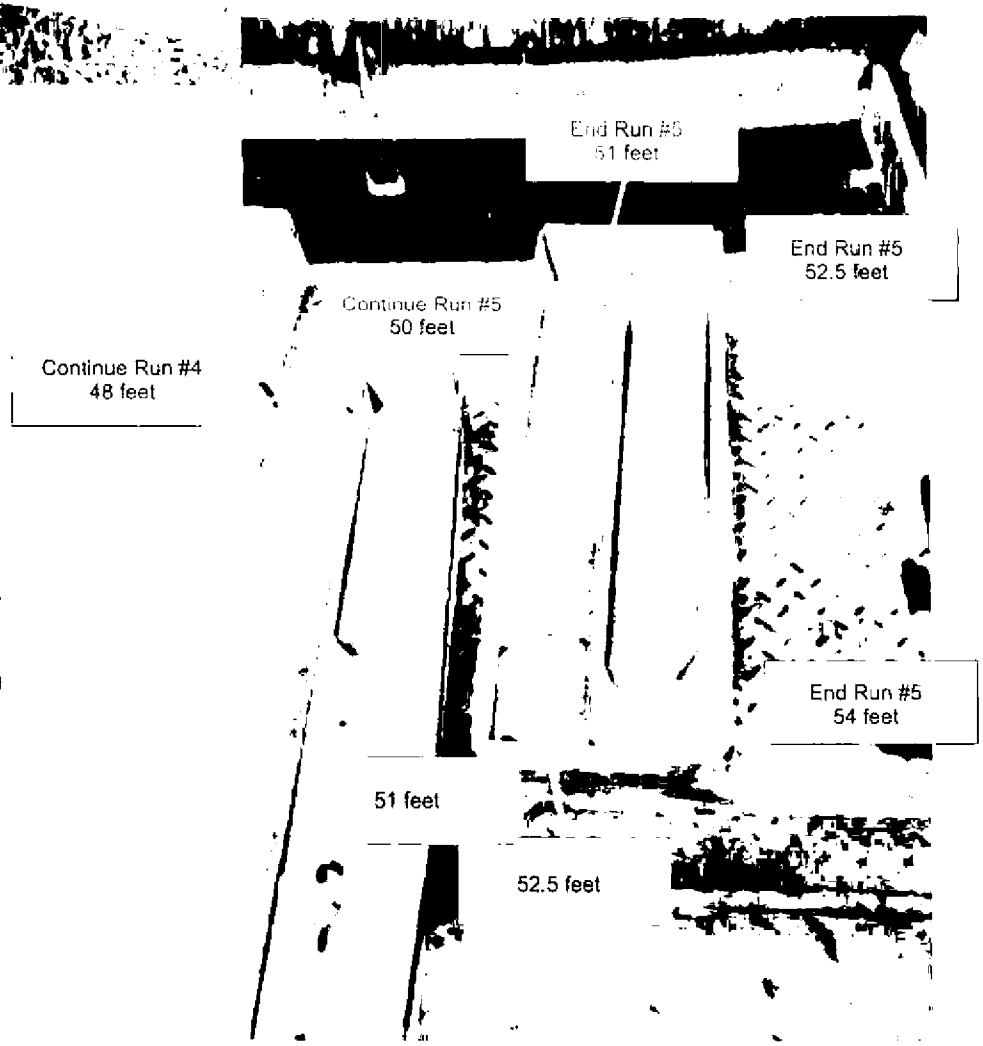


PB-BED-MW27
Box 4 of 24; 41-44 feet
Continue of Run #3; 41 - 44 feet
9/7/01 (#7 SL13)



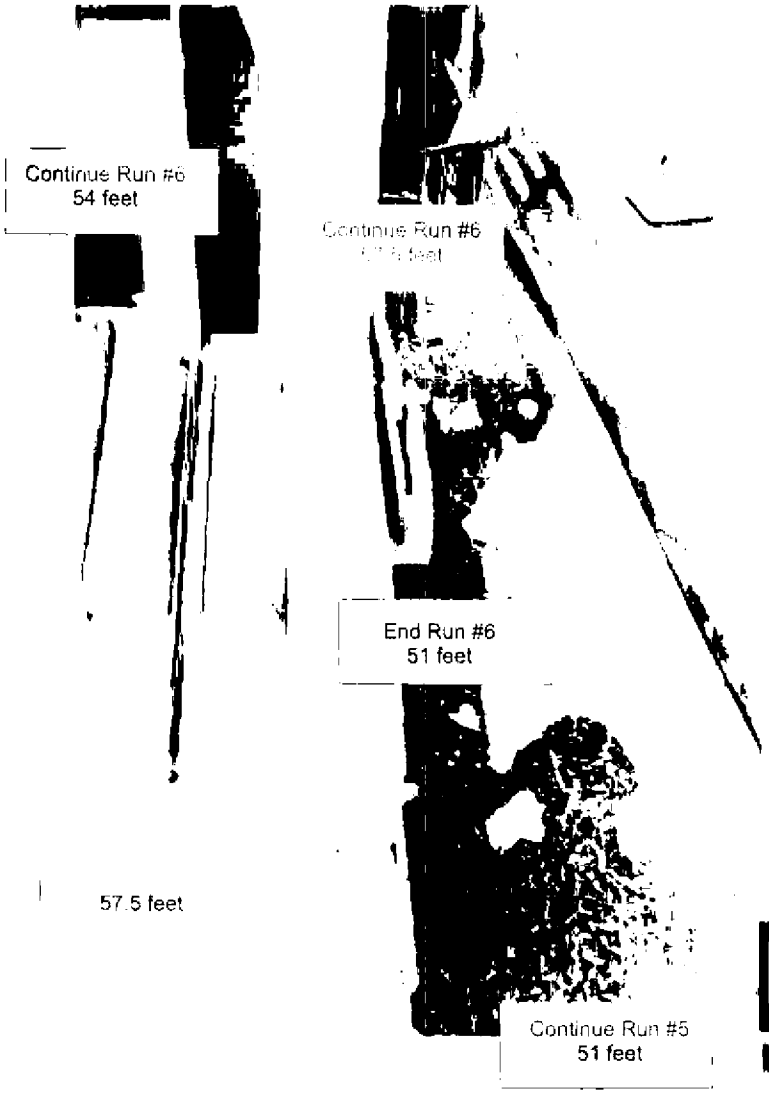
PB-BED-MW27
Box 5 of 24; 44-48 feet
Run #4 (44 49 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
Box 6 of 24; 48-51 feet
Run #5 (49 - 54 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
Box 7 of 24; 51-54 feet
Continue of Run #5; 51 - 54 feet
9/7/01 (#7 SI12)

(Heavy Petroleum Staining at
Brown Areas on Rock Core)



PB-BED-MW27
Box 6 of 24; 48-51 feet
Continue Run #4 (48 - 49 feet)
Run #5 (49 - 54 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
Box 7 of 24; 51-54 feet
Continue of Run #5 (51 - 54 feet)
9/7/01 (#7 SI11)

(Heavy Petroleum Staining at
Brown Areas on Rock Core)



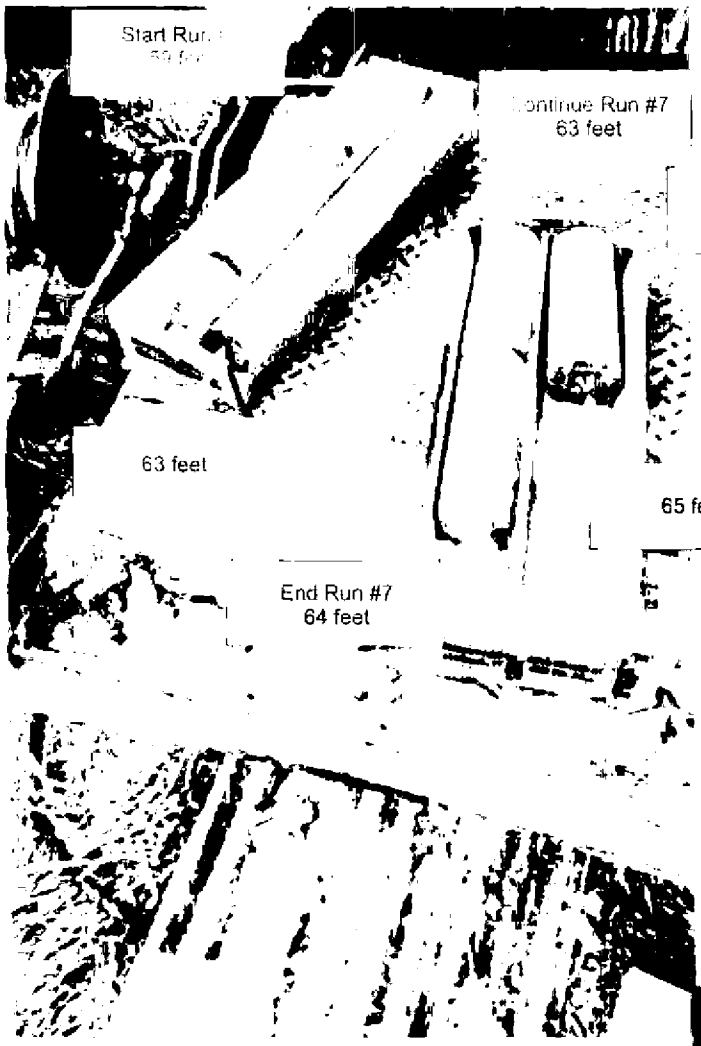
PB-BED-MW27
Box 8 of 24; 54-57.5 feet
Run #6 (54 - 59 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
Box 9 of 24; 57.5-59.0 feet
Continue of Run #6; 57.5 - 59 feet
9/7/01 (#7 SI9)

(Heavy Petroleum Staining at
Brown Areas on Rock Core)

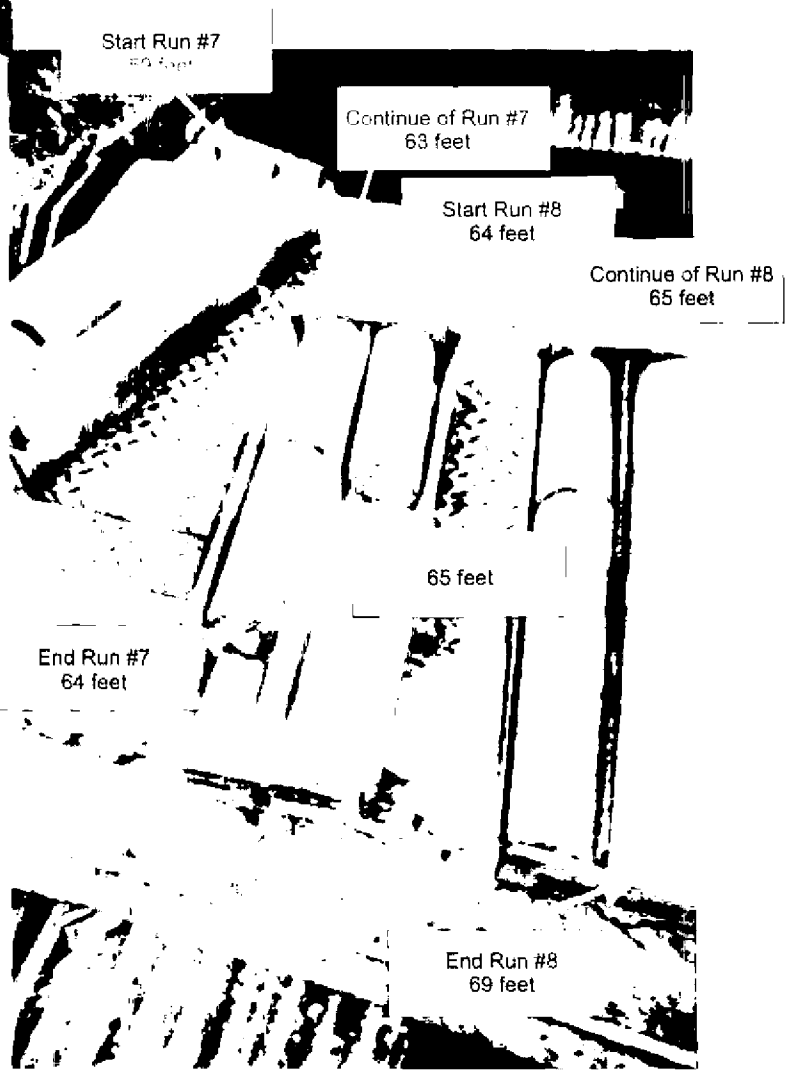
PB-BED-MW27
Box 7 of 24; 51-54 feet
Continue of Run #5; 51 - 54 feet
Box 8 of 24; 54-57.5 feet
Run #6 (54 - 59), Run 5 feet,
Recovered 5 feet, Lost 0 feet
Box 9 of 24; 57.5-59.0 feet
Continue of Run #6; 57.5 - 59.0 feet
9/7/01 (#7 SI10)

(Heavy Petroleum Staining at
Brown Areas on Rock Core)

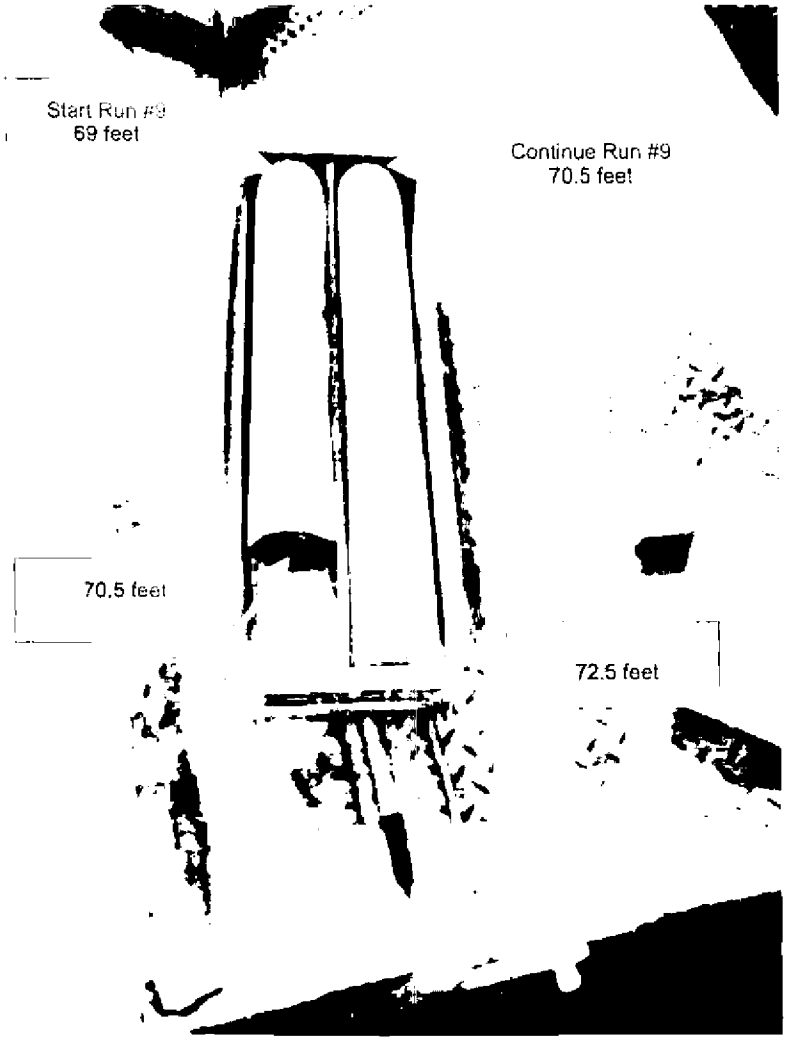
End Run #5
54 feet



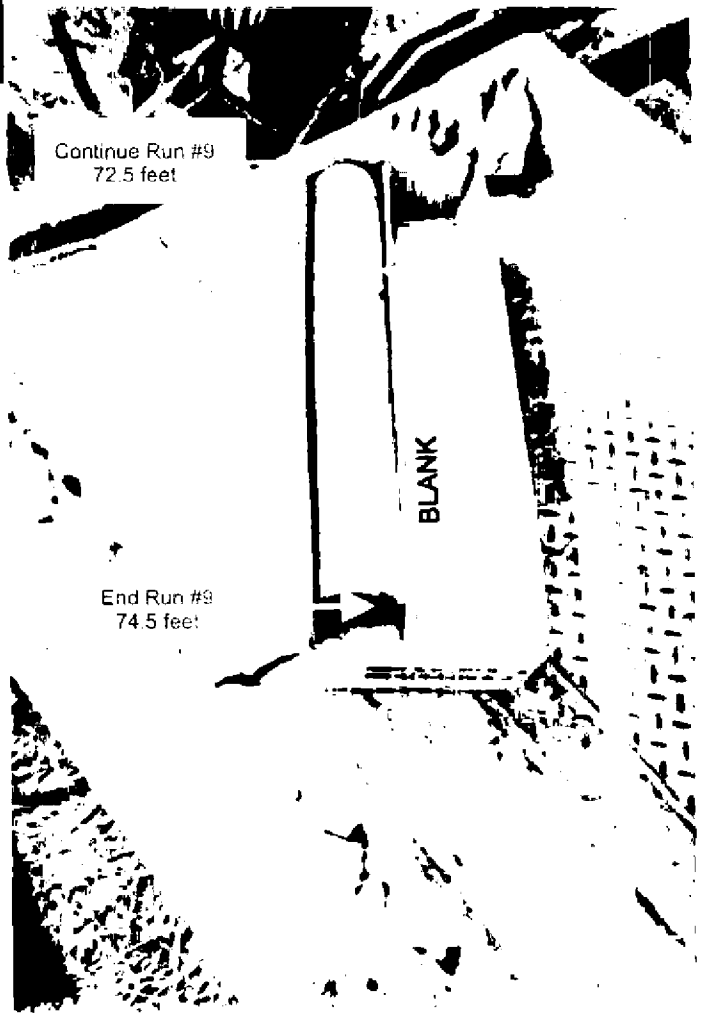
PB-BED-MW27
Box 10 of 24; 59-63 feet
Run #7 (59 - 64 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
Box 11 of 24; 63-65 feet
Continue of Run #7; 63 - 64 feet
Run #8 (64 - 69 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/7/01 (#7 SL8)



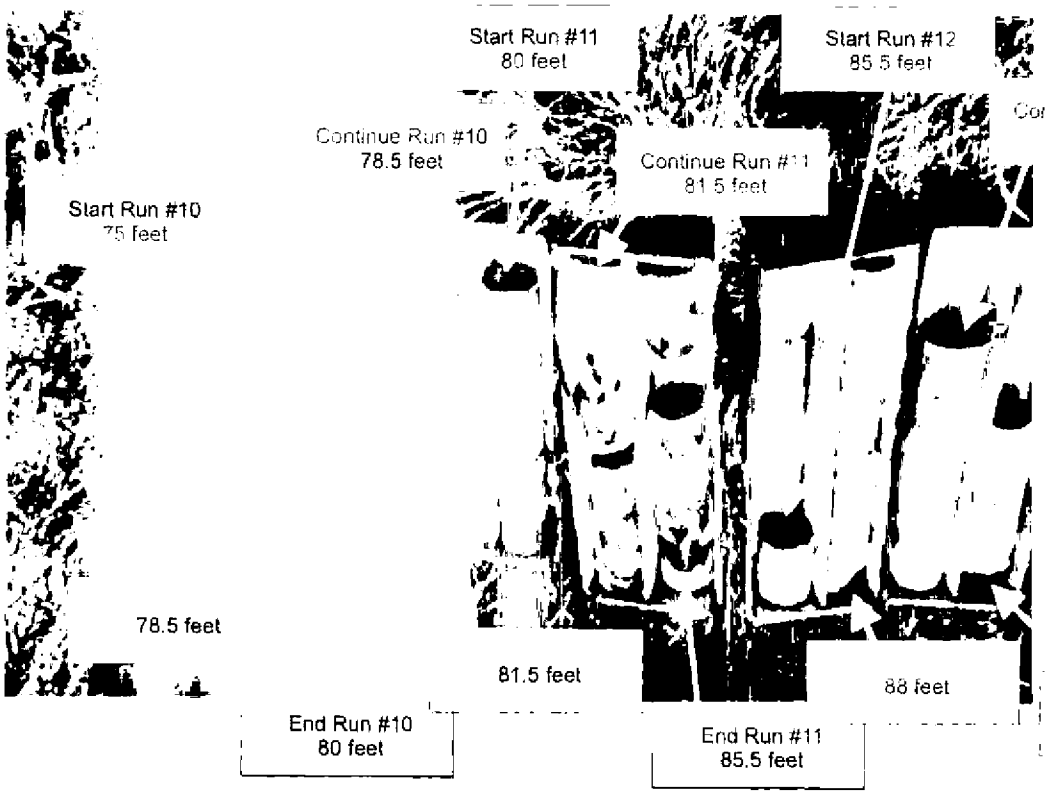
PB-BED-MW27
Box 10 of 24; 59-63 feet
Run #7 (59 - 64 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
Box 11 of 24; 63-65 feet
Continue of Run #7; 63 - 64 feet
Run #8 (64 - 69 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/7/01 (#7 SL7)



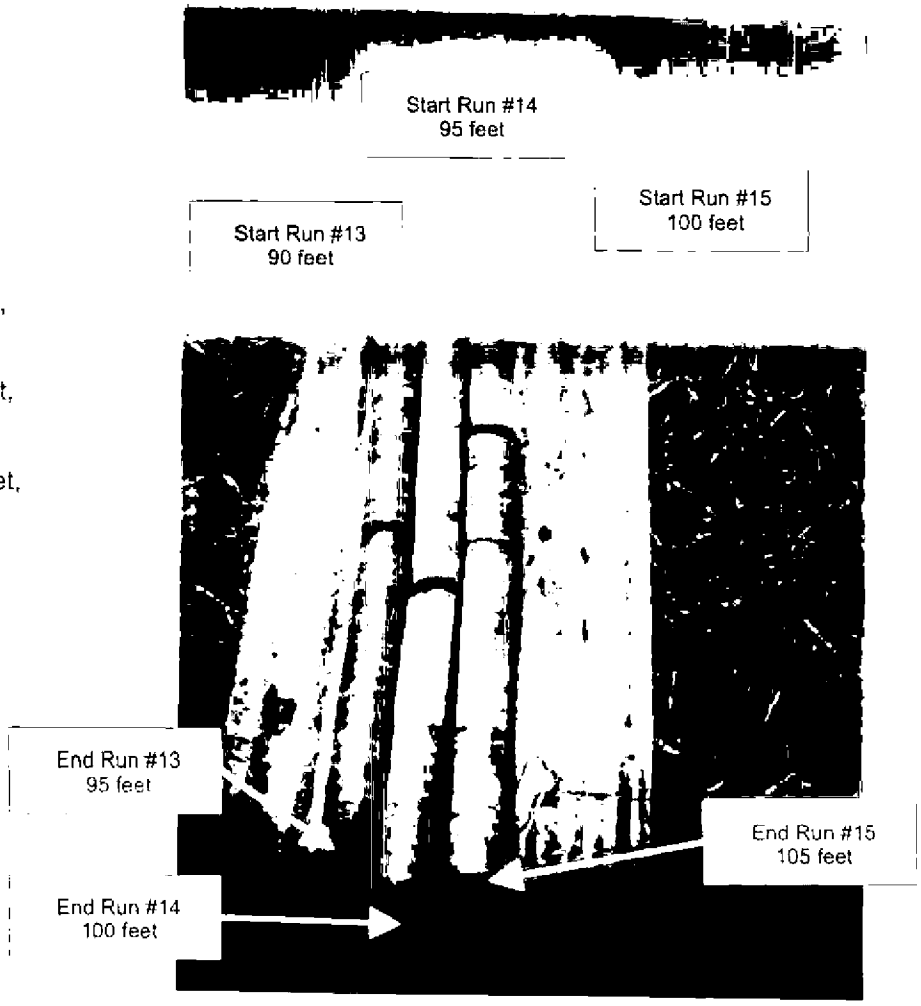
PB-BED-MW27
Box 13 of 24; 69-72.5 feet
Run #9 (69 - 75 feet), Run 6 feet,
Recovered 5.5 feet, Lost 0.5 feet
9/7/01 (#7 SL6)



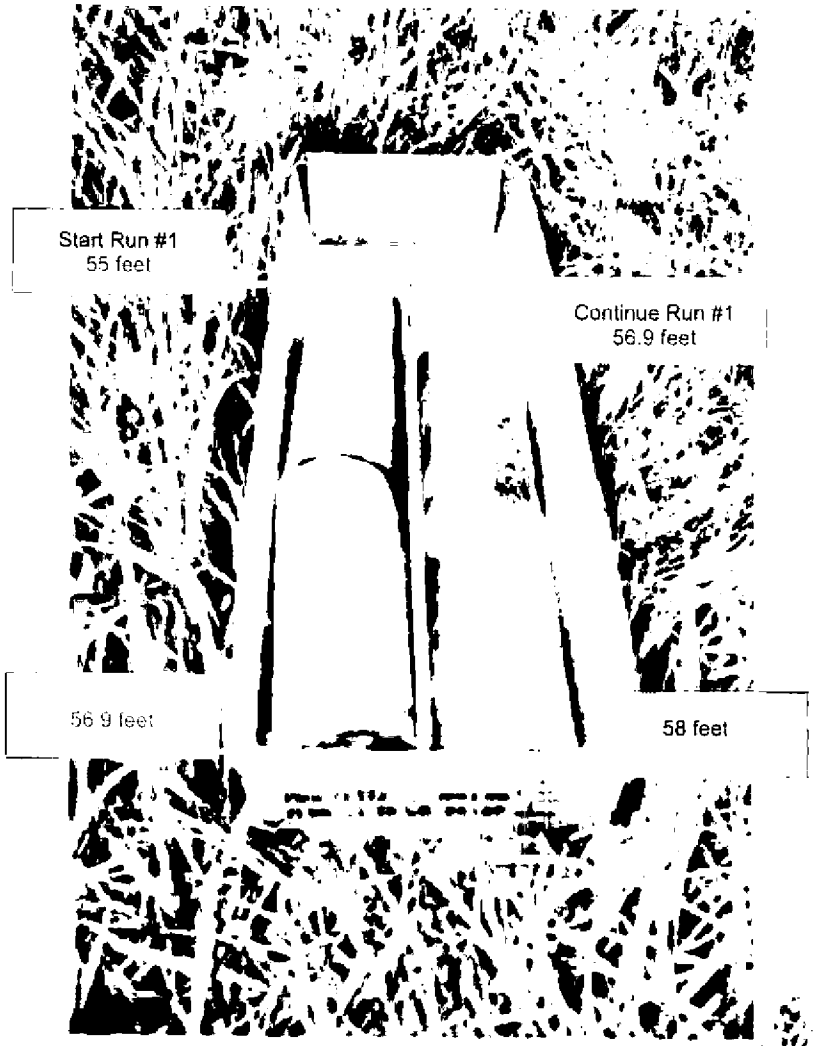
PB-BED-MW27
Box 14 of 24; 72.5-74.5 feet
Continue of Run #9; 72.5 - 74.5 feet
9/7/01 (#7 SL5)



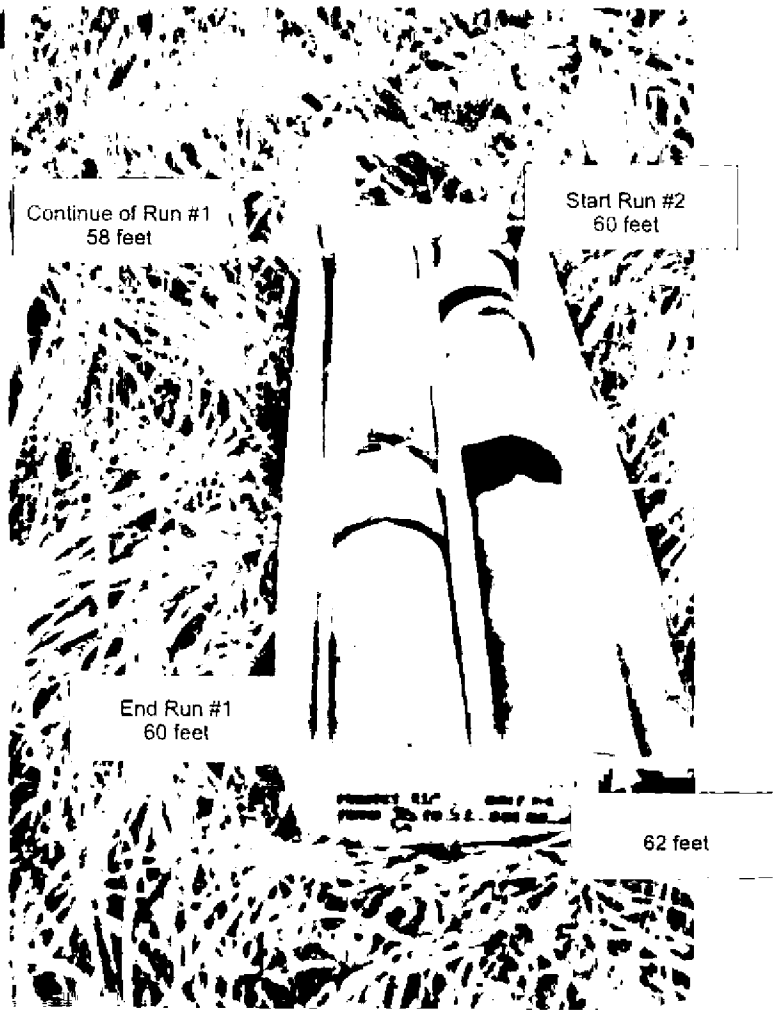
PB-BED-MW27
Box 15 of 24; 74.5 - 78.5 feet
Run #10 (75 -80 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
Box 16 of 24; 78.5 - 81.5 feet
Continue Run #10; 78.5 - 80 feet
Run #11 (80 - 85 feet), Run 5 feet,
Recovered 5.5 feet, Gained 0.5 feet
Box 17 of 24; 81.5 - 85.5 feet
Continue Run #11; 81.5 - 85.5 feet
Box 18 of 24; 85.5 - 88 feet
Run #12 (85 - 90 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
Box 19 of 24; 88 - 90 feet
Continue Run #12; 88 - 90 feet
9/8/01 (#7 SL2)



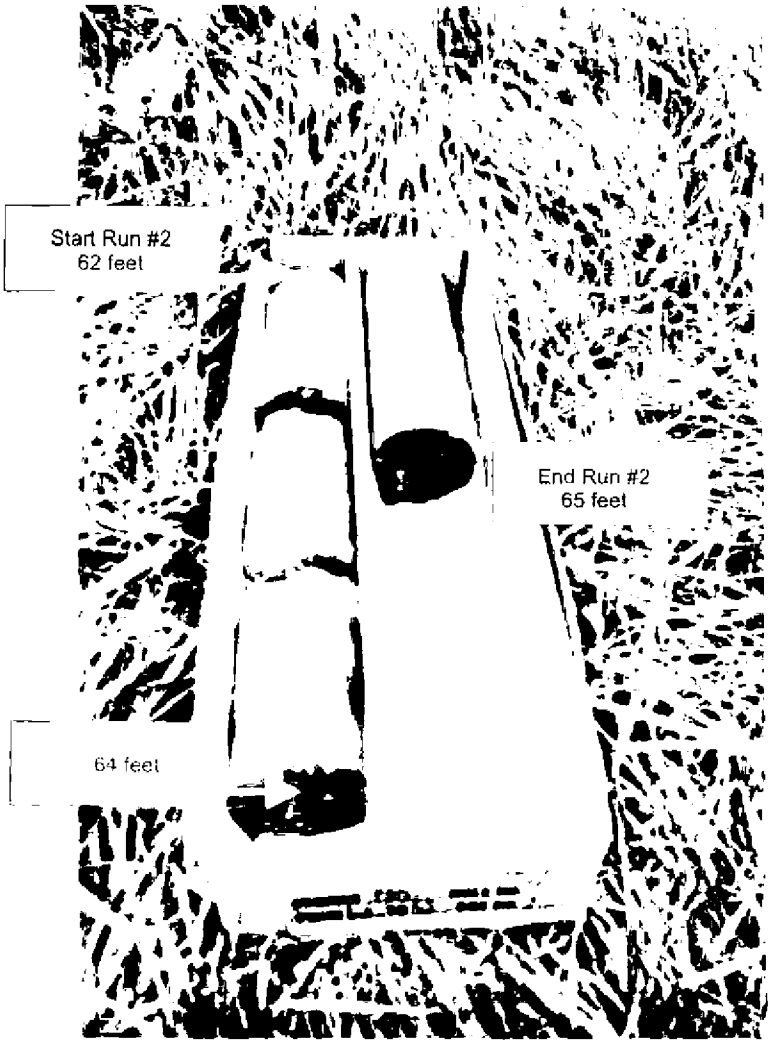
PB-BED-MW27
Core Left; 90-95 feet
Run #13 (90 - 95 feet), Run 5 feet,
Recovery 5 feet, Lost 0 feet
Core Center; 95-100 feet
Run #14 (95 - 100 feet), Run 5 feet,
Recovery 5 feet, Lost 0 feet
Core Right; 100-105 feet
Run #15 (100 - 105 feet), Run 5 feet,
Recovery 5 feet, Lost 0 feet
Total Depth at 105 feet
9/8/01 (#7 SL3)



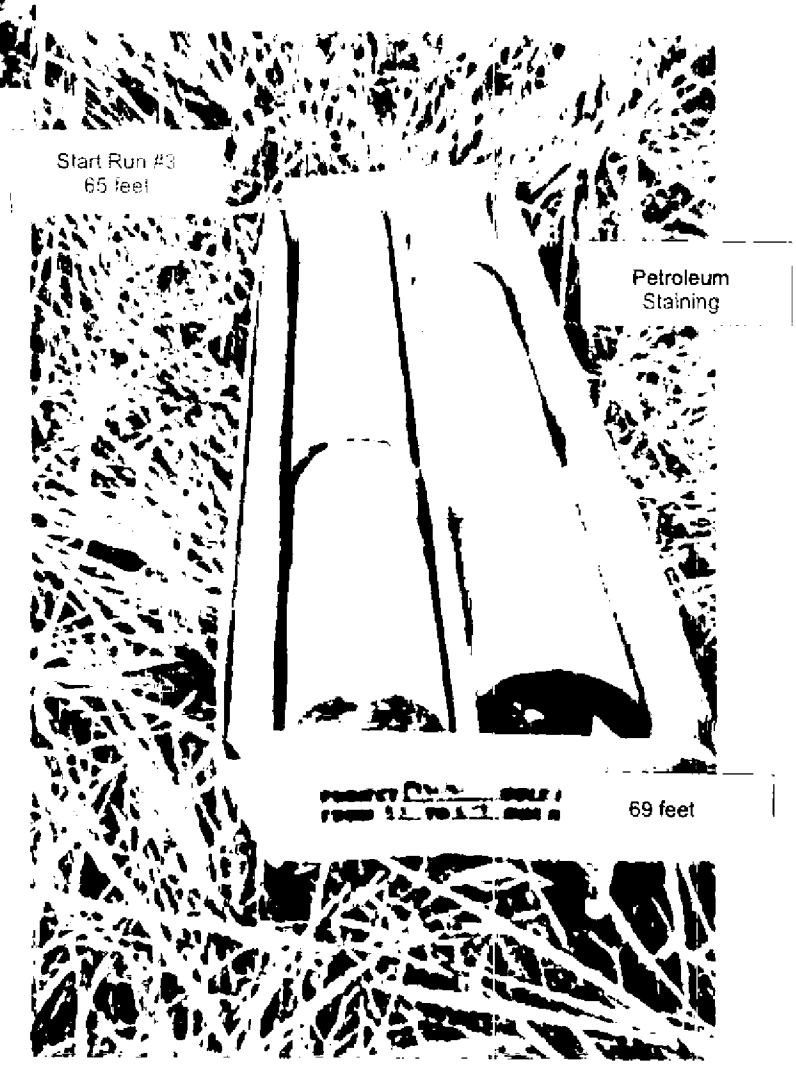
TNTA-BEDGW-001
Box 1 of 9; 55-58 feet
Run #1 (55 - 60 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/13/01 (#1 SI19)



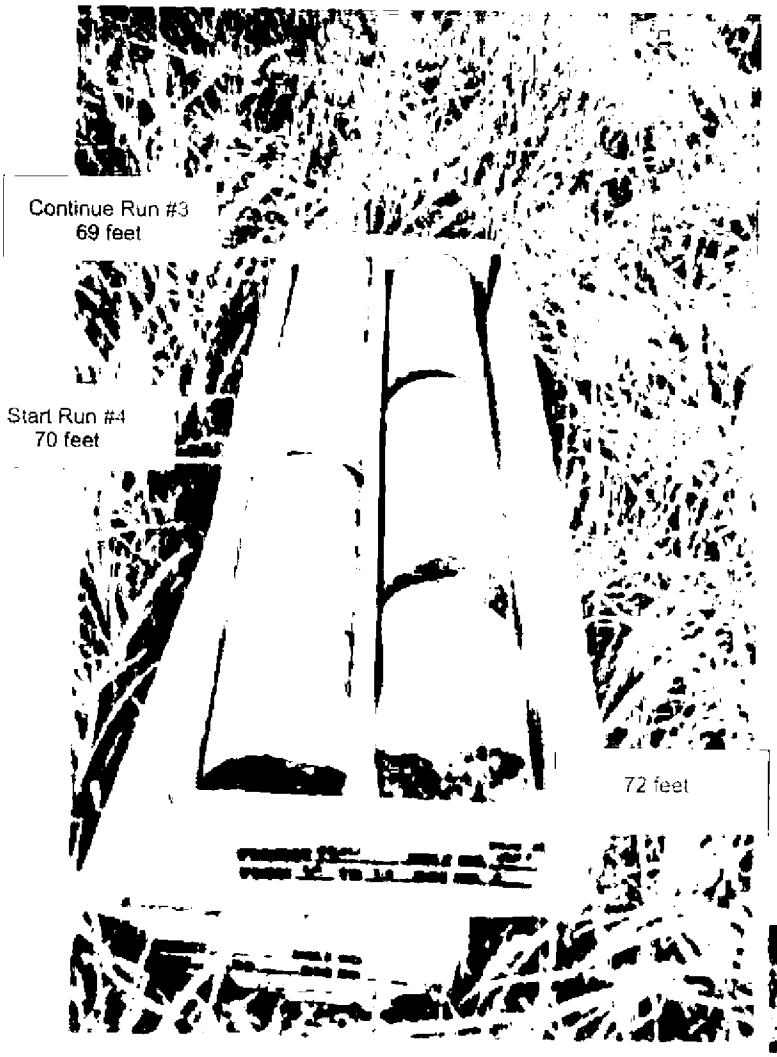
TNTA-BEDGW-001
Box 2 of 9; 58-62 feet
Continue of Run #1; 58 -60 feet
Start Run #2 (60 - 65 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/13/01 (#1 SL18)



TNTA-BEDGW-001
Box 3 of 9; 62-65 feet
Continue of Run #2; 62 - 65 feet
9/13/01 (#1 SL17)

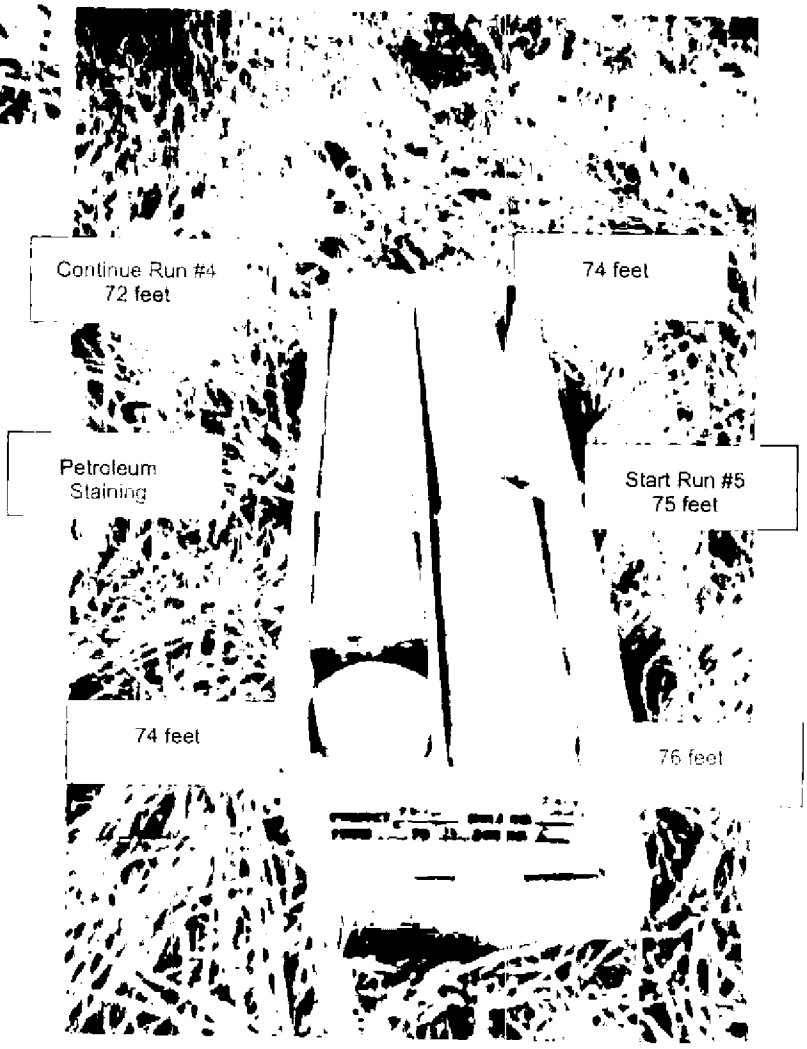


TNTA-BEDGW-001
Box 4 of 9; 65-69 feet
Run #3 (65 - 70 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/13/01 (#1 SL16)

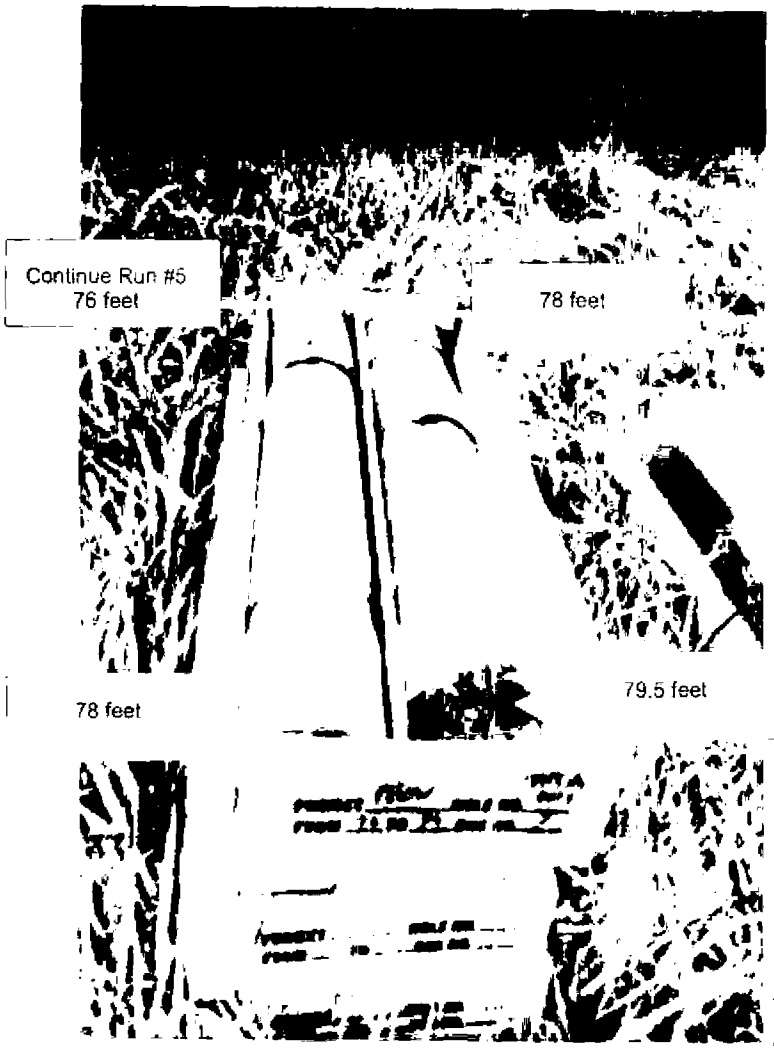


TNTA-BEDGW-001
Box 5 of 9; 69-72 feet
Continue Run #3; 69 - 70 feet
Run #4 (70 - 75 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/13/01 (#1 SI15)

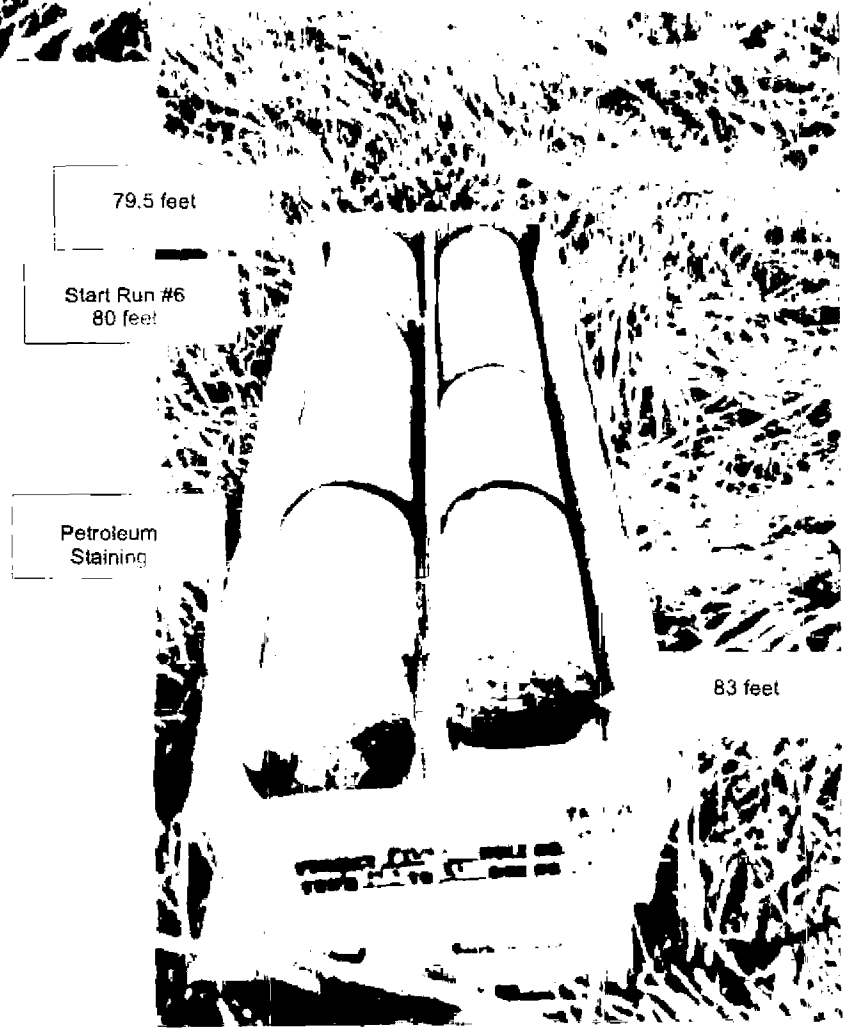
(Petroleum Staining at
Brown Areas on Rock Core)



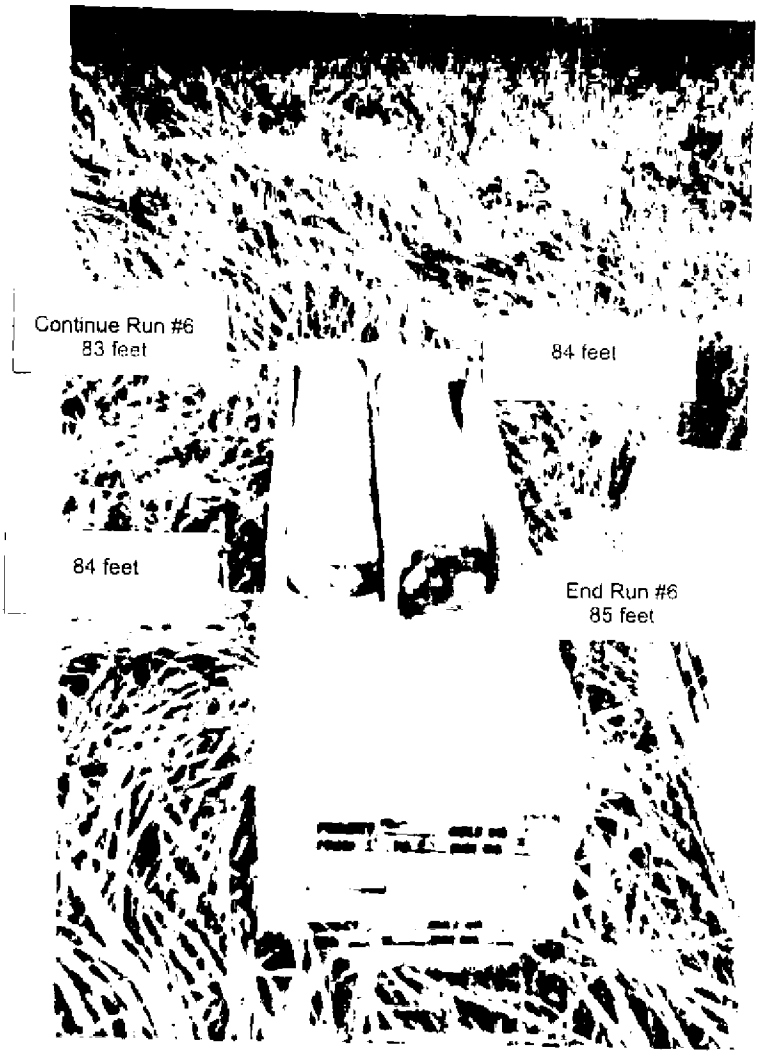
TNTA-BEDGW-001
Box 6 of 9; 72-76 feet
Continue Run #4; 72 - 75 feet
Run #5 (75 - 80 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/13/01 (#1 SL14)



TNTA-BEDGW-001
Box 7 of 9; 76-79.5 feet
Continue of Run #5; 76 - 79.5 feet
9/13/01 (#1 SL13)



TNTA-BEDGW-001
Box 8 of 9; 79.5-83 feet
Continue of Run #5; 79.5 - 80 feet
Run #6 (80 -85 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/13/01 (#1 SL12)

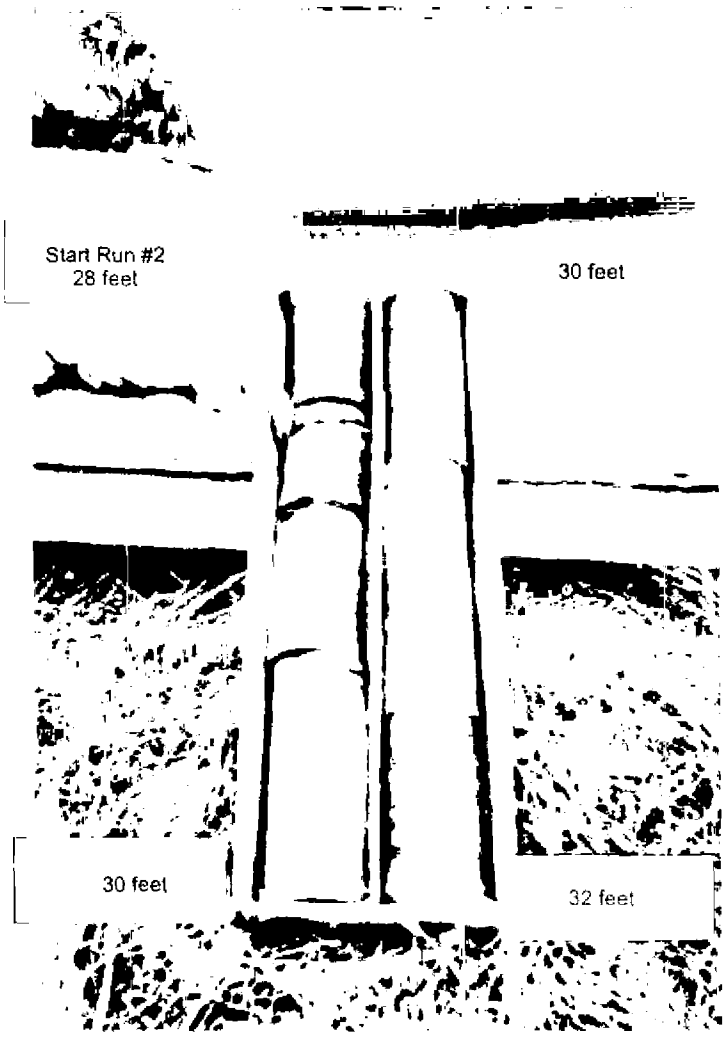


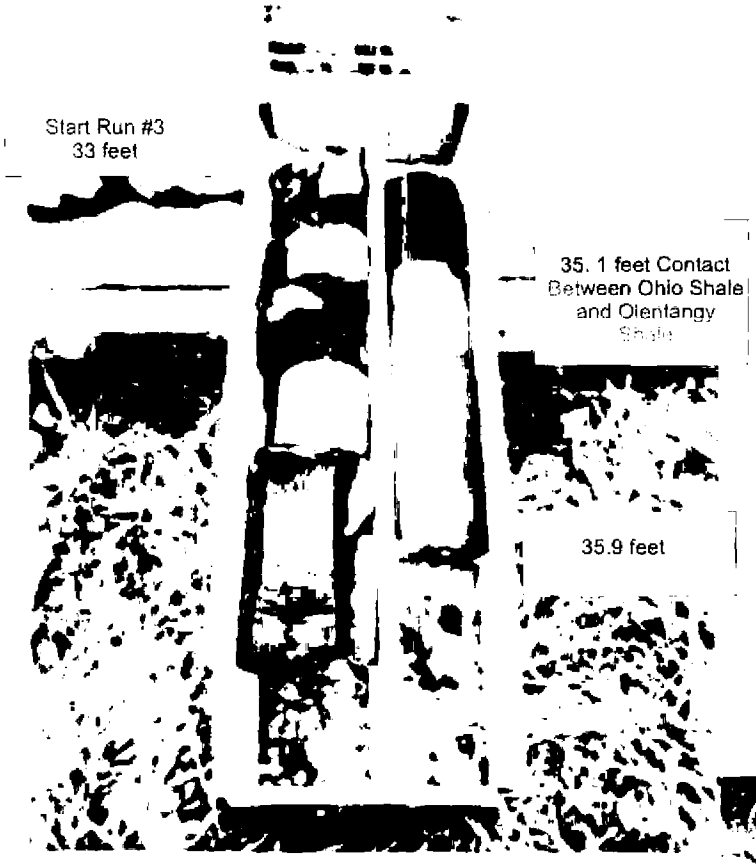
TNTA-BEDGW-001
Box 9 of 9; 83-85 feet
Continue of Run #6; 83 - 85 feet
Total Depth at 86 feet
9/13/01 (#1 SL12)

TNTB-BEDGW-003
Run #1 (23 - 28 feet)
Run 5 feet, Recovered 0 feet,
Lost 5 feet

No photograph
Borehole Open to
28 feet, Rock Core Washed Away

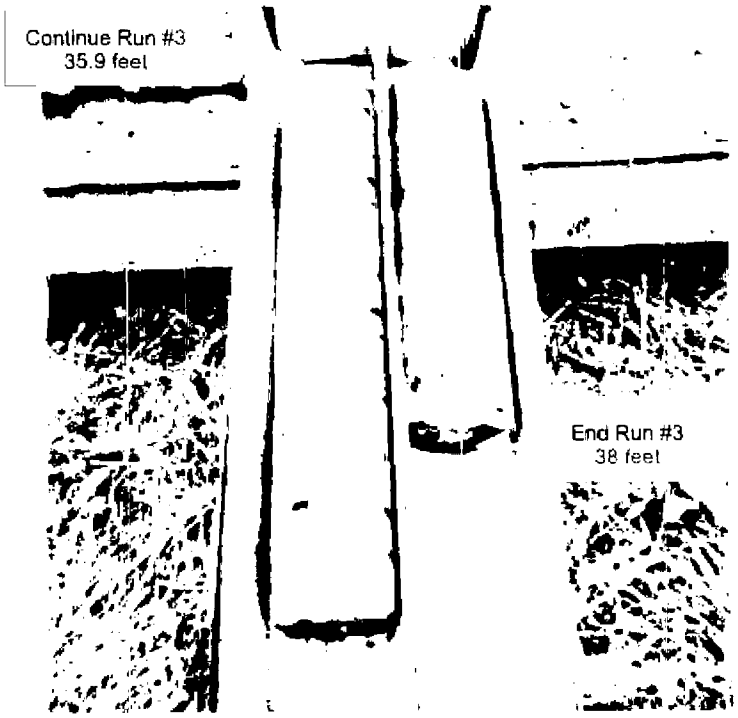
TNTB-BEDGW-003
Box 1 of 5; 28-32 feet
Run #2 (28 - 33 feet), Run 5 feet,
Recovered 4 feet, Lost 1 foot
9/7/01 (#2 SL27)

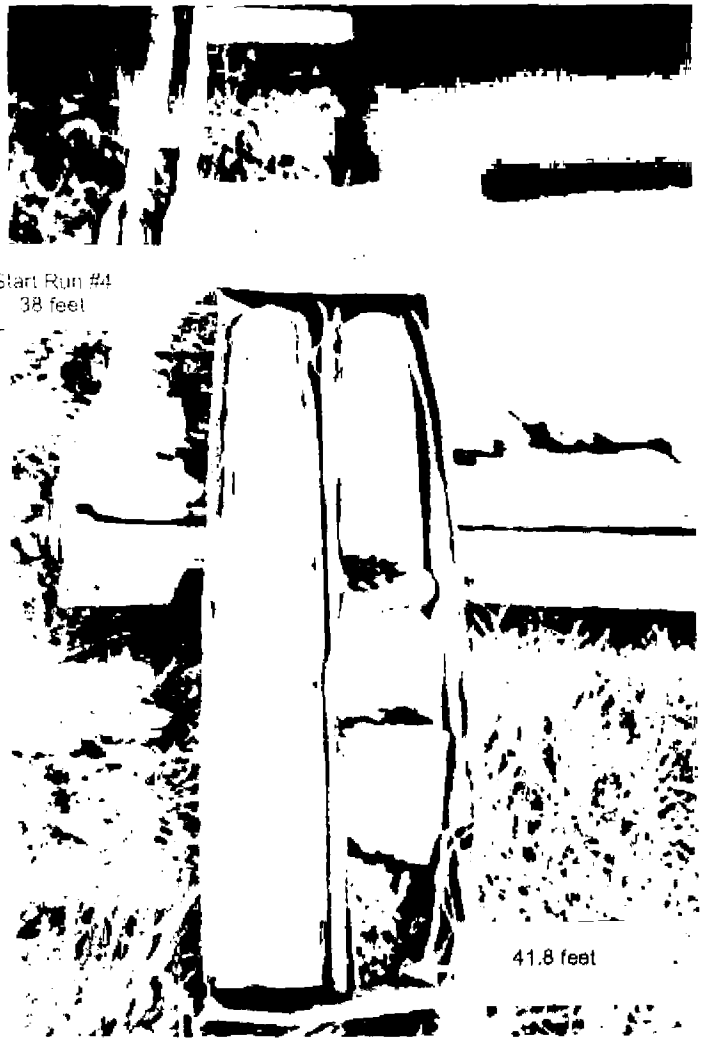




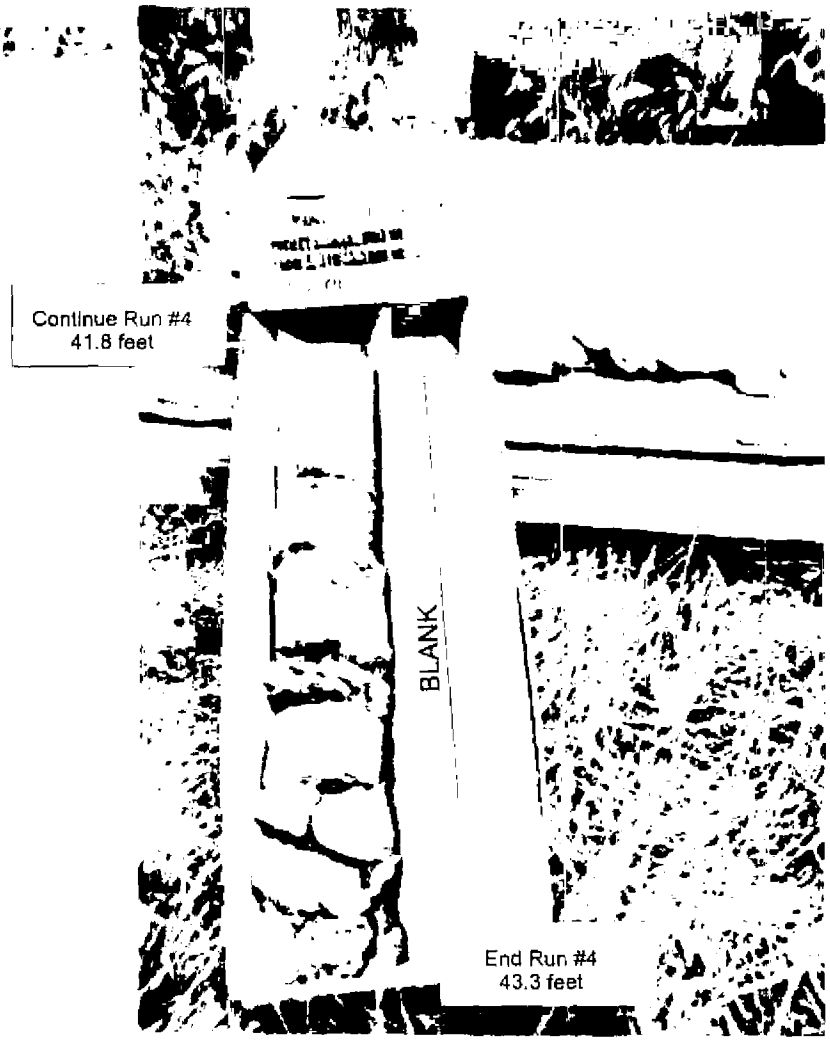
TNTB-BEDGW-003
Box 2 of 5; 33-35.9 feet
Run #3 (33 - 38 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/7/01 (#2 SL26)

TNTB-BEDGW-003
Box 3 of 5; 35.9-38 feet
Run #3, Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/8/01 (#2 SL25)

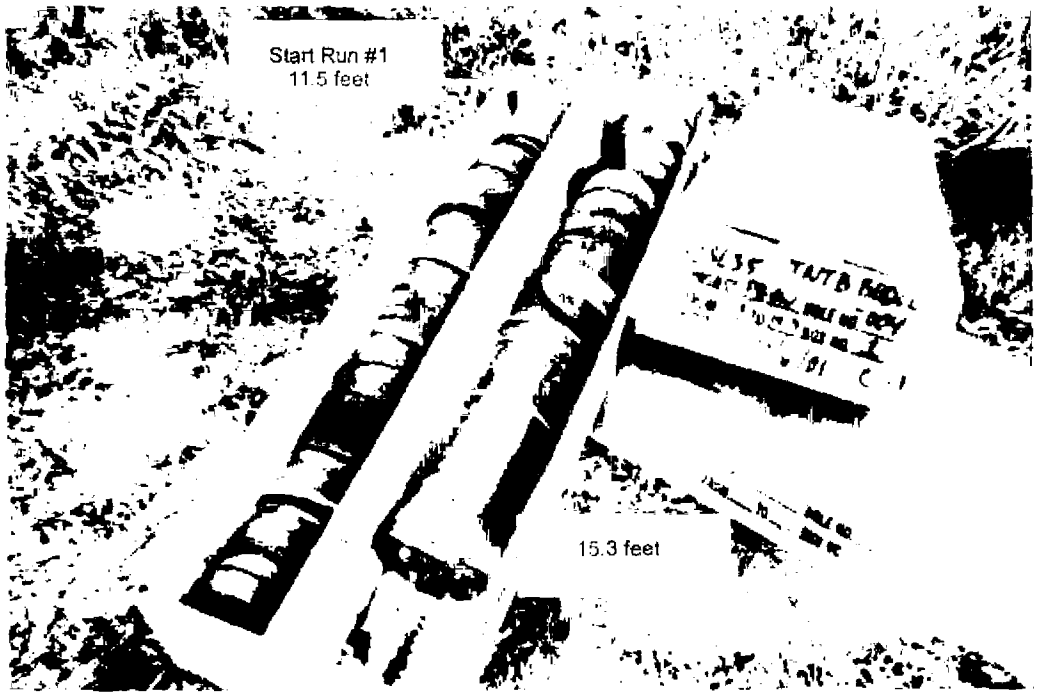




TNTB-BEDGW-003
Box 4 of 5; 38- 41.8 ft
Run #4 (38 - 43.3 feet), Run 5 feet,
Recovered 5.3 feet, Lost 0 feet
9/8/01 (#2 SL24)

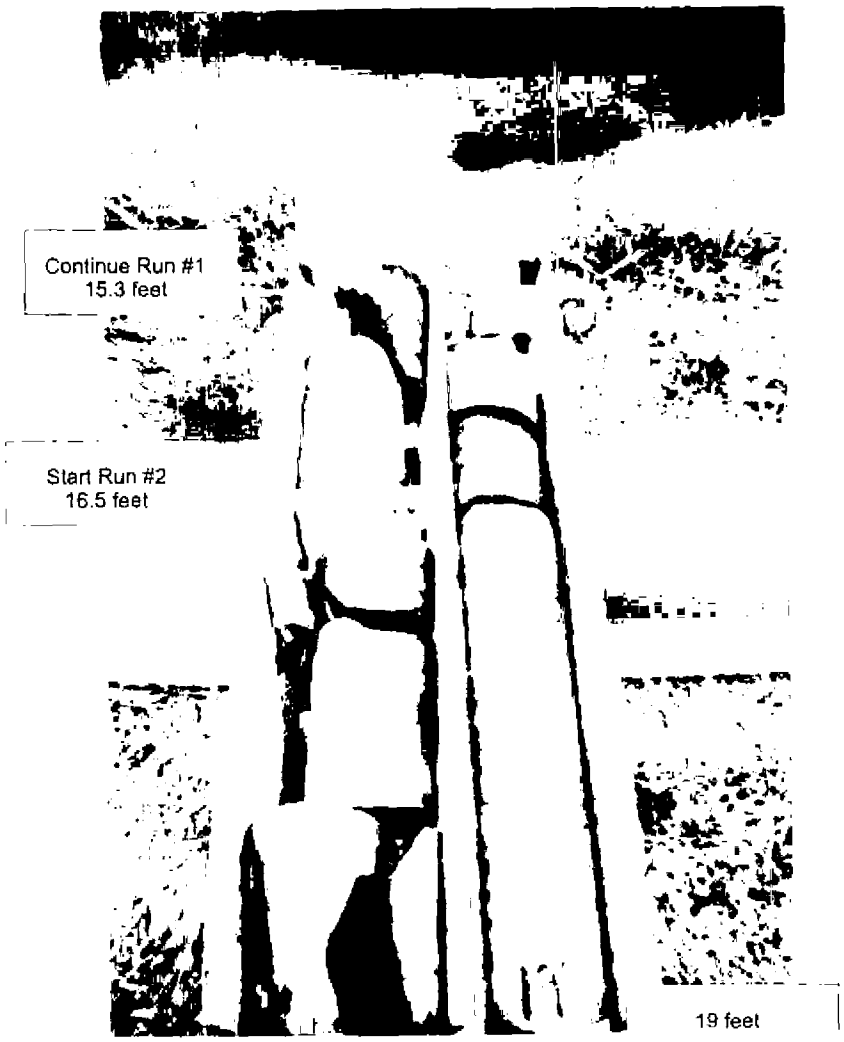


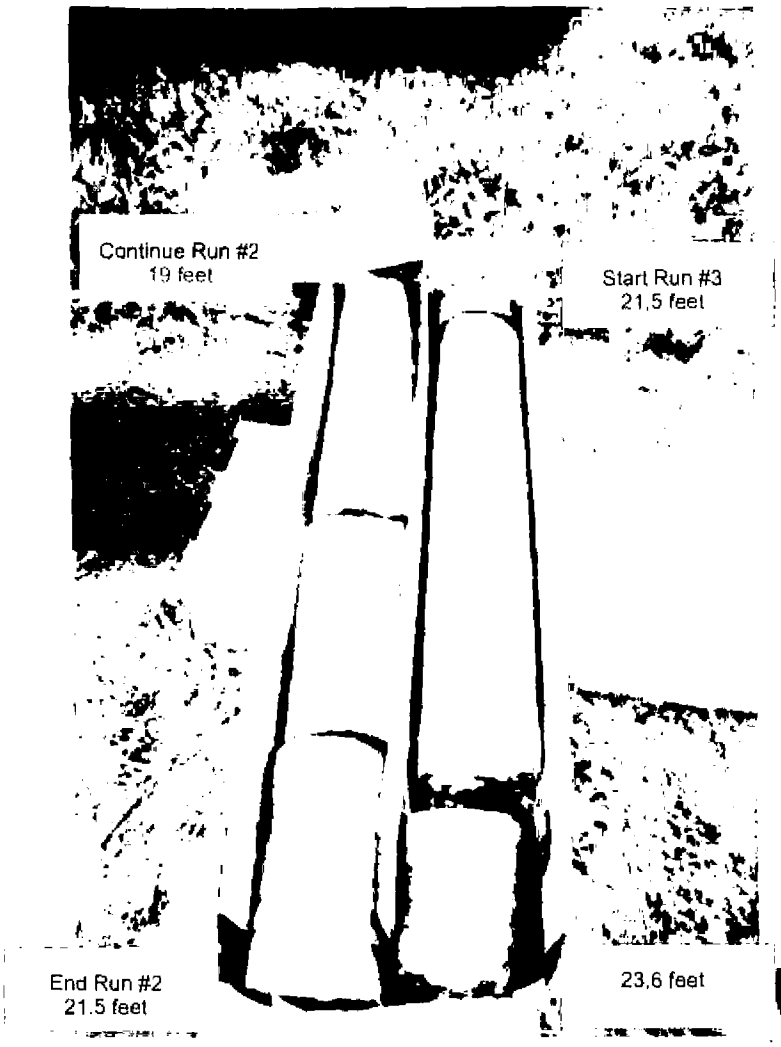
TNTB-BEDGW-003
Box 5 of 5; 41.8-43.3 feet
Continue of Run #4; 41.8 - 43.3
Total Depth 43.3 feet
9/8/01 (#2 SL23)



TNTB-BEDGW-004
Box 1 of 4; 11.5-15.3 feet
Run #1 (11.5 - 16.5 feet),
Run 5 feet, Recovered 4.5 feet,
Lost 0.5 feet
9/6/01 (#4, SL5)

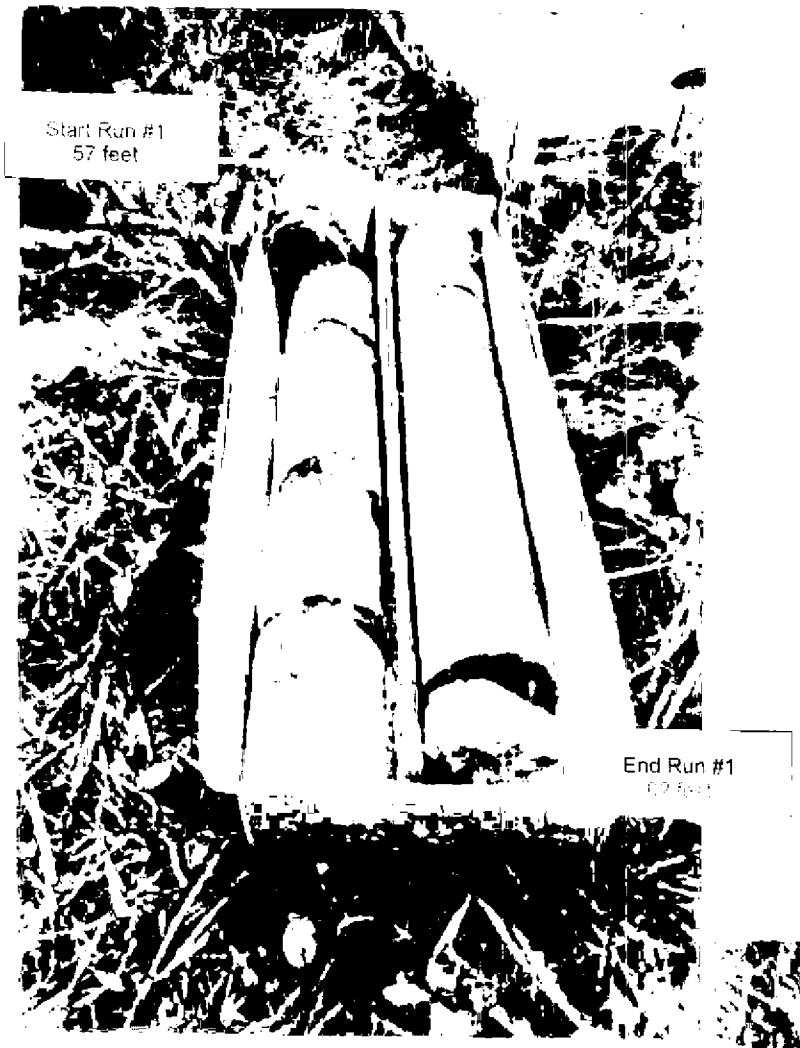
TNTB-BEDGW-004
Box 2 of 4; 15.3-19 feet
Continue of Run #1; 15.3 - 16.5 feet
Run #2 (16.5 - 21.5 feet), Run 5 feet,
Recovered 5.3, Gained 0.3 feet
9/6/01 (#4, SL4)



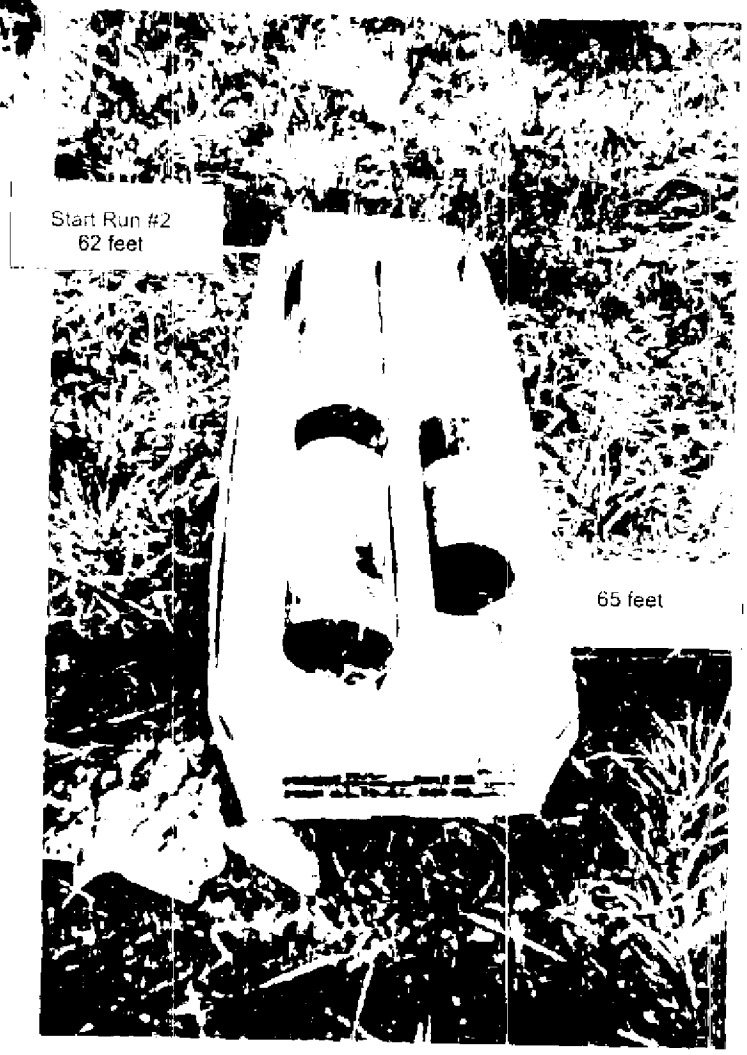


TNTB-BEDGW-004
Box 3 of 4; 19.0-23.6 feet
Continue Run #2; 19 - 21.5 feet
Run #3 (21.5 - 26.1 feet), Runt 4.6 feet,
Recovered 4.6 feet, Lost 0 feet
9/6/01 (#4, SL3)

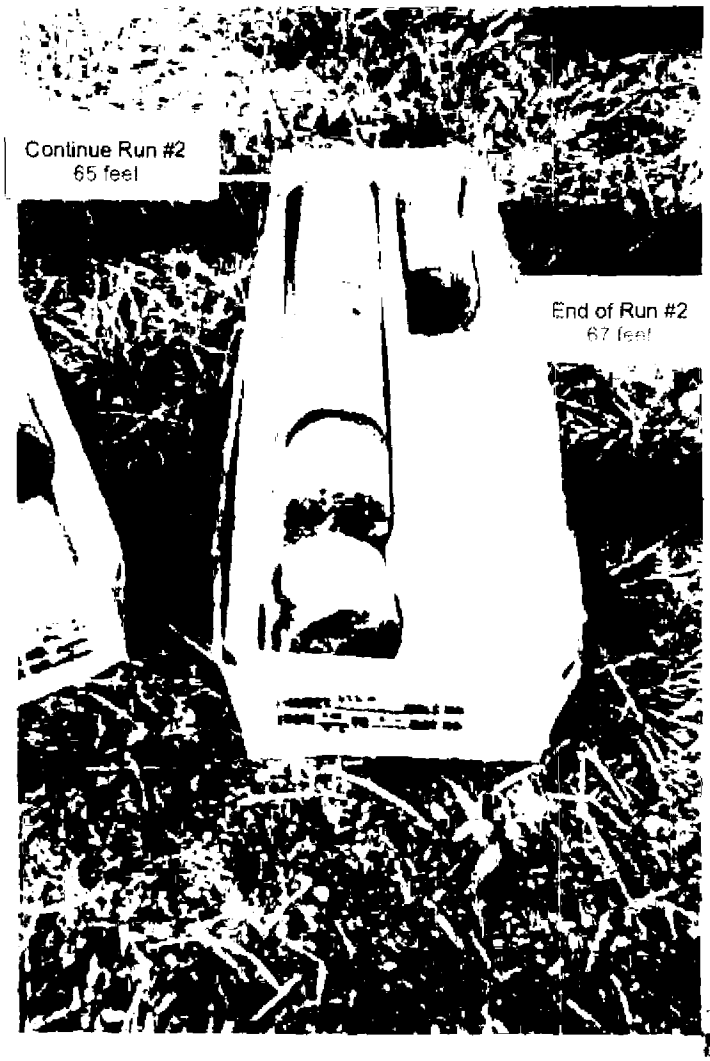
TNTB-BEDGW-004
Box 4 of 4; 23.6-26.1 feet
Continue of Run #3; 23.6 - 26.1 feet
Total Depth at 26.1 feet
9/6/01 (#4, SL2)



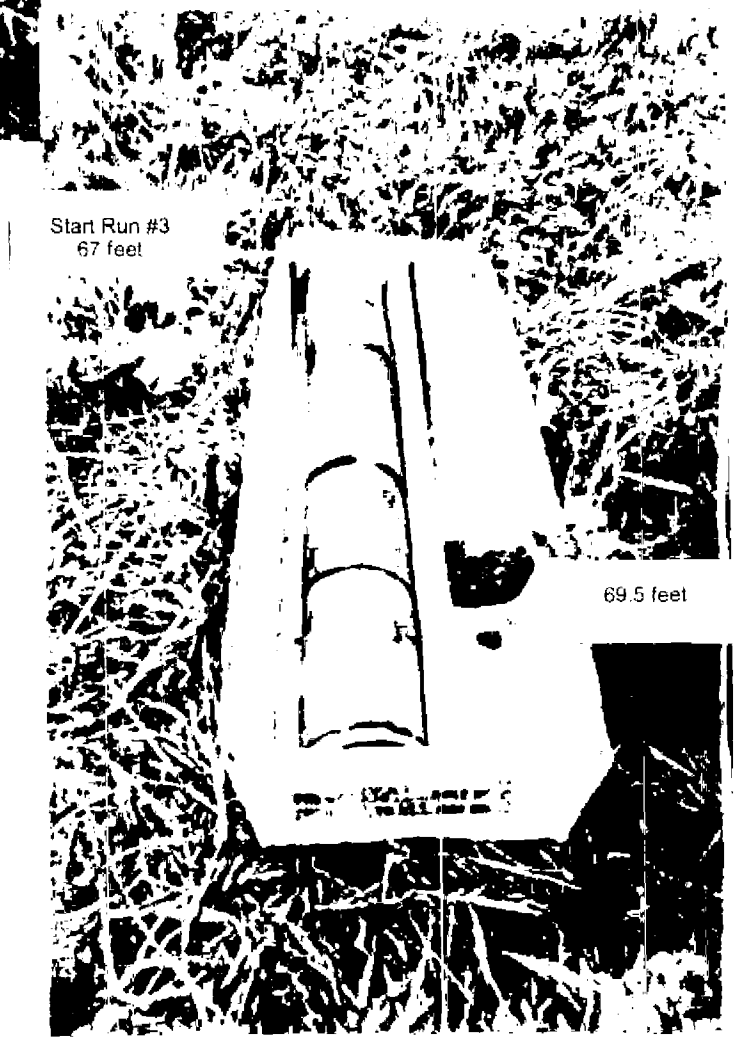
TNTC-BEDGW-001
Box 1 of 9; 57-62 feet
Run #1 (57 - 62 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/11/01 (#1 SL25)



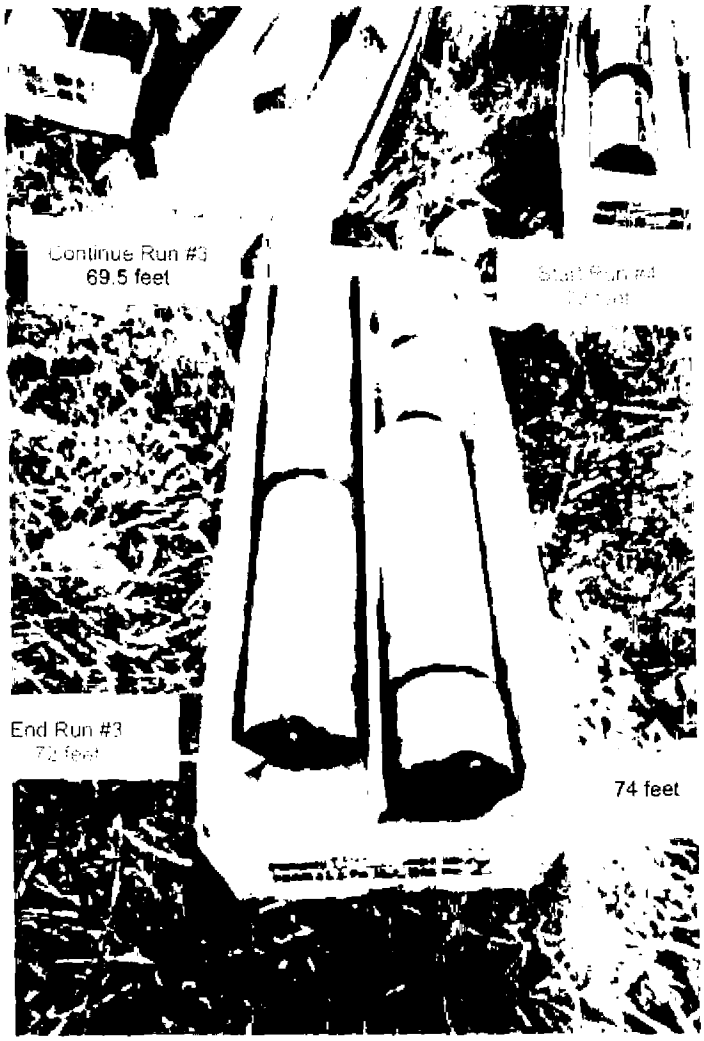
TNTC-BEDGW-001
Box 2 of 9; 62-65 feet
Run #2 (62 - 67 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/11/01 (#1 SL24)



TNTC-BEDGW-001
Box 3 of 9; 65-67 feet
Continue of Run #2; 65 - 67 feet
9/11/01 (#1 SL23)



TNTC-BEDGW-001
Box 4 of 9; 67-69.5 feet
Run #3 (67 - 72 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/11/01 (#1 SL22)



TNTC-BEDGW-001
Box 5 of 9; 69.5-74 feet
Continue of Run #3; 69.5 - 72 feet
Run #4 (72 - 77 feet), Run 5 feet,
Recovered 5 feet, Lost 0 feet
9/11/01 (#1 SI21)

TNTC-BEDGW-001
Pictures not taken of:
Box 6 of 9; 74-76 feet
Box 7 of 9; 76-78.5 feet
Box 8 of 9; 78.5-82 feet
Box 9 of 9; 82-86 feet
Total Depth at 86 feet

No Pictures Taken for:

PB-BED-MW23. Monitoring well went dry during development. Final turbidity reading 1511.8 NTU, 9/14/01.

PB-BED-MW25. Final turbidity reading 26.3 NTU, 9/19/01.

TNTB-BEDGW-003. Monitoring well went dry during development, 9/14/01.

APPENDIX E

WELL DEVELOPMENT LOGS

COMPLETED 9/22/01

GOOD

IT CORPORATION

Well Development Log

Project Number: 825635
Project Name: PBOW
Form Completed by: CARLOS GRANADE
Well Developed by/firm: GIART LONGYEAR

Site ID:
Location ID: PB BED MW 22
Date Started: 9/21/01

Monitoring Well Information

Development Method:
Development Equipment: GRUNDFOS PUMP & BAILER

Screen Height (ft): 15
Filter pack lenght (ft): 17"
Casing Diameter (in): 2

Begining Measurements (BTOC)
Depth to Water (ft): 30.15
Total depth of Well (ft): 44.45

Monitoring Well Purge Calculations

Volume of Water in Casing:
Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (2)^2) = 0.16 gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = 14.3 ft x 0.16 gal/ft = 2.28 gallons

50 GALLONS LOST

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((6)^2 - (2)^2) = 1.31 gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (14.3) ft x (1.31) gal/ft x 0.3 = 5.62 gal

Purge Well Volume:
Purge well Volume = Filter pack volume + Well Volume = 5.61 gal + 2.28 gal = 7.89 gal.

39.45
50.00
89.45

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
7.89	15.78	23.67	31.56	39.45

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conducivity (mS/cm)	D.O. (mg/L)	ORP Redox (mV)	Comments
0935	3	36.13	8373	GRAY	15.10	7.13	0.915	3.08	-84	0930 BEGAN BAILING
0945	4.5	40.10	1609	GRAY	15.19	7.11	0.869		-68.4	
0950	5.5	WELL DRY								
1004	6.5	WELL DRY								
1026	7.0	40.10	1615	GRAY	16.42	7.34	0.849	1.84		WELL DRY
1040	9.0	40.90	1578.4	GRAY	13.13	6.88	0.984	5.01	-110	BAILING
1050	12.0	40.10	1598.5	GRAY	13.06	6.85	1.00	2.22	-122	
1100	14.00	40.90	1597	GRAY	12.79	6.86	0.967	1.58	-127	
1120	16.5	43.00	1158	LIGHT GRAY WHITE	12.92	6.80	1.08	2.30	-116	

COMPLETED GOOD 9/22/01

IT CORPORATION

Well Development Log

Project Number: 825635
Project Name: PBOW
Form Completed by: CARLOS GRANADE
Well Developed by/firm: BART LONGYEAR

Site ID: PBOW
Location ID: ~~PBOWED~~ MW22
Date Started: 9/21/01

Monitoring Well Information

Development Method:
Development Equipment:

Screen Height (ft): 15
Filter pack lenght (ft): 17
Casing Diameter (in): 2

Begining Measurements (BTOC)
Depth to Water (ft): 30.15
Total depth of Well (ft): 44.45

Monitoring Well Purge Calculations

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ gal/ft = _____ gallons

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((_____)^2- (_____)^2) = _____ gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (_____)ft x (_____) gal/ft x 0.3 = _____ gal

Purge Well Volume: Purge well Volume = Filter pack volume + Well Volume = _____ gal + _____ gal = _____ gal.

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
7.89	15.78	23.67	31.56	39.45

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity. (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	~~Redox~~ ORP (mV)	Comments
1150	17.0	31.9	406.3	GRAY	13.06	6.77	1.106	4.92	-132.5	
1220	28.5	43.16	728	GRAY	12.57	6.91	1.16	5.03	-113.8	
1221			WELL BAILED DRY							
1420	~~237~~ 23.5	37.2	1235.8	GRAY	12.98	6.87	1.13	4.61	-117.6	1410 BEGAN BAILING
1430	26.5	42.5	1284	GRAY	12.43	6.80	1.14	3.50	-125.3	
1440	28.0	43.5	366	GRAY	12.51	6.74	1.10	3.88	-140.8	
0850	28.0	30.15	456	GRAY CLOUDY	11.97	6.92	1.00	—	-115.0	9/22/01
0905	31	34.60	1134	GRAY CLOUDY	11.97	6.84	0.969	13.02	-125.8	
0915	33	38.40	912	GRAY CLOUDY	11.92	6.77	1.07	12.26	-163	

COMPLETED 9/22/03
GOOD

IT CORPORATION

Well Development Log

Project Number: 825635
Project Name: PBOW
Form Completed by: CHRIS GRAWUK
Well Developed by/firm: BOART LONGYEAR

Site ID:
Location ID: PBOW MW 22
Date Started: 9/21/03

Monitoring Well Information

Development Method:
Development Equipment: PUMP - GRUNFOS & BAILER

Screen Height (ft): 15
Filter pack lenght (ft): 17
Casing Diameter (in): 2"

Begining Measurements (BTOC)
Depth to Water (ft): 30.15
Total depth of Well (ft): 44.45

Monitoring Well Purge Calculations

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ gal/ft = _____ gallons

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((_____)^2- (_____)^2) = _____ gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (_____)ft x (_____) gal/ft x 0.3 = _____ gal

Purge Well Volume: Purge well Volume = Filter pack volume + Well Volume = _____ gal + _____ gal = _____ gal.

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
7.89	15.78	23.67	31.56	39.45

Development Record

ORD

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	Redox (mV)	Comments
0928	34	40.05	113	GRAY CLOUDY	12.04	6.95	1.09	—	-111	9/22/03
0935	39	42.30	23	CLEAR	11.95	6.78	1.11	—	-148.8	↓
0945	42	42.50	23.0	CLEAR	11.91	6.76	1.19	—	-159	↓
0950	43	42.85	23.0	CLEAR	11.93	6.76	1.19	—	-161	↓

IT CORPORATION
A Member of The IT Group

Well Development Log

Project Number: 875135
Project Name: Plum Brook
Form Completed by: R Roderis
Well Developed by/firm: Boart Longyear

Site ID: Plum Brook
Location ID: PB-BGD-MW23
Date Started: 9/14/01

Monitoring Well Information

Development Method: Grundfos pump
Development Equipment:

Screen Height (ft): 20
Filter pack lenght (ft): 25
Casing Diameter (in): 2

Begining Measurements (BTOC)
Depth to Water (ft): 44
Total depth of Well (ft): 78

Monitoring Well Purge Calculations

Volume of Water in Casing:

Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft.

Well Volume (gallons) = Water Column (ft) x Gal/ft = 28 ft x 0.164 gal/ft = 4.72 gallons

Volume of Water in Filter Pack:

Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((6)^2 - (2)^2) = 1.312 gal/ft.

Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (25)ft x (.164) gal/ft x 0.3 = ~~4.1~~ 1.23 gal

Purge Well Volume: Purge well Volume = Filter pack volume + Well Volume = 1.23 gal + 4.72 gal = 5.95 gal.

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
5.95				29.75

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	Redox (mV)	Comments
440	30	~~dry~~ 65	1524.8	gray	16.3	7.23	1.855	11.36		
500	30	67	1511.8	l. gray	13.6	7.19	2.404	9.54		

COM SETTLED 9/21/01

GOOD

IT CORPORATION

Well Development Log

Project Number: 875635
Project Name: PBOW
Form Completed by: CHRIS GRANDE
Well Developed by/firm: BOART LONG YEAR

Site ID:
Location ID: PB BRD MW 24
Date Started: 9/19/01

Monitoring Well Information

Development Method:
Development Equipment: BAILING GRUNDFOS PUMP

Screen Height (ft): 15
Filter pack lenght (ft): 17
Casing Diameter (in): 2"

Begining Measurements (BTOC)
Depth to Water (ft): 28.03
Total depth of Well (ft): 42.75

Monitoring Well Purge Calculations

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (2 $)^2$) = 0.16 gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = 14.72 ft x 0.16 gal/ft = 2.35 gallons

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((6 $)^2$ - (2 $)^2$) = 1.23 gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (14.72 ft x 1.23 gal/ft x 0.3 = ~~10.85~~ gal 5.78

Purge Well Volume: Purge well Volume = Filter pack volume + Well Volume = ~~10.85~~ 5.78 gal + 2.35 gal = ~~13.21~~ gal. 8.13

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
~~13.21~~ 8.13	~~26.42~~ 16.26	~~39.63~~ 24.39	~~52.84~~ 32.52	~~66.05~~ 40.65

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	~~Redox~~ ORP (mV)	Comments
1620	0	28.03	1568	DARK GRAY	12.56	6.94	1.759	0.95	-95.7	STRONG ROTTEN EGG ODOR
1645	5	41.20	1567	DARK GRAY	12.22	6.35	1.67	3.60	-223.4	WELL DRY
1710		34.50								
1715	5.5	34.50	1567	DARK GRAY	12.27	5.98	1.735	7.47	-2.69	
9/19/01 1723	6.3	42.00								WELL DRY AGAIN
9/20/01 1415	7.3	29.00	1029	GRAY	12.85	6.85	1.800	18.33		9/20/01 PUMPING
1430	10.3	29.93	1713	GRAY	12.64	6.75	1.81	20.33	-234.9	
1440	15.3	29.80	1397	GRAY	13.06	6.77	1.82	14.20	-231.3	
1503	20	39.50	407	GRAY	18.65	6.81	1.76	16.92	-240	

COMPLETE 9/21/01

GOOD

IT CORPORATION

Well Development Log

Project Number: 825635
Project Name: PBOW
Form Completed by: CHRIS GRANDE
Well Developed by/firm: BART LONGYEAR

Site ID: ~~PB-BED MW2~~
Location ID: PB-BED MW2
Date Started: 9/29/01

Monitoring Well Information

Development Method:
Development Equipment:

Screen Height (ft):
Filter pack lenght (ft):
Casing Diameter (in):

Begining Measurements (BTOC)
Depth to Water (ft):
Total depth of Well (ft):

Monitoring Well Purge Calculations

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ gal/ft = _____ gallons

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (_____)ft x (_____) gal/ft x 0.3 = _____ gal

Purge Well Volume: Purge well Volume = Filter pack volume + Well Volume = _____ gal + _____ gal = _____ gal.

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
8.13	16.26	24.39	32.52	40.65

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	Redox (mV)	Comments
1525	22	37.89	402	GRAY	21.58	6.86	1.76	19.16	-230	9/20/01
1537	24	35.5	466.2	GRAY	23.84	6.83	1.74	20.03	-225	
1540	26	39.5	201	GRAY	18.23	6.73	1.75	14.16	-234	
1550	28	40.8	347	GRAY	16.93	6.73	1.57	17.18	-164	28.60 WATER 9/21/01
1555	29	— WELL DRY —								
1605	33	38.8	857	GRAY	15.68	6.62	1.78	19.15	-188	
1610	38	39.02	452	GRAY	15.76	6.61	1.80	21.08	-182.3	
1620	44	39.75	85.6	CLEAR	16.05	6.57	1.78	21.83	-183.5	
1630	51	39.90	14.7	CLEAR	15.92	6.53	1.75	18.71	-198.7	
1635	54	39.98	19.8	CLEAR	16.2	6.55	1.77	18.01	-200.8	

COMPLETED 9/19/01
GOOD

IT CORPORATION

Well Development Log

Project Number: 825635
Project Name: PBDW
Form Completed by: CHRIS GRANDE
Well Developed by/firm: BOART LONGYEAR

Site ID: PB BFED MW25
Location ID:
Date Started: 9/19/01

Monitoring Well Information

Development Method: BAILER
Development Equipment: GRUNDFOS PUMP BEGAN PUMPING 0850

Screen Height (ft): 15
Filter pack lenght (ft): 17
Casing Diameter (in): 2

Begining Measurements (BTOC)
Depth to Water (ft): 16.88
Total depth of Well (ft): 40.5

Monitoring Well Purge Calculations

Volume of Water in Casing:
Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (2 $)^2$) = 0.16 gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = 23.62 ft x 0.16 gal/ft = 3.77 gallons

PUMPING AT 1.5GPM

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((8 $)^2$ - (2 $)^2$) = 2.46 gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (17)ft x (2.46) gal/ft x 0.3 = 12.54 gal

Purge Well Volume: Purge well Volume = Filter pack volume + Well Volume = 12.54 gal + 3.77 gal = 16.31 gal.

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
16.31	32.62	48.93	65.24	81.55

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	~~Redox~~ ORP (mV)	Comments
0830	0	16.88	1577.5	CLOUDY	14.32	8.14	1.036	1.73		BAILED
0855	8.0	21.28	1168.	CLOUDY	14.56	7.47	1.289	2.54	53.8	BEGAN DEVELOPING WITH PUMP
0905	23.0									STOPPED PURGING PUMP SET 38 FROM TOC
0915	23.0									BEGAN PUMPING
0925	38	21.3	390	CLOUDY	13.81	7.17	1.496	4.05	-126	
0935	53	21.83	169	CLOUDY	13.72	7.12	1.574	5.15	-129	
0955	80	20.60	357	CLOUDY	13.94	7.14	1.64	3.34	-136	
1005	98	20.61	62.5	CLEAR	13.89	7.01	1.64	3.52	-156.6	
1010	105.5	20.65	31.0	CLEAR	13.75	6.98	1.639	3.03	-153.4	
1015	113.0	20.67	28.8	CLEAR	13.85	6.96	1.639	3.07	-159.7	
1025	128	20.62	26.3		13.98	6.98	1.643	3.29	-152.9	
1027										END DEVELOPMENT

n:\shared\common\damgroup\id_forms\Dev\Page 1/7/13/00

NOT ENOUGH WATER IN WELL

COMPLETED 9/20/01

IT CORPORATION

Well Development Log

Project Number: ~~PBOW~~ 825835
Project Name: PBOW
Form Completed by: CHRIS GRANDE
Well Developed by/firm: BART LONG TAAC

Site ID:
Location ID: ~~PB BED MW26~~
Date Started: 9/19/01

Monitoring Well Information

Development Method: SURGE & PUMP
Development Equipment: GRUNDFOS PUMP & BAILING

Screen Height (ft): 15
Filter pack lenght (ft): 17
Casing Diameter (in): 2

Begining Measurements (BTOC)

Depth to Water (ft): 42.62
Total depth of Well (ft): 60.15

Monitoring Well Purge Calculations

Volume of Water in Casing:
Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (2)^2) = 0.16 gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = 17.53 ft x 0.16 gal/ft = 2.80 gallons

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((6.8)^2 - (2)^2) = ~~2.46~~ 1.31 gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (17) ft x (~~2.46~~ 1.31) gal/ft x 0.3 = ~~14.78~~ 6.68 gal

Purge Well Volume:
Purge well Volume = Filter pack volume + Well Volume = ~~14.78~~ 6.68 gal + 2.80 gal = ~~17.08~~ 9.48 gal.

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
~~17.08~~ 9.48	~~18.96~~	~~51.24~~ 28.44	~~68.32~~ 37.92	~~85.4~~ 47.4

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	~~Redox~~ ORP (mV)	Comments
1220	4	57.	1596	GRAY	18.30	7.48	3.653	6.39	63.6	9/19/00
1230										BEGAN BAILING
1255	5.0	53.57	1576	GRAY	14.30	7.48	3.99	3.08	24.4	
1308	7.0	58.80	—							
1320	—	53.60	—							
1335	7.0	53.44	1396	GRAY	13.60	7.51	5.84	3.04	104	BEGAN BAILING
1545	8.5	59.00	1571	GRAY	13.28	7.43	5.74	2.84	36.4	WELL DRY
1610	9.0	59.5	1619	GRAY	17.58	7.60	6.28	0.88	-94.2	9/20/01

NOT ENOUGH WATER IN WELL TO

COMPLETED AS OF 9/2

IT CORPORATION
A Shaw/IT Group

Well Development Log

Project Number: 526635
Project Name:
Form Completed by: CARLOS GRANDE
Well Developed by/firm: ~~BART LONGBEAR~~

Site ID:
Location ID: ~~PBGFD MW26~~
Date Started: 9/19/01

Monitoring Well Information

Development Method:
Development Equipment: BAILER

Screen Height (ft): 15
Filter pack lenght (ft): 17
Casing Diameter (in): 2"

Bagining Measurements (BTOC)
Depth to Water (ft): 42.62
Total depth of Well (ft): ~~60.15~~

Monitoring Well Purge Calculations

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (_____)^2) = _____ gal/ft. SEE PAGE 1

Well Volume (gallons) = Water Column (ft) x Gal/ft = _____ ft x _____ gal/ft = _____ gallons

Volume of Water in Filter Pack:

Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((_____)^2 - (_____)^2) = _____ gal/ft.

Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (_____)ft x (_____) gal/ft x 0.3 = _____ gal

Purge Well Volume: Purge well Volume = Filter pack volume + Well Volume = _____ gal + _____ gal = _____ gal.

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	~~Redox~~ ORP (mV)	Comments	
1510	9.25	56.20	1054	GRAY	12.85	7.49	7.031	0.73	-44	WATERLEVEL 56.20	9/21/01
1518	9.50			WELL	BAILED		DRY				
1410		58.61								TDW = 60.27	9/22/01

NOT ENOUGH WATER IN WELL AS OF 9/22/03

IT CORPORATION

Well Development Log

Page 1 of 1

Project Number: 823635
Project Name: PBOW
Form Completed by: CHRIS GRANITE
Well Developed by/firm: BART LONGSHAW

Site ID:
Location ID: PBBGD MW27
Date Started: 9/22/03

Monitoring Well Information

Development Method: 1
Development Equipment: BAILER

Screen Height (ft): OPEN HOLE
Filter pack lenght (ft):
Casing Diameter (in):

Begining Measurements (BTOC)
Depth to Water (ft): 54.55
Total depth of Well (ft): 106.8

Monitoring Well Purge Calculations

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (6)^2) = 1.476 gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = 52.25 ft x 1.476 gal/ft = 77.12 gallons

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((____)^2- (____)^2) = ____ gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (____)ft x (____) gal/ft x 0.3 = ____ gal

Purge Well Volume: Purge well Volume = Filter pack volume + Well Volume = ____ gal + ____ gal = ____ gal.

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
77.12	154.24	231.365	308.485	385.605

10

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	~~Redox~~ ORP (mV)	Comments
1100	6.0	60.00	642.4	GRAY	16.8	6.74	3.07	—	-222.5	BEGAN PUMPING
1110	14.00	67.33	483.9	GRAY CLOUDY	16.5	6.63	3.11	—	-232.7	
1120	24.00	75.00	449.8	GRAY CLOUDY	15.38	6.62	3.13	—	-234.6	
1132	34.00	86.55	457.0	GRAY CLOUDY	15.48	6.62	3.176	—	-237.0	
1145	45.00	97.45	1099	GRAY CLOUDY	16.57	6.66	3.19	—	-232.4	
1151	50.0	102.50	1296	GRAY CLOUDY	16.72	6.64	3.19	—	-235.9	
1154	53.00	104.8 WELL DRY								

IT ENOUGH WATER IN WELL

IT CORPORATION

Well Development Log

Project Number: 825635
Project Name: PBOW
Form Completed by: CHRIS GRANDE
Well Developed by/firm: BAKER LONGYEAR

Site ID:
Location ID: INITIAL GW 0.01
Date Started: 9/20/01

Monitoring Well Information

Development Method: ~~BAILER~~ SURGE & PUMP
Development Equipment: GRUNDFOS PUMP

Screen Height (ft): 15
Filter pack lenght (ft): 17
Casing Diameter (in): 2"

Begining Measurements (BTOC)
Depth to Water (ft): 30.35
Total depth of Well (ft): 85.45
TDW ~~86.15 ft~~ 9/22/01 1340

Monitoring Well Purge Calculations

Volume of Water in Casing:
Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (2)^2) = 0.16 gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = 55.10 ft x 0.16 gal/ft = 8.8 gallons

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((6)^2 - (2)^2) = 1.31 gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (17) ft x (1.31) gal/ft x 0.3 = 6.68 gal

Purge Well Volume:
Purge well Volume = Filter pack volume + Well Volume = 6.68 gal + 8.8 gal = 15.48 gal.

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
15.48	30.96	46.44	61.92	77.4

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	~~Redox~~ ORP (mV)	Comments
1727	3.5	48.7	1617	WHITE GRAY	17.32	11.75	1.76	3.04	-170	9/20/01
1735	8.0	83.1	761	WHITE GRAY	17.81	11.83	1.66	2.93	-42.6	
1808	9.5	83.2		GRAY						
9/21/01 0825	10.5	83.0	16.08	WHITE GRAY	14.98	11.41	2.09	14.52	-115.0	9/21/01
0800	12.5	79.15	1592	GRAY	12.42	10.24	2.79	54.36		9/22/01
0815	14.5	81.00	1620							WELL BAILED DRY
1340	14.5	82.69								

BAILING 9/22/01

82.69
86.15 TDW

IT CORPORATION

Well Development Log

Project Number: 825635
Project Name: PBOW
Form Completed by: R. Poderis
Well Developed by/firm: ~~[illegible]~~ Boart Longyear

Site ID: Plum Brook
Location ID: INTB-BEDRW-009
Date Started: 9-14-01

Monitoring Well Information

Development Method: Submersible pump
Development Equipment:

Screen Height (ft): 10
Filter pack lenght (ft): 13
Casing Diameter (in): 2"

Begining Measurements (BTOC)
Depth to Water (ft): 15.73
Total depth of Well (ft): 42.5

42.50
15.73
26.77

Monitoring Well Purge Calculations

Volume of Water in Casing:
Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (2)^2) = 0.164 gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = 26.77 ft x 0.164 gal/ft = 4.39 gallons

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((6)^2 - (2)^2) = 1.312 gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (~~26.77~~ 13) ft x (0.164) gal/ft x 0.3 = ~~5.75~~ ~~1.317~~ gal ~~2.152~~ 2.63

Purge Well Volume:
Purge well Volume = Filter pack volume + Well Volume = ~~1.317~~ (.63) gal + 4.39 gal = ~~5.707~~ 2.76 gal.

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
2.76				13.8

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity. (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	Redox (mV)	Comments
1110	9	dry								removed 15 gal at beginning
1115	9	dry								

* drilling! so settles in hole. DKK

IT CORPORATION

Well Development Log

Project Number: 825635
Project Name: PBOW
Form Completed by: Reed Podeyis
Well Developed by/firm: IT / Boart Environmental

Site ID: Plum Brook
Location ID: NTB-BED-MW-4
Date Started: 9-14-01

Monitoring Well Information

Development Method: submersible pump
Development Equipment:

Screen Height (ft): 10
Filter pack lenght (ft): 16.41
Casing Diameter (in): 2"

Begining Measurements (BTOC)
Depth to Water (ft): 9.69
Total depth of Well (ft): 26.1

Monitoring Well Purge Calculations

Volume of Water in Casing: Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (2 $)^2$) = 0.164 gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = 16.41 ft x 0.164 gal/ft = 2.69 gallons

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((6 $)^2$ - (2 $)^2$) = 1.312 gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (16.41 ft x (0.164 gal/ft x 0.3 = 0.807 gal

Purge Well Volume: Purge well Volume = Filter pack volume + Well Volume = 0.807 gal + 2.69 gal = 3.497 gal.

5
10.62
1.85
10.77

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
3.497	6.994	10.491		

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	Redox (mV)	Comments
920	1	11.82	152.8	brown	16.97	7.98	.675	28.0		
945	87	11.54	127.6	clear	16.13	7.31	.566	5.87		
1005	10	11.64	50.5	clear	16.79	6.80	.566	5.39		
1010	11	11.62	49.1	clear	16.70	6.91	.566	5.35		
1015	12	11.59	47.2	clear	16.72	6.87	.565	5.29		surged after, several times
120	50	13.85	503.0	clear	17.06	7.48	.605	9.15		
145	80	14.42	58.1	clear	15.38	7.00	.605	10.87		
155	100	14.50	28.7	clear	14.88	6.75	.616	10.46		
200	110	14.55	22.6	clear	15.12	6.72	.633	10.81		

COMPLETED 9/20/01

GOOD

IT CORPORATION

Well Development Log

Project Number: 825635
Project Name: PBOW
Form Completed by: CHRIS GRANDE
Well Developed by/firm: BOART LONGYEAR

Site ID:
Location ID: TNTC BRDGW 001
Date Started: 9/19/01

Development Method: BAILER & 9/19/01
Development Equipment: GRUNDFOS PUMP WITH SURGING

Monitoring Well Information

Screen Height (ft): 15
Filter pack lenght (ft): 17
Casing Diameter (in): 2"

Begining Measurements (BTOC)

Depth to Water (ft): 59.35
Total depth of Well (ft): 87.8

Monitoring Well Purge Calculations

Volume of Water in Casing:
Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (2)^2) = 0.16 gal/ft.
Well Volume (gallons) = Water Column (ft) x Gal/ft = 28.45 ft x 0.16 gal/ft = 4.55 gallons

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((8)^2 - (2)^2) = 1.31 gal/ft.
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (~~28.45~~ 17)ft x (1.31) gal/ft x 0.3 = 6.69 gal

Purge Well Volume:
Purge well Volume = Filter pack volume + Well Volume = 6.69 gal + 4.55 gal = 11.24 gal.

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
11.24	22.48	33.72	44.96	56.2

Development Record

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	Redox (mV)	Comments
1800	0	59.35	190.3	~~CLEAR~~ CLOUDY	12.74	6.66	1.32	7.88	-280.8	
1820	4	66.65	246	CLOUDY	12.79	6.57	1.46	15.92	-286.5	
1830	6	67.67	147.5	CLOUDY ~~CLEAR~~	12.31	6.38	1.81	9.71	-278.4	STOPPED BAILING WELL
0810		59.50	—						—	BEGAN PUMPING 9/20/01
0835	12									
0853	16	78.00	850.7	GRAY	16.68	7.27	2.37	18.01	-160	PUMPING RATE = 3/4 GPM
0900	20	85.00	—						—	RAN DRY
0925	23	83.00	175.5	CLOUDY	14.89	6.80	2.51	10.30	-218.3	
0941	26	65.10	733.2	GRAY	15.33	6.71	2.66	8.16	-243	

COMPLETED 7/20/01
GOOD

IT CORPORATION

Well Development Log

Project Number: 825635
Project Name: PBOW
Form Completed by: CHRIS GRANDE
Well Developed by/firm: ~~BOART LONG YEAR~~

Site ID:
Location ID: JNTC BRD GW 002
Date Started: 9/19/01

Monitoring Well Information

Development Method: BAILED 9/19/01
Development Equipment: GRUNFOS PUMP WITH SURGING 09/20/01

Screen Height (ft): 15
Filter pack lenght (ft): 17
Casing Diameter (in): 2"

Begining Measurements (BTOC)

Depth to Water (ft):
Total depth of Well (ft):

Monitoring Well Purge Calculations

Volume of Water in Casing:
Gallons/foot = 0.041 x d^2, where casing diameter in inches = (0.041 x (2)^2) = 0.16 gal/ft
Well Volume (gallons) = Water Column (ft) x Gal/ft = 28.45 ft x 0.16 gal/ft = 4.55 gallons

20 GALS OF FLUID LOST

Volume of Water in Filter Pack:
Gallons/foot = 0.041 x (D^2 - d^2), where D is total borehole diameter in inches & d is casing diameter in inches = 0.041 x ((8)^2 - (2)^2) = ~~2.46~~ 1.31 gal/ft
Filter Pack Volume (gal) = (the less of the filter pack lenght or water column) x gal/ft x porosity (0.3) = (17) ft x (~~2.46~~) gal/ft x 0.3 = ~~12.55~~ gal 6.69

Purge Well Volume: 11.24 Purge well Volume = Filter pack volume + Well Volume = ~~12.55~~ 6.69 gal + ~~4.55~~ 4.55 gal = 11.24 gal.
22.48 33.72 44.96

1 x Purge Well Volume	2 x Purge Well Volume	3 x Purge Well Volume	4 x Purge Well Volume	5 x Purge Well Volume
~~15.01~~ 11.2	~~34.02~~	~~51.30~~	~~68.04~~	~~85.05~~

~~75~~ 56.2
+ 20
76.2

Development Record OKP

Time (24 hrs)	Volume Removed (gal)	Water Level (ft) (TOC)	Turbidity (NTU)	Clarity (color)	Temp. (C)	pH (Std Units)	Conductivity (mS/cm)	D.O. (mg/L)	Redox (mV)	Comments
0950	36.00	~~66~~ 84.30	142.2	CLOUDY CLEAR	15.26	6.70	2.60	10.69	-243.3	0955 WELL PUMP DRY
1020	40.00	80.65	60.6	CLEAR	15.44	6.72	2.82	10.21	-254	
1030	48.00	83.00	22.2	CLEAR	16.31	6.76	2.81	12.70	-244	
1040	56.00	83.10	15.6	CLEAR	16.93	6.73	2.88	13.43	-251.1	
1050	64.00									
1110	64.50	72.00	74.9	CLOUDY GRAY	16.45	6.74	2.94	12.04	-255.6	
1115	70.00	~~[illegible]~~ 80.0	120.0	CLOUDY	15.48	6.69	2.96	10.34	-257.8	
1125	78.00	81.9	80.00	CLEAR	17.55	6.71	2.98	14.61	-258.6	
1130	84.00	81.4	12.7	CLEAR	17.92	6.70	2.98	15.85	-255.1	
1135	85	81.6	16.8	CLEAR	17.39	6.66	3.00	14.55	-259.1	
1140	89	83.10	29.5	CLEAR	18.0	6.67	3.00	9.81	-260	

APPENDIX F

HYDRAULIC CONDUCTIVITY DATA

Aquifer Test Results

Plum Brook Ordnance Works
Sandusky, OH
Project Number 825635

1.0 Purpose

This aquifer test in the form of slug testing was conducted to estimate the hydraulic conductivity of geologic materials in the vicinity of eight monitoring wells at the Plum Brook Ordnance works, Sandusky, Ohio. Newly installed during the 2001 Site-Wide Groundwater Remedial Investigation, the following wells were tested:

- PB-BED-MW22 (Bedrock)
- PB-BED-MW23 (Bedrock)
- PB-BED-MW24 (Bedrock)
- PB-BED-MW25 (Bedrock)
- PB-BED-MW27 (Bedrock)
- TNTB-BEDGW-003 (Bedrock)
- TNTB-BEDGW-004 (Bedrock)
- TNTC-BEDGW-001 (Bedrock)

2.0 Method

The methods of Bouwer and Rice (1976), as implemented through the computer program AQTESOLV® for Windows (HydroSOLVE, Inc. 1989), was used to calculate the hydraulic conductivity near a well. The calculation was based on the rate of water level change after adding a slug of known volume to the well (Falling Test) or sudden removal of a volume of water (Rising Test).

3.0 Theory

The Bouwer and Rice (1976) method for unconfined aquifers is based on the following equation:

$$Q = 2\pi\, KL_e \frac{y}{ln(R_e / r_w)}. \qquad 1$$

where:

Q is the flux to the well (length^3/time), K is the hydraulic conductivity of the aquifer (length/time), L_e is the length of screen contributing water to the well (length), y is the difference between the water level in the well and the equilibrium water table (length), R_e is the aquifer radius over which water level changes are dissipated (length) and r_w is the boring radius (length).

The instantaneous change in water level in the well, dy/dt, is given by:

$$dy/dt = -Q/\pi r_c^2 \qquad 2$$

Where $\pi r_c^2 1$ is the cross sectional area of the well.

Combining equations (1) and (2) yields:

$$\frac{1}{y} dy = -\frac{2KL_e}{r_c^2 ln(R_e/r_w)} dt \qquad 3$$

Integration of (3) between y_o at time t = 0 and y_t at time t and solving for K yields:

$$K = \left[\frac{r_c^2 ln(R_e/r_w)}{2L_e}\right]\frac{1}{t} ln\frac{y_o}{y_t} \qquad 4$$

K and the factor in square brackets are constants. Therefore, field data plotted as $ln(y_t)$ versus t should lie on a straight line with slope,

$$-\frac{2KL_e}{r_c^2 ln(R_e/r_w)}. \qquad 5$$

The factor $ln(R_e/r_w)$ in (4) is an empirical function of aquifer and well geometry. For partially penetrating wells:

$$ln\frac{R_e}{r_w} = \left[\frac{1.1}{ln(L_w/r_w)} + \frac{A + B\,ln[(H - L_w)/r_w]}{L_e/r_w}\right]^{-1}, \qquad 6$$

where $ln\,[(H-L_w)/r_w] \leq 6$.

For fully penetrating wells:

$$ln\frac{R_e}{r_w} = \left(\frac{1.1}{ln(L_w/r_w)} + \frac{C}{L_e/r_w}\right)^{-1}. \qquad 7$$

The dimensionless parameters A, B, and C are empirical functions of well geometry as determined by electric analog modeling (Bouwer and Rice, 1976).

Hydraulic conductivity is calculated from (4) using the slope and y-intercept of a line fit to the field data and $ln(R_e/r_w)$ from (6) or (7).

4.0 Assumptions

The Bouwer and Rice (1976) method for unconfined aquifers is based on the assumptions that:

- The aquifer is homogeneous, isotropic and unconfined.
- Drawdown is negligible compared to aquifer thickness.
- Vadose zone flow is negligible.
- Well losses are negligible.

5.0 Procedure

The following steps were followed in estimating the aquifer hydraulic conductivity:

a) Define the aquifer and well geometry using the following parameters (Table 1) :

H	Aquifer saturated thickness (assumed)
L_e	Length of saturated well screen
L_w	Static height of water in well
r_c	Radius of well casing
r_w	Radius of boring
Φ	Porosity of filter pack (Assumed to be 30 percent. Porosity of unconsolidated sand ranges from 25 to 50 percent [Freeze and Cherry, 1979])
y_o	Initial change in water level

b) Using the field data to determine whether water level fluctuations occurred within the screened interval of the well.

When $L_w = L_e$. Water level fluctuations occurred in the screened section of the well. Modify r_c to account for filter pack storage according to:

$$r_c^* = \left[r_c^2 + \phi(r_w^2 - r_c^2)\right]^{1/2} \qquad 8$$

When $L_w > L_e$. Water level fluctuations occurred above the screened portion of the well. Note that the filter pack porosity in this case does not affect subsequent calculations, therefore, r_c is used in calculation.

c) Input geometric parameters listed above and time versus drawdown data.

d) Perform hydraulic conductivity calculations. Hydraulic conductivity is calculated interactively using AQTESOLV® for Windows. AQTESOLV® is used to display field data, which is then visually matched with a best-fit line. AQTESOLV® then calculates the hydraulic conductivity from the input geometric data and slope and y-intercept of the best-fit line.

6.0 Results

The slug tests were performed from November 13 through 15, 2001. Both falling and rising tests were conducted in PB-BED-MW22, PB-BED-MW23, TNTB-BEDGW-003, TNTB-BEDGW-004, and TNTC-BEDGW-001 while only rising test was conducted in PB-BED-MW22, PB-BED-MW23, and PB-BED-MW27 because the water level prior to the test was below the top of the screen. Two monitoring wells were originally planned for slug testing but were not tested. PB-BED-MW-26 had an insufficient water column (about 2 ft) for a meaning test and was therefore not tested. Another well TNTA-BEDGW-001 exhibited an erratic water level fluctuation between August 2001 and November 2001. The depth to water measurement at this location was 30.35 ft below ground surface in August 2001and was 80.2 ft prior to the test, indicating that this location was not suitable for aquifer testing purpose.

Table 1 summarizes the depth to groundwater, the total well depth, and the geometric data of each well tested. Values of calculated hydraulic conductivity (K) and transmissivity (T) are summarized in Table 2. The hydraulic conductivity values of the tested well are range from 0.00241 ft/day (TNTB-BEDGW-003) to 5.48 ft/day (PB-BED-MW25) with a geometric mean of 0.395 ft/day. The transmissivity (T) was also calculated for each test using an assumed aquifer saturated thickness for each location. T values are summarized in Table 2.

The slug test results were analyzed using AQTESOLV for Windows Pro 3.0, which assumes that the aquifer being tested is homogenous and isotropic. Since the aquifer is rarely a homogenous and isotropic media, the hydraulic conductivity calculation based on the commonly accepted assumption will have uncertainties associated with it. The degree of uncertainty is directly proportional to the deviation of the homogenous and isotropic model from the reality. Therefore, it is recommended that the slug test data be used with caution, knowing the limitations and uncertainties associated with these results.

7.0 References

Bouwer, H. and R. C. Rice, 1976, "A Slug Test Method for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells," ***Water Resources Research***, Vol. 12, No. 3, pp. 423-428.

Cooper, H. H., J. D. Bredehoeft, and I. S. Papadopulos, 1967, "Response of a Finite Diameter Well to an Instantaneous Change of Water," ***Water Resources Research***, Vol. 3, No. 1, pp. 263-269.

Freeze, R. A., and J. A. Cherry, 1979, ***Groundwater***, Prentice-Hall, Englewood Cliffs, New Jersey, 604 p.

Geraghty and Miller Environmental Services, 1989, AQTESOLV, Aquifer Test Design and Analysis Software, Version 1.1.

Table 1

Summary of Monitoring Well Geometry Data
PBOW, Sandusky, OH

Well No.	Water Level (TOC) (ft)	Total Depth (TOC) (ft)	H (Assumed)	r_c (ft)	r_w (ft)	L_e (ft)	L_w (ft)
PB-BED-MW22	30.24	44.45	14.21	0.08	0.25	15	14.21
PB-BED-MW23	67.33	75.6	8.27	0.08	0.25	20	8.27
PB-BED-MW24	27.46	42.78	15.32	0.08	0.25	15	15.32
PB-BED-MW25	15.05	40.6	25.55	0.08	0.25	10	25.55
PB-BED-MW26	58.02	60.15	2.13	0.08	0.25	15	2.13
PB-BED-MW27	48.44	107.7	59.26	0.25	0.25	78.5	59.26
TNTA-BEDGW-001	80.2	85.45	5.25	0.08	0.25	15	5.25
TNTB-BEDGW-003	29.55	41.23	11.68	0.08	0.25	10	11.68
TNTB-BEDGW-004	8.39	26.75	18.36	0.08	0.25	10	18.36
TNTC-BEDGW-001	59.03	87.62	28.59	0.08	0.25	15	28.59

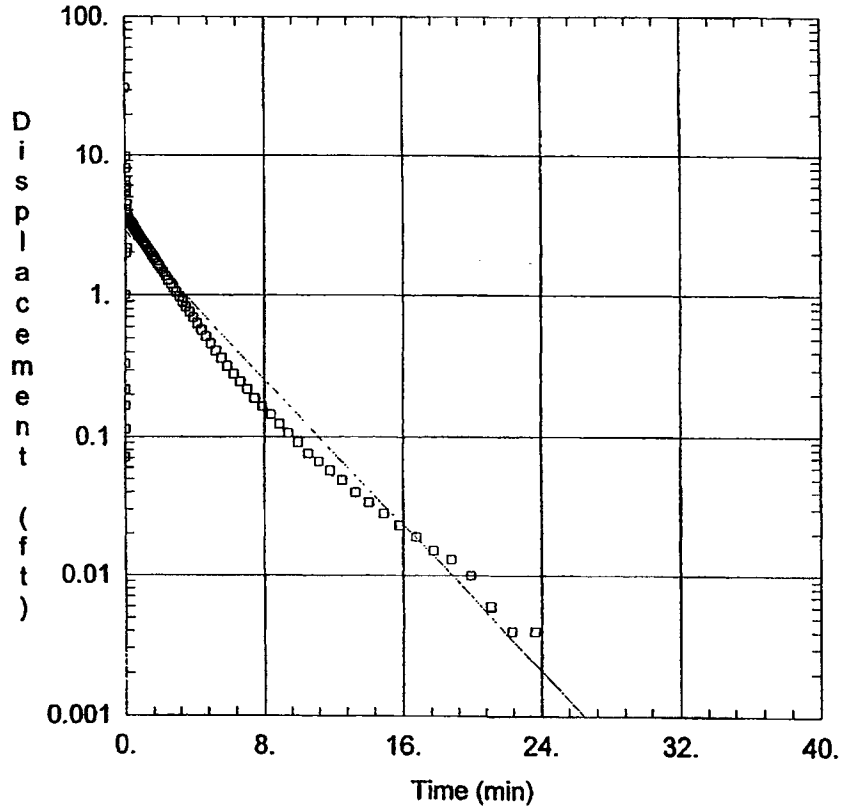
Note:
- H — Aquifer saturated thickness (assumed)
- r_c — Radius of well casing
- r_w — Radius of boring
- L_e — Length of saturated well screen
- L_w — Static height of water in well
- Φ — Porosity of filter pack (Assumed to be 30 percent. Porosities of unconsolidated sand range from 25 to 50 percent [Freeze and Cherry, 1979])

Table 2

Summary of Hydraulic Conductivities
PBOW, Sandusky, OH

Well No.	Date Tested	Aquifer Response	Saturated Aquifer Thickness (Assumed)	Test Type	Transmisivities T (ft^2/day)	Hydraulic Conductivities K (ft/min)	Hydraulic Conductivities K (cm/sec)	Hydraulic Conductivities K (ft/day)
PB-BED-MW22	11/13/01	Unconfined	14.21	Rising	3.69E+00	1.80E-04	9.16E-05	2.59E-01
PB-BED-MW23	11/14/01	Unconfined	8.27	Rising	5.41E-01	4.54E-05	2.31E-05	6.54E-02
PB-BED-MW24	11/13/01	Unconfined	15.32	Falling	2.35E+01	1.07E-03	5.42E-04	1.54E+00
				Rising	2.81E+01	1.28E-03	6.48E-04	1.84E+00
PB-BED-MW25	11/14/01	Unconfined	25.55	Falling	1.40E+02	3.81E-03	1.94E-03	5.48E+00
				Rising	1.23E+02	3.33E-03	1.69E-03	4.80E+00
PB-BED-MW26	slug test was not performed due to low water column in the well							
PB-BED-MW27	11/14/01	Unconfined	59.26	Rising	4.38E-01	5.13E-06	2.61E-06	7.39E-03
TNTA-BEDGW-001	slug test was not performed due to low water column in the well							
TNTB-BEDGW-003	11/13/01	Unconfined	11.68	Falling	insufficient data			
				Rising	2.82E-02	1.68E-06	8.52E-07	2.41E-03
TNTB-BEDGW-004	11/13/01	Unconfined	18.36	Falling	4.03E+01	1.53E-03	7.75E-04	2.20E+00
				Rising	8.51E+01	3.22E-03	1.64E-03	4.63E+00
TNTC-BEDGW-001	11/14/01	Unconfined	28.59	Falling	9.36E+00	2.27E-04	1.16E-04	3.27E-01
				Rising	5.46E+00	1.33E-04	6.74E-05	1.91E-01
Maximum					***1.40E+02***	***3.81E-03***	***1.94E-03***	***5.48E+00***
Minimum					***2.82E-02***	***1.68E-06***	***8.52E-07***	***2.41E-03***
Geometric Mean					***7.78E+00***	***2.74E-04***	***1.39E-04***	***3.95E-01***

Time Versus Drawdown Data



FALLING TEST ANALYSIS

Data Set: C:\...\cgw1f.aqt
Date: 02/21/02 Time: 15:26:24

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: TNTC-BEDGW-001
Test Date: 11/14/01

AQUIFER DATA

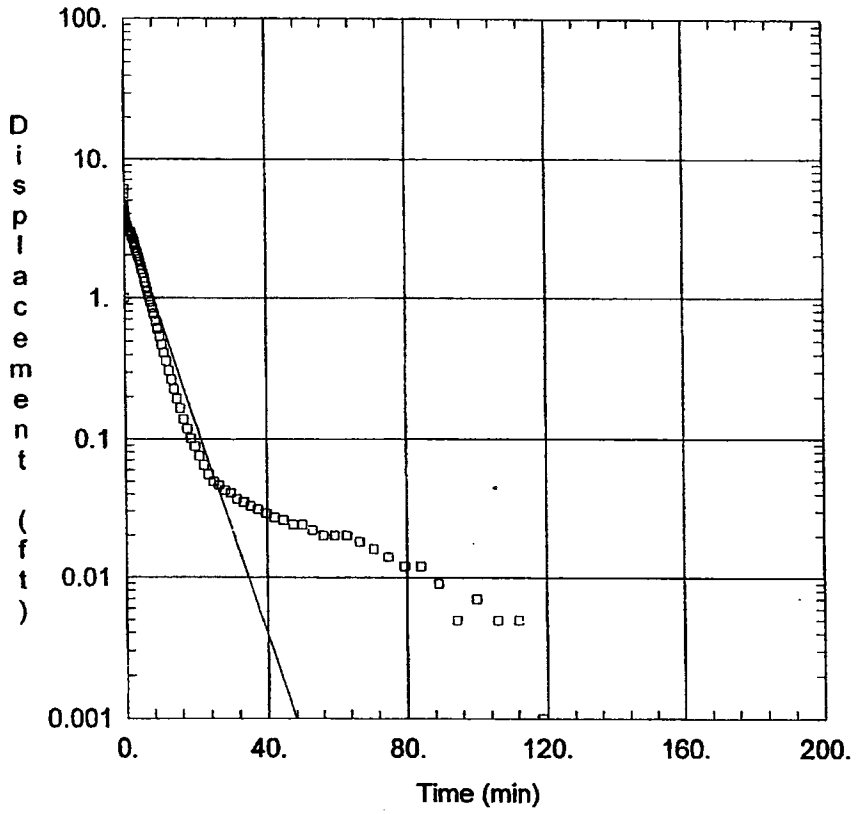
Saturated Thickness: 28.59 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CGW-001)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 15. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.08 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 28.59 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0002274 ft/min
y0 = 2.852 ft



RISING TEST ANALYSIS

Data Set: C:\Documents and Settings\jli\My Documents\Projects\PBOW\cgw1r.aqt
Date: 02/21/02 Time: 14:11:12

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: TNTC-BEDGW-001
Test Date: 11/14/01

AQUIFER DATA

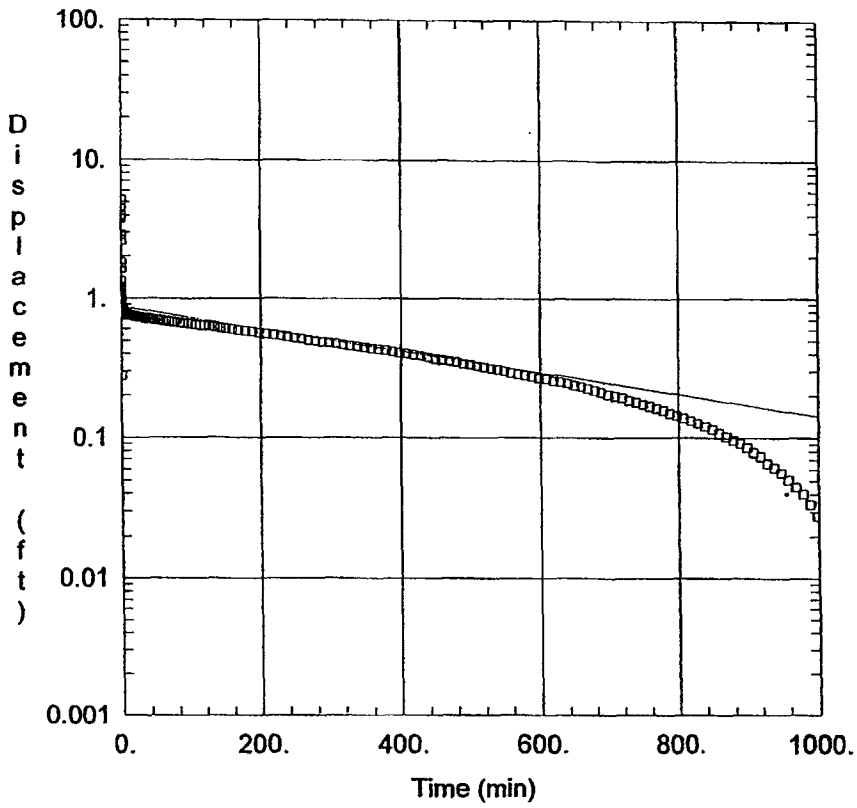
Saturated Thickness: 28.59 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (CGW-001)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 15. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.08 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 28.59 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0001326 ft/min
y0 = 4.318 ft



RISING TEST ANALYSIS

Data Set: C:\Documents and Settings\jli\My Documents\Projects\PBOW\gw3r.aqt
Date: 02/21/02 Time: 14:13:53

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: TNTB-BEDGW-003
Test Date: 11/13/01

AQUIFER DATA

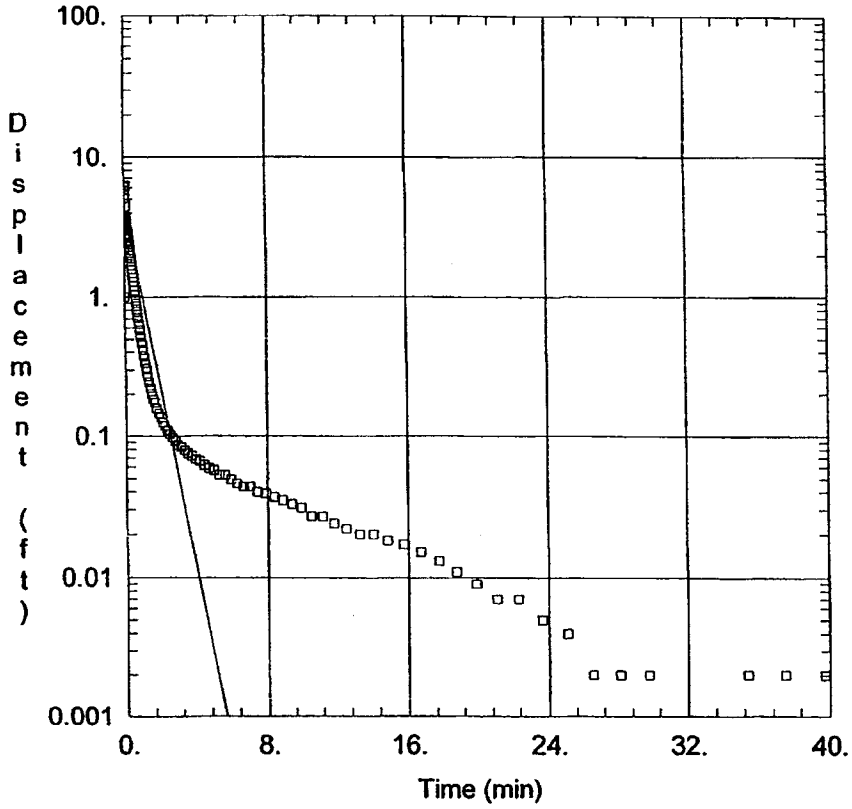
Saturated Thickness: 11.68 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (GW-003)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.08 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 11.68 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.676E-06 ft/min
y0 = 0.8637 ft



FALLING TEST ANALYSIS

Data Set: C:\Documents and Settings\jli\My Documents\Projects\PBOW\gw4f.aqt
Date: 02/21/02 Time: 14:15:07

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: TNTB-BEDGW-004
Test Date: 11/13/01

AQUIFER DATA

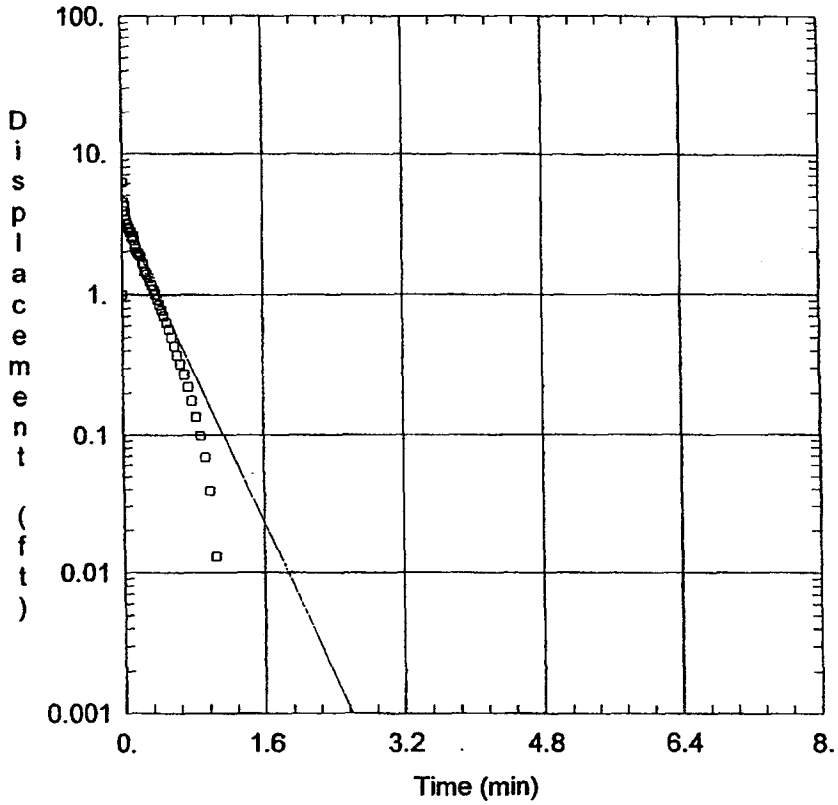
Saturated Thickness: 18.36 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (GW-004)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.08 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 18.36 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.001525 ft/min
y0 = 4.318 ft



RISING TEST ANALYSIS

Data Set: C:\Documents and Settings\jli\My Documents\Projects\PBOW\gw4r.aqt
Date: 02/21/02 Time: 14:15:30

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: TNTB-BEDGW-004
Test Date: 11/13/01

AQUIFER DATA

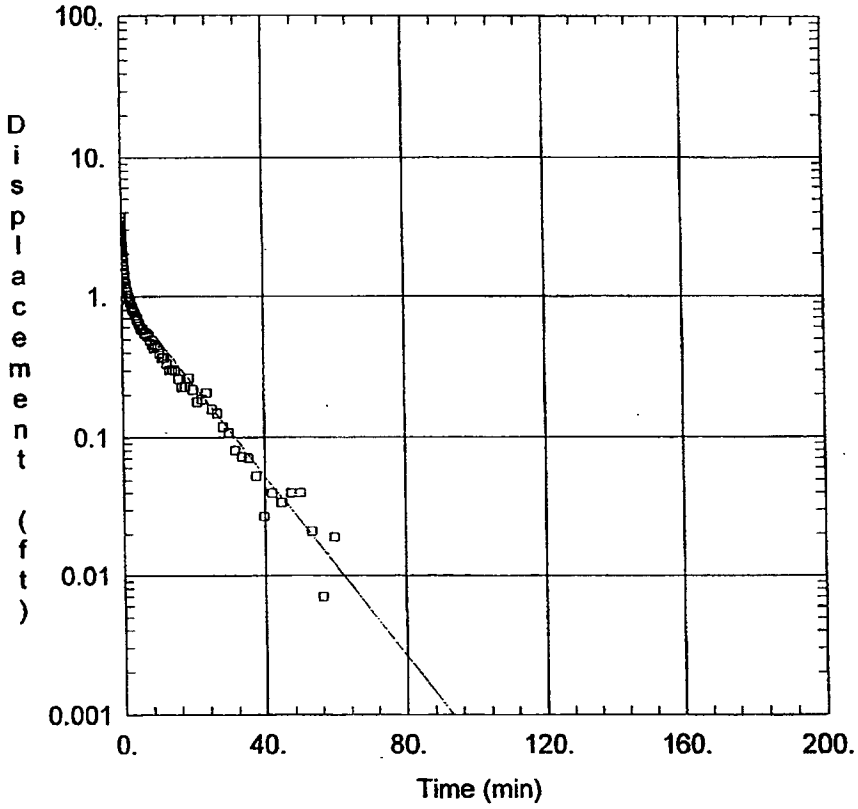
Saturated Thickness: 18.36 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (GW-004)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.08 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 18.36 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.003218 ft/min
y0 = 3.554 ft



RISING TEST ANALYSIS

Data Set: C:\Documents and Settings\jli\My Documents\Projects\PBOW\mw22r.aqt
Date: 02/21/02 Time: 14:16:02

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: PB-BED-MW22
Test Date: 11/13/01

AQUIFER DATA

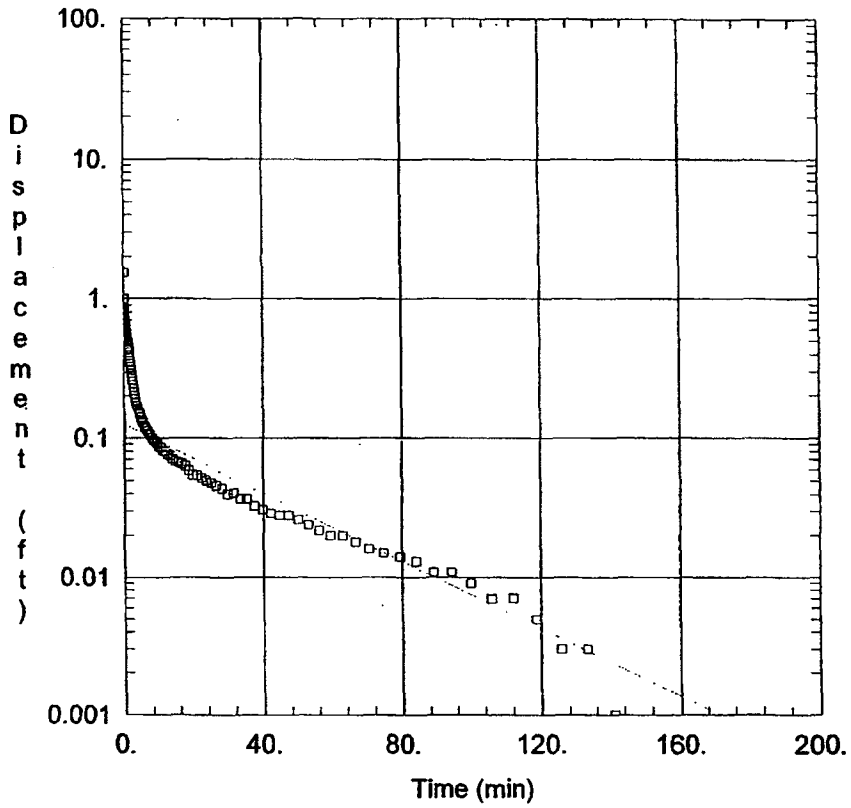
Saturated Thickness: 14.21 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-22)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 15. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.08 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 14.21 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0001802 ft/min
y0 = 1.054 ft



RISING TEST ANALYSIS

Data Set: C:\Documents and Settings\jli\My Documents\Projects\PBOW\mw23r.aqt
Date: 02/21/02 Time: 14:16:30

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: PB-BED-MW23
Test Date: 11/14/01

AQUIFER DATA

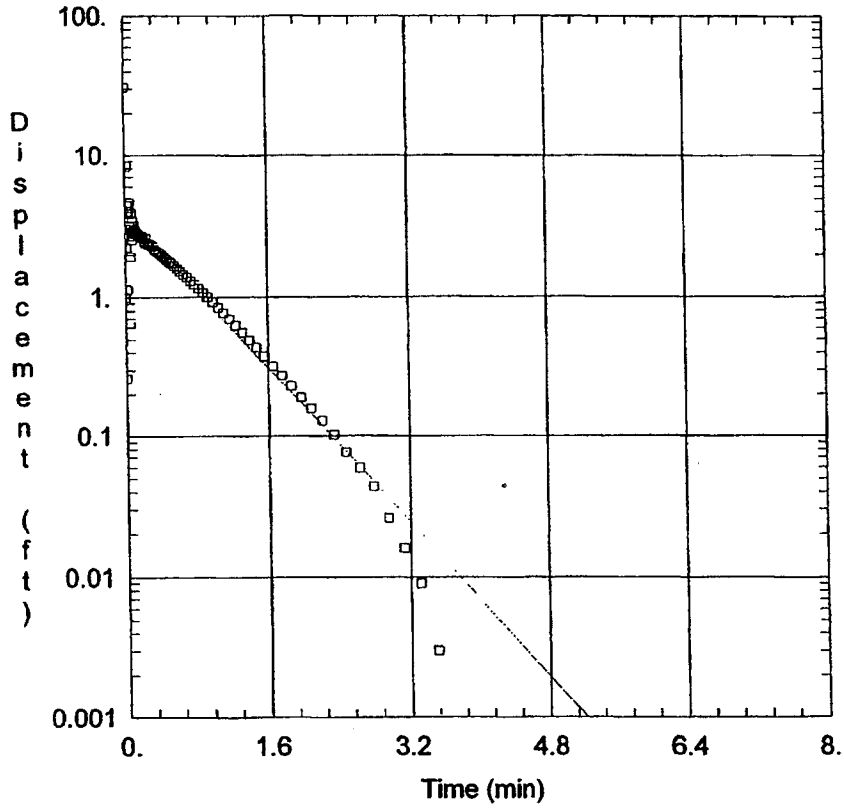
Saturated Thickness: 8.27 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-23)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 20. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.08 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 8.27 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 4.542E-05 ft/min
y0 = 0.1244 ft



FALLING TEST ANALYSIS

Data Set: C:\Documents and Settings\jli\My Documents\Projects\PBOW\mw24f.aqt
Date: 02/21/02 Time: 14:16:52

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: PB-BED-MW24
Test Date: 11/13/01

AQUIFER DATA

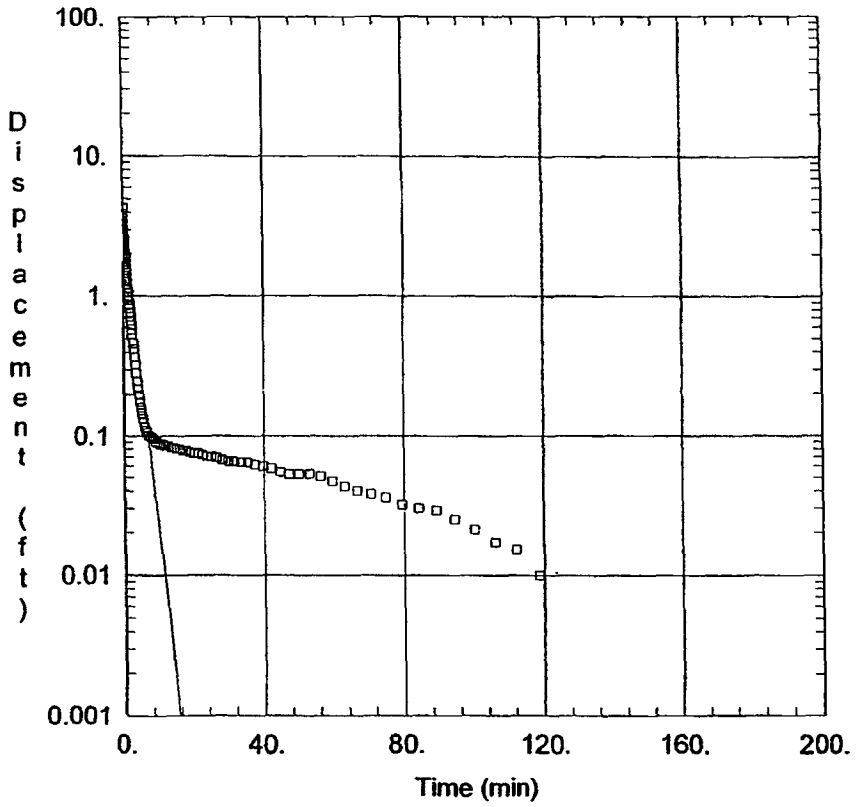
Saturated Thickness: 15.32 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-24)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 15. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.08 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 15.32 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.001067 ft/min
y0 = 3.94 ft



RISING TEST ANALYSIS

Data Set: C:\Documents and Settings\jli\My Documents\Projects\PBOW\mw24r.aqt
Date: 02/21/02 Time: 14:18:08

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: PB-BED-MW23
Test Date: 11/13/01

AQUIFER DATA

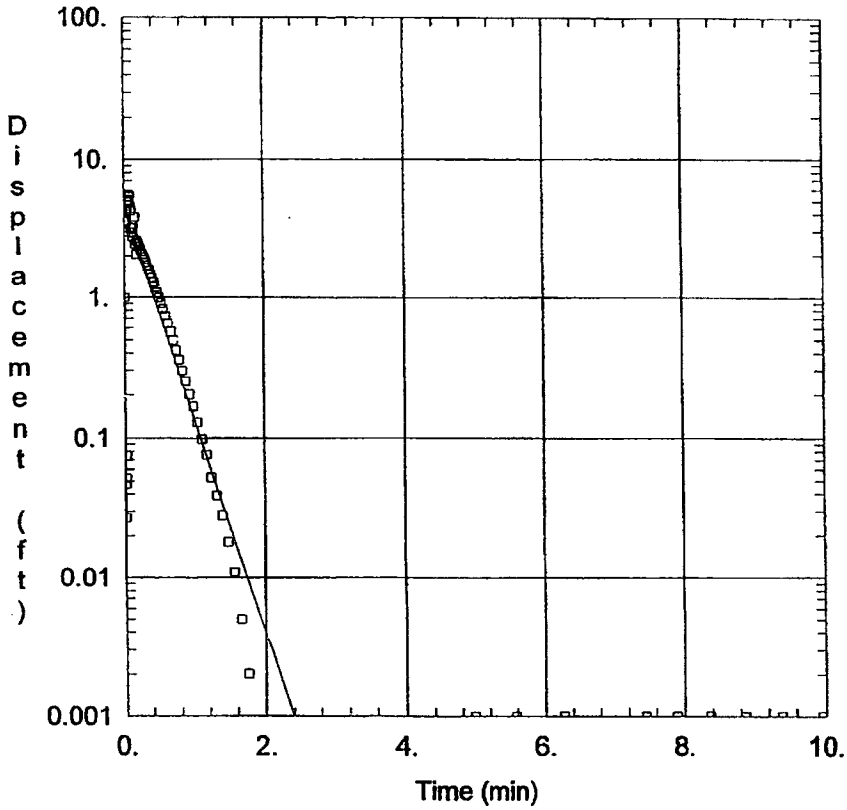
Saturated Thickness: 15.32 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-23)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 15. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.08 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 15.32 ft

SOLUTION

Aquifer Model: Unconfined
= 0.001275 ft/min
Solution Method: Bouwer-Rice
y0 = 3.18 ft



FALLING TEST ANALYSIS

Data Set: C:\Documents and Settings\jli\My Documents\Projects\PBOW\mw25f.aqt
Date: 02/21/02 Time: 14:19:18

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: PB-BED-MW25
Test Date: 11/13/01

AQUIFER DATA

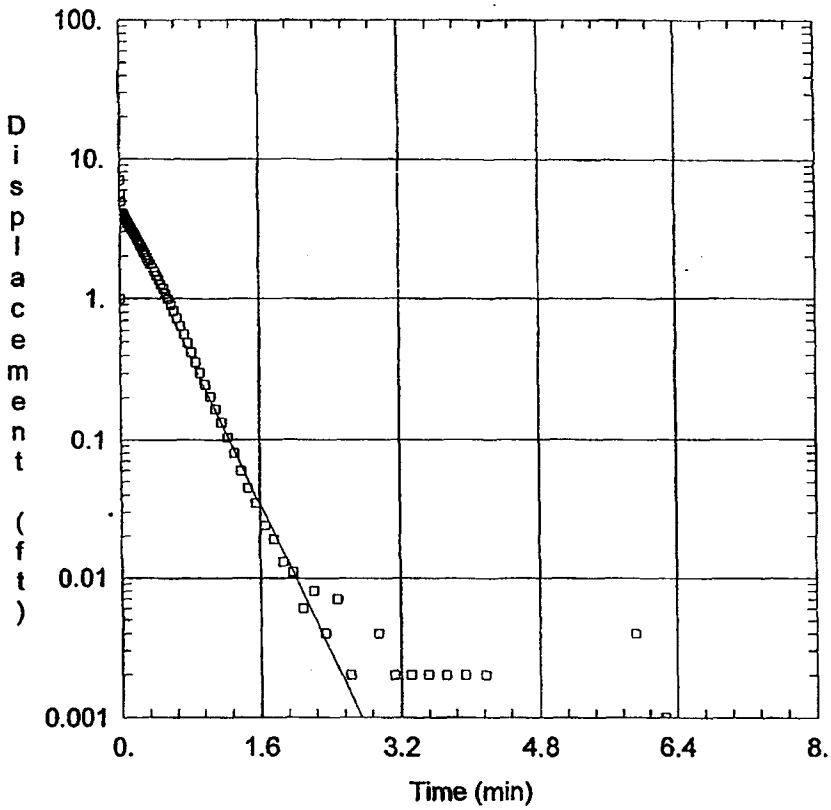
Saturated Thickness: 25.55 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-25)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.08 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 25.55 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.003808 ft/min
y0 = 4.458 ft



RISING TEST ANALYSIS

Data Set: C:\Documents and Settings\jli\My Documents\Projects\PBOW\mw25r.aqt
Date: 02/21/02 Time: 14:19:52

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: PB-BED-MW25
Test Date: 11/13/01

AQUIFER DATA

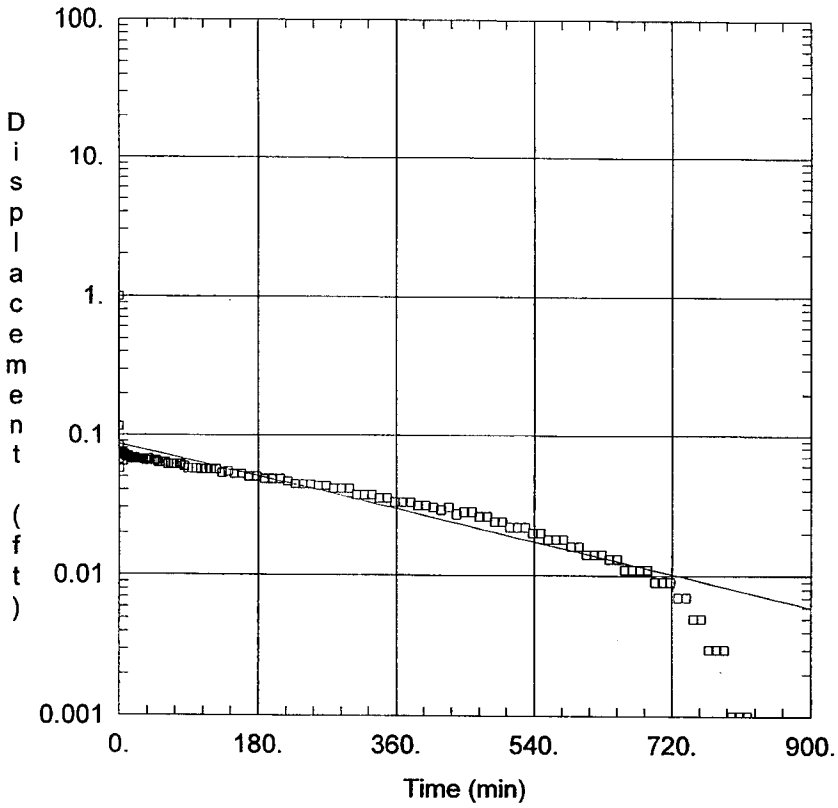
Saturated Thickness: 25.55 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-25)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.08 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 25.55 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.003333 ft/min
y0 = 4.729 ft



RISING TEST ANALYSIS

Data Set: C:\...\mw27r.aqt
Date: 12/18/02 Time: 08:19:12

PROJECT INFORMATION

Company: IT
Client: USACE
Project: 825635 04000000
Test Location: PBOW, Sandusky, OH
Test Well: PB-BED-MW27
Test Date: 11/14/01

AQUIFER DATA

Saturated Thickness: 59.26 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-27)

Initial Displacement: 1. ft
Wellbore Radius: 0.25 ft
Screen Length: 78.5 ft
Gravel Pack Porosity: 0.3
Casing Radius: 0.25 ft
Well Skin Radius: 0.25 ft
Total Well Penetration Depth: 59.26 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 5.134E-06 ft/min
y0 = 0.08558 ft

APPENDIX G

LAND SURVEY DATA

2001 - PBOW Survey Data
Monitoring Wells, Temporary Piezometers, and Soil Borings

M&S ID#	N (y)	E (x)	Riser Elevation	*Ground Elevation	I.T. DESIGNATION
PMW22	629778.465	1918366.518	629.67	627.22	PB-BED-MW22
PMW23	625837.856	1918150.334	633.71	631.11	PB-BED-MW23
MW24	622916.444	1908168.033	645.98	644.2	PB-BED-MW24
MW25	617820.942	1914457.628	684.59	681.99	PB-BED-MW25
PMW26	613878.45	1920274.330	677.21	674.61	PB-BED-MW26
PMW21	627896.268	1920791.393	627.14**	625.24	PB-BED-MW27
1421	623446.555	1922580.206	638.79	636.99	TNTA-BEDGW-001
GW003	618102.551	1918710.111	683.11	681.34	TNTB-BEDGW-003
GW04a	618468.655	1918572.329	668.63	666.78	TNTB-BEDGW-004
GW02a	620253.524	1912852.629	667.04	664.04	TNTC-BEDGW-001

Elevation of the well indicated by the double asterisk (**), is reported to the lip of the metal casing, the lip being further defined as the rim of the un-hinged portion of the casing when the well is open.

Temporary Piezometer Locations: TNT AREA "A"

M&S ID#	N (y)	E (x)	Ground Elevation	I.T. DESIGNATION
AGW11	622927.387	1923122.509	660.78	PBOW-TNTA-GW11
AGW14	623190.957	1922681.123	651.03	PBOW-TNTA-GW14
AGW17	623355.606	1923280.926	657.67	PBOW-TNTA-GW17
AGW18	623615.678	1922615.978	635.99	PBOW-TNTA-GW18
AGW19	623612.675	1923052.195	640.78	PBOW-TNTA-GW19
AGW20	623518.063	1923277.547	650.07	PBOW-TNTA-GW20
AGW21	623536.519	1923487.366	653.45	PBOW-TNTA-GW21
AGW22	623786.499	1923374.405	636.96	PBOW-TNTA-GW22
AGW23	624594.636	1923848.627	630.05	PBOW-TNTA-GW23
AGW24	624626.183	1924076.124	630.71	PBOW-TNTA-GW24
AGW25	624216.2087	1924365.209	647.27	PBOW-TNTA-GW25
AGW26	624710.322	1925228.323	635.59	PBOW-TNTA-GW26
AGW29	624060.502	1925148.986	651.70	PBOW-TNTA-GW29

Temporary Piezometer Locations: TNT AREA "B"

M&S ID#	N (y)	E (x)	Ground Elevation	I.T. DESIGNATION
GW01	618367.591	1918624.926	666.70	PBOW-TNTB-GW01
GW02a	618188.481	1918855.644	675.42	PBOW-TNTB-GW02
GW003	618102.551	1918710.111	680.81	PBOW-TNTB-GW03
BGW04	617135.012	1918389.937	671.48	PBOW-TNTB-GW04
GW05a	618217.994	1918058.619	668.41	PBOW-TNTB-GW05

Temporary Piezometer Locations: TNT AREA "C"

M&S ID#	N (y)	E (x)	Ground Elevation	I.T. DESIGNATION
CGW11	620331.710	1910550.710	653.83	PBOW-TNTC-GW11
CGW12	620146.522	1910611.696	662.05	PBOW-TNTC-GW12
CGW13	620758.676	1911179.138	646.45	PBOW-TNTC-GW13
CGW14	620274.222	1911096.543	665.86	PBOW-TNTC-GW14
CGW15	620356.049	1911289.110	663.64	PBOW-TNTC-GW15
CGW16	620580.093	1911620.405	652.40	PBOW-TNTC-GW16
CGW17	620595.298	1911806.326	654.39	PBOW-TNTC-GW17
1422	620512.153	1912367.605	656.21	PBOW-TNTC-GW18
1424	620501.150	1912567.123	653.19	PBOW-TNTC-GW19
1427	620516.741	1912868.095	650.61	PBOW-TNTC-GW20
CGW22	620004.907	1910543.651	667.56	PBOW-TNTC-GW22
CGW24	619961.510	1910900.212	673.99	PBOW-TNTC-GW24
CGW29	619944.630	1912604.500	675.09	PBOW-TNTC-GW29
CGW31	619846.540	1913163.050	673.35	PBOW-TNTC-GW31

Soil Borings

M&S ID#	N (y)	E (x)	I.T. DESIGNATION
575	625038.03	1919102.57	PBOW-PRWP-DP03A
583	624840.68	1919354.54	PBOW-PRWP-DP11A
587	625028.14	1919381.06	PBOW-PWRP-DP10A
600	622543.21	1910216.51	PBOW-WRWP-DP13A
619	622546.61	1909995.23	PBOW-WRWP-DP09A
621	622425.11	1910395.07	PBOW-WRWP-DP16A
1069	618043.21	1918673.57	PBOW-TNTB-SS375A
1080	618323.00	1918633.09	PBOW-TNTB-SS295A

M & S CONTROL POINTS USED:

M&S ID#	N (y)	E (x)	ELEV.
68	620384.34	1912011.51	662.63
1137	623519.65	1922494.73	638.67
1139	623137.9	1922479.99	652.75
1305	620363.23	1912296.61	662.99
1310	620524.21	1912187.81	653.25
1423	620366.89	1912542.66	662.89
1425	620319.01	1912809.24	662.82
6	621515.91	1921536.94	
10	620366.08	1921493.74	
55	622733.16	1910235.74	
59	622538.8	1910286.75	
94	624985.39	1919003.31	
95	624663.49	1919144.88	
597	622610.14	1910150.91	
1428	622395.48	1910271.94	
1429	618585.17	1919007.83	

Notes:

[a]Ground Elevation not provided by surveyors. Elevation obtained by subtracting riser height from TOC elevation.

A) SAMPLE STAKES AT NINE PREVIOUS SAMPLE LOCATIONS WERE RECOVERED AND/OR REPLACED BY CONVENTIONAL LAND SURVEYING TECHNIQUES. A TOPCON GTS-303 ELECTRONIC TOTAL STATION WAS USED TO MEASURE ANGLES AND DISTANCES FROM CONTROL POINTS PREVIOUSLY ESTABLISHED BY MURPHY AND SACKS SURVEYORS. WHERE AN EXISTING SAMPLE STAKE WAS NOT RECOVERED, STAKES WERE RESET AT A HORIZONTAL TOLERANCE OF 0.10' +/-.

B) WHERE POSSIBLE, NEW SAMPLE POINTS WERE COLLECTED BY DIRECT STATIC DIFFERENTIAL GPS OBSERVATION USING THREE LEICA SR-261 RECEIVERS. GPS VECTORS WERE ADJUSTED HOLDING FIXED STATION "CLARK" USING LEICA SKI SOFTWARE (VERSION 2.30), PRODUCING A LEAST SQUARES ADJUSTMENTS OF THE WGS 84 POSITIONS. A LOOP OF 5,409 METERS USING THE UNADJUSTED VECTORS PASSING THE FIXED AND DERIVED CONTROL YIELDS A LOOP PRECISION OF 1 PART IN 177,490. COORDINATE VALUES ARE REPORTED IN OHIO STATE PLANE SYSTEM, NORTH ZONE (NAD 1983.) A COMBINED SCALE FACTOR OF 0.9999270034 WAS USED IN THIS CALCULATION. VERTICAL DATUM IS NGVD 1929. VALUES OBTAINED ARE WITHIN THE HORIZONTAL TOLERANCE OF 0.10' +/- AND THE VERTICAL TOLERANCE OF 0.01' +/-.

C) WHEN DIRECT GPS OBSERVATION PROVED IMPOSSIBLE NEW SAMPLE LOCATIONS (M&S ID# 1421, 1422, 1424, 1427) WERE LOCATED BY CONVENTIONAL SURVEY TECHNIQUES AS DESCRIBED IN SECTION "A", ABOVE. VALUES OBTAINED ARE WITHIN THE HORIZONTAL TOLERANCE OF 0.10' +/- AND THE VERTICAL TOLERANCE OF 0.01' +/-

GPS CONTROL:

MONUMENT "CLARK" WAS ESTABLISHED BY M&S IN 1996 AS A PERMANANT, ON-SITE GPS CONTROL STATION. HORIZONTAL VALUES WERE DERIVED FROM NGS MONUMENT "SKYWAY RM 2" AND VERTICAL VALUES FROM FIRST ORDER CONTROL BENCHMARK J 318 USING A CLOSED, ADJUSTED GPS TRAVERSE. VALUES FOR MONUMENT "CLARK" ARE:

NORTHING (y) 191,029.0899m
EASTING (x) 585,910.9777m
COORDINATE REFERENCE SYSTEM IS NAD 83 (OHIO STATE PLANE NORTH ZONE)
ELLIPSOID ELEVATION 190.6255m (NGVD 29)
REFERENCE ELLIPSOID IS WGS 1984
GEOID HEIGHT -35.1900m
EPOCH IS GEOID 93

APPENDIX H

DATA VALIDATION SUMMARIES

Data Validation Summary Report
April 2002 Background/Non Background Wells
Former Plum Brook Ordnance Works
Sandusky, Ohio

1.0 Introduction

Level III data validation was performed on 100 percent of the environmental samples collected for LTM. The analytical data consisted of delivery groups (SDGs) CB001, CB002, and CB003, which were analyzed by Severn Trent Laboratories (STL). In addition, validation of the field-split data, which were analyzed by Accutest Laboratories, was performed and findings are discussed in section 5.0 of this report. Water matrix was validated.

The following samples were validated for this site investigation:

SDG Number	Sample Number
CB001	CB3001, CB3004, CB3005, CB3007, CB3008, CB3009, CB3010, CB3013, CB3015, CB3016, CB3018, CB3019, CB3020, CB3017, CB3022, CB3023, CB3029
CB002	CB3012, CB3026, CB3024, CB3025, CB3027, CB3028, CB3030, CB3014, CB3033, CB3034, CB3037, CB3038, CB3039, CB3040, CB3046
CB003	CB3041, CB3042, CB3043, CB3044
F12806	CB3006, CB3011
F12851	CB3045
F12883	CB3035
F12898	CB3047

The chemical parameters for which the samples were analyzed, are identified below:

Parameter (Prep/Analytical Method)
Volatile Organics by GC/MS SW846 5030/8260B
Semivolatile Organics by GC/MS SW846 3510C/8270C
Total and Dissolved Metals by SW846 3005A/6010B and 7470A
Gasoline Range Organics and Diesel Range Organics by 3580A/8015A
Nitroaromatic and Nitramine Explosives by SW846 8330M
Wet Chemistry (TOC, sulfate, Nitrate, Chloride, Alkalinity, Turbidity, TSD, TSS, Hardness, Cyanide)

Analysis found in Test Methods For Evaluating Solid Waste, Physical/Chemical Methods, Third

Edition and Methods for Chemical Analysis of Water and Wastes, March 1983 and their subsequent revisions.

2.0 Procedures

The sample data were validated following the logic identified in the 1994 *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* and the 1999 *EPA Contract Laboratory Program National Functional Guidelines for Organic Review* for all areas except blanks. *Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses* (April 1993) and *Region III Modifications to National Functional Guidelines for Organic Data Review, Multi-Media, Multi-Concentration* (September 1994) were applied to the areas associated with blank contamination. Specific quality control (QC) criteria as identified in the quality assurance plan (QAP), analytical methods, and laboratory standard operating procedures (SOP) were applied to all sample results. As a result of the use of Update III SW846 test methods for the analytical data and the application of the Contract Laboratory Program (CLP) guidelines during the validation process, there were instances where specific QC requirements for all target compounds were not defined. This primarily occurred in the organic, gas chromatography (GC) and GC/mass spectrometry (MS) calibration areas and is due to the fact that the analytical methods are performance-based and allow the use of average calibration responses in lieu of individual responses, which are defined by CLP protocol. In light of applying CLP guidelines to SW846 methods and evaluating the usability of the data during the validation process, specific QC criteria were determined to address all target compounds and are identified in this report for each parameter, as well as in the validation checklists, which function as worksheets. All completed validation checklists are included in attachment A. For those analytical methods not addressed by the CLP and Region III guidelines, the validation was based on the method requirements (i.e., SW846, Code of Federal Regulations, SOPs) and technical judgement, following the logic of the CLP validation guidelines.

3.0 Summary of Data Validation Findings

The overall quality of the data was determined to be acceptable with minimal qualifications. The only rejected data ("R" qualified) was due to "poor performing" volatile compounds (ketones, some halogenated hydrocarbons, etc.), which experienced poor calibration responses in the associated calibration data, and semivolatile compounds which experienced extremely low LSC % recoveries. Also, explosive compound Tetryl which had no recovery in the MS/MSD analysis, and samples that were reanalyzed and have more than one set of results reported.

Individual validation reports have been prepared for each parameter, and the overall results of the validation findings are summarized in this report. A listing of the validation qualifiers and the

reason codes, along with their definitions, is found in Attachment A. The following section highlights the key findings of the data validation for each analysis.

4.0 Analysis-Specific Data Validation Summaries

4.1 Volatile Organics by GC/MS SW846 8260B

Overall, the data are of good quality and are usable as reported by the laboratory with the exceptions noted below. Data were reviewed for the following:

Preservation

Preservation criteria were met for all samples with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB002	CB3012, CB3025, CB3033, CB3037	Benzene, Ethylbenzene, Toluene	J
CB003	CB3044	Benzene, Ethylbenzene, Toluene	J

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

The initial calibration (ICAL) and continuing calibrations (CCAL) associated with the project samples met QC criteria with the following exception(s):

- The following exhibited individual ICAL/CCAL relative response factor (RRF) <0.05:

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB001	CB3001, CB3004, CB3005, CB3007, CB3008, CB3009, CB3010, CB3013, CB3015, CB3016, CB3017, CB3018, CB3019, CB3020, CB3022, CB3023, CB3029	Acetone	J/R/B
	CB3001, CB3004, CB3005, CB3007, CB3008, CB3009, CB3010, CB3013, CB3016	2-Butanone	UJ/R
	CB3001, CB3004, CB3005, CB3008, CB3015, CB3022	Bromomethane	R
CB002	All Samples: CB3012, CB3014, CB3024, CB3025, CB3026, CB3027, CB3028, CB3030, CB3033, CB3034, CB3037, CB3038, CB3039, CB3040, CB3046	Acetone, 2-Butanone	J/R

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB003	All Samples: CB3041, CB3042, CB3043, CB3044	Acetone, 2-Butanone	J/R

- The following exhibited individual ICAL relative standard deviation (%RSD) >30 and/or CCAL percent difference (%D) >25:

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB001	CB3001, CB3004, CB3005, CB3008, CB3015, CB3022	2-Butanone, Bromomethane, Chloromethane, 1,2-Dichloroethene	J/R/UJ
	CB3007, CB3013	Methylene chloride	J/UJ
CB003	All Samples: CB3041, CB3042, CB3043, CB3044	Acetone	J

Blanks

The 5X/10X rule for contaminants found in the associated equipment rinses, trip blanks, and method blanks was applied to all sample results. All were found to be acceptable with the following exception(s):

SDG	Samples Affected	Compound(s)	Blank Contaminant	Validation Qualifier
CB001	CB3004, CB3005, CB3016, CB3022	Methylene chloride	Method/TB	B
	CB3018, CB3019, CB3020, CB3023	Acetone	Method/TB	B
CB002	CB3024	Methylene chloride	Method/TB	B
CB003	CB3042, CB3043	Methylene chloride	Method/TB	B

Surrogate Recoveries

All surrogate recoveries were within QC limits with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB001	CB3015	All Compounds	J/R/UJ

Matrix Spike / Matrix Spike Duplicate

Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis was performed for the project samples, and all QC criteria were met.

Laboratory Control Sample

Laboratory Control Sample (LCS) analysis was performed for the project samples, and all QC criteria were met.

Field Duplicates

Original and field duplicate results were evaluated and no problems were identified except for the following:

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB001	CB3004, CB3005	Carbon Disulfide	J

Internal Standards

All internal standards met QC criteria.

Quantitation

Results quantitated between the method detection limit (MDL) and the reporting limit (RL), which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected.

4.2 Semivolatile Organics by GC/MS SW846 8270C

Overall, the data are of good quality and are usable as reported by the laboratory with the exceptions noted below. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB002	CB3014	All Compounds	J/UJ

Initial and Continuing Calibration

All initial and continuing calibrations associated with the project samples met QC criteria with the following exception(s):

- The following exhibited individual CCAL percent difference (%D) >25:

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB002	All Samples: CB3012, CB3014, CB3024, CB3025, CB3026, CB3027, CB3028, CB3030, CB3033, CB3034, CB3037, CB3038, CB3039, CB3040, CB3046	2,4-Dinitrophenol	UJ
CB003	CB3041, CB3042, CB3043, CB3044	2,4-Dinitrophenol	UJ

Blanks

The 5X/10X rule for contaminants found in the associated equipment rinses and method blanks was applied to all sample results. All were found to be acceptable.

Surrogate Recoveries

All surrogate recoveries were within QC criteria.

Matrix Spike / Matrix Spike Duplicate

MS/MSD analysis was performed for the project samples, and all QC criteria were met.

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB003	CB3044	All Acid Compounds	J/UJ/R*

* Pentachlorophenol and 4-Nitrophenol results were R qualified due to LCS % recovery <10%

Field Duplicates

Original and field duplicate results were evaluated, and all QC criteria were met.

Internal Standards

All internal standards met QC criteria.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected.

4.3 Metals by SW846 6010B/7470A

Overall, the data are of good quality and are usable as reported by the laboratory with the exceptions noted below. Data were reviewed for the following:

Sample Preservation

Preservation criteria were met for all samples.

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibrations

All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X rule for contaminants found in the associated equipment rinse, calibration, and method blanks was applied to all sample results. All criteria were acceptable with the following exception(s):

SDG	Samples Affected	Compound(s)	Blank Contaminant	Validation Qualifier
CB001	CB3009, CB3010, CB3013, CB3015, CB3016, CB3018, CB3019, CB3020, CB3022, CB3023, CB3029	Aluminum (dissolved)	Calibration	B
	CB3022	Aluminum (total)	Calibration	B
	CB3017	Copper (dissolved)	Calibration	B
CB002	CB3012, CB3014, CB3025, CB3026, CB3027, CB3030, CB3033, CB3034, CB3037, CB3039, CB3040	Aluminum (total)	Calibration	B
	CB3034, CB3037	Aluminum (dissolved)	Calibration	B
	CB3012	Copper (total)	Calibration	B
	CB3014, CB3024, CB025, CB3026, CB3027, CB3030, CB3033, CB3037, CB3038, CB3039, CB3046	Thallium (total)	Method/Calib	B
	CB3037	Thallium (dissolved)	Method	B
	CB3024, CB3038, CB3046	Beryllium (total)	Calibration	B
CB003	CB3041, CB3042	Aluminum (total)	Calibration	B
	CB3041, CB3042, CB3043, CB3044	Aluminum (dissolved)	Calibration	B

SDG	Samples Affected	Compound(s)	Blank Contaminant	Validation Qualifier
	CB3044	Beryllium	Calibration	B

Matrix Spike / Matrix Spike Duplicate

MS/MSD analysis was performed for the project samples, and all QC criteria were met.

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

Interference Check Sample All Interference Check Sample (ICS) percent recoveries were acceptable. All QC criteria were met.

Inductively Coupled Plasma Serial Dilutions

All QC criteria were met for the serial dilutions associated with the project samples with the following exception(s):

SDG	Samples Affected	Compound(s)	Validation Qualifier
CB001	All Samples: CB3009, CB3010, CB3013, CB3015, CB3016, CB3017, CB3018, CB3019, CB3020, CB3022, CB3023, CB3029	Potassium (total and dissolved)	J
	CB3009, CB3010, CB3013, CB3015, CB3016, CB3017, CB3022, CB3023, CB3029	Zinc (dissolved)	J
CB002	CB3012, CB3024, CB3025, CB3027, CB3028, CB3030, CB3033, CB3034, CB3038, CB3039, CB3040, CB3046	Iron (total)	J
	CB3012, CB3030, CB3038, CB3040, CB3046	Iron (dissolved)	J
CB003	CB3041, CB3042, CB3044	Potassium (total)	J
	CB3041, CB3042, CB3043, CB3044	Potassium (dissolved)	J
	CB3042, CB3043	Zinc (dissolved)	J
	CB3041, CB3042, CB3043	Zinc (dissolved)	J

Field Duplicates

Original and field duplicate results were evaluated, and no problems were identified with the following exception(s):

SDG	Samples Affected	Compound(s)	Validation Qualifier
CB001 (dissolved)	CB3019 (original), CB3020 (FD)	Manganese	J
	CB3004 (original), CB3005 (FD)	Zinc	J
CB001 (total)	CB3009 (original), CB3010 (FD)	Iron	J
	CB3019 (original), CB3020 (FD)	Zinc	J
CB002	CB3038 (original), CB3046 (FD)	Thallium (total)	B

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected.

4.4 Nitroaromatic and Nitramine Explosives by SW846 8330

Overall, the data are of good quality and are usable as reported by the laboratory. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X rule for contaminants found in the associated equipment rinses and method blanks was applied to all sample results. All were found to be acceptable.

Surrogate Recoveries

All surrogate recoveries were within QC criteria.

Matrix Spike / Matrix Spike Duplicate

MS/MSD analysis was performed for the project samples, and all QC criteria were met with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB001	CB3001, CB3004, CB3005, CB3007, CB3008, CB3009, CB3010, CB3013, CB3015, CB3016, CB3017, CB3018, CB3019, CB3020, CB3022, CB3023, CB3029	Tetryl	*R

*R qualified due to 0% recovery of MS/MSD sample.

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

2ND Column Confirmation

The percent difference QC criteria between columns for analyte concentrations were met.

Field Duplicates

Original and field duplicate results were evaluated, and no problems were identified with the following exception(s):

SDG	Samples Affected	Compound(s)	Validation Qualifier
CB002	CB3038 (original), CB3039 (FD)	2,6-Dinitrotoluene	J

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected.

4.5 Wet Chemistry (TOC, Sulfate, Nitrate, Chloride, Alkalinity, Turbidity, TDS, TSS, Hardness, Cyanide)

Overall, the data are of good quality and are usable as reported by the laboratory. Data were reviewed for the following:

Preservation

Preservation criteria were met for all samples with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB001	CB3001, CB3015	Cyanide	UJ

Holding Times

Technical holding time criteria were met for all samples with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB001	CB3015, CB3016, CB3018, CB3019	Nitrate, Turbidity	J/UJ

Initial and Continuing Calibration

All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X rule for contaminants found in the associated equipment rinses and method blanks was applied to all sample results. All were found to be acceptable with the following exception(s):

SDG	Samples Affected	Compound(s)	Blank Contaminant	Validation Qualifier
CB001	CB3015	Sulfate	Method	B
	CB3017	Alkalinity	Method	B
CB002	CB3038	Alkalinity	Method	B

Matrix Spike / Matrix Spike Duplicate

MS/MSD analysis was performed for the project samples, and all QC criteria were met with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
CB001	CB3001, CB3004, CB3005, CB3007, CB3008, CB3009, CB3013, CB3015, CB3016, CB3017, CB3018, CB3019, CB3022, CB3023, CB3029	Chloride	J

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

Field Duplicates

Original and field duplicate results were evaluated, and no problems were identified.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected.

5.0 Quality Assurance Field Split Sample Data Evaluation

Data from the quality assurance split samples: SDG F12806 sample CB3011, SDG F12851 sample CB3045, SDG F12883 sample CB3035, and SDG F12898 sample CB3047, were validated. The FS samples were analyzed for Volatiles by SW846 8260B, Semivolatiles by SW846 8270C, Explosives by SW846 8330, and Metals by SW846 6010B and 7470A. The following section highlights the key findings of the data validation for each analysis.

5.1 Volatile Organics by GC/MS SW846 8260B

Overall, the data are of good quality and are usable as reported by the laboratory. Data were reviewed for the following:

Preservation

Preservation criteria were met for all samples.

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

The initial calibration (ICAL) and continuing calibrations (CCAL) associated with the project samples met QC criteria.

Blanks

The 5X/10X rule for contaminants found in the associated equipment rinses, trip blanks, and method blanks was applied to all sample results. All were found to be acceptable.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike / Matrix Spike Duplicate

Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis was performed for the project samples, and all QC criteria were met.

Laboratory Control Sample

Laboratory Control Sample (LCS) analysis was performed for the project samples, and all QC criteria were met.

Internal Standards

All internal standards met QC criteria.

Field Split/Original Sample Comparison

SDG F12806

CB3009 (original) and CB3011 (FS) results were evaluated. It should be noted that CB3011 (FS) were non-detect for all compounds. CB3009 (original) had hits for methylene chloride below the reporting limits. CB3004 (original) and CB3006 (FS) results were evaluated. It should be noted that CB3006 (FS) were non-detect for all compounds. CB3004 (original) had hits for carbon disulfide, methylene chloride, and toluene below the reporting limits.

SDG F12851

CB3026 (original) and CB3045 (FS) results were evaluated. CB3026 (original) and CB3045 (FS) had hits for acetone, benzene, toluene, and ethylbenzene and all RPD QC criteria were met. It should also be note that CB3026 had hits for methylene chloride and CB3046 (FS) had hits for carbon disulfide.

SDG F12883

CB3033 (original) and CB3035 (FS) results were evaluated. CB3033 (original) and CB3035 (FS) had hits for benzene, toluene, and ethylbenzene and all RPD QC criteria were met. It should also be note that CB3033 had hits for methylene chloride and Xylenes.

SDG 12898

CB3038 (original) and CB3047 (FS) results were evaluated. It should be noted that CB3047 (FS) were non-detect for all compounds. CB3038 (original) had a hit for acetone below the reporting limit.

Quantitation

Results quantitated between the method detection limit (MDL) and the reporting limit (RL), which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was

present or the results were rejected.

5.2 Semivolatile Organics by GC/MS SW846 8270C

Overall, the data are of good quality and are usable as reported by the laboratory with the exceptions noted below. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

The initial calibration and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X/10X rule for contaminants found in the associated blanks was applied to all sample results and all were found to be acceptable.

Matrix Spike / Matrix Spike Duplicate

Batch QC was performed for the project samples and all QC criteria were met.

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
F12898	CB3047	All acid compounds	UJ

Surrogate Recoveries

All surrogate recoveries were within QC criteria with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
F12898	CB3047	All acid compounds	UJ

Internal Standards

All internal standards met QC.

Field Split/Original Sample Comparison

SDG F12806
CB3009 (original) and CB3011 (FS) results were evaluated. It should be noted that CB3009 (original) and CB3011 (FS) were non-detect for all compounds. CB3004 (original) and CB3006 (FS) results were evaluated. No compounds were detected in either sample.

SDG F12851
CB3026 (original) and CB3045 (FS) results were evaluated. CB3026 (original) were non-detect for all compounds. CB3046 (FS) had hits for 2-methylnaphthalene below the reporting limits.

SDG F12883
CB3033 (original) and CB3035 (FS) results were evaluated. CB3033 (original) had hits for naphthalene below the reporting limits and CB3035 (FS) had hits for 3&4-methylphenol.

SDG F12898
CB3038 (original) and CB3047 (FS) results were evaluated. CB3038 (original) and CB3047 (FS) had hits for 2,4-dinitrotoluene and all RPD QC criteria were met. It should also be note that CB3038 had hits for 2,6-dinitrotoluene below the reporting limits.

Quantitation
Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected.

5.3 Metals by SW846 6010B/7470A

Overall, the data are of good quality and are usable as reported by the laboratory. Data were reviewed for the following:

Holding Times
Technical holding time criteria were met for all samples.

Initial and Continuing Calibration
All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks
The 5X rule for contaminants found in the associated blanks was applied to all sample results and all were found to be acceptable.

Matrix Spike / Matrix Spike Duplicate

Batch QC was performed for the project samples and all QC criteria were met.

Laboratory Control Sample (LCS)
All QC criteria were met for the LCS associated with the project sample analyses.

Interference Check Sample All Interference Check Sample (ICS) percent recoveries were acceptable. All QC criteria were met.

Inductively Coupled Plasma Serial Dilutions
All QC criteria were met for the serial dilutions associated with the project samples.

Field Split/Original Sample Comparison

SDG F12806
CB3009 (original) and CB3011 (FS) results were evaluated. It should be noted that total and dissolved results for CB3011 (FS) had a high RPD for potassium. CB3004 (original) and CB3006 (FS) results were evaluated. High RPDs for total and dissolved potassium and total iron were encountered.

SDG F12851
CB3026 (original) and CB3045 (FS) results were evaluated. All RPD QC criteria results for total metals were met. It should be noted that dissolved results for CB3045 (FS) had a high RPD for potassium

SDG F12883
CB3033 (original) and CB3035 (FD) results were evaluated. All RPD QC criteria results for dissolved metals were met. Is should be noted that total results for CB3035 (FS) had a high RPD for iron.

SDG F12898
CB3038 (original) and CB3047 (FS) results were evaluated. All RPD QC results for total and dissolved metals were met.

Quantitation
Results quantified between the MDL and the RL, which the lab qualified as "J," were qualified as estimated "J" unless blank contamination was present or the results were rejected.

5.4 Nitroaromatic and Nitramine Explosives by SW846 8330

Overall, the data are of good quality and are usable as reported by the laboratory with the exceptions noted below. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X rule for contaminants found in the associated equipment rinses and method blanks was applied to all sample results. All were found to be acceptable.

Surrogate Recoveries

All surrogate recoveries were within QC criteria with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
F12851	CB3045	All compounds	UJ
F12883	CB3035	All compounds	UJ

Matrix Spike / Matrix Spike Duplicate

MS/MSD analysis was performed for the project samples, and all QC criteria were met with the following exception(s):

SDG Number	**Samples Affected**	**Compound(s)**	**Validation Qualifier**
F12898	CB3047	2,6-Ninitrotoluene, 1,3,5-Trinitrobenzene	UJ

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

2ND Column Confirmation

The percent difference QC criteria between columns for analyte concentrations were met.

Field Split/Original Sample Comparison

SDG F12806

CB3009 (original) and CB3011 (FS) results were evaluated. It should be noted that CB3004

(original) and CB3006 (FS) were non-detect for all compounds.

SDG F12851

CB3026 (original) and CB3045 (FS) results were evaluated. It should be noted that CB3026 (original) and CB3045 (FS) were non-detect for all compounds.

SDG 12883

CB3033 (original) and CB3035 (FS) results were evaluated. It should be noted that CB3033 (original) and CB3035 (FS) were none-detect for all compounds.

SDG F12898

CB3038 (original) and CB3047 (FS) results were evaluated. CB3038 (original) and CB3047 (FS) had hits for 2,4,6-trinitrotoluene, 4-amino-2,6-dinitrotoluene, 2-amino-4,6,dinitrotoluene, 2,6-dinitrotoluene, and 2,4-dinitrotoluene. It should be noted that CB3047 had high RPD results for 2,6-Dinitrotoluene.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected.

Attachment A:

Validation Qualifiers

U Not detected. The compound/analyte was analyzed for, but not detected above the associated reporting limit.

J The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

B The concentration reported was detected significantly above the levels reported in the associated equipment rinse samples and/or laboratory method and trip blanks. (5X/10X Rule was applied).

R The reported sample results are rejected due to the following:

1. Severe deficiencies in the supporting quality control data.
2. Anomalies noted in the sampling and/or analysis process which could affect the validity of the reported data.
3. The presence or absence of the constituent cannot be verified based on the data provided.
4. To indicate not to use a particular result in the event of a reanalysis.

UJ The compound/analyte was analyzed for, but not detected above the established reporting limit. However, review and evaluation of supporting QC data and/or sampling and analysis process have indicated that the "nondetect" may be inaccurate or imprecise. The nondetect result should be estimated.

Validation Reason Code Definitions

Reason Code	Definition
01	Sample received outside of 4+/-2 degrees Celsius
01A	Improper sample preservation
02	Holding time exceeded
02A	Extraction
02B	Analysis
03	Instrument performance – outside criteria
03A	BFB
03B	DFTPP
03C	DDT and/or Endrin % breakdown exceeds criteria
03D	Retention time windows
03E	Resolution
04	Initial calibration results outside specified criteria
04A	Compound mean RRF QC criteria not met
04B	Individual % RSD criteria not met
04C	Correlation coefficient >0.995
05	Continuing calibration results outside specified criteria
05A	Compound mean RRF QC criteria not met
05B	Compound % D QC criteria not met
06	Result qualified as a result of the 5x/10x blank correction
06A	Method or preparation blank
06B	ICB or CCB
06C	ER
06D	TB
06E	FB
07	Surrogate recoveries outside control limits
07A	Sample
07B	Associated method blank or LCS
08	MS/MSD/Duplicate results outside criteria
08A	MS and/or MSD recovery not within control limits (accuracy)
08B	% RPD outside acceptance criteria (precision)
09	Post digestion spike outside criteria (GFAA)
10	Internal standards outside specified control limits
10A	Recovery
10B	Retention time
11	Laboratory control sample recoveries outside specified limits
11A	Recovery
11B	% RPD (if run in duplicate)
12	Interference check standard
13	Serial dilution
14	Tentatively identified compounds
15	Quantitation
16	Multiple results available; alternate analysis preferred
17	Field duplicate RPD criteria is exceeded
18	Percent difference between original and second column exceeds QC criteria
19	Professional judgement was used to qualify the data
20	Pesticide clean-up checks
21	Target compound identification
22	Radiological calibration
23	Radiological quantitation
24	Reported result and/or lab qualifier revised to reflect validation findings

Data Validation Summary Report
July 2002 Background Monitoring Wells
Former Plum Brook Ordnance Works
Sandusky, Ohio

1.0 Introduction

Level III data validation was performed on 100 percent of the environmental samples collected for July 2002 Background Well Sampling. The analytical data consisted of delivery groups (SDGs) H2G110121, H2G120123, H2G120173, and H2G130120, which were analyzed by Severn Trent Laboratories (STL). In addition, validation of the field-split data, which were analyzed by Accutest Laboratories, was performed and findings are discussed in Section 5.0 of this report. Water matrix was validated.

The following samples were validated for this site investigation:

SDG Number	Sample Number
H2G110121	CC3009, CC3003
H2G120123	CC3002
H2G120173	CC3005, CC3006, CC3002
H2G130120	CC3004, CC3001

The chemical parameters for which the samples were analyzed, are identified below:

Parameter (Prep/Analytical Method)
Volatile Organics by GC/MS SW846 5030/8260B
Semivolatile Organics by GC/MS SW846 3510C/8270C
Total and Dissolved Metals by SW846 3005A/6010B and 7470A
Nitroaromatic and Nitramine Explosives by SW846 8330M
Gasoline Range Organics (GRO) by SW846 8015B
Diesel Range Organics (DRO) by SW846 8015B
Wet Chemistry (TOC, Sulfate, Nitrate, Chloride, Alkalinity, Turbidity, TSD, TSS, Hardness, Cyanide)

2.0 Procedures

The sample data were validated following the logic identified in the 1994 *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* and the 1999

EPA Contract Laboratory Program National Functional Guidelines for Organic Review for all areas except blanks. *EPA Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses* (April 1993) and *Region III Modifications to National Functional Guidelines for Organic Data Review, Multi-Media, Multi-Concentration (September 1994)* were applied to the areas associated with blank contamination. Specific quality control (QC) criteria as identified in the quality assurance plan (QAP), analytical methods, and laboratory standard operating procedures (SOP) were applied to all sample results. As a result of the use of Update III SW846 test methods for the analytical data and the application of the Contract Laboratory Program (CLP) guidelines during the validation process, there were instances where specific QC requirements for all target compounds were not defined. This primarily occurred in the organic, gas chromatography (GC) and GC/mass spectrometry (MS) calibration areas and is due to the fact that the analytical methods are performance-based and allow the use of average calibration responses in lieu of individual responses, which are defined by CLP protocol. In light of applying CLP guidelines to SW846 methods and evaluating the usability of the data during the validation process, specific QC criteria were determined to address all target compounds and are identified in this report for each parameter, as well as in the validation checklists, which function as worksheets. All completed validation checklists are include in attachment A. For those analytical methods not addressed by the CLP and Region III guidelines, the validation was based on the method requirements (i.e., SW846, Code of Federal Regulations, SOPs) and technical judgement, following the logic of the CLP validation guidelines.

3.0 Summary of Data Validation Findings

The overall quality of the data was determined to be acceptable with minimal qualifications. The only rejected data ("R" qualified) was explosive compound Tetryl which had no recovery in the MS/MSD analysis, and samples that were reanalyzed and have more than one set of results reported. The "R" qualifier was assigned to the samples with more than one set of results to indicate that a given result should not be used to characterize a particular constituent or an analysis for a given sample.

Individual validation reports have been prepared for each parameter, and the overall results of the validation findings are summarized in this report. A listing of the validation qualifiers and the reason codes, along with their definitions, is found in Attachment A. The following section highlights the key findings of the data validation for each analysis.

4.0 Analysis-Specific Data Validation Summaries

4.1 Volatile Organics by GC/MS SW846 8260B

Overall, the data are of good quality and are usable as reported by the laboratory with the exceptions noted below. Data were reviewed for the following:

Preservation

Preservation criteria were met for all samples with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
H2G130120	*CC3004	Benzene, Ethylbenzene, Toluene	J

* The pH of sample CC3004 was greater than 2. Since EPA has indicated that some aromatic compounds in wastewater samples, notably benzene, toluene, and ethylbenzene may be susceptible to biological degradation, results for these compounds were estimated.

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

The initial calibration (ICAL) and continuing calibrations (CCAL) associated with the project samples met QC criteria with the following exception(s):

- The following exhibited individual ICAL relative standard deviation (%RSD) >30 and/or CCAL percent difference (%D) >25:

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
H2G110121	CC3003, CC3009	Bromoform, Carbon tetrachloride, trans-1,3-Dichloropropene	UJ
H2G120173	CC3005, CC3006	Bromoform, Carbon tetrachloride, trans-1,3-Dichloropropene	UJ
H2G130120	CC3001, CC3004	Bromoform, trans-1,3-Dichloropropene	UJ

Blanks

The 5X/10X rule for contaminants found in the associated equipment rinses, trip blanks, and method blanks was applied to all sample results. All were found to be acceptable with the following exception(s):

SDG	Samples Affected	Compound(s)	Blank Contaminant	Validation Qualifier
H2G110121	CC3003, CC3009	Acetone	Method/TB	B
	CC3003	Toluene	TB	B
	CC3009	Methylene chloride	Method/TB	B
H2G120173	CC3005, CC3006	Acetone	Method/TB	B
	CC3006	Bromomethane	TB	B
H2G130120	CC3001, CC3004	2-Butanone	TB	B
	CC3001	Acetone	Method/TB	B

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike / Matrix Spike Duplicate

Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis was performed for the project samples, and all QC criteria were met.

Laboratory Control Sample

Laboratory Control Sample (LCS) analysis was performed for the project samples, and all QC criteria were met.

Field Duplicates

Original and field duplicate results were evaluated and no problems were identified.

Internal Standards

All internal standards met QC criteria.

Quantitation

Results quantitated between the method detection limit (MDL) and the reporting limit (RL), which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected. Results rejected in favor of a preferred result (e.g., due to dilution or reanalysis) were qualified as rejected "R".

4.2 Semivolatile Organics by GC/MS SW846 8270C

Overall, the data are of good quality and are usable as reported by the laboratory with the exceptions noted below. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

All initial and continuing calibrations associated with the project samples met QC criteria with the following exception(s):

- The following exhibited individual ICAL relative standard deviation (%RSD) >30 and/or CCAL percent difference (%D) >25:

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
H2G110121	CC3003, CC3009	2,4-Dinitrophenol, Hexachlorocyclopentadiene, 2-Methylnaphthalene	UJ
H2G120173	CC3005, CC3006	2,4-Dinitrophenol, Hexachlorocyclopentadiene	UJ
H2G130120	CC3001, CC3004	2,4-Dinitrophenol, Hexachlorocyclopentadiene, 2-Methylnaphthalene	UJ

Blanks

The 5X/10X rule for contaminants found in the associated equipment rinses and method blanks was applied to all sample results. All were found to be acceptable with the following exception(s):

SDG	Samples Affected	Compound(s)	Blank Contaminant	Validation Qualifier
H2G120173	CC3005, CC3006	bis(2-Ethylhexyl)phthalate	Method	B
H2G130120	CC3001, CC3004	bis(2-Ethylhexyl)phthalate	Method	B

Surrogate Recoveries

All surrogate recoveries were within QC criteria.

Matrix Spike / Matrix Spike Duplicate

MS/MSD analysis was performed for the project samples, and all QC criteria were met.

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

Field Duplicates

Original and field duplicate results were evaluated, and all QC criteria were met.

Internal Standards

All internal standards met QC criteria.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J," were qualified as estimated "J" unless blank contamination was present or the results were rejected. Results rejected in favor of a preferred result (e.g., due to dilution or reanalysis) were qualified as rejected "R".

4.3 Total and Dissolved Metals by SW846 6010B/7470A

Overall, the data are of good quality and are usable as reported by the laboratory with the exceptions noted below. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibrations

All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X rule for contaminants found in the associated equipment rinse, calibration, and method blanks was applied to all sample results. All criteria were acceptable with the following exception(s):

SDG	Samples Affected	Compound(s)	Blank Contaminant	Validation Qualifier
H2G110121	CC3003, CC3009	Aluminum (dissolved)	Calibration	B
	CC3003	Aluminum (total)	Calibration	B
H2G120173	CC3005, CC3006	Aluminum (dissolved)	Method/Calib	B
H2H130120	CC3001, CC3004	Aluminum (dissolved)	Method/Calib	B
	CC3001	Aluminum (total)	Calibration	B
	CC3004	Lead (total)	Calibration	B

Matrix Spike / Matrix Spike Duplicate

MS/MSD analysis was performed for the project samples, and all QC criteria were met.

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

Interference Check Sample

All Interference Check Sample (ICS) percent recoveries were acceptable. All QC criteria were met.

Inductively Coupled Plasma Serial Dilutions

All QC criteria were met for the serial dilutions associated with the project samples with the following exception(s):

SDG	Samples Affected	Compound(s)	Validation Qualifier
H2G110121	CC3003, CC3009	Potassium (dissolved/total)	J
H2G120173	CC3005, CC3006	Potassium (dissolved/total)	J

Field Duplicates

Original and field duplicate results were evaluated, and no problems were identified.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected. Results rejected in favor of a preferred result (e.g., due to dilution or reanalysis) were qualified as rejected "R".

4.4 Nitroaromatic and Nitramine Explosives by SW846 8330

Overall, the data are of good quality and are usable as reported by the laboratory. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X rule for contaminants found in the associated equipment rinses and method blanks was applied to all sample results. All were found to be acceptable.

Surrogate Recoveries

All surrogate recoveries were within QC criteria.

Matrix Spike / Matrix Spike Duplicate

MS/MSD analysis was performed for the project samples, and all QC criteria were met with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
H2G120173	CC3005, CC3006	*Tetryl	R

*R qualified due to 0% recovery of MS/MSD sample.

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

2ND Column Confirmation

The percent difference QC criteria between columns for analyte concentrations were met.

Field Duplicates

Original and field duplicate results were evaluated, and no problems were identified.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected. Results rejected in favor of a preferred result (e.g., due to dilution or reanalysis) were qualified as rejected "R".

4.5 Gasoline Range Organics (GRO) by SW846 8015B

Overall, the data are of good quality and are usable as reported by the laboratory. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X rule for contaminants found in the associated equipment rinses and method blanks was applied to all sample results. All were found to be acceptable.

Surrogate Recoveries

All surrogate recoveries were within QC criteria.

Matrix Spike / Matrix Spike Duplicate

MS/MSD analysis was performed for the project samples, and all QC criteria were met.

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

Field Duplicates

Original and field duplicate results were evaluated, and no problems were identified.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected. Results rejected in favor of a preferred result (e.g., due to dilution or reanalysis) were qualified as rejected "R".

4.6 Diesel Range Organics (DRO) by SW846 8015B

Overall, the data are of good quality and are usable as reported by the laboratory. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X rule for contaminants found in the associated equipment rinses and method blanks was applied to all sample results. All were found to be acceptable.

Surrogate Recoveries

All surrogate recoveries were within QC criteria.

Matrix Spike / Matrix Spike Duplicate

MS/MSD analysis was performed for the project samples, and all QC criteria were met.

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

Field Duplicates

Original and field duplicate results were evaluated, and no problems were identified.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected. Results rejected in favor of a preferred result (e.g., due to dilution or reanalysis) were qualified as rejected "R".

4.7 Wet Chemistry (TOC, Sulfate, Nitrate, Chloride, Alkalinity, Turbidity, TDS, TSS, Hardness, Cyanide)

Overall, the data are of good quality and are usable as reported by the laboratory. Data were reviewed for the following:

Preservation

Preservation criteria were met for all samples.

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X rule for contaminants found in the associated equipment rinses and method blanks was applied to all sample results. All were found to be acceptable.

Matrix Spike / Matrix Spike Duplicate

MS/MSD analysis was performed for the project samples, and all QC criteria were met with the

following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
H2G120173	CC3005	Cyanide	UJ
H2G130120	CC3001, CC3004	Cyanide	UJ

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

Field Duplicates

Original and field duplicate results were evaluated, and no problems were identified.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected. Results rejected in favor of a preferred result (e.g., due to dilution or reanalysis) were qualified as rejected "R".

5.0 Quality Assurance Field Split Sample Data Evaluation

Data from the quality assurance split sample: SDG F13829 sample CC3007, were validated. The FS sample was analyzed for Volatiles by SW846 8260B, Semivolatiles by SW846 8270C, Explosives by WS846 8330, and Total and Dissolved Metals by SW846 6010B and 7470A. The following section highlights the key findings of the data validation for each analysis.

5.1 Volatile Organics by GC/MS SW846 8260B

Overall, the data are of good quality and are usable as reported by the laboratory. Data were reviewed for the following:

Preservation

Preservation criteria were met for all samples.

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

The initial calibration (ICAL) and continuing calibrations (CCAL) associated with the project

samples met QC criteria.

Blanks

The 5X/10X rule for contaminants found in the associated equipment rinses, trip blanks, and method blanks was applied to all sample results. All were found to be acceptable.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike / Matrix Spike Duplicate

No Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis was performed on the project sample.

Laboratory Control Sample

Laboratory Control Sample (LCS) analysis was performed for the project samples, and all QC criteria were met.

Internal Standards

All internal standards met QC criteria.

Field Split/Original Sample Comparison

SDG F13829

CC3005 (original) and CC3007 (FS) results were evaluated. It should be noted that CC3007 (FS) were non-detect for all compounds. CC3005 (original) had hits for acetone and carbon disulfide below the reporting limits. It should also be noted that acetone results for the original sample were blank qualified due to method and trip blank contamination.

Quantitation

Results quantitated between the method detection limit (MDL) and the reporting limit (RL), which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected. Results rejected in favor of a preferred result (e.g., due to dilution or reanalysis) were qualified as rejected "R".

5.2 Semivolatile Organics by GC/MS SW846 8270C

Overall, the data are of good quality and are usable as reported by the laboratory. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

The initial calibration and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X/10X rule for contaminants found in the associated blanks was applied to all sample results and all were found to be acceptable.

Matrix Spike / Matrix Spike Duplicate

No Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis was performed on the project sample.

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

Surrogate Recoveries

All surrogate recoveries were within QC criteria.

Internal Standards

All internal standards met QC.

Field Split/Original Sample Comparison

SDG F13829

CC3005 (original) and CC3007 (FS) results were evaluated. It should be noted that CC3007 (FS) were non-detect for all compounds. CC3005 (original) had a hit for bis(2-Ethylhexyl)phthalate but was blank qualified due to method blank contamination.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J," were qualified as estimated "J" unless blank contamination was present or the results were rejected.

5.3 Total and Dissolved Metals by SW846 6010B/7470A

Overall, the data are of good quality and are usable as reported by the laboratory with the exceptions noted below. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X rule for contaminants found in the associated blanks was applied to all sample results and all were found to be acceptable.

Matrix Spike / Matrix Spike Duplicate

No Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis was performed on the project sample.

Laboratory Control Sample (LCS)

All QC criteria were met for the LCS associated with the project sample analyses.

Interference Check Sample

All Interference Check Sample (ICS) percent recoveries were acceptable. All QC criteria were met.

Inductively Coupled Plasma Serial Dilutions

All QC criteria were met for the serial dilutions associated with the project samples with the following exception(s):

SDG Number	Samples Affected	Compound(s)	Validation Qualifier
F13829	CC3007	Aluminum, Sodium	J

Field Split/Original Sample Comparison

SDG F13829

CC3005 (original) and CC3007 (FS) results were evaluated. It should be noted that total results for CC3007 (FS) had a high RPD for aluminum, iron, and potassium. All RPD QC criteria results for dissolved results were met.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J," were qualified

as estimated "J" unless blank contamination was present or the results were rejected.

5.4 Nitroaromatic and Nitramine Explosives by SW846 8330

Overall, the data are of good quality and are usable as reported by the laboratory with the exceptions noted below. Data were reviewed for the following:

Holding Times

Technical holding time criteria were met for all samples.

Initial and Continuing Calibration

All initial and continuing calibrations associated with the project samples met QC criteria.

Blanks

The 5X rule for contaminants found in the associated equipment rinses and method blanks was applied to all sample results. All were found to be acceptable.

Surrogate Recoveries

All surrogate recoveries were within QC criteria.

Matrix Spike / Matrix Spike Duplicate

No Matrix Spike/Matrix Spike Duplicate (MS/MSD) analysis was performed on the project sample.

Laboratory Control Sample

LCS analysis was performed for the project samples, and all QC criteria were met.

2ND Column Confirmation

The percent difference QC criteria between columns for analyte concentrations were met.

Field Split/Original Sample Comparison

SDG F13829

CC3005 (original) and CC3007 (FS) results were evaluated. It should be noted that CC3005 (original) and CC3007 (FS) were non-detect for all compounds.

Quantitation

Results quantified between the MDL and the RL, which the lab qualified as "J", were qualified as estimated "J" unless blank contamination was present or the results were rejected. Results

rejected in favor of a preferred result (e.g., due to dilution or reanalysis) were qualified as rejected "R".

Attachment A:

Validation Qualifiers

U Not detected. The compound/analyte was analyzed for, but not detected above the associated reporting limit.

J The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

B The concentration reported was detected significantly above the levels reported in the associated equipment rinse samples and/or laboratory method and trip blanks. (5X/10X Rule was applied).

R The reported sample results are rejected due to the following:

1. Severe deficiencies in the supporting quality control data.
2. Anomalies noted in the sampling and/or analysis process which could affect the validity of the reported data.
3. The presence or absence of the constituent cannot be verified based on the data provided.
4. To indicate not to use a particular result in the event of a reanalysis.

UJ The compound/analyte was analyzed for, but not detected above the established reporting limit. However, review and evaluation of supporting QC data and/or sampling and analysis process have indicated that the "nondetect" may be inaccurate or imprecise. The nondetect result should be estimated.

APRIL 2002

BACKGROUND/NON-BACKGROUND CASE NARRATIVE

PROJECT NARRATIVE
CB001
Revised

The results reported herein are applicable to the samples submitted for analysis only.

This report shall not be reproduced except in full, without the written approval of the laboratory.

The original chain of custody documentation was included with the original report.

Sample Receipt

This report has been revised. The original report did not comment on nitrate and turbidity samples that were received after the holding time had expired. The nitrate and turbidity portion of samples CB3015, CB3016, CB3018, and CB3019 were received after the holding time had expired. The client was notified (V. Graves, 4/10/02) and instructed the laboratory to proceed with the analyses.

The cyanide portion of sample CB3013 was received but was not listed on the chain of custody.

Sample CB3007 for total organic carbon was listed on the chain of custody but was not received.

The cyanide portion of samples CB3001 and CB3015 were received at pH 11. The samples were preserved to pH 12 by laboratory personnel.

An extra 500ml container was received for the cyanide portion of sample CB3004.

The filtered metals portion of sample CB3004 was listed on the chain of custody but was not received.

One of the three vials of sample CB3015 was received with headspace.

The hardness portion of sample CB3019 was received by STL Knoxville and the cyanide portion of sample CB3019 was received by STL North Canton. The samples were shipped to the correct laboartories for analysis.

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PROJECT NARRATIVE
CB001
Revised

Subcontract

The following analyses were performed by STL North Canton Laboratory, 4101 Shuffel Drive, NW, North Canton, OH 44720: Total Dissolved Solids (MCAAW 160.1), Total Suspended Solids (MCAAW 106.2), Hardness (MCAAW 130.2), Turbidity (MCAAW 180.1), Alkalinity (MCAAW 310.1), Chloride (MCAAW 325.2), Nitrate (MCAAW 353.2), Sulfate (MCAAW 375.4) and Total Organic Carbon (SW846 9060).

Quality Control

Unless otherwise noted, all holding times and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

Volatiles

Laboratory control duplicate sample EXNW71AD had a recovery for 1,1-dichloroethene that was slightly above QC limits (121% vs. 120%). However, since the recovery was high, and no target analytes were detected in the associated samples, the validity of the data is unaffected.

Samples CB3010, CB3013, and CB3009 were reported with elevated reporting limits for all analytes due to the presence of non-target compounds. A dilution was necessary prior to analysis, and the reporting limits were adjusted accordingly.

Sample CB3022 was reported with elevated reporting limits for all analytes due to a difficult foaming sample matrix. A dilution was necessary prior to analysis, and the reporting limits were adjusted accordingly.

Sample CB3008 and CB3015 were reported with elevated reporting limits for all analytes. Based on screening results, a dilution was necessary prior to analysis; the reporting limits were adjusted accordingly.

Surrogate recoveries for CB3015 were outside QC limits due to matrix interferences.

The surrogate recoveries for the matrix spike/matrix spike duplicate for sample CB3004 were outside criteria. However, the laboratory control sample also showed acceptable results indicating that the analysis was in control.

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PROJECT NARRATIVE
CB001
Revised

Semivolatiles

Samples CB3016, CB3018, CB3019, CB3020, CB3017, CB3029, MS/MSD for CB3004, and LCS EXFGV had high internal standard #6 and high surrogate # 5. Samples CB3001, CB3004, CB3007, CB3023 and method blank EXFGV had high internal standard #6; sample CB3013 and CB3022 had high surrogate #5. This was likely due to cumulative detrimental effects on the column/MS from the samples that were high in sulfur. The higher mass analytes increased in response. Since this IS and SS had the higher masses, their response increased. A similar increase would be expected for target analytes having higher masses also, but there were none detected. In addition, the LCS/MS/MSD results showed all control analytes in control. Therefore the impact on the data is minimal or none at all.

Sample CB3015 had a high recovery of 2-fluorophenol due to matrix interference. There were ion interferences with this surrogate. Since only one target analyte was detected slight above the reporting limit, the date should not be affected.

Internal standard #6 was lost in sample CB3022 at the first analysis. The sample was re-run at a one to10 dilution in order to have it within the QC criteria, both analyses were reported. Target analytes not referencing internal standard #6 were reported from the 1st analysis; only target analytes associated with internal standard #6 were reported from the diluted analysis and the reporting limits were elevated accordingly.

Explosives

The matrix spike/matrix spike duplicate recoveries and/or RPDs for sample CB3004 were acceptable for all analytes except tetryl. The laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike/matrix spike duplicate results are, therefore, attributed to matrix effects.

Due to sample matrix interferences, estimated results below the reporting limit were not reported for several analytes for samples CB3013 and CB3015. The result was qualified with an "I" flag to indicate the presence of matrix interferences.

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PROJECT NARRATIVE
CB001
Revised

Explosives (continued)

The following samples were reported with elevated reporting limits for one or more analytes due to sample matrix interferences: CB3008, CB3013 and CB3015. The affected analytes are flagged on the sample report.

Sample CB3022 was reported with elevated reporting limits for all analytes due to sample matrix interferences, sample was run at at 1/10 dilution.

Metals

The serial dilution of sample CB3004 was outside control limits for potassium due to physical or chemical matrix interferences.

The serial dilution of sample CB3004D was outside control limits for potassium and zinc due to physical or chemical matrix interferences.

Cyanide

Samples CB3004, CB3008, CB3009, CB3013, CB3015, CB3018, CB3019 and the method standards were treated for sulfide prior to distillation.

Chloride

The matrix spike/matrix spike duplicate recoveries and/or RPDs for sample CB3004 were outside limits for chloride. The laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike/matrix spike duplicate results are, therefore, attributed to matrix effects.

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PROJECT NARRATIVE
CB002
Revision

The results reported herein are applicable to the samples submitted for analysis only.

This report shall not be reproduced except in full, without the written approval of the laboratory.

The original chain of custody documentation was included with the original report.

Sample Receipt

Sample CB5013 was received but was not listed on the chain of custody.

The wet chemistry parameters for sample CB3024 were listed on the STL – Knoxville chain of custody, but the container was not received. The wet chemistry parameters for sample CB3024 were listed on the STL – North Canton chain of custody, and the container was received.

The hardness portion of sample CB3033 was listed on the chain of custody but was not received.

The metals portion of sample CB5001 was received at pH 6. The sample was preserved to pH 2 by laboratory personnel.

The filtered box was not marked on the metal containers for samples CB3038 and CB3046, however, the samples were labeled as total metals and dissolved metals.

The collection date for sample CB3040 was listed as 4/12/02 on the STL – Knoxville chain of custody, but the sample was labeled as 4/10/02. The client was contacted (V. Graves, 4/18/02) and instructed the laboratory to use the collection date on the label.

The collection date for the total organic carbon portion of sample CB3040 was listed as 4/11/02, but the sample was labeled as 4/10/02. The client was contacted (V. Graves, 4/18/02) and instructed the laboratory to use the collection date on the label.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

PROJECT NARRATIVE
CB002
Revision

Sample Receipt (continued)

The collection time for the alkalinity, chloride, sulfate, total dissolved solids, and total suspended solids portion of sample CB3040 was listed as 4/18:25 AM, but the sample was labeled as 7:55 AM. The client was contacted (V. Graves, 4/18/02) and instructed the laboratory to use the collection time on the label.

An extra container was received at STL – North Canton for sample CB3038.

Subcontract

The following analyses were performed by STL North Canton Laboratory, 4101 Shuffel Drive, NW, North Canton, OH 44720: Total Dissolved Solids (MCAAW 160.1), Total Suspended Solids (MCAAW 106.2), Hardness (MCAAW 130.2), Turbidity (MCAAW 180.1), Alkalinity (MCAAW 310.1), Chloride (MCAAW 325.2), Nitrate (MCAAW 353.2), Sulfate (MCAAW 375.4) and Total Organic Carbon (SW846 9060).

Quality Control

This report has been revised. The calibration information for the sample CB3014 was not included in the original report.

Unless otherwise noted, all holding times and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

Volatiles

The pH of samples CB3012, CB3025, CB5018, CB3033, and CB3037 was greater than 2. The samples were analyzed within the normal 14 day holding time. EPA has indicated that some aromatic compounds in wastewater samples, notably benzene, toluene, and ethyl benzene, may be susceptible to biological degradation if samples are not preserved to a pH of 2.

Samples CB3012, CB3014, CB3025, CB3030, CB3026, CB3033, CB3034, CB3037, CB3039 and CB3040 were reported with elevated reporting limits for all analytes due to the presence of non-target compounds. A dilution was necessary prior to analysis, and the reporting limits were adjusted accordingly.

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PROJECT NARRATIVE
CB002
Revision

Semivolatiles

Due to a laboratory error, sample CB3014 was not prepared. The clinet was contacted (M. McMyler, 4/26/02) and instructed the laboratory to prepare the sample outside the holding time.

Explosives

Due to sample matrix interferences, estimated results below the reporting limit were not reported for one or more analytes for samples CB3025, CB3030, CB3014, CB3037, CB3038, CB3039, CB3040, and CB5001. The results were qualified with an "I" flag to indicate the presence of matrix interferences.

The matrix spike/matrix spike duplicate recoveries and RPDs for sample CB3038 were not calculated because the spikes were diluted out. The laboratory control sample/duplicate showed acceptable results indicating that the analysis was in control. Results outside of limits do not necessarily reflect poor method performance due to high analyte concentrations in the sample relative to the spike level.

Metals

The serial dilution of sample CB3038F was outside control limits for potassium due to physical or chemical matrix interferences.

The serial dilution of sample CB3038 was outside control limits potassium due to physical or chemical matrix interferences.

The matrix spike/matrix spike duplicate recoveries for dissolved metals for sample CB3038 was outside control limits for iron. However, the laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike/matrix spike duplicate results are, therefore, attributed to matrix effects. The affected analytes are flagged appropriately on the matrix spike/matrix spike duplicate report.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

PROJECT NARRATIVE
CB002
Revision

Metals (continued)

The matrix spike/matrix spike duplicate results for were not calculated on sample CB3038 for total iron because the sample concentration was four times greater than the spiked amount.. The affected analyte is flagged appropriately on the matrix spike/matrix spike duplicate report.

Cyanide

Samples CB3012, CB3014, CB3025, CB3026, CB3030, CB3033, CB3039 and the method standards were treated for sulfide prior to distillation.

Sulfate

The matrix spike/matrix spike duplicate results for were not calculated on sample CB3038 because the sample concentration was four times greater than the spiked amount.. The affected analyte is flagged appropriately on the matrix spike/matrix spike duplicate report.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

PROJECT NARRATIVE
CB003

The results reported herein are applicable to the samples submitted for analysis only.

This report shall not be reproduced except in full, without the written approval of the laboratory.

The original chain of custody documentation is included with this report.

Sample Receipt

The metals portion of sample CB3044 was received at pH 7. The sample was preserved to pH 2 by laboratory personnel.

One of two semivolatile containers for sample CB3044 was received broken.

Sample CB3049 was listed as a water sample on the chain of custody, however, it was an oil sample.

Subcontract

The following analyses were performed by STL North Canton Laboratory, 4101 Shuffel Drive, NW, North Canton, OH 44720: Total Dissolved Solids (MCAAW 160.1), Total Suspended Solids (MCAAW 106.2), Hardness (MCAAW 130.2), Turbidity (MCAAW 180.1), Alkalinity (MCAAW 310.1), Chloride (MCAAW 325.2), Nitrate (MCAAW 353.2), Sulfate (MCAAW 375.4) and Total Organic Carbon (SW846 9060).

The following analyses were performed by STL Austin Laboratory, 14046 Summit Dr, Austin TX, 78728: Diesel Range Organics and Gasoline Range Organics (SW846 8015B), and FlashPoint (SW846 1020A).

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

PROJECT NARRATIVE
CB003

Quality Control

Unless otherwise noted, all holding times and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

Volatiles

Samples CB3049 and CB3041 were reported with elevated reporting limits for all analytes. Based on screening results, a dilution was necessary prior to analysis; the reporting limits were adjusted accordingly.

Sample CB3044 was reported with elevated reporting limits for all analytes due to the presence of non-target compounds. A dilution was necessary prior to analysis, and the reporting limits were adjusted accordingly.

The pH of sample CB3044 was greater than 2. The sample was analyzed within the normal 14 day holding time. EPA has indicated that some aromatic compounds in wastewater samples, notably benzene, toluene, and ethyl benzene, may be susceptible to biological degradation if samples are not preserved to a pH of 2.

Semivolatiles

The recoveries of the acidic surrogates and acidic analytes for the laboratory control sample/ laboratory control sample duplicate of batch 2107141 were outside QC limits. However, re-extraction and reanalysis of sample CB3044 was not possible due to insufficient sample volume.

Explosives

Due to sample matrix interferences, estimated results below the reporting limit were not reported for several analytes for samples CB3041 and CB3044. The result was qualified with an "I" flag to indicate the presence of matrix interferences.

The following samples were reported with elevated reporting limits for one or more analytes due to sample matrix interferences: CB3041 and CB3044. The affected analytes are flagged on the sample report.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

PROJECT NARRATIVE
CB003

Metals

The serial dilution of sample CB3042 was outside control limits for potassium and zinc for preparation batch 2109142 and 2109144 due to physical or chemical matrix interferences.

Wet Chemistry

The batch matrix spike/matrix spike duplicate recoveries were outside control limits for cyanide. The laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike results are, therefore, attributed to matrix effects.

Samples CB3041 and CB3044 and the method standards were treated for sulfide prior to distillation.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

Accutest Laboratories Southeast, Inc.
Analytical Narrative

Client: IT Corporation
Site: Plum Brook Ordinance WKS., 825635
Report Date: May 09, 2002
Job Number: F12898

2 samples were collected on April 12, 2002 and received on April 13, 2002. Samples were properly cooled, preserved and intact. A listing of the Laboratory Sample ID, Client Sample ID, and dates of collection are presented in the Results Summary section of this report.
All method specified holding times, calibrations and quality control performance criteria were met, with the following notes:

VOC, SW846-8260B:

- Sample CB5017 had a surrogate recovery above acceptance limits. The sample was non-detect. Data not adversely affected. The sample has been footnoted accordingly.
- The MS/MSD associated with analytical batch number VG500 had several recoveries above acceptance limits. All RPD were within acceptance limits. The Blank spike was within acceptance limits. The Method Blank was free of interference from this compound. Data not adversely affected.

Explosives: SW846, 8330A

- Sample CB3047 has elevated reporting limits due to matrix interference. Surrogate recovery was not reported on two of the analysis due to matrix interference. The sample has been footnoted accordingly.
- The MS/MSD associated with analytical batch number GGG153 had several recoveries above acceptance limits. All recoveries were out high due high level in the sample relative to the spike amount or matrix interference. The Blank spike was within acceptance limits. The Method Blank was free of interference from this compound. Data not adversely affected.

SVOC, SW846-8270C:

- Sample CB3047 had surrogate recoveries below acceptance limits. Sample was confirmed by reanalysis. All values reported should be considered estimated. The sample could not be re-extracted due to insufficient sample volume. All values reported should be considered estimated. The sample has been footnoted accordingly.
- The Blank Spike associated with analytical batch number SW527 had several recoveries below acceptance limits. The associated sample CB3047 could not be re-extracted due to insufficient sample volume.

Metals: SW-846, 6010B

- The Serial Dilution associated with analytical batch number MP4337 had several RPDs above acceptance limits. All RPDs were found to be acceptable either due to low duplicate and sample concentrations and or matrix interference. The Blank Spike found these metals to be within acceptance limits and the Method Blank free of interference from this compound. Data not adversely affected.

Accutest Laboratories Southeast, Inc. certifies that this report meets the project requirements for analytical data produced for the samples as received at the Accutest Laboratories Southeast location as stated in the Analytical Task Order and the COC. In addition, Accutest Laboratories Southeast, Inc. certifies that data as reported meet the Data Quality Objectives for precision, accuracy and completeness as specified in the Accutest Laboratories Southeast, Inc. Quality Manual for other that conditions detailed above. ALSE routinely reports Organic target analytes down to 1/2 the Reporting Level. These positive results are flagged with a "J" qualifier. It is recommended by Accutest Laboratories Southeast, Inc. that this report is to be used in its entirety. Accutest Laboratories Southeast, Inc. is not responsible for any assumptions of data quality if partial data packages are used to interpret data. The Accutest Laboratories Southeast, Inc. Laboratory Director as verified by the signature on the front page has authorized release of this report.

Narrative prepared by:

Date: May 09, 2002

Sue O. Bell, Project Manager (signature on file)

0 06

Accutest Laboratories Southeast, Inc.
Analytical Narrative

Client: IT Corporation
Site: Plum Brook Ordinance WKS., 825635
Report Date: May 08, 2002
Job Number: F12883

2 samples were collected on April 11, 2002 and received on April 12, 2002. Samples were properly cooled, preserved and intact. A listing of the Laboratory Sample ID, Client Sample ID, and dates of collection are presented in the Results Summary section of this report.
All method specified holding times, calibrations and quality control performance criteria were met, with the following notes:

VOC, SW846-8260B:

- The MS/MSD associated with analytical batch number VB401 had several recoveries below acceptance limits. Some RPD were above acceptance limits. The recovery for Toluene was below acceptance limits due to a high level in the sample relative to the spike amount. The Blank spike was within acceptance limits. The Method Blank was free of interference from this compound. Data not adversely affected.

Explosives: SW846, 8330A

- Sample CB3035 had a surrogate recovery below acceptance limits. The sample was re-extracted, outside of the recommended holding time. The re-extracted sample also had a surrogate recovery below acceptance limits. All values should be considered estimated. The sample has been footnoted accordingly.
- The MS/MSD associated with analytical batch number GGG153 had several recoveries above acceptance limits. All recoveries were out high due high level in the sample relative to the spike amount. The Blank spike was within acceptance limits. The Method Blank was free of interference from this compound. Data not adversely affected.

SVOC, SW846-8270C:

- The Blank Spike associated with analytical batch number SW527 had several recoveries below acceptance limits. The associated sample CB3035 could not be re-extracted due to insufficient sample volume. The surrogate recoveries in the sample were within acceptance limits.
- The Blank Spike associated with analytical batch number SW527 had several recoveries below acceptance limits. This Blank Spike is not associated with any samples from F12883. This Blank Spike has been included because it is associated with the corresponding MS/MSD which was performed on another client's sample.

Metals: SW-846, 6010B

- The MS/MSD associated with analytical batch number MP4347 had some recoveries and RPDs above acceptance limits. It was found that the spike amount was low relative to the sample amount. The Blank Spike found these metals was within acceptance limits and the Method Blank free of interference from this compound. Data not adversely affected.
- The Serial Dilution associated with analytical batch number MP4347 had several RPDs above acceptance limits. All RPDs were found to be acceptable either due to low duplicate and sample concentrations or possible matrix interference. The Blank Spike found these metals to be within acceptance limits and the Method Blank free of interference from this compound. Data not adversely affected.

Accutest Laboratories Southeast, Inc. certifies that this report meets the project requirements for analytical data produced for the samples as received at the Accutest Laboratories Southeast location as stated in the Analytical Task Order and the COC. In addition, Accutest Laboratories Southeast, Inc. certifies that data as reported meet the Data Quality Objectives for precision, accuracy and completeness as specified in the Accutest Laboratories Southeast, Inc. Quality Manual for other that conditions detailed above. ALSE routinely reports Organic target analytes down to 1/2 the Reporting Level. These positive results are flagged with a "J" qualifier. It is recommended by Accutest Laboratories Southeast, Inc. that this report is to be used in its entirety. Accutest Laboratories Southeast, Inc. is not responsible for any assumptions of data quality if partial data packages are used to interpret data. The Accutest Laboratories Southeast, Inc. Laboratory Director as verified by the signature on the front page has authorized release of this report.

Narrative prepared by:

Date: May 08, 2002

Sue O. Bell, Project Manager (signature on file)

Accutest Laboratories Southeast, Inc.
Analytical Narrative

Client: IT Corporation
Site: Plum Brook Ordinance WKS.
Report Date: May 02, 2002
Job Number: F12851

2 samples were collected on April 09, 2002 and received on April 10, 2002. Samples were properly cooled, preserved and intact. A listing of the Laboratory Sample ID, Client Sample ID, and dates of collection are presented in the Results Summary section of this report.
All method specified holding times, calibrations and quality control performance criteria were met, with the following notes:

VOC: SW-846, 8260B

- Sample CB3045 has an elevated reporting limit for Methyl Chloride due to matrix interference. The sample has been footnoted accordingly.

Explosives: SW846, 8330A

- Sample CB3045 had a surrogate recovery below acceptance limits. The sample was re-extracted, outside of the recommended holding time., The re-extracted sample also had a surrogate recovery below acceptance limits. All values should be considered estimated. The sample has been footnoted accordingly.

Metals: SW-846, 6010B

- The MS/MSD associated with analytical batch number MP4335 had some recoveries and RPDs above acceptance limits. It was found that the spike amount was low relative to the sample amount. The Blank Spike found these metals was within acceptance limits and the Method Blank free of interference from this compound. Data not adversely affected.
- The Serial Dilution associated with analytical batch number MP4335 had several RPDs above acceptance limits. All RPDs were found to be acceptable either due to low duplicate and sample concentrations or possible matrix interference. The Blank Spike found these metals to be within acceptance limits and the Method Blank free of interference from this compound. Data not adversely affected.

Accutest Laboratories Southeast, Inc. certifies that this report meets the project requirements for analytical data produced for the samples as received at the Accutest Laboratories Southeast location as stated in the Analytical Task Order and the COC. In addition, Accutest Laboratories Southeast, Inc. certifies that data as reported meet the Data Quality Objectives for precision, accuracy and completeness as specified in the Accutest Laboratories Southeast, Inc. Quality Manual for other that conditions detailed above. ALSE routinely reports Organic target analytes down to 1/2 the Reporting Level. These positive results are flagged with a "J" qualifier. It is recommended by Accutest Laboratories Southeast, Inc. that this report is to be used in its entirety. Accutest Laboratories Southeast, Inc. is not responsible for any assumptions of data quality if partial data packages are used to interpret data. The Accutest Laboratories Southeast, Inc. Laboratory Director as verified by the signature on the front page has authorized release of this report.

Narrative prepared by:

Date: May 02, 2002

Sue O. Bell, Project Manager (signature on file)

0005

Accutest Laboratories Southeast, Inc.
Analytical Narrative

Client: IT Corporation
Site: Plum Brook Ordinance WKS.
Report Date: April 25, 2002
Job Number: F12806

3 samples were collected on April 03 and 04, 2002 and received on April 05, 2002. Samples were properly cooled, preserved and intact. A listing of the Laboratory Sample ID, Client Sample ID, and dates of collection are presented in the Results Summary section of this report.
All method specified holding times, calibrations and quality control performance criteria were met, with the following notes:

Metals: SW-846, 6010B

- The MS/MSD associated with analytical batch number MP4332 had recoveries for Sodium below acceptance limits. It was found that the spike amount was low relative to the sample amount. The Blank Spike found these metals was within acceptance limits and the Method Blank free of interference from this compound. Data not adversely affected.
- The Serial Dilution associated with analytical batch number MP4332 had several RPDs above acceptance limits. All RPDs were found to be acceptable either due to low duplicate and sample concentrations or possible matrix interference. The Blank Spike found these metals to be within acceptance limits and the Method Blank free of interference from this compound. Data not adversely affected.
- The MS/MSD associated with analytical batch number MP4329 had RPDs above acceptance limits. It was found that the spike amount was low relative to the sample amount. The Blank Spike found these metals was within acceptance limits and the Method Blank free of interference from this compound. Data not adversely affected.
- The Serial Dilution associated with analytical batch number MP4329 had several RPDs above acceptance limits. All RPDs were found to be acceptable either due to low duplicate and sample concentrations or possible matrix interference. The Blank Spike found these metals to be within acceptance limits and the Method Blank free of interference from this compound. Data not adversely affected.

Accutest Laboratories Southeast, Inc. certifies that this report meets the project requirements for analytical data produced for the samples as received at the Accutest Laboratories Southeast location as stated in the Analytical Task Order and the COC. In addition, Accutest Laboratories Southeast, Inc. certifies that data as reported meet the Data Quality Objectives for precision, accuracy and completeness as specified in the Accutest Laboratories Southeast, Inc. Quality Manual for other that conditions detailed above. ALSE routinely reports Organic target analytes down to 1/2 the Reporting Level. These positive results are flagged with a "J" qualifier. It is recommended by Accutest Laboratories Southeast, Inc. that this report is to be used in its entirety. Accutest Laboratories Southeast, Inc. is not responsible for any assumptions of data quality if partial data packages are used to interpret data. The Accutest Laboratories Southeast, Inc. Laboratory Director as verified by the signature on the front page has authorized release of this report.

Narrative prepared by:

Date: April 25, 2002

Sue O. Bell, Project Manager (signature on file)

0005

JULY 2002

BACKGROUND CASE NARRATIVE

PROJECT NARRATIVE
H2G130120

The results reported herein are applicable to the samples submitted for analysis only.

This report shall not be reproduced except in full, without the written approval of the laboratory.

The original chain of custody documentation is included with this report.

Sample Receipt

One of the containers for volatiles of sample CC3004 was received with headspace.

Subcontract

The following analyses were performed by STL North Canton Laboratory, 4101 Shuffel Drive, NW, North Canton, OH 44720: Hardness (MCAAW 130.2), Total Dissolved Solids (MCAAW 160.1) Total Suspended Solids (MCAAW 106.2), Turbidity (MCAAW 180.1), Alkalinity (MCAAW 310.1), Chloride (MCAAW 325.2), Nitrate (MCAAW 353.2), Sulfate (MCAAW 375.1), and Total Organic Carbon (SW846 9060).

Quality Control

Unless otherwise noted, all holding times and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

Volatiles

The pH of sample CC3004 was greater than 2. The sample was analyzed within the normal 14 day holding time. EPA has indicated that some aromatic compounds in wastewater samples, notably benzene, toluene, and ethyl benzene, may be susceptible to biological degradation if samples are not preserved to a pH of 2.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

PROJECT NARRATIVE
H2G130120

Explosives

Samples CC3004 and CC3001were reported with elevated reporting limits for one or more analytes due to sample matrix interferences. The affected analytes were flagged on the sample report.

Metals

The serial dilution of the batch sample E4K8L was outside control limits due to physical or chemical matrix interferences.

The serial dilution of sample E4K7M was outside control limits due to physical or chemical matrix interferences.

Wet Chemistry

The matrix spike/matrix spike duplicate recoveries for the batch QC were outside control limits for cyanide. The laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike results are, therefore, attributed to matrix effects.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

PROJECT NARRATIVE
H2G110121

The results reported herein are applicable to the samples submitted for analysis only.

This report shall not be reproduced except in full, without the written approval of the laboratory.

The original chain of custody documentation is included with this report.

Sample Receipt

All three containers for volatiles of sample CC5001 were received with headspace.

The cyanide portion of sample CC5001 was received at pH 9. The sample was preserved to pH 12 by laboratory personnel.

The chain of custody requested method 200.7 for samples CC3009 and CC3003. The client was notified (J. McGee, 7/12/02) and instructed the laboratory to use method 130.2.

Subcontract

The following analyses were performed by STL North Canton Laboratory, 4101 Shuffel Drive, NW, North Canton, OH 44720: Hardness (MCAAW 130.2), Total Dissolved Solids (MCAAW 160.1) Total Suspended Solids (MCAAW 106.2), Turbidity (MCAAW 180.1), Alkalinity (MCAAW 310.1), Chloride (MCAAW 325.2), Nitrate (MCAAW 353.2), Sulfate (MCAAW 375.1), and Total Organic Carbon (SW846 9060).

Quality Control

Unless otherwise noted, all holding times and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

PROJECT NARRATIVE
H2G110121

Metals

The serial dilution of sample CC3009 was outside control limits for potassium due to physical or chemical matrix interferences.

The serial dilution of sample CC3009F was outside control limits for potassium due to physical or chemical matrix interferences.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

PROJECT NARRATIVE
H2G120173

The results reported herein are applicable to the samples submitted for analysis only.

This report shall not be reproduced except in full, without the written approval of the laboratory.

The original chain of custody documentation is included with this report.

Sample Receipt

Cyanide was requested on the chain of custody for sample CC3006, however, a container for cyanide was not received. The client was contacted (V. Graves, 7/12/02) and informed the laboratory that cyanide was not collected for this sample and should not have been listed on the chain of custody.

Subcontract

The following analyses were performed by STL North Canton Laboratory, 4101 Shuffel Drive, NW, North Canton, OH 44720: Hardness (MCAAW 130.2), Total Dissolved Solids (MCAAW 160.1) Total Suspended Solids (MCAAW 106.2), Turbidity (MCAAW 180.1), Alkalinity (MCAAW 310.1), Chloride (MCAAW 325.2), Nitrate (MCAAW 353.2), Sulfate (MCAAW 375.1), and Total Organic Carbon (SW846 9060).

Quality Control

Unless otherwise noted, all holding times and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

Volatiles

Sample CC3002 was reported with elevated reporting limits for all analytes. Based on screening results, a dilution was necessary prior to analysis; the reporting limits were adjusted accordingly.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

PROJECT NARRATIVE
H2G120173

Explosives

The matrix spike/matrix spike duplicate recoveries for sample CC3005 were acceptable for all analytes except tetryl. The laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike/matrix spike duplicate results are, therefore, attributed to matrix effects.

Metals

The serial dilution of sample CC3005 was outside control limits for potassium due to physical or chemical matrix interferences.

The serial dilution of sample CC3005F was outside control limits for potassium due to physical or chemical matrix interferences.

Wet Chemistry

The matrix spike/matrix spike duplicate recoveries for sample were outside control limits for cyanide. The laboratory control sample showed acceptable results indicating that the analysis was in control. The matrix spike results are, therefore, attributed to matrix effects.

STL Knoxville maintains the following certifications, approvals and accreditations: Arkansas DEQ, California DHS ELAP Cert. #2423, Connecticut DPH Cert. #PH-0223, Florida DOH Cert. #E87177, Georgia DNR Cert. #906 (SDWA, 5/14/01-6/21/02), Hawaii DOH, Illinois EPA Cert. #000510, Indiana DOH Cert. #C-TN-02, Kentucky DEP Lab ID #90101, Louisiana DEQ Cert. #03079, Maryland DHMH Cert. #277, Massachusetts DEP Cert. #M-TN009, Michigan DEQ Lab ID #9933, New Jersey DEP Cert. #TN001, New York DOH Lab #10781, North Carolina DPH Lab ID #21705, North Carolina DEHNR Cert. #64, Oklahoma DEQ ID #9415, Pennsylvania DEP Cert. #68-576, South Carolina DHEC Lab ID #84001, Tennessee DOH Lab ID #02014, Virginia DGS Lab ID #00165, Washington DOE Lab #C120, Wisconsin DNR Lab ID #998044300, US Army Corps of Engineers, Naval Facilities Engineering Service Center, US EPA Perchlorate Approval and USDA Soil Permit #S-46424. This list of approvals is subject to change and does not imply that laboratory certification is available for all parameters reported in this environmental sample data report.

Accutest Laboratories Southeast, Inc.
Analytical Narrative

Client: Shaw E & I, Inc.
Site: PBOW
Report Date: July 26, 2002
Job Number: F13829

2 samples were collected on July 11, 2002, and received on July 12, 2002. Samples were properly cooled, preserved and intact. A listing of the Laboratory Sample ID, Client Sample ID, and dates of collection are presented in the Results Summary section of this report.
A cyanide bottle was not received for sample CC3007. Per Vicki Graves on 07/15/02, the sample was not collected for Cyanide.

All method specified holding times, calibrations and quality control performance criteria were met, with the following notes:

VOCs: SW-846, 8260B:

- The MS/MSD associated with analytical batch VC475 had various RPDs above acceptance limits. The Blank Spike was within limits. Data not adversely affected.

Metals: SW-846, 6010B:

- The MS/MSD associated with analytical batch MP4570 had various RPDs above acceptance limits. Some RPDs were found to be acceptable due to low duplicate and sample concentration. Other RPDs were high due to possible sample nonhomogeneity. The Blank Spike was within limits. Data not adversely affected.
- The Serial Dilution associated with analytical batch MP4570 had various RPDs above acceptance limits. Some RPDs were found to be acceptable due to low duplicate and sample concentration. Other RPDs were high due to possible interference. The Blank Spike was within limits. Data not adversely affected.

Accutest Laboratories Southeast, Inc. certifies that this report meets the project requirements for analytical data produced for the samples as received at the Accutest Laboratories Southeast location as stated in the Analytical Task Order and the COC. In addition, Accutest Laboratories Southeast, Inc. certifies that data as reported meet the Data Quality Objectives for precision, accuracy and completeness as specified in the Accutest Laboratories Southeast, Inc. Quality Manual for other that conditions detailed above. ALSE routinely reports Organic target analytes down to 1/2 the Reporting Level. These positive results are flagged with a "J" qualifier. It is recommended by Accutest Laboratories Southeast, Inc. that this report is to be used in its entirety. Accutest Laboratories Southeast, Inc. is not responsible for any assumptions of data quality if partial data packages are used to interpret data. The Accutest Laboratories Southeast, Inc. Laboratory Director as verified by the signature on the front page has authorized release of this report.

Narrative prepared by:

Date: July 26, 2002

Sue O. Bell, Project Manager (signature on file)

0005

APPENDIX I

CHEMICAL ANALYTICAL DATA SUMMARY

Laboratory and Validation Qualifier Definitions
Plum Brook Ordnance Works

Qualifier	Lab	Definition
Laboratory - Organic		
B	STL/Paragon	The compound was detected in the sample and in an associated method blank.
E	STL/Paragon	The compound was detected. The concentration exceeds the calibration range of the instrument.
D	STL	Dilution.
G	STL	Elevated reporting limit due to matrix interference.
J	STL/Paragon	The compound was positively identified; the reported value is an estimated concentration between the method detection limit and the reporting limit.
I	STL	Matrix interference
U	STL/Paragon	Not detected. The compound was analyzed for, but not detected above the associated reporting limit.
Laboratory - Inorganic		
B	STL/Paragon	The analyte was positively identified; the reported value is an estimated concentration between the method detection limit and the reporting limit.
E	STL/Paragon	The analyte was detected. The concentration is estimated because of the presence of interference.
J	STL/Paragon	The compound was detected in the sample and in an associated method blank.
N	STL/Paragon	Spiked sample recovery not within control limits
U	STL/Paragon	Not detected. The analyte was analyzed for, but not detected above the associated reporting limit.
Validation - All		
B		The analyte was not detected significantly above the levels found in the associated method blank or field blanks
J		The compound/analyte was positively identified; the reported value is an estimated concentration.
R		Rejected due to severe deficiencies in the analytical process or supporting quality control data. The presence or absence of the compound/analyte cannot be verified.
U		Not detected. The compound/analyte was analyzed for, but not detected above the associated reporting limit.
UJ		Not detected. The associated reporting limit may be inaccurate or imprecise.

Samples with 'nv' denotation have not been validated.

APRIL 2002

NON-BACKGROUND CHEMICAL ANALYTICAL DATA SUMMARY

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Data Summary

Report Date: 03/18/03

	Location Code:		IT-AA2-BEDGW-001			IT-AA3-BEDGW-001			IT-ABG-BEDGW-01			IT-MNTA-BEDGW-001		
	Associated Site:		AA2			AA3			ABG			MSA		
	Sample No:		CB3030			CB3033			CB3016			CB3039		
	Sample Date:		10-APR-02			10-APR-02			05-APR-02			12-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Amino-4,6-dinitrotoluene, 2-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Dinitrobenzene, 1,3-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Dinitrotoluene, 2,4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Dinitrotoluene, 2,6-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	I U	U
HMX		ug/L	0.50	U	U	0.50	U	U	0.50	U	U	0.50	U	U
Nitrobenzene		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Nitrotoluene, 2-		ug/L	0.20	I U	U	0.20	U	U	0.20	U	U	0.75	G U	U
Nitrotoluene, 3-		ug/L	0.50	G U	U	0.20	U	U	0.20	U	U	0.20	U	U
Nitrotoluene, 4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
RDX		ug/L	0.50	U	U	0.50	U	U	0.50	U	U	0.50	U	U
Tetryl		ug/L	0.20	U	U	0.20	U	U	0.20	U	R	0.20	U	U
Trinitrobenzene, 1,3,5-		ug/L	0.61	G U	U	0.20	U	U	0.20	U	U	0.20	U	U
Trinitrotoluene, 2,4,6-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
GEN CHEMISTRY														
Alkalinity		ug/L	586000	J		650000	J		250000	J		691000	J	
Chloride		ug/L	56000			369000			10000		J	3480000		
Cyanide, total		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hardness		ug/L	700000			480000			440000			1580000		
Nitrate		ug/L	100	U	U	100	U	U	1000	G U	UJ	100	U	U
Sulfate		ug/L	32700			5000	U	U	292000	J		1400	B	J
Total dissolved solids		ug/L	712000			1200000			731000			6010000		
Total organic carbon		ug/L	3100			1000			3300			5900		
Total suspended solids		ug/L	22000			16000			24000			24000		
Turbidity		NTU	137			118			151		J	277		
METALS														
Aluminum	Y	ug/L	42.6	B	J	49.2	B	J	63.7	B	B	51.1	B	J
Aluminum		ug/L	195	B	B	104	B	B	39.2	B	J	129	B	B

Plum Brook Ordnance Works
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Location Code:			IT-TNTB-BEDGW-001			IT-TNTB-BEDGW-002			MK-MW16			MK-MW17		
Associated Site:			TNTB			TNTB			TNTB			TNTB		
Sample No:			CB3019			CB3018			CB3017			CB3038		
Sample Date:			05-APR-02			05-APR-02			08-APR-02			12-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	22		
Amino-4,6-dinitrotoluene, 2-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	26		
Dinitrobenzene, 1,3-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	3.0	U	U
Dinitrotoluene, 2,4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	5.8		
Dinitrotoluene, 2,6-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	4.0		J
HMX		ug/L	0.50	U	U	0.50	U	U	0.50	U	U	7.5	U	U
Nitrobenzene		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	3.0	U	U
Nitrotoluene, 2-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	3.0	U	U
Nitrotoluene, 3-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	3.0	U	U
Nitrotoluene, 4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	3.0	U	U
RDX		ug/L	0.50	U	U	0.50	U	U	0.50	U	U	7.5	I U	U
Tetryl		ug/L	0.20	U	R	0.20	U	R	0.20	U	R	3.0	U	U
Trinitrobenzene, 1,3,5-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	3.0	U	U
Trinitrotoluene, 2,4,6-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	68		
GEN CHEMISTRY														
Alkalinity		ug/L	375000	J		365000	J		2600	B J	B	1900	B J	B
Chloride		ug/L	761000		J	117000		J	1700		J	2100		
Cyanide, total		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hardness		ug/L	420000			390000			430000			272000		
Nitrate		ug/L	1000	G U	UJ	1000	G U	UJ	42	B	J	100	U	U
Sulfate		ug/L	32100	J		165000	J		719000	J		286000		
Total dissolved solids		ug/L	1520000			740000			868000			518000		
Total organic carbon		ug/L	3400			3000			2000			1600		
Total suspended solids		ug/L	4000	U	U	4000	U	U	150000			4000	U	U
Turbidity		NTU	38.4		J	72.6		J	156			0.98		
METALS														
Aluminum	Y	ug/L	66.6	B	B	64.2	B	B	1480			4680		
Aluminum		ug/L	54.8	B	J	45.4	B	J	2380			4600		

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		Location Code:	PB-BED-MW13			PB-BED-MW14			PB-BED-MW15			PB-BED-MW16		
		Associated Site:	TNTC			WARP			PRRP			UTTA		
		Sample No:	CB3025			CB3022			CB3041			CB3037		
		Sample Date:	10-APR-02			08-APR-02			15-APR-02			11-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	1.1	GU	U	2.0	U	U	0.97			2.4	GU	U
Amino-4,6-dinitrotoluene, 2-		ug/L	0.20	U	U	2.0	U	U	0.20	U	U	0.40	U	U
Dinitrobenzene, 1,3-		ug/L	0.20	U	U	2.0	U	U	0.20	U	U	0.40	U	U
Dinitrotoluene, 2,4-		ug/L	0.20	U	U	2.0	U	U	0.20	U	U	1.0	GU	U
Dinitrotoluene, 2,6-		ug/L	0.42	GU	U	2.0	U	U	2.1	GU	U	11		
HMX		ug/L	0.50	IU	U	5.0	U	U	0.50	IU	U	1.0	IU	U
Nitrobenzene		ug/L	0.55	GU	U	2.0	U	U	0.35			0.40	U	U
Nitrotoluene, 2-		ug/L	0.20	U	U	2.0	U	U	0.20	U	U	0.40	U	U
Nitrotoluene, 3-		ug/L	0.20	U	U	2.0	U	U	0.20	U	U	0.40	U	U
Nitrotoluene, 4-		ug/L	0.35	GU	U	2.0	U	U	0.20	U	U	0.40	U	U
RDX		ug/L	0.50	U	U	5.0	U	U	0.51			6.8	GU	U
Tetryl		ug/L	0.20	U	U	2.0	U	R	0.20	U	U	0.40	IU	U
Trinitrobenzene, 1,3,5-		ug/L	0.20	U	U	2.0	U	U	1.5	GU	U	4.3	GU	U
Trinitrotoluene, 2,4,6-		ug/L	0.20	U	U	2.0	U	U	1.3			0.49	GU	U
GEN CHEMISTRY														
Alkalinity		ug/L	476000	J		481000	J		501000	J				
Chloride		ug/L	4220000			75600		J	2100000			75900		
Cyanide, total		ug/L	10	U	U	38			10	U	U	10	U	U
Hardness		ug/L	1960000			1230000			1490000			700000		
Nitrate		ug/L	100	U	U	79300			1000	GU	U	2000	GU	U
Sulfate		ug/L	66600			2660000	J		103000			734000		
Total dissolved solids		ug/L	4810000			7360000			3720000			1450000		
Total organic carbon		ug/L	7400			937000			6500			5500		
Total suspended solids		ug/L	32000			54000			25000			14000		
Turbidity		NTU	585			0.50	U	U	140			8.0		
METALS														
Aluminum	Y	ug/L	86.4	B	J	94.8	B	B	52.4	B	B	61.4	B	B
Aluminum		ug/L	177	B	B	87.5	B	B	74.8	B	B	85.3	B	B

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		Location Code:	PB-BED-MW17			PB-BED-MW18			PB-BED-MW19			PB-BED-MW22		
		Associated Site:	TNTA			TNTA			AA2			DGP		
		Sample No:	CB3014			CB3015			CB3013			CB3009		
		Sample Date:	11-APR-02			05-APR-02			04-APR-02			04-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	3.4	G U	U	0.20	U	U	0.93	G U	U	0.20	U	U
Amino-4,6-dinitrotoluene, 2-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Dinitrobenzene, 1,3-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Dinitrotoluene, 2,4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Dinitrotoluene, 2,6-		ug/L	0.25	G U	U	0.20	U	U	0.20	I U	U	0.20	U	U
HMX		ug/L	0.50	U	U	0.50	U	U	0.50	U	U	0.50	U	U
Nitrobenzene		ug/L	0.20	U	U	0.21	G U	U	0.20	U	U	0.20	U	U
Nitrotoluene, 2-		ug/L	0.55			0.31			0.20	U	U	0.20	U	U
Nitrotoluene, 3-		ug/L	0.20	I U	U	0.30			0.20	U	U	0.20	U	U
Nitrotoluene, 4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
RDX		ug/L	6.5	G U	U	0.50	I U	U	0.17	J	J	0.50	U	U
Tetryl		ug/L	0.20	U	U	0.65	G U	R	0.20	U	R	0.20	U	R
Trinitrobenzene, 1,3,5-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Trinitrotoluene, 2,4,6-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
GEN CHEMISTRY														
Alkalinity		ug/L	874000	J		350000	J		302000	J		416000	J	
Chloride		ug/L	2210000			12900000		J	373000		J	86300		J
Cyanide, total		ug/L	10	U	U	10	U	UJ	10	U	U	10	U	U
Hardness		ug/L	1330000			7000000			424000			388000		
Nitrate		ug/L	1000	G U	U	1000	G U	UJ	2000	G U	U	2000	U	U
Sulfate		ug/L	42700			440	B J	B	32200	J		5000	U	U
Total dissolved solids		ug/L	3020000			15200000			651000			476000		
Total organic carbon		ug/L	5300			1400			5900			2200		
Total suspended solids		ug/L	18000			4000			44000			4000		
Turbidity		NTU	9.2			69.0		J	164			76.4		
METALS														
Aluminum	Y	ug/L	53.2	B	J	71.3	B	B	66.6	B	B	64.5	B	B
Aluminum		ug/L	97.0	B	B	79.2	B	J	56.2	B	J	71.3	B	J

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Location Code:			PB-BED-MW23			PB-BED-MW27			PB-TNTA-MW10			PB-TNTA-MW11		
Associated Site:			PRRP			DGP			TNTA			TNTA		
Sample No:			CB3040			CB3012			CB3042			CB3043		
Sample Date:			11-APR-02			09-APR-02			15-APR-02			15-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	1.6	G U	U	0.20	U	U	0.20	U	U	16		
Amino-4,6-dinitrotoluene, 2-		ug/L	1.0	I U	U	0.20	U	U	0.20	U	U	46		
Dinitrobenzene, 1,3-		ug/L	1.0	U	U	0.20	U	U	0.20	U	U	5.0	U	U
Dinitrotoluene, 2,4-		ug/L	1.0	I U	U	0.58			0.20	U	U	5.0	U	U
Dinitrotoluene, 2,6-		ug/L	3.6	G U	U	0.59			0.20	U	U	5.0	U	U
HMX		ug/L	2.5	I U	U	0.50	U	U	0.50	U	U	12	U	U
Nitrobenzene		ug/L	1.0	U	U	0.20	U	U	0.20	U	U	5.0	U	U
Nitrotoluene, 2-		ug/L	1.0	U	U	0.20	U	U	0.20	U	U	5.0	U	U
Nitrotoluene, 3-		ug/L	1.0	U	U	0.20	U	U	0.20	U	U	5.0	U	U
Nitrotoluene, 4-		ug/L	1.0	U	U	0.20	U	U	0.20	U	U	5.0	U	U
RDX		ug/L	2.5	U	U	0.50	U	U	0.50	U	U	12	U	U
Tetryl		ug/L	1.0	U	U	0.20	U	U	0.20	U	U	5.0	U	U
Trinitrobenzene, 1,3,5-		ug/L	1.0	U	U	0.20	U	U	0.20	U	U	5.0	U	U
Trinitrotoluene, 2,4,6-		ug/L	1.3	G U	U	0.20	U	U	0.20	U	U	110		
GEN CHEMISTRY														
Alkalinity		ug/L	246000	J		488000	J		378000	J		402000	J	
Chloride		ug/L	6400000			194000			40100			10500		
Cyanide, total		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hardness		ug/L	5740000			1750000			738000			611000		
Nitrate		ug/L	100	U	U	100	U	U	1000	G U	U	1000	G U	U
Sulfate		ug/L	218000			868000			261000			309000		
Total dissolved solids		ug/L	12500000			2280000			792000			848000		
Total organic carbon		ug/L	6400	J		3500			4000			9000		
Total suspended solids		ug/L	1660000			499000			14000			74000		
Turbidity		NTU	6500			1470			36.2			78.5		
METALS														
Aluminum	Y	ug/L	38.1	B	J	59.0	B	J	36.0	B	B	35.6	B	B
Aluminum		ug/L	104	B	B	232		B	60.0	B	B	807		

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Location Code:			PB-TNTC-MW3			PB-TNTC-MW4			PB-TNTC-MW5			TNTA-BEDGW-001		
Associated Site:			TNTC			TNTC			TNTC			TNTA		
Sample No:			CB3027			CB3028			CB3029			CB3044		
Sample Date:			10-APR-02			10-APR-02			08-APR-02			15-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	1.3		
Amino-4,6-dinitrotoluene, 2-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.55		
Dinitrobenzene, 1,3-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Dinitrotoluene, 2,4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Dinitrotoluene, 2,6-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
HMX		ug/L	0.50	U	U	0.50	U	U	0.50	U	U	0.50	I U	U
Nitrobenzene		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.23	G U	U
Nitrotoluene, 2-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Nitrotoluene, 3-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Nitrotoluene, 4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
RDX		ug/L	0.50	U	U	0.50	U	U	0.50	U	U	2.6	G U	U
Tetryl		ug/L	0.20	U	U	0.20	U	U	0.20	U	R	0.20	U	U
Trinitrobenzene, 1,3,5-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	U	U
Trinitrotoluene, 2,4,6-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U	0.20	I U	U
GEN CHEMISTRY														
Alkalinity		ug/L	233000	J		351000	J		229000	J		282000	J	
Chloride		ug/L	4500			20000			4800		J	4810000		
Cyanide, total		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hardness		ug/L	496000			980000			284000			5020000		
Nitrate		ug/L	100	U	U	120			100	U	U	1000	G U	U
Sulfate		ug/L	248000			749000			163000	J		388000		
Total dissolved solids		ug/L	670000			784000			506000			7960000		
Total organic carbon		ug/L	2000			1100			2900			10700		
Total suspended solids		ug/L	21000			37000			75000			1080000		
Turbidity		NTU	59.0			147			112			605		
METALS														
Aluminum	Y	ug/L	57.2	B	J	59.5	B	J	70.4	B	B	74.0	B	J
Aluminum		ug/L	128	B	B	1190			164	B	J	8300		J

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		Location Code:	TNTB-BEDGW-003			TNTB-BEDGW-004			TNTC-BEDGW-001		
		Associated Site:	TNTB			TNTB			TNTC		
		Sample No:	CB3024			CB3023			CB3026		
		Sample Date:	10-APR-02			08-APR-02			09-APR-02		
User Test Group											
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES											
Amino-2,6-dinitrotoluene, 4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U
Amino-4,6-dinitrotoluene, 2-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U
Dinitrobenzene, 1,3-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U
Dinitrotoluene, 2,4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U
Dinitrotoluene, 2,6-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U
HMX		ug/L	0.50	U	U	0.50	U	U	0.50	U	U
Nitrobenzene		ug/L	0.20	U	U	0.20	U	U	0.20	U	U
Nitrotoluene, 2-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U
Nitrotoluene, 3-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U
Nitrotoluene, 4-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U
RDX		ug/L	0.50	U	U	0.50	U	U	0.50	U	U
Tetryl		ug/L	0.20	U	U	0.20	U	R	0.20	U	U
Trinitrobenzene, 1,3,5-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U
Trinitrotoluene, 2,4,6-		ug/L	0.20	U	U	0.20	U	U	0.20	U	U
GEN CHEMISTRY											
Alkalinity		ug/L	68600	J		123000	J		562000	J	
Chloride		ug/L	3720000			2800		J	242000		
Cyanide, total		ug/L	10	U	U	10	U	U	10	U	U
Hardness		ug/L	2500000			330000			1450000		
Nitrate		ug/L	100	U	U	100	U	U	100	U	U
Sulfate		ug/L	31100			160000	J		1030000		
Total dissolved solids		ug/L	5370000			378000			2200000		
Total organic carbon		ug/L	4600			2900			1400		
Total suspended solids		ug/L	115000			26000			11000		
Turbidity		NTU	9250			53.6			158		
METALS											
Aluminum	Y	ug/L	56.7	B	J	68.3	B	B	64.1	B	J
Aluminum		ug/L	6410			163	B	J	90.6	B	B

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Data Summary

Report Date: 03/18/03

		Location Code:	IT-AA2-BEDGW-001			IT-AA3-BEDGW-001			IT-ABG-BEDGW-01			IT-MNTA-BEDGW-001		
		Associated Site:	AA2			AA3			ABG			MSA		
		Sample No:	CB3030			CB3033			CB3016			CB3039		
		Sample Date:	10-APR-02			10-APR-02			05-APR-02			12-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Antimony	Y	ug/L	60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	U
Antimony		ug/L	60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	U
Arsenic	Y	ug/L	9.0	B	J	10.0	U	U	10.0	U	U	10.0	U	U
Arsenic		ug/L	6.6	B	J	10.0	U	U	10.0	U	U	10.0	U	U
Barium	Y	ug/L	336			78.1	B	J	78.2	B	J	398		
Barium		ug/L	368			80.2	B	J	82.7	B	J	388		
Beryllium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Beryllium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Cadmium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Cadmium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Calcium	Y	ug/L	89900			104000			184000			316000		
Calcium		ug/L	99400			104000			186000			305000		
Chromium	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Chromium		ug/L	1.3	B	J	10.0	U	U	10.0	U	U	10.0	U	U
Cobalt	Y	ug/L	3.4	B	J	50.0	U	U	50.0	U	U	50.0	U	U
Cobalt		ug/L	9.2	B	J	50.0	U	U	50.0	U	U	50.0	U	U
Copper	Y	ug/L	25.0	U	U	25.0	U	U	25.0	U	U	25.0	U	U
Copper		ug/L	25.0	U	U	25.0	U	U	25.0	U	U	25.0	U	U
Iron	Y	ug/L	124		J	100	U	U	5630			100	U	U
Iron		ug/L	2020		J	118		J	9130			376		J
Lead	Y	ug/L	3.0	U	U	3.0	U	U	3.0	U	U	3.0	U	U
Lead		ug/L	3.0	U	U	3.0	U	U	3.0	U	U	3.0	U	U
Magnesium	Y	ug/L	57100			67100			36600			239000		
Magnesium		ug/L	58000			69300			36700			236000		
Manganese	Y	ug/L	207			17.0			860			380		
Manganese		ug/L	228			20.7			872			388		
Mercury	Y	ug/L	.2	U	U	.2	U	U	.2	U	U	.2	U	U
Mercury		ug/L	.2	U	U	.2	U	U	.2	U	U	.2	U	U
Nickel	Y	ug/L	40.0	U	U	40.0	U	U	40.0	U	U	40.0	U	U
Nickel		ug/L	4.0	B	J	40.0	U	U	40.0	U	U	40.0	U	U

		Location Code:	IT-TNTB-BEDGW-001			IT-TNTB-BEDGW-002			MK-MW16			MK-MW17		
		Associated Site:	TNTB			TNTB			TNTB			TNTB		
		Sample No:	CB3019			CB3018			CB3017			CB3038		
		Sample Date:	05-APR-02			05-APR-02			08-APR-02			12-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Antimony	Y	ug/L	60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	U
Antimony		ug/L	60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	U
Arsenic	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Arsenic		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Barium	Y	ug/L	974			403			8.4	B	J	14.1	B	J
Barium		ug/L	1080			411			13.1	B	J	14.6	B	J
Beryllium	Y	ug/L	5.0	U	U	5.0	U	U	0.76	B	J	2.0	B	J
Beryllium		ug/L	5.0	U	U	5.0	U	U	0.82	B	J	2.4	B	B
Cadmium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Cadmium		ug/L	5.0	U	U	5.0	U	U	0.59	B	J	5.0	U	U
Calcium	Y	ug/L	91800			105000			127000			78200		
Calcium		ug/L	91500			110000			125000			79400		
Chromium	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Chromium		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Cobalt	Y	ug/L	50.0	U	U	50.0	U	U	45.3	B	J	95.5		
Cobalt		ug/L	50.0	U	U	50.0	U	U	47.3	B	J	95.7		
Copper	Y	ug/L	25.0	U	U	25.0	U	U	3.2	B	B	25.0	U	U
Copper		ug/L	25.0	U	U	25.0	U	U	7.4	B	J	25.0	U	U
Iron	Y	ug/L	100	U	U	100	U	U	695			11500		J
Iron		ug/L	100	U	U	100	U	U	11300			11800		J
Lead	Y	ug/L	3.0	U	U	3.0	U	U	3.0	U	U	3.0	U	U
Lead		ug/L	3.0	U	U	3.0	U	U	1.9	B	J	3.0	U	U
Magnesium	Y	ug/L	52600			41400			47900			22200		
Magnesium		ug/L	55500			43000			48600			23000		
Manganese	Y	ug/L	51.1		J	32.2			8290			1330		
Manganese		ug/L	33.2			33.8			8520			1350		
Mercury	Y	ug/L	.2	U	U	.2	U	U	.2	U	U	.2	U	U
Mercury		ug/L	.2	U	U	.2	U	U	.2	U	U	.2	U	U
Nickel	Y	ug/L	40.0	U	U	40.0	U	U	76.0			214		
Nickel		ug/L	40.0	U	U	40.0	U	U	80.4			208		

Location Code:			PB-BED-MW13			PB-BED-MW14			PB-BED-MW15			PB-BED-MW16		
Associated Site:			TNTC			WARP			PRRP			UTTA		
Sample No:			CB3025			CB3022			CB3041			CB3037		
Sample Date:			10-APR-02			08-APR-02			15-APR-02			11-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Antimony	Y	ug/L	60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	U
Antimony		ug/L	60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	U
Arsenic	Y	ug/L	2.5	B	J	9.0	B	J	10.0	U	U	10.0	U	U
Arsenic		ug/L	10.0	U	U	9.5	B	J	10.0	U	U	10.0	U	U
Barium	Y	ug/L	2680			51.4	B	J	855			18.4	B	J
Barium		ug/L	2680			51.4	B	J	856			19.2	B	J
Beryllium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Beryllium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Cadmium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Cadmium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Calcium	Y	ug/L	364000			321000			286000			330000		
Calcium		ug/L	351000			325000			287000			318000		
Chromium	Y	ug/L	10.0	U	U	3.0	B	J	10.0	U	U	10.0	U	U
Chromium		ug/L	10.0	U	U	3.4	B	J	10.0	U	U	10.0	U	U
Cobalt	Y	ug/L	50.0	U	U	265			50.0	U	U	50.0	U	U
Cobalt		ug/L	50.0	U	U	267			50.0	U	U	50.0	U	U
Copper	Y	ug/L	25.0	U	U	92.0			25.0	U	U	25.0	U	U
Copper		ug/L	25.0	U	U	94.8			25.0	U	U	25.0	U	U
Iron	Y	ug/L	100	U	U	417			100	U	U	100	U	U
Iron		ug/L	335		J	438			142			100	U	U
Lead	Y	ug/L	3.0	U	U	3.6			3.0	U	U	3.0	U	U
Lead		ug/L	3.0	U	U	3.6			3.0	U	U	3.0	U	U
Magnesium	Y	ug/L	347000			229000			236000			32000		
Magnesium		ug/L	334000			230000			234000			31700		
Manganese	Y	ug/L	18.0			136			6.3	B	J	6.8	B	J
Manganese		ug/L	23.7			136			7.0	B	J	17.0		
Mercury	Y	ug/L	.2	U	U	.2	U	U	.2	U	U	.2	U	U
Mercury		ug/L	.2	U	U	.2	U	U	.2	U	U	.2	U	U
Nickel	Y	ug/L	40.0	U	U	276			40.0	U	U	40.0	U	U
Nickel		ug/L	40.0	U	U	278			40.0	U	U	3.2	B	J

			Location Code:	PB-BED-MW17			PB-BED-MW18			PB-BED-MW19			PB-BED-MW22		
			Associated Site:	TNTA			TNTA			AA2			DGP		
			Sample No:	CB3014			CB3015			CB3013			CB3009		
			Sample Date:	11-APR-02			05-APR-02			04-APR-02			04-APR-02		
User Test Group															
Parameter	*Flt*	*Units*		*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS															
Antimony	Y	ug/L		60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	U
Antimony		ug/L		60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	U
Arsenic	Y	ug/L		4.0	B	J	10.0	U	U	10.0	U	U	10.0	U	U
Arsenic		ug/L		4.5	B	J	10.0	U	U	10.0	U	U	10.0	U	U
Barium	Y	ug/L		1070			1330			852			617		
Barium		ug/L		1090			1290			892			620		
Beryllium	Y	ug/L		5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Beryllium		ug/L		5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Cadmium	Y	ug/L		5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Cadmium		ug/L		5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Calcium	Y	ug/L		273000			1370000			109000			121000		
Calcium		ug/L		268000			1390000			121000			123000		
Chromium	Y	ug/L		10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Chromium		ug/L		10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Cobalt	Y	ug/L		50.0	U	U	50.0	U	U	50.0	U	U	50.0	U	U
Cobalt		ug/L		50.0	U	U	50.0	U	U	50.0	U	U	50.0	U	U
Copper	Y	ug/L		25.0	U	U	25.0	U	U	25.0	U	U	25.0	U	U
Copper		ug/L		25.0	U	U	25.0	U	U	15.6	B	J	25.0	U	U
Iron	Y	ug/L		100	U	U	100	U	U	100	U	U	100	U	U
Iron		ug/L		100	U	U	100	U	U	100	U	U	43.2	B	J
Lead	Y	ug/L		3.0	U	U	3.0	U	U	3.0	U	U	3.0	U	U
Lead		ug/L		3.0	U	U	3.0	U	U	3.0	U	U	3.0	U	U
Magnesium	Y	ug/L		243000			929000			44000			35700		
Magnesium		ug/L		250000			943000			41900			35800		
Manganese	Y	ug/L		10.2	B	J	107			2.5	B	J	43.3		
Manganese		ug/L		8.4	B	J	109			2.2	B	J	45.1		
Mercury	Y	ug/L		.2	U	U	.2	U	U	.2	U	U	.2	U	U
Mercury		ug/L		.2	U	U	.2	U	U	.2	U	U	.2	U	U
Nickel	Y	ug/L		40.0	U	U	40.0	U	U	4.3	B	J	40.0	U	U
Nickel		ug/L		40.0	U	U	40.0	U	U	3.5	B	J	40.0	U	U

		Location Code:	PB-BED-MW23			PB-BED-MW27			PB-TNTA-MW10			PB-TNTA-MW11		
		Associated Site:	PRRP			DGP			TNTA			TNTA		
		Sample No:	CB3040			CB3012			CB3042			CB3043		
		Sample Date:	11-APR-02			09-APR-02			15-APR-02			15-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Antimony	Y	ug/L	60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	U
Antimony		ug/L	60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	U
Arsenic	Y	ug/L	10.0	U	U	5.2	B	J	10.0	U	U	10.0	U	U
Arsenic		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Barium	Y	ug/L	104	B	J	83.6	B	J	56.6	B	J	27.3	B	J
Barium		ug/L	106	B	J	93.8	B	J	56.0	B	J	24.0	B	J
Beryllium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Beryllium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Cadmium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Cadmium		ug/L	5.0	U	U	1.1	B	J	5.0	U	U	5.0	U	U
Calcium	Y	ug/L	857000			378000			177000			226000		
Calcium		ug/L	859000			370000			174000			206000		
Chromium	Y	ug/L	10.0	U	U	1.4	B	J	10.0	U	U	10.0	U	U
Chromium		ug/L	6.1	B	J	24.4			10.0	U	U	2.0	B	J
Cobalt	Y	ug/L	50.0	U	U	50.0	U	U	50.0	U	U	2.4	B	J
Cobalt		ug/L	50.0	U	U	10.9	B	J	50.0	U	U	50.0	U	U
Copper	Y	ug/L	25.0	U	U	25.0	U	U	25.0	U	U	25.0	U	U
Copper		ug/L	25.0	U	U	6.3	B	B	25.0	U	U	25.0	U	U
Iron	Y	ug/L	4450		J	189		J	3270			100	U	U
Iron		ug/L	5640		J	257000		J	4710			1700		
Lead	Y	ug/L	3.0	U	U	3.0	U	U	3.0	U	U	3.0	U	U
Lead		ug/L	3.0	U	U	3.0	U	U	3.0	U	U	3.0		
Magnesium	Y	ug/L	575000			168000			45900			42500		
Magnesium		ug/L	591000			165000			45100			35200		
Manganese	Y	ug/L	212			1460			625			80.7		
Manganese		ug/L	219			4660			607			86.5		
Mercury	Y	ug/L	.2	U	U	.2	U	U	.2	U	U	.2	U	U
Mercury		ug/L	.2	U	U	.2	U	U	.2	U	U	.2	U	U
Nickel	Y	ug/L	4.8	B	J	40.0	U	U	40.0	U	U	3.4	B	J
Nickel		ug/L	7.2	B	J	17.7	B	J	2.1	B	J	3.9	B	J

		Location Code:	PB-TNTC-MW3			PB-TNTC-MW4			PB-TNTC-MW5			TNTA-BEDGW-001		
		Associated Site:	TNTC			TNTC			TNTC			TNTA		
		Sample No:	CB3027			CB3028			CB3029			CB3044		
		Sample Date:	10-APR-02			10-APR-02			08-APR-02			15-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Antimony	Y	ug/L	60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	UJ
Antimony		ug/L	60.0	U	U	60.0	U	U	60.0	U	U	60.0	U	UJ
Arsenic	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	UJ
Arsenic		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	17.3		J
Barium	Y	ug/L	31.2	B	J	14.9	B	J	21.3	B	J	398		J
Barium		ug/L	27.5	B	J	28.6	B	J	24.0	B	J	471		J
Beryllium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	UJ
Beryllium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	1.1	B	J
Cadmium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	UJ
Cadmium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	1.2	B	J
Calcium	Y	ug/L	117000			262000			117000			577000		J
Calcium		ug/L	86600			254000			122000			1780000		J
Chromium	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	6.8	B	J
Chromium		ug/L	10.0	U	U	2.4	B	J	10.0	U	U	37.2		J
Cobalt	Y	ug/L	50.0	U	U	3.1	B	J	50.0	U	U	50.0	U	UJ
Cobalt		ug/L	50.0	U	U	10.3	B	J	50.0	U	U	12.7	B	J
Copper	Y	ug/L	25.0	U	U	25.0	U	U	25.0	U	U	25.0	U	UJ
Copper		ug/L	25.0	U	U	25.0	U	U	25.0	U	U	53.1		J
Iron	Y	ug/L	100	U	U	100	U	U	100	U	U	152		J
Iron		ug/L	61.3	B	J	3060		J	199			33400		J
Lead	Y	ug/L	3.0	U	U	3.0	U	U	3.0	U	U	3.0	U	UJ
Lead		ug/L	3.0	U	U	2.0	B	J	3.0	U	U	18.4		J
Magnesium	Y	ug/L	36400			127000			21200			349000		J
Magnesium		ug/L	25000			128000			22200			408000		J
Manganese	Y	ug/L	6.7	B	J	448			24.2			26.7		J
Manganese		ug/L	8.1	B	J	684			56.3			1830		J
Mercury	Y	ug/L	.2	U	U	.2	U	U	.2	U	U	.2	U	UJ
Mercury		ug/L	.2	U	U	.2	U	U	.2	U	U	.2	U	UJ
Nickel	Y	ug/L	40.0	U	U	6.6	B	J	40.0	U	U	40.0	U	UJ
Nickel		ug/L	40.0	U	U	9.2	B	J	2.2	B	J	48.8		J

		Location Code:	TNTB-BEDGW-003			TNTB-BEDGW-004			TNTC-BEDGW-001		
		Associated Site:	TNTB			TNTB			TNTC		
		Sample No:	CB3024			CB3023			CB3026		
		Sample Date:	10-APR-02			08-APR-02			09-APR-02		
User Test Group											
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS											
Antimony	Y	ug/L	60.0	U	U	60.0	U	U	60.0	U	U
Antimony		ug/L	60.0	U	U	60.0	U	U	60.0	U	U
Arsenic	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U
Arsenic		ug/L	12.5			10.0	U	U	10.0	U	U
Barium	Y	ug/L	1750			39.2	B	J	18.0	B	J
Barium		ug/L	1780			39.9	B	J	16.5	B	J
Beryllium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U
Beryllium		ug/L	0.66	B	B	5.0	U	U	5.0	U	U
Cadmium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U
Cadmium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U
Calcium	Y	ug/L	156000			78000			462000		
Calcium		ug/L	180000			76500			434000		
Chromium	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U
Chromium		ug/L	14.8			10.0	U	U	10.0	U	U
Cobalt	Y	ug/L	50.0	U	U	50.0	U	U	50.0	U	U
Cobalt		ug/L	10.1	B	J	50.0	U	U	50.0	U	U
Copper	Y	ug/L	3.2	B	J	25.0	U	U	25.0	U	U
Copper		ug/L	49.4			25.0	U	U	25.0	U	U
Iron	Y	ug/L	100	U	U	5550			100	U	U
Iron		ug/L	17100		J	6560			100	U	U
Lead	Y	ug/L	3.0	U	U	3.0	U	U	3.0	U	U
Lead		ug/L	7.0			3.0	U	U	3.0	U	U
Magnesium	Y	ug/L	67000			23400			157000		
Magnesium		ug/L	58900			22900			152000		
Manganese	Y	ug/L	15.0	U	U	641			5.2	B	J
Manganese		ug/L	509			634			5.1	B	J
Mercury	Y	ug/L	.2	U	U	.2	U	U	.2	U	U
Mercury		ug/L	.2	U	U	.2	U	U	.2	U	U
Nickel	Y	ug/L	40.0	U	U	40.0	U	U	40.0	U	U
Nickel		ug/L	37.7	B	J	40.0	U	U	40.0	U	U

Report Date: 03/18/03

Location Code:			IT-AA2-BEDGW-001			IT-AA3-BEDGW-001			IT-ABG-BEDGW-01			IT-MNTA-BEDGW-001		
Associated Site:			AA2			AA3			ABG			MSA		
Sample No:			CB3030			CB3033			CB3016			CB3039		
Sample Date:			10-APR-02			10-APR-02			05-APR-02			12-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Potassium	Y	ug/L	29600			40000			432	B	J	96300		
Potassium		ug/L	28900			40400			444	B	J	92000		
Selenium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Selenium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Silver	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Silver		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Sodium	Y	ug/L	103000			237000			5070			1280000		
Sodium		ug/L	100000			237000			4900	B	J	1210000		
Thallium	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Thallium		ug/L	5.2	B J	B	6.9	B J	B	10.0	U	U	8.7	B J	B
Vanadium	Y	ug/L	50.0	U	U	50.0	U	U	50.0	U	U	50.0	U	U
Vanadium		ug/L	50.0	U	U	50.0	U	U	50.0	U	U	50.0	U	U
Zinc	Y	ug/L	5.0	B	J	20.0	U	U	35.4		J	2.6	B	J
Zinc		ug/L	6.2	B	J	20.0	U	U	35.3			12.9	B	J
SEMIVOLATILES														
Acenaphthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Acenaphthylene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(a)anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(a)pyrene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(b)fluoranthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(ghi)perylene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(k)fluoranthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroethoxy)methane		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroethyl)ether		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroisopropyl)ether		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-ethylhexyl)phthalate		ug/L	2.0	J	J	10	U	U	10	U	U	0.91	J	J
Bromophenyl phenyl ether, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Butyl benzyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U

		Location Code:	IT-TNTB-BEDGW-001			IT-TNTB-BEDGW-002			MK-MW16			MK-MW17		
		Associated Site:	TNTB			TNTB			TNTB			TNTB		
		Sample No:	CB3019			CB3018			CB3017			CB3038		
		Sample Date:	05-APR-02			05-APR-02			08-APR-02			12-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Potassium	Y	ug/L	38300		J	5790		J	1120	B	J	1460	B	J
Potassium		ug/L	43400		J	6070		J	1360	B	J	1470	B	J
Selenium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Selenium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Silver	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Silver		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Sodium	Y	ug/L	366000			106000			6040			3260	B	J
Sodium		ug/L	435000			109000			6030			3240	B	J
Thallium	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Thallium		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	8.6	B J	B
Vanadium	Y	ug/L	50.0	U	U	50.0	U	U	50.0	U	U	50.0	U	U
Vanadium		ug/L	50.0	U	U	50.0	U	U	2.0	B	J	50.0	U	U
Zinc	Y	ug/L	20.0	U	U	20.0	U	U	70.1		J	200		
Zinc		ug/L	2.6	B	J	20.0	U	U	59.8			194		
SEMIVOLATILES														
Acenaphthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Acenaphthylene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(a)anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(a)pyrene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(b)fluoranthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(ghi)perylene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(k)fluoranthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroethoxy)methane		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroethyl)ether		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroisopropyl)ether		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-ethylhexyl)phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bromophenyl phenyl ether, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Butyl benzyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U

	Location Code:		PB-BED-MW13			PB-BED-MW14			PB-BED-MW15			PB-BED-MW16		
	Associated Site:		TNTC			WARP			PRRP			UTTA		
	Sample No:		CB3025			CB3022			CB3041			CB3037		
	Sample Date:		10-APR-02			08-APR-02			15-APR-02			11-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Potassium	Y	ug/L	95000			57000		J	75900		J	4700	B	J
Potassium		ug/L	89000			56800		J	75100		J	4420	B	J
Selenium	Y	ug/L	5.0	U	U	7.4			5.0	U	U	5.0	U	U
Selenium		ug/L	5.0	U	U	7.8			5.0	U	U	5.0	U	U
Silver	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Silver		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Sodium	Y	ug/L	1210000			1010000			716000			31700		
Sodium		ug/L	1150000			1020000			705000			30100		
Thallium	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	6.2	B J	B
Thallium		ug/L	5.1	B J	B	10.0	U	U	10.0	U	U	5.9	B J	B
Vanadium	Y	ug/L	50.0	U	U	5.8	B	J	50.0	U	U	50.0	U	U
Vanadium		ug/L	50.0	U	U	5.5	B	J	50.0	U	U	50.0	U	U
Zinc	Y	ug/L	9.5	B	J	68.2		J	9.4	B	J	365		
Zinc		ug/L	7.1	B	J	64.8			20.0	U	U	20.0	U	U
SEMIVOLATILES														
Acenaphthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Acenaphthylene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(a)anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(a)pyrene		ug/L	10	U	U	100	U	U	10	U	U	10	U	U
Benzo(b)fluoranthene		ug/L	10	U	U	100	U	U	10	U	U	10	U	U
Benzo(ghi)perylene		ug/L	10	U	U	100	U	U	10	U	U	10	U	U
Benzo(k)fluoranthene		ug/L	10	U	U	100	U	U	10	U	U	10	U	U
Bis(2-chloroethoxy)methane		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroethyl)ether		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroisopropyl)ether		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-ethylhexyl)phthalate		ug/L	5.2	J	J	10	U	U	1.8	J	J	2.1	J	J
Bromophenyl phenyl ether, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Butyl benzyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U

		Location Code:	PB-BED-MW17			PB-BED-MW18			PB-BED-MW19			PB-BED-MW22		
		Associated Site:	TNTA			TNTA			AA2			DGP		
		Sample No:	CB3014			CB3015			CB3013			CB3009		
		Sample Date:	11-APR-02			05-APR-02			04-APR-02			04-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Potassium	Y	ug/L	66900			187000		J	42900		J	2470	B	J
Potassium		ug/L	67200			188000		J	41500		J	2500	B	J
Selenium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Selenium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Silver	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Silver		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Sodium	Y	ug/L	582000			4000000			92900			19100		
Sodium		ug/L	583000			4050000			88400			19200		
Thallium	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Thallium		ug/L	6.7	B J	B	10.0	U	U	10.0	U	U	10.0	U	U
Vanadium	Y	ug/L	50.0	U	U	50.0	U	U	50.0	U	U	50.0	U	U
Vanadium		ug/L	50.0	U	U	50.0	U	U	50.0	U	U	50.0	U	U
Zinc	Y	ug/L	10	B	J	9.1	B	J	3.1	B	J	12.7	B	J
Zinc		ug/L	5.7	B	J	48.1			31.3			20.2		
SEMIVOLATILES														
Acenaphthene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Acenaphthylene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Anthracene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Benzo(a)anthracene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Benzo(a)pyrene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Benzo(b)fluoranthene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Benzo(ghi)perylene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Benzo(k)fluoranthene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Bis(2-chloroethoxy)methane		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Bis(2-chloroethyl)ether		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Bis(2-chloroisopropyl)ether		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Bis(2-ethylhexyl)phthalate		ug/L	4.0	J	J	10	U	U	9.7	J	J	10	U	U
Bromophenyl [illegible]l ether, 4-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Butyl benzyl [illegible]ate		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U

Report Date: 03/18/03

Location Code:			PB-BED-MW23			PB-BED-MW27			PB-TNTA-MW10			PB-TNTA-MW11		
Associated Site:			PRRP			DGP			TNTA			TNTA		
Sample No:			CB3040			CB3012			CB3042			CB3043		
Sample Date:			11-APR-02			09-APR-02			15-APR-02			15-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Potassium	Y	ug/L	91900			32100			1450	B	J	176	B	J
Potassium		ug/L	96000			30400			1420	B	J	5000	U	U
Selenium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Selenium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Silver	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Silver		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Sodium	Y	ug/L	1810000			103000			28600			11500		
Sodium		ug/L	1810000			98100			28600			7210		
Thallium	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Thallium		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	U
Vanadium	Y	ug/L	50.0	U	U	50.0	U	U	50.0	U	U	50.0	U	U
Vanadium		ug/L	50.0	U	U	7.8	B	J	50.0	U	U	1.9	B	J
Zinc	Y	ug/L	8.6	B	J	3.0	B	J	30.4		J	26.8		J
Zinc		ug/L	3.0	B	J	18.5	B	J	31.8		J	5.9	B	J
SEMIVOLATILES														
Acenaphthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Acenaphthylene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(a)anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(a)pyrene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(b)fluoranthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(ghi)perylene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(k)fluoranthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroethoxy)methane		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroethyl)ether		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroisopropyl)ether		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-ethylhexyl)phthalate		ug/L	3.3	J	J	10	U	U	10	U	U	10	U	U
Bromophenyl phenyl ether, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Butyl benzyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U

Location Code:			PB-TNTC-MW3			PB-TNTC-MW4			PB-TNTC-MW5			TNTA-BEDGW-001		
Associated Site:			TNTC			TNTC			TNTC			TNTA		
Sample No:			CB3027			CB3028			CB3029			CB3044		
Sample Date:			10-APR-02			10-APR-02			08-APR-02			15-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Potassium	Y	ug/L	1000	B	J	15200			326	B	J	310000		J
Potassium		ug/L	406	B	J	15500			451	B	J	334000		J
Selenium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	4.5	B	J
Selenium		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	UJ
Silver	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	UJ
Silver		ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	UJ
Sodium	Y	ug/L	24400			63300			28400			1540000		J
Sodium		ug/L	16300			62600			29600			1610000		J
Thallium	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U	10.0	U	UJ
Thallium		ug/L	5.9	B J	B	10.0	U	U	10.0	U	U	10.0	U	UJ
Vanadium	Y	ug/L	50.0	U	U	50.0	U	U	50.0	U	U	50.0	U	UJ
Vanadium		ug/L	50.0	U	U	2.1	B	J	50.0	U	U	36.9	B	J
Zinc	Y	ug/L	18.2	B	J	7.9	B	J	16.0	B	J	5.7	B	J
Zinc		ug/L	4.7	B	J	13.0	B	J	2.8	B	J	425		J
SEMIVOLATILES														
Acenaphthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Acenaphthylene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(a)anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(a)pyrene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(b)fluoranthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(ghi)perylene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Benzo(k)fluoranthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroethoxy)methane		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroethyl)ether		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-chloroisopropyl)ether		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bis(2-ethylhexyl)phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Bromophenyl [illegible] ether, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Butyl benzyl p[illegible]ate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U

		Location Code:	TNTB-BEDGW-003			TNTB-BEDGW-004			TNTC-BEDGW-001		
		Associated Site:	TNTB			TNTB			TNTC		
		Sample No:	CB3024			CB3023			CB3026		
		Sample Date:	10-APR-02			08-APR-02			09-APR-02		
User Test Group											
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS											
Potassium	Y	ug/L	137000			850	B	J	10900		
Potassium		ug/L	136000			851	B	J	9610		
Selenium	Y	ug/L	5.0	U	U	5.0	U	U	5.0	U	U
Selenium		ug/L	5.6			5.0	U	U	5.0	U	U
Silver	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U
Silver		ug/L	10.0	U	U	10.0	U	U	10.0	U	U
Sodium	Y	ug/L	1120000			6840			57100		
Sodium		ug/L	849000			6660			51900		
Thallium	Y	ug/L	10.0	U	U	10.0	U	U	10.0	U	U
Thallium		ug/L	7.7	B J	B	10.0	U	U	4.8	B J	B
Vanadium	Y	ug/L	6.3	B	J	50.0	U	U	50.0	U	U
Vanadium		ug/L	23.2	B	J	50.0	U	U	50.0	U	U
Zinc	Y	ug/L	20.0	U	U	45.9		J	20.0	U	U
Zinc		ug/L	98.7			51.3			20.0	U	U
SEMIVOLATILES											
Acenaphthene		ug/L	10	U	U	10	U	U	10	U	U
Acenaphthylene		ug/L	10	U	U	10	U	U	10	U	U
Anthracene		ug/L	10	U	U	10	U	U	10	U	U
Benzo(a)anthracene		ug/L	10	U	U	10	U	U	10	U	U
Benzo(a)pyrene		ug/L	10	U	U	10	U	U	10	U	U
Benzo(b)fluoranthene		ug/L	10	U	U	10	U	U	10	U	U
Benzo(ghi)perylene		ug/L	10	U	U	10	U	U	10	U	U
Benzo(k)fluoranthene		ug/L	10	U	U	10	U	U	10	U	U
Bis(2-chloroethoxy)methane		ug/L	10	U	U	10	U	U	10	U	U
Bis(2-chloroethyl)ether		ug/L	10	U	U	10	U	U	10	U	U
Bis(2-chloroisopropyl)ether		ug/L	10	U	U	10	U	U	10	U	U
Bis(2-ethylhexyl)phthalate		ug/L	10	U	U	10	U	U	10	U	U
Bromophenyl phenyl ether, 4-		ug/L	10	U	U	10	U	U	10	U	U
Butyl benzyl phthalate		ug/L	10	U	U	10	U	U	10	U	U

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Data Summary

Report Date: 03/18/03

Location Code:		IT-AA2-BEDGW-001			IT-AA3-BEDGW-001			IT-ABG-BEDGW-01			IT-MNTA-BEDGW-001		
Associated Site:		AA2			AA3			ABG			MSA		
Sample No:		CB3030			CB3033			CB3016			CB3039		
Sample Date:		10-APR-02			10-APR-02			05-APR-02			12-APR-02		
User Test Group													
Parameter	*Flt Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES													
Carbazole	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloro-3-methylphenol, 4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloroaniline, 4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloronaphthalene, 2-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chlorophenol, 2-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chlorophenyl phenyl ether, 4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chrysene	ug/L	10	U	U	10	U	U	10	U	U	0.54	J	J
Di-n-butyl phthalate	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Di-n-octyl phthalate	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dibenz(a,h)anthracene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dibenzofuran	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,2-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,3-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzidine, 3,3'-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Dichlorophenol, 2,4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Diethyl phthalate	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dimethyl phthalate	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dimethylphenol, 2,4-	ug/L	1.8	J	J	10	U	U	10	U	U	10	U	U
Dinitro-2-methylphenol, 4,6-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Dinitrophenol, 2,4-	ug/L	50	U	UJ	50	U	UJ	50	U	U	50	U	UJ
Dinitrotoluene, 2,4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dinitrotoluene, 2,6-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Fluoranthene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Fluorene	ug/L	10	U	U	10	U	U	10	U	U	1.2	J	J
Hexachlorobenzene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hexachlorobutadiene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hexachlorocyclopentadiene	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Hexachloroeth	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Indeno(1,2,3-c[illegible]ene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U

	Location Code:	IT-TNTB-BEDGW-001			IT-TNTB-BEDGW-002			MK-MW16			MK-MW17		
	Associated Site:	TNTB			TNTB			TNTB			TNTB		
	Sample No:	CB3019			CB3018			CB3017			CB3038		
	Sample Date:	05-APR-02			05-APR-02			08-APR-02			12-APR-02		
User Test Group													
Parameter	*Flt Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES													
Carbazole	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloro-3-methylphenol, 4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloroaniline, 4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloronaphthalene, 2-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chlorophenol, 2-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chlorophenyl phenyl ether, 4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chrysene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Di-n-butyl phthalate	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Di-n-octyl phthalate	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dibenz(a,h)anthracene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dibenzofuran	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,2-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,3-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzidine, 3,3'-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Dichlorophenol, 2,4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Diethyl phthalate	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dimethyl phthalate	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dimethylphenol, 2,4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dinitro-2-methylphenol, 4,6-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Dinitrophenol, 2,4-	ug/L	50	U	U	50	U	U	50	U	U	50	U	UJ
Dinitrotoluene, 2,4-	ug/L	10	U	U	10	U	U	10	U	U	4.0	J	J
Dinitrotoluene, 2,6-	ug/L	10	U	U	10	U	U	10	U	U	1.4	J	J
Fluoranthene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Fluorene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hexachlorobenzene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hexachlorobutadiene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hexachlorocyclopentadiene	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Hexachloroethane	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Indeno(1,2,3-cd)pyrene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U

Location Code:			PB-BED-MW13			PB-BED-MW14			PB-BED-MW15			PB-BED-MW16		
Associated Site:			TNTC			WARP			PRRP			UTTA		
Sample No:			CB3025			CB3022			CB3041			CB3037		
Sample Date:			10-APR-02			08-APR-02			15-APR-02			11-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES														
Carbazole		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloro-3-methylphenol, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloroaniline, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloronaphthalene, 2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chlorophenol, 2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chlorophenyl phenyl ether, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chrysene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Di-n-butyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Di-n-octyl phthalate		ug/L	10	U	U	100	U	U	10	U	U	10	U	U
Dibenz(a,h)anthracene		ug/L	10	U	U	100	U	U	10	U	U	10	U	U
Dibenzofuran		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,3-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzidine, 3,3'-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Dichlorophenol, 2,4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Diethyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dimethyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dimethylphenol, 2,4-		ug/L	21			10	U	U	6.8	J	J	13		
Dinitro-2-methylphenol, 4,6-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Dinitrophenol, 2,4-		ug/L	50	U	UJ	50	U	U	50	U	UJ	50	U	UJ
Dinitrotoluene, 2,4-		ug/L	10	U	U	19			10	U	U	10	U	U
Dinitrotoluene, 2,6-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Fluoranthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Fluorene		ug/L	1.4	J	J	10	U	U	10	U	U	1.8	J	J
Hexachlorobenzene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hexachlorobutadiene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hexachlorocyclopentadiene		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Hexachloroeth		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Indeno(1,2,3-c .ene		ug/L	10	U	U	100	U	U	10	U	U	10	U	U

Location Code:			PB-BED-MW17			PB-BED-MW18			PB-BED-MW19			PB-BED-MW22		
Associated Site:			TNTA			TNTA			AA2			DGP		
Sample No:			CB3014			CB3015			CB3013			CB3009		
Sample Date:			11-APR-02			05-APR-02			04-APR-02			04-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES														
Carbazole		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Chloro-3-methylphenol, 4-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Chloroaniline, 4-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Chloronaphthalene, 2-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Chlorophenol, 2-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Chlorophenyl phenyl ether, 4-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Chrysene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Di-n-butyl phthalate		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Di-n-octyl phthalate		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Dibenz(a,h)anthracene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Dibenzofuran		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,2-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,3-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,4-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Dichlorobenzidine, 3,3'-		ug/L	50	U	UJ	50	U	U	50	U	U	50	U	U
Dichlorophenol, 2,4-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Diethyl phthalate		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Dimethyl phthalate		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Dimethylphenol, 2,4-		ug/L	3.0	J	J	12			10	U	U	10	U	U
Dinitro-2-methylphenol, 4,6-		ug/L	50	U	UJ	50	U	U	50	U	U	50	U	U
Dinitrophenol, 2,4-		ug/L	50	U	UJ	50	U	U	50	U	U	50	U	U
Dinitrotoluene, 2,4-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Dinitrotoluene, 2,6-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Fluoranthene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Fluorene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Hexachlorobenzene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Hexachlorobutadiene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Hexachlorocyclopentadiene		ug/L	50	U	UJ	50	U	U	50	U	U	50	U	U
Hexachloroethane		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Indeno(1,2,3-cd)pyrene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U

Report Date: 03/18/03

	Location Code:		PB-BED-MW23			PB-BED-MW27			PB-TNTA-MW10			PB-TNTA-MW11		
	Associated Site:		PRRP			DGP			TNTA			TNTA		
	Sample No:		CB3040			CB3012			CB3042			CB3043		
	Sample Date:		11-APR-02			09-APR-02			15-APR-02			15-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES														
Carbazole		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloro-3-methylphenol, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloroaniline, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloronaphthalene, 2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chlorophenol, 2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chlorophenyl phenyl ether, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chrysene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Di-n-butyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Di-n-octyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dibenz(a,h)anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dibenzofuran		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,3-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzidine, 3,3'-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Dichlorophenol, 2,4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Diethyl phthalate		ug/L	0.68	J	J	10	U	U	10	U	U	10	U	U
Dimethyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dimethylphenol, 2,4-		ug/L	51			5.1	J	J	10	U	U	10	U	U
Dinitro-2-methylphenol, 4,6-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Dinitrophenol, 2,4-		ug/L	50	U	UJ	50	U	UJ	50	U	UJ	50	U	UJ
Dinitrotoluene, 2,4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dinitrotoluene, 2,6-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Fluoranthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Fluorene		ug/L	1.4	J	J	10	U	U	10	U	U	10	U	U
Hexachlorobenzene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hexachlorobutadiene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hexachlorocyclopentadiene		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Hexachloroeth[illegible]		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Indeno(1,2,3-c[illegible]ne		ug/L	10	U	U	10	U	U	10	U	U	10	U	U

Report Date: 03/18/03

	Location Code:		PB-TNTC-MW3			PB-TNTC-MW4			PB-TNTC-MW5			TNTA-BEDGW-001		
	Associated Site:		TNTC			TNTC			TNTC			TNTA		
	Sample No:		CB3027			CB3028			CB3029			CB3044		
	Sample Date:		10-APR-02			10-APR-02			08-APR-02			15-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES														
Carbazole		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloro-3-methylphenol, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	UJ
Chloroaniline, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chloronaphthalene, 2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chlorophenol, 2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	UJ
Chlorophenyl phenyl ether, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Chrysene		ug/L	10	U	U	10	U	U	10	U	U	0.62	J	J
Di-n-butyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Di-n-octyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dibenz(a,h)anthracene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dibenzofuran		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,3-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dichlorobenzidine, 3,3'-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Dichlorophenol, 2,4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	UJ
Diethyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dimethyl phthalate		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dimethylphenol, 2,4-		ug/L	10	U	U	10	U	U	10	U	U	18		J
Dinitro-2-methylphenol, 4,6-		ug/L	50	U	U	50	U	U	50	U	U	50	U	UJ
Dinitrophenol, 2,4-		ug/L	50	U	UJ	50	U	UJ	50	U	U	50	U	UJ
Dinitrotoluene, 2,4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Dinitrotoluene, 2,6-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Fluoranthene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Fluorene		ug/L	10	U	U	10	U	U	10	U	U	1.9	J	J
Hexachlorobenzene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hexachlorobutadiene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Hexachlorocyclopentadiene		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Hexachloroethane		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Indeno(1,2,3-cd)pyrene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U

Location Code:			TNTB-BEDGW-003			TNTB-BEDGW-004			TNTC-BEDGW-001		
Associated Site:			TNTB			TNTB			TNTC		
Sample No:			CB3024			CB3023			CB3026		
Sample Date:			10-APR-02			08-APR-02			09-APR-02		
User Test Group											
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES											
Carbazole		ug/L	10	U	U	10	U	U	10	U	U
Chloro-3-methylphenol, 4-		ug/L	10	U	U	10	U	U	10	U	U
Chloroaniline, 4-		ug/L	10	U	U	10	U	U	10	U	U
Chloronaphthalene, 2-		ug/L	10	U	U	10	U	U	10	U	U
Chlorophenol, 2-		ug/L	10	U	U	10	U	U	10	U	U
Chlorophenyl phenyl ether, 4-		ug/L	10	U	U	10	U	U	10	U	U
Chrysene		ug/L	10	U	U	10	U	U	10	U	U
Di-n-butyl phthalate		ug/L	10	U	U	10	U	U	10	U	U
Di-n-octyl phthalate		ug/L	10	U	U	10	U	U	10	U	U
Dibenz(a,h)anthracene		ug/L	10	U	U	10	U	U	10	U	U
Dibenzofuran		ug/L	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,2-		ug/L	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,3-		ug/L	10	U	U	10	U	U	10	U	U
Dichlorobenzene, 1,4-		ug/L	10	U	U	10	U	U	10	U	U
Dichlorobenzidine, 3,3'-		ug/L	50	U	U	50	U	U	50	U	U
Dichlorophenol, 2,4-		ug/L	10	U	U	10	U	U	10	U	U
Diethyl phthalate		ug/L	10	U	U	10	U	U	10	U	U
Dimethyl phthalate		ug/L	10	U	U	10	U	U	10	U	U
Dimethylphenol, 2,4-		ug/L	10	U	U	10	U	U	10	U	U
Dinitro-2-methylphenol, 4,6-		ug/L	50	U	U	50	U	U	50	U	U
Dinitrophenol, 2,4-		ug/L	50	U	UJ	50	U	U	50	U	UJ
Dinitrotoluene, 2,4-		ug/L	10	U	U	10	U	U	10	U	U
Dinitrotoluene, 2,6-		ug/L	10	U	U	10	U	U	10	U	U
Fluoranthene		ug/L	10	U	U	10	U	U	10	U	U
Fluorene		ug/L	10	U	U	10	U	U	10	U	U
Hexachlorobenzene		ug/L	10	U	U	10	U	U	10	U	U
Hexachlorobutadiene		ug/L	10	U	U	10	U	U	10	U	U
Hexachlorocyclopentadiene		ug/L	50	U	U	50	U	U	50	U	U
Hexachloroet[illegible]		ug/L	10	U	U	10	U	U	10	U	U
Indeno(1,2,3-c[illegible]rene		ug/L	10	U	U	10	U	U	10	U	U

Location Code:		IT-AA2-BEDGW-001			IT-AA3-BEDGW-001			IT-ABG-BEDGW-01			IT-MNTA-BEDGW-001		
Associated Site:		AA2			AA3			ABG			MSA		
Sample No:		CB3030			CB3033			CB3016			CB3039		
Sample Date:		10-APR-02			10-APR-02			05-APR-02			12-APR-02		
User Test Group													
Parameter	*Flt Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES													
Isophorone	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Methylnaphthalene, 2-	ug/L	3.2	J	J	10	U	U	10	U	U	23		
Methylphenol, 2-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Methylphenol, 4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Naphthalene	ug/L	2.5	J	J	0.70	J	J	10	U	U	16		
Nitroaniline, 2-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitroaniline, 3-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitroaniline, 4-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitrobenzene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Nitrophenol, 2-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Nitrophenol, 4-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Pentachlorophenol	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Phenanthrene	ug/L	10	U	U	10	U	U	10	U	U	1.9	J	J
Phenol	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Pyrene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorobenzene, 1,2,4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorophenol, 2,4,5-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorophenol, 2,4,6-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
n-Nitroso-di-n-propylamine	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
n-Nitrosodiphenylamine	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
VOLATILES													
Acetone	ug/L	50	U	R	100	U	R	10	U	R	140	J	J
Benzene	ug/L	4.8	J	J	8.0	J	J	1.0	U	U	36	J	J
Bromodichloromethane	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Bromoform	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Bromomethane	ug/L	10	U	U	20	U	U	2.0	U	U	200	U	U
Butanone, 2-	ug/L	25	U	R	50	U	R	5.0	U	R	500	U	R
Carbon disulfide	ug/L	0.84	J	J	10	U	U	1.0	U	U	100	U	U
Carbon tetrachloride	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U

	Location Code:		IT-TNTB-BEDGW-001			IT-TNTB-BEDGW-002			MK-MW16			MK-MW17		
	Associated Site:		TNTB			TNTB			TNTB			TNTB		
	Sample No:		CB3019			CB3018			CB3017			CB3038		
	Sample Date:		05-APR-02			05-APR-02			08-APR-02			12-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES														
Isophorone		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Methylnaphthalene, 2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Methylphenol, 2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Methylphenol, 4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Naphthalene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Nitroaniline, 2-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitroaniline, 3-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitroaniline, 4-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitrobenzene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Nitrophenol, 2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Nitrophenol, 4-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Pentachlorophenol		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Phenanthrene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Phenol		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Pyrene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorobenzene, 1,2,4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorophenol, 2,4,5-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorophenol, 2,4,6-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
n-Nitroso-di-n-propylamine		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
n-Nitrosodiphenylamine		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
VOLATILES														
Acetone		ug/L	2.3	J	B	3.2	J	B	10	U	R	2.4	J	J
Benzene		ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Bromodichloromethane		ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Bromoform		ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Bromomethane		ug/L	2.0	U	U	2.0	U	U	2.0	U	U	2.0	U	U
Butanone, 2-		ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	R
Carbon disulfid		ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Carbon tetracl		ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U

	Location Code:	PB-BED-MW13			PB-BED-MW14			PB-BED-MW15			PB-BED-MW16		
	Associated Site:	TNTC			WARP			PRRP			UTTA		
	Sample No:	CB3025			CB3022			CB3041			CB3037		
	Sample Date:	10-APR-02			08-APR-02			15-APR-02			11-APR-02		
User Test Group													
Parameter	*Flt Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES													
Isophorone	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Methylnaphthalene, 2-	ug/L	34			10	U	U	27			24		
Methylphenol, 2-	ug/L	6.0	J	J	10	U	U	3.9	J	J	0.88	J	J
Methylphenol, 4-	ug/L	5.8	J	J	10	U	U	5.6	J	J	10	U	U
Naphthalene	ug/L	34			10	U	U	25			5.0	J	J
Nitroaniline, 2-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitroaniline, 3-	ug/L	50	U	U	150			50	U	U	50	U	U
Nitroaniline, 4-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitrobenzene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Nitrophenol, 2-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Nitrophenol, 4-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Pentachlorophenol	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Phenanthrene	ug/L	1.9	J	J	10	U	U	1.3	J	J	2.6	J	J
Phenol	ug/L	11			10	U	U	15			1.0	J	J
Pyrene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorobenzene, 1,2,4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorophenol, 2,4,5-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorophenol, 2,4,6-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
n-Nitroso-di-n-propylamine	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
n-Nitrosodiphenylamine	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
VOLATILES													
Acetone	ug/L	500	U	R	50	U	R	87	J	J	60	J	J
Benzene	ug/L	410		J	5.0	U	U	600			150		J
Bromodichloromethane	ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Bromoform	ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Bromomethane	ug/L	100	U	U	10	U	R	40	U	U	20	U	U
Butanone, 2-	ug/L	250	U	R	25	U	UJ	100	U	R	50	U	R
Carbon disulfide	ug/L	50	U	U	5.0	U	U	3.1	J	J	10	U	U
Carbon tetrachloride	ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U

Location Code:			PB-BED-MW17			PB-BED-MW18			PB-BED-MW19			PB-BED-MW22		
Associated Site:			TNTA			TNTA			AA2			DGP		
Sample No:			CB3014			CB3015			CB3013			CB3009		
Sample Date:			11-APR-02			05-APR-02			04-APR-02			04-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES														
Isophorone		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Methylnaphthalene, 2-		ug/L	7.5	J	J	5.3	J	J	10			10	U	U
Methylphenol, 2-		ug/L	10	U	UJ	4.7	J	J	10	U	U	10	U	U
Methylphenol, 4-		ug/L	1.4	J	J	4.4	J	J	10	U	U	10	U	U
Naphthalene		ug/L	10		J	9.9	J	J	6.1	J	J	10	U	U
Nitroaniline, 2-		ug/L	50	U	UJ	50	U	U	50	U	U	50	U	U
Nitroaniline, 3-		ug/L	50	U	UJ	50	U	U	50	U	U	50	U	U
Nitroaniline, 4-		ug/L	50	U	UJ	50	U	U	50	U	U	50	U	U
Nitrobenzene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Nitrophenol, 2-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Nitrophenol, 4-		ug/L	50	U	UJ	50	U	U	50	U	U	50	U	U
Pentachlorophenol		ug/L	50	U	UJ	50	U	U	50	U	U	50	U	U
Phenanthrene		ug/L	10	U	UJ	10	U	U	0.74	J	J	10	U	U
Phenol		ug/L	2.0	J	J	1.4	J	J	10	U	U	10	U	U
Pyrene		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Trichlorobenzene, 1,2,4-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Trichlorophenol, 2,4,5-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
Trichlorophenol, 2,4,6-		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
n-Nitroso-di-n-propylamine		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
n-Nitrosodiphenylamine		ug/L	10	U	UJ	10	U	U	10	U	U	10	U	U
VOLATILES														
Acetone		ug/L	200	U	R	50	U	R	500	U	R	400	U	R
Benzene		ug/L	13	J	J	14		J	42	J	J	40	U	U
Bromodichloromethane		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Bromoform		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Bromomethane		ug/L	40	U	U	10	U	R	100	U	U	80	U	U
Butanone, 2-		ug/L	100	U	R	25	U	UJ	250	U	R	200	U	R
Carbon disulf[illegible]		ug/L	2.3	J	J	4.8	J	J	50	U	U	40	U	U
Carbon tetrac[illegible]		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U

Location Code:			PB-BED-MW23			PB-BED-MW27			PB-TNTA-MW10			PB-TNTA-MW11		
Associated Site:			PRRP			DGP			TNTA			TNTA		
Sample No:			CB3040			CB3012			CB3042			CB3043		
Sample Date:			11-APR-02			09-APR-02			15-APR-02			15-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES														
Isophorone		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Methylnaphthalene, 2-		ug/L	32			18			10	U	U	10	U	U
Methylphenol, 2-		ug/L	37			0.89	J	J	10	U	U	10	U	U
Methylphenol, 4-		ug/L	43			1.1	J	J	10	U	U	10	U	U
Naphthalene		ug/L	31			14			10	U	U	10	U	U
Nitroaniline, 2-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitroaniline, 3-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitroaniline, 4-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitrobenzene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Nitrophenol, 2-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Nitrophenol, 4-		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Pentachlorophenol		ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Phenanthrene		ug/L	2.4	J	J	0.75	J	J	10	U	U	10	U	U
Phenol		ug/L	150			2.0	J	J	10	U	U	10	U	U
Pyrene		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorobenzene, 1,2,4-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorophenol, 2,4,5-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorophenol, 2,4,6-		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
n-Nitroso-di-n-propylamine		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
n-Nitrosodiphenylamine		ug/L	10	U	U	10	U	U	10	U	U	10	U	U
VOLATILES														
Acetone		ug/L	1400		J	100	J	J	6.8	J	J	1.7	J	J
Benzene		ug/L	2500			70		J	1.0	U	U	1.0	U	U
Bromodichloromethane		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Bromoform		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Bromomethane		ug/L	200	U	U	40	U	U	2.0	U	U	2.0	U	U
Butanone, 2-		ug/L	500	U	R	100	U	R	5.0	U	R	5.0	U	R
Carbon disulfide		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Carbon tetrachloride		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U

Location Code:		PB-TNTC-MW3			PB-TNTC-MW4			PB-TNTC-MW5			TNTA-BEDGW-001		
Associated Site:		TNTC			TNTC			TNTC			TNTA		
Sample No:		CB3027			CB3028			CB3029			CB3044		
Sample Date:		10-APR-02			10-APR-02			08-APR-02			15-APR-02		
User Test Group													
Parameter	*Flt* *Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES													
Isophorone	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Methylnaphthalene, 2-	ug/L	10	U	U	10	U	U	10	U	U	47		
Methylphenol, 2-	ug/L	10	U	U	10	U	U	10	U	U	12		J
Methylphenol, 4-	ug/L	10	U	U	10	U	U	10	U	U	15		J
Naphthalene	ug/L	10	U	U	10	U	U	10	U	U	39		
Nitroaniline, 2-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitroaniline, 3-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitroaniline, 4-	ug/L	50	U	U	50	U	U	50	U	U	50	U	U
Nitrobenzene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Nitrophenol, 2-	ug/L	10	U	U	10	U	U	10	U	U	10	U	UJ
Nitrophenol, 4-	ug/L	50	U	U	50	U	U	50	U	U	50	U	R
Pentachlorophenol	ug/L	50	U	U	50	U	U	50	U	U	50	U	R
Phenanthrene	ug/L	10	U	U	10	U	U	10	U	U	3.4	J	J
Phenol	ug/L	10	U	U	10	U	U	10	U	U	27		J
Pyrene	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorobenzene, 1,2,4-	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
Trichlorophenol, 2,4,5-	ug/L	10	U	U	10	U	U	10	U	U	10	U	UJ
Trichlorophenol, 2,4,6-	ug/L	10	U	U	10	U	U	10	U	U	10	U	UJ
n-Nitroso-di-n-propylamine	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
n-Nitrosodiphenylamine	ug/L	10	U	U	10	U	U	10	U	U	10	U	U
VOLATILES													
Acetone	ug/L	13		J	10	U	R	10	U	R	290	J	J
Benzene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	490		J
Bromodichloromethane	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Bromoform	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Bromomethane	ug/L	2.0	U	U	2.0	U	U	2.0	U	U	200	U	U
Butanone, 2-	ug/L	4.9	J	J	5.0	U	R	5.0	U	U	500	U	R
Carbon disulfi	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Carbon tetrach	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U

Location Code:		TNTB-BEDGW-003			TNTB-BEDGW-004			TNTC-BEDGW-001			
Associated Site:		TNTB			TNTB			TNTC			
Sample No:		CB3024			CB3023			CB3026			
Sample Date:		10-APR-02			08-APR-02			09-APR-02			
User Test Group											
Parameter	*Flt Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	
SEMIVOLATILES											
Isophorone	ug/L	10	U	U	10	U	U	10	U	U	
Methylnaphthalene, 2-	ug/L	4.8	J	J	10	U	U	3.2	J	J	
Methylphenol, 2-	ug/L	10	U	U	10	U	U	10	U	U	
Methylphenol, 4-	ug/L	10	U	U	10	U	U	10	U	U	
Naphthalene	ug/L	2.8	J	J	10	U	U	2.5	J	J	
Nitroaniline, 2-	ug/L	50	U	U	50	U	U	50	U	U	
Nitroaniline, 3-	ug/L	50	U	U	50	U	U	50	U	U	
Nitroaniline, 4-	ug/L	50	U	U	50	U	U	50	U	U	
Nitrobenzene	ug/L	10	U	U	10	U	U	10	U	U	
Nitrophenol, 2-	ug/L	10	U	U	10	U	U	10	U	U	
Nitrophenol, 4-	ug/L	50	U	U	50	U	U	50	U	U	
Pentachlorophenol	ug/L	50	U	U	50	U	U	50	U	U	
Phenanthrene	ug/L	0.73	J	J	10	U	U	10	U	U	
Phenol	ug/L	1.6	J	J	10	U	U	10	U	U	
Pyrene	ug/L	10	U	U	10	U	U	10	U	U	
Trichlorobenzene, 1,2,4-	ug/L	10	U	U	10	U	U	10	U	U	
Trichlorophenol, 2,4,5-	ug/L	10	U	U	10	U	U	10	U	U	
Trichlorophenol, 2,4,6-	ug/L	10	U	U	10	U	U	10	U	U	
n-Nitroso-di-n-propylamine	ug/L	10	U	U	10	U	U	10	U	U	
n-Nitrosodiphenylamine	ug/L	10	U	U	10	U	U	10	U	U	
VOLATILES											
Acetone	ug/L	85		J	1.8	J	B	53	J	J	
Benzene	ug/L	14			0.50	J	J	8.4	J	J	
Bromodichloromethane	ug/L	1.0	U	U	1.0	U	U	20	U	U	
Bromoform	ug/L	1.0	U	U	1.0	U	U	20	U	U	
Bromomethane	ug/L	2.0	U	U	2.0	U	U	40	U	U	
Butanone, 2-	ug/L	69		J	5.0	U	U	100	U	R	
Carbon disulfide	ug/L	0.37	J	J	1.0	U	U	20	U	U	
Carbon tetrachloride	ug/L	1.0	U	U	1.0	U	U	20	U	U	

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Location Code:		IT-AA2-BEDGW-001			IT-AA3-BEDGW-001			IT-ABG-BEDGW-01			IT-MNTA-BEDGW-001		
Associated Site:		AA2			AA3			ABG			MSA		
Sample No:		CB3030			CB3033			CB3016			CB3039		
Sample Date:		10-APR-02			10-APR-02			05-APR-02			12-APR-02		
User Test Group													
Parameter	*Flt Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES													
Chlorobenzene	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Chloroethane	ug/L	10	U	U	20	U	U	2.0	U	U	200	U	U
Chloroform	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Chloromethane	ug/L	10	U	U	20	U	U	2.0	U	U	200	U	U
Dibromochloromethane	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Dichloroethane, 1,1-	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Dichloroethane, 1,2-	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Dichloroethene, 1,1-	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Dichloroethene, 1,2-	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Dichloropropane, 1,2-	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Dichloropropene, cis-1,3-	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Dichloropropene, trans-1,3-	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Ethylbenzene	ug/L	13			4.6	J	J	1.0	U	U	25	J	J
Hexanone, 2-	ug/L	25	U	U	50	U	U	5.0	U	U	500	U	U
Methyl-2-pentanone, 4-	ug/L	25	U	U	50	U	U	5.0	U	U	500	U	U
Methylene chloride	ug/L	3.9	J B	J	9.2	J	J	0.49	J	B	110	J	J
Styrene	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Tetrachloroethane, 1,1,2,2-	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Tetrachloroethene	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Toluene	ug/L	2.2	J	J	12		J	1.0	U	U	40	J	J
Trichloroethane, 1,1,1-	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Trichloroethane, 1,1,2-	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Trichloroethene	ug/L	5.0	U	U	10	U	U	1.0	U	U	18	J	J
Vinyl chloride	ug/L	5.0	U	U	10	U	U	1.0	U	U	100	U	U
Xylenes, total	ug/L	98			31			1.0	U	U	310		

Location Code:		IT-TNTB-BEDGW-001			IT-TNTB-BEDGW-002			MK-MW16			MK-MW17		
Associated Site:		TNTB			TNTB			TNTB			TNTB		
Sample No:		CB3019			CB3018			CB3017			CB3038		
Sample Date:		05-APR-02			05-APR-02			08-APR-02			12-APR-02		
User Test Group													
Parameter	*Flt Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES													
Chlorobenzene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Chloroethane	ug/L	2.0	U	U	2.0	U	U	2.0	U	U	2.0	U	U
Chloroform	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Chloromethane	ug/L	2.0	U	U	2.0	U	U	2.0	U	U	2.0	U	U
Dibromochloromethane	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Dichloroethane, 1,1-	ug/L	0.38	J	J	1.0	U	U	1.0	U	U	1.0	U	U
Dichloroethane, 1,2-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Dichloroethene, 1,1-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Dichloroethene, 1,2-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Dichloropropane, 1,2-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Dichloropropene, cis-1,3-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Dichloropropene, trans-1,3-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Ethylbenzene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Hexanone, 2-	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Methyl-2-pentanone, 4-	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	5.0	U	U
Methylene chloride	ug/L	2.0	U	U	2.0	U	U	2.0	U	U	2.0	U	U
Styrene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Tetrachloroethane, 1,1,2,2-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Tetrachloroethene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Toluene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Trichloroethane, 1,1,1-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Trichloroethane, 1,1,2-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Trichloroethene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Vinyl chloride	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U
Xylenes, total	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1.0	U	U

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Location Code:			PB-BED-MW13			PB-BED-MW14			PB-BED-MW15			PB-BED-MW16		
Associated Site:			TNTC			WARP			PRRP			UTTA		
Sample No:			CB3025			CB3022			CB3041			CB3037		
Sample Date:			10-APR-02			08-APR-02			15-APR-02			11-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES														
Chlorobenzene		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Chloroethane		ug/L	100	U	U	10	U	U	40	U	U	20	U	U
Chloroform		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Chloromethane		ug/L	100	U	U	10	U	UJ	40	U	U	20	U	U
Dibromochloromethane		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Dichloroethane, 1,1-		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Dichloroethane, 1,2-		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Dichloroethene, 1,1-		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Dichloroethene, 1,2-		ug/L	50	U	U	5.0	U	UJ	20	U	U	10	U	U
Dichloropropane, 1,2-		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Dichloropropene, cis-1,3-		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Dichloropropene, trans-1,3-		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Ethylbenzene		ug/L	130		J	5.0	U	U	130			40		J
Hexanone, 2-		ug/L	250	U	U	25	U	U	100	U	U	50	U	U
Methyl-2-pentanone, 4-		ug/L	250	U	U	25	U	U	100	U	U	50	U	U
Methylene chloride		ug/L	49	J B	J	1.9	J B	B	31	J B	J	11	J	J
Styrene		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Tetrachloroethane, 1,1,2,2-		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Tetrachloroethene		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Toluene		ug/L	300		J	5.0	U	U	460			150		J
Trichloroethane, 1,1,1-		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Trichloroethane, 1,1,2-		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Trichloroethene		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Vinyl chloride		ug/L	50	U	U	5.0	U	U	20	U	U	10	U	U
Xylenes, total		ug/L	1300			5.0	U	U	880			610		

Report Date: 03/18/03

	Location Code:		PB-BED-MW17			PB-BED-MW18			PB-BED-MW19			PB-BED-MW22		
	Associated Site:		TNTA			TNTA			AA2			DGP		
	Sample No:		CB3014			CB3015			CB3013			CB3009		
	Sample Date:		11-APR-02			05-APR-02			04-APR-02			04-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES														
Chlorobenzene		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Chloroethane		ug/L	40	U	U	10	U	UJ	100	U	U	80	U	U
Chloroform		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Chloromethane		ug/L	40	U	U	10	U	UJ	100	U	U	80	U	U
Dibromochloromethane		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Dichloroethane, 1,1-		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Dichloroethane, 1,2-		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Dichloroethene, 1,1-		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Dichloroethene, 1,2-		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Dichloropropane, 1,2-		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Dichloropropene, cis-1,3-		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Dichloropropene, trans-1,3-		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Ethylbenzene		ug/L	100			100		J	16	J	J	40	U	U
Hexanone, 2-		ug/L	100	U	U	25	U	UJ	250	U	U	200	U	U
Methyl-2-pentanone, 4-		ug/L	100	U	U	25	U	UJ	250	U	U	200	U	U
Methylene chloride		ug/L	20	J	J	10	U	UJ	9.7	J B	J	11	J	J
Styrene		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Tetrachloroethane, 1,1,2,2-		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Tetrachloroethene		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Toluene		ug/L	150			74		J	18	J	J	40	U	U
Trichloroethane, 1,1,1-		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Trichloroethane, 1,1,2-		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Trichloroethene		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Vinyl chloride		ug/L	20	U	U	5.0	U	UJ	50	U	U	40	U	U
Xylenes, total		ug/L	440			420		J	170			40	U	U

Location Code:			PB-BED-MW23			PB-BED-MW27			PB-TNTA-MW10			PB-TNTA-MW11		
Associated Site:			PRRP			DGP			TNTA			TNTA		
Sample No:			CB3040			CB3012			CB3042			CB3043		
Sample Date:			11-APR-02			09-APR-02			15-APR-02			15-APR-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES														
Chlorobenzene		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Chloroethane		ug/L	200	U	U	40	U	U	2.0	U	U	2.0	U	U
Chloroform		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Chloromethane		ug/L	200	U	U	40	U	U	2.0	U	U	2.0	U	U
Dibromochloromethane		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Dichloroethane, 1,1-		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Dichloroethane, 1,2-		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Dichloroethene, 1,1-		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Dichloroethene, 1,2-		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Dichloropropane, 1,2-		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Dichloropropene, cis-1,3-		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Dichloropropene, trans-1,3-		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Ethylbenzene		ug/L	230			83		J	1.0	U	U	1.0	U	U
Hexanone, 2-		ug/L	500	U	U	100	U	U	5.0	U	U	5.0	U	U
Methyl-2-pentanone, 4-		ug/L	500	U	U	100	U	U	5.0	U	U	5.0	U	U
Methylene chloride		ug/L	100	J	J	18	J B	J	0.43	J B	B	0.32	J B	B
Styrene		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Tetrachloroethane, 1,1,2,2-		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Tetrachloroethene		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Toluene		ug/L	1000			73		J	1.0	U	U	1.0	U	U
Trichloroethane, 1,1,1-		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Trichloroethane, 1,1,2-		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Trichloroethene		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Vinyl chloride		ug/L	100	U	U	20	U	U	1.0	U	U	1.0	U	U
Xylenes, total		ug/L	1600			460			1.0	U	U	1.0	U	U

	Location Code:	PB-TNTC-MW3			PB-TNTC-MW4			PB-TNTC-MW5			TNTA-BEDGW-001		
	Associated Site:	TNTC			TNTC			TNTC			TNTA		
	Sample No:	CB3027			CB3028			CB3029			CB3044		
	Sample Date:	10-APR-02			10-APR-02			08-APR-02			15-APR-02		
User Test Group													
Parameter	*Flt Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES													
Chlorobenzene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Chloroethane	ug/L	2.0	U	U	2.0	U	U	2.0	U	U	200	U	U
Chloroform	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Chloromethane	ug/L	2.0	U	U	2.0	U	U	2.0	U	U	200	U	U
Dibromochloromethane	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Dichloroethane, 1,1-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Dichloroethane, 1,2-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Dichloroethene, 1,1-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Dichloroethene, 1,2-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Dichloropropane, 1,2-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Dichloropropene, cis-1,3-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Dichloropropene, trans-1,3-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Ethylbenzene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	210		J
Hexanone, 2-	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	500	U	U
Methyl-2-pentanone, 4-	ug/L	5.0	U	U	5.0	U	U	5.0	U	U	500	U	U
Methylene chloride	ug/L	2.0	U	U	2.0	U	U	2.0	U	U	170	J B	J
Styrene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Tetrachloroethane, 1,1,2,2-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Tetrachloroethene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Toluene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	630		J
Trichloroethane, 1,1,1-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Trichloroethane, 1,1,2-	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Trichloroethene	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Vinyl chloride	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	100	U	U
Xylenes, total	ug/L	1.0	U	U	1.0	U	U	1.0	U	U	1200		

	Location Code:		TNTB-BEDGW-003			TNTB-BEDGW-004			TNTC-BEDGW-001		
	Associated Site:		TNTB			TNTB			TNTC		
	Sample No:		CB3024			CB3023			CB3026		
	Sample Date:		10-APR-02			08-APR-02			09-APR-02		
User Test Group											
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES											
Chlorobenzene		ug/L	1.0	U	U	1.0	U	U	20	U	U
Chloroethane		ug/L	2.0	U	U	2.0	U	U	40	U	U
Chloroform		ug/L	1.0	U	U	1.0	U	U	20	U	U
Chloromethane		ug/L	2.0	U	U	2.0	U	U	40	U	U
Dibromochloromethane		ug/L	1.0	U	U	1.0	U	U	20	U	U
Dichloroethane, 1,1-		ug/L	1.0	U	U	1.0	U	U	20	U	U
Dichloroethane, 1,2-		ug/L	1.0	U	U	1.0	U	U	20	U	U
Dichloroethene, 1,1-		ug/L	1.0	U	U	1.0	U	U	20	U	U
Dichloroethene, 1,2-		ug/L	1.0	U	U	1.0	U	U	20	U	U
Dichloropropane, 1,2-		ug/L	1.0	U	U	1.0	U	U	20	U	U
Dichloropropene, cis-1,3-		ug/L	1.0	U	U	1.0	U	U	20	U	U
Dichloropropene, trans-1,3-		ug/L	1.0	U	U	1.0	U	U	20	U	U
Ethylbenzene		ug/L	0.52	J	J	1.0	U	U	12	J	J
Hexanone, 2-		ug/L	0.56	J	J	5.0	U	U	100	U	U
Methyl-2-pentanone, 4-		ug/L	0.70	J	J	5.0	U	U	100	U	U
Methylene chloride		ug/L	0.44	J B	B	2.0	U	U	19	J B	J
Styrene		ug/L	1.0	U	U	1.0	U	U	20	U	U
Tetrachloroethane, 1,1,2,2-		ug/L	1.0	U	U	1.0	U	U	20	U	U
Tetrachloroethene		ug/L	1.0	U	U	1.0	U	U	20	U	U
Toluene		ug/L	4.7			1.0	U	U	8.8	J	J
Trichloroethane, 1,1,1-		ug/L	1.0	U	U	1.0	U	U	20	U	U
Trichloroethane, 1,1,2-		ug/L	1.0	U	U	1.0	U	U	20	U	U
Trichloroethene		ug/L	1.0	U	U	1.0	U	U	20	U	U
Vinyl chloride		ug/L	1.0	U	U	1.0	U	U	20	U	U
Xylenes, total		ug/L	2.3			1.0	U	U	90		

JULY 2002

BACKGROUND CHEMICAL ANALYTICAL DATA SUMMARY

Plum Brook C ance Works
Monitoring Well Groundwater
Data Summary

Report Date: 08/21/02

		Location Code:	IT-BG8-BEDGW-001			IT-MW01			MK-MW20			PB-BED-MW20		
		Associated Site:	BCG			BCG			UTTA			BCG		
		Sample No:	CC3001			CC3009			CC3002			CC3003		
		Sample Date:	12-JUL-02			10-JUL-02			11-JUL-02			10-JUL-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
Amino-4,6-dinitrotoluene, 2-		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
Dinitrobenzene, 1,3-		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
Dinitrotoluene, 2,4-		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
Dinitrotoluene, 2,6-		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
HMX		ug/L	0.50	U	U	0.50	U	U				0.50	U	U
Nitrobenzene		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
Nitrotoluene, 2-		ug/L	0.53	G U		0.20	U	U				0.20	U	U
Nitrotoluene, 3-		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
Nitrotoluene, 4-		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
RDX		ug/L	0.50	U	U	0.50	U	U				0.50	U	U
Tetryl		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
Trinitrobenzene, 1,3,5-		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
Trinitrotoluene, 2,4,6-		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
GEN CHEMISTRY														
Alkalinity		ug/L	367000			90000						293000		
Chloride		ug/L	896000			3400						19000000		
Cyanide, total		ug/L	10	U	UJ	10	U	U				10	U	U
Hardness		ug/L	647000			144000						8140000		
Nitrate		ug/L	100	U	U	190						100	U	U
Sulfate		ug/L	9200			118000						5000	U	U
Total dissolved solids		ug/L	2040000			279000						35500000		
Total organic carbon		ug/L	1900			7100						1000	U	U
Total suspended solids		ug/L	21000			4000						33000		
Turbidity		NTU	39.0			1.7						7.4		
METALS														
Aluminum	Y	ug/L	113	B J	B	62.2	B	B				63.1	B	B
Aluminum		ug/L	65.2	B	B	117	B	J				83.4	B	B

Plum Brook Ordnance Works
Monitoring Well Groundwater
Data Summary

Report Date: 08/21/02

		Location Code:		PB-BED-MW24			PB-BED-MW25		
		Associated Site:		BCG			BCG		
		Sample No:		CC3004			CC3005		
		Sample Date:		12-JUL-02			11-JUL-02		
User Test Group									
Parameter	*Flt*	*Units*		*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES									
Amino-2,6-dinitrotoluene, 4-		ug/L		0.20	U	U	0.20	U	U
Amino-4,6-dinitrotoluene, 2-		ug/L		0.20	U	U	0.20	U	U
Dinitrobenzene, 1,3-		ug/L		0.20	U	U	0.20	U	U
Dinitrotoluene, 2,4-		ug/L		0.20	U	U	0.20	U	U
Dinitrotoluene, 2,6-		ug/L		0.36	G U		0.20	U	U
HMX		ug/L		0.50	U	U	0.50	U	U
Nitrobenzene		ug/L		0.20	U	U	0.20	U	U
Nitrotoluene, 2-		ug/L		0.20	U	U	0.20	U	U
Nitrotoluene, 3-		ug/L		0.20	U	U	0.20	U	U
Nitrotoluene, 4-		ug/L		0.54	G U		0.20	U	U
RDX		ug/L		0.50	U	U	0.50	U	U
Tetryl		ug/L		0.20	U	U	0.20	U	R
Trinitrobenzene, 1,3,5-		ug/L		0.20	U	U	0.20	U	U
Trinitrotoluene, 2,4,6-		ug/L		0.20	U	U	0.20	U	U
GEN CHEMISTRY									
Alkalinity		ug/L		979000			329000		
Chloride		ug/L		155000			219000		
Cyanide, total		ug/L		10	U	UJ	10	U	UJ
Hardness		ug/L		1370000			772000		
Nitrate		ug/L		100	U	U	100	U	U
Sulfate		ug/L		32300			416000		
Total dissolved solids		ug/L		1020000			1180000		
Total organic carbon		ug/L		3700			2700		
Total suspended solids		ug/L		124000			5000		
Turbidity		NTU		742			23.6		
METALS									
Aluminum	Y	ug/L		110	B J	B	97.8	B J	B
Aluminum		ug/L		1150			44.6	B	J

Plum Brook C. .ance Works
Monitoring Well Groundwater
Data Summary

Report Date: 08/21/02

													Low		
		Location Code:	IT-BG8-BEDGW-001			IT-MW01			MK-MW20			PB-BED-MW20		
		Associated Site:	BCG			BCG			UTTA			BCG		
		Sample No:	CC3001			CC3009			CC3002			CC3003		
		Sample Date:	12-JUL-02			10-JUL-02			11-JUL-02			10-JUL-02		
User Test Group															
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS															
Antimony	Y	ug/L	60.0	U	U	60.0	U	U				60.0	U	U
Antimony		ug/L	60.0	U	U	60.0	U	U				60.0	U	U
Arsenic	Y	ug/L	10.0	U	U	10.0	U	U				10.0	U	U
Arsenic		ug/L	3.6	B	J	10.0	U	U				10.0	U	U
Barium	Y	ug/L	236			82.5	B	J				23900		
Barium		ug/L	229			75.9	B	J				24000		
Beryllium	Y	ug/L	5.0	U	U	5.0	U	U				5.0	U	U
Beryllium		ug/L	5.0	U	U	5.0	U	U				5.0	U	U
Cadmium	Y	ug/L	5.0	U	U	5.0	U	U				5.0	U	U
Cadmium		ug/L	5.0	U	U	5.0	U	U				5.0	U	U
Calcium	Y	ug/L	133000			39300						2020000		
Calcium		ug/L	134000			39400						2000000		
Chromium	Y	ug/L	10.0	U	U	10.0	U	U				10.0	U	U
Chromium		ug/L	10.0	U	U	10.0	U	U				10.0	U	U
Cobalt	Y	ug/L	8.2	B	J	10.3	B	J				8.0	B	J
Cobalt		ug/L	12.1	B	J	7.5	B	J				8.0	B	J
Copper	Y	ug/L	25.0	U	U	2.8	B	J				25.0	U	U
Copper		ug/L	25.0	U	U	9.1	B	J				25.0	U	U
Iron	Y	ug/L	1160			745						5100		
Iron		ug/L	1490			563						4970		
Lead	Y	ug/L	3.0	U	U	3.0	U	U				4.0	U	U
Lead		ug/L	3.0	U	U	3.0	U	U				4.0	U	U
Magnesium	Y	ug/L	76000			14600						969000		
Magnesium		ug/L	73500			15900						960000		
Manganese	Y	ug/L	728			326						193		
Manganese		ug/L	688			292						190		
Mercury	Y	ug/L	0.20	U	U	0.20	U	U				0.20	U	U
Mercury		ug/L	0.20	U	U	0.20	U	U				0.20	U	U
Nickel	Y	ug/L	8.5	B	J	26.2	B	J				40.0	U	U
Nickel		ug/L	8.6	B	J	15.0	B	J				40.0	U	U

Plum Brook Ordnance Works
Monitoring Well Groundwater
Data Summary

Report Date: 08/21/02

	Location Code:		PB-BED-MW24			PB-BED-MW25		
	Associated Site:		BCG			BCG		
	Sample No:		CC3004			CC3005		
	Sample Date:		12-JUL-02			11-JUL-02		
User Test Group								
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS								
Antimony	Y	ug/L	60.0	U	U	60.0	U	U
Antimony		ug/L	60.0	U	U	60.0	U	U
Arsenic	Y	ug/L	10.0	U	U	10.0	U	U
Arsenic		ug/L	4.3	B		10.0	U	U
Barium	Y	ug/L	670			160	B	J
Barium		ug/L	680			164	B	J
Beryllium	Y	ug/L	5.0	U	U	5.0	U	U
Beryllium		ug/L	5.0	U	U	5.0	U	U
Cadmium	Y	ug/L	5.0	U	U	5.0	U	U
Cadmium		ug/L	5.0	U	U	5.0	U	U
Calcium	Y	ug/L	147000			187000		
Calcium		ug/L	346000			183000		
Chromium	Y	ug/L	10.0	U	U	10.0	U	U
Chromium		ug/L	9.4	B		10.0	U	U
Cobalt	Y	ug/L	50.0	U	U	50.0	U	U
Cobalt		ug/L	2.9	B		50.0	U	U
Copper	Y	ug/L	25.0	U	U	25.0	U	U
Copper		ug/L	8.6	B		25.0	U	U
Iron	Y	ug/L	100	U	U	59.8	B	J
Iron		ug/L	13400			103		
Lead	Y	ug/L	3.0	U	U	3.0	U	U
Lead		ug/L	5.2		B	3.0	U	U
Magnesium	Y	ug/L	79400			74100		
Magnesium		ug/L	88800			69100		
Manganese	Y	ug/L	44.2			94.0		
Manganese		ug/L	420			95.6		
Mercury	Y	ug/L	0.20	U	U	0.20	U	U
Mercury		ug/L	0.20	U	U	0.20	U	U
Nickel	Y	ug/L	40.0	U	U	40.0	U	U
Nickel		ug/L	7.9	B		40.0	U	U

Plum Brook O. . ance Works
Monitoring Well Groundwater
Data Summary

Report Date: 08/21/02

															low
		Location Code:	IT-BG8-BEDGW-001			IT-MW01			MK-MW20			PB-BED-MW20			
		Associated Site:	BCG			BCG			UTTA			BCG			
		Sample No:	CC3001			CC3009			CC3002			CC3003			
		Sample Date:	12-JUL-02			10-JUL-02			11-JUL-02			10-JUL-02			
User Test Group															
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	
METALS															
Potassium	Y	ug/L	31000			6390		J				102000		J	
Potassium		ug/L	30500			6780		J				101000		J	
Selenium	Y	ug/L	5.0	U	U	5.0	U	U				5.0	U	U	
Selenium		ug/L	5.0	U	U	5.0	U	U				5.0	U	U	
Silver	Y	ug/L	10.0	U	U	10.0	U	U				10.0	U	U	
Silver		ug/L	10.0	U	U	10.0	U	U				10.0	U	U	
Sodium	Y	ug/L	392000			19200						8120000			
Sodium		ug/L	395000			19400						8380000			
Thallium	Y	ug/L	10.0	U	U	10.0	U	U				10.0	U	U	
Thallium		ug/L	10.0	U	U	10.0	U	U				10.0	U	U	
Vanadium	Y	ug/L	50.0	U	U	50.0	U	U				50.0	U	U	
Vanadium		ug/L	50.0	U	U	50.0	U	U				50.0	U	U	
Zinc	Y	ug/L	7.3	B	J	124						3.2	B	J	
Zinc		ug/L	10.0	B		34.3						9.7	B	J	
RANGE ORGANICS															
Diesel Range Organics		ug/L							140						
Gasoline Range Organics		ug/L							65000						
SEMIVOLATILES															
Acenaphthene		ug/L	10	U	U	10	U	U				10	U	U	
Acenaphthylene		ug/L	10	U	U	10	U	U				10	U	U	
Anthracene		ug/L	10	U	U	10	U	U				10	U	U	
Benzo(a)anthracene		ug/L	10	U	U	10	U	U				10	U	U	
Benzo(a)pyrene		ug/L	10	U	U	10	U	U				10	U	U	
Benzo(b)fluoranthene		ug/L	10	U	U	10	U	U				10	U	U	
Benzo(ghi)perylene		ug/L	10	U	U	10	U	U				10	U	U	
Benzo(k)fluoranthene		ug/L	10	U	U	10	U	U				10	U	U	
Bis(2-chloroethoxy)methane		ug/L	10	U	U	10	U	U				10	U	U	
Bis(2-chloroethyl)ether		ug/L	10	U	U	10	U	U				10	U	U	

Plum Brook Ordnance Works
Monitoring Well Groundwater
Data Summary

Report Date: 08/21/02

		Location Code:	PB-BED-MW24			PB-BED-MW25		
		Associated Site:	BCG			BCG		
		Sample No:	CC3004			CC3005		
		Sample Date:	12-JUL-02			11-JUL-02		
User Test Group								
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS								
Potassium	Y	ug/L	38300			12100		J
Potassium		ug/L	41600			11400		J
Selenium	Y	ug/L	5.0	U	U	5.0	U	U
Selenium		ug/L	5.0	U	U	5.0	U	U
Silver	Y	ug/L	10.0	U	U	10.0	U	U
Silver		ug/L	10.0	U	U	10.0	U	U
Sodium	Y	ug/L	98500			97600		
Sodium		ug/L	101000			92300		
Thallium	Y	ug/L	10.0	U	U	6.4	B	J
Thallium		ug/L	10.0	U	U	10.0	U	U
Vanadium	Y	ug/L	50.0	U	U	50.0	U	U
Vanadium		ug/L	6.1	B		50.0	U	U
Zinc	Y	ug/L	20.0	U	U	20.0	U	U
Zinc		ug/L	28.4			20.0	U	U
RANGE ORGANICS								
Diesel Range Organics		ug/L						
Gasoline Range Organics		ug/L						
SEMIVOLATILES								
Acenaphthene		ug/L	10	U	U	10	U	U
Acenaphthylene		ug/L	10	U	U	10	U	U
Anthracene		ug/L	10	U	U	10	U	U
Benzo(a)anthracene		ug/L	10	U	U	10	U	U
Benzo(a)pyrene		ug/L	10	U	U	10	U	U
Benzo(b)fluoranthene		ug/L	10	U	U	10	U	U
Benzo(ghi)perylene		ug/L	10	U	U	10	U	U
Benzo(k)fluoranthene		ug/L	10	U	U	10	U	U
Bis(2-chloroe[illegible]methane		ug/L	10	U	U	10	U	U
Bis(2-chloroe[illegible]ier		ug/L	10	U	U	10	U	U

Report Date: 08/21/02

Location Code:		IT-BG8-BEDGW-001			IT-MW01			MK-MW20			PB-BED-MW20		
Associated Site:		BCG			BCG			UTTA			BCG		
Sample No:		CC3001			CC3009			CC3002			CC3003		
Sample Date:		12-JUL-02			10-JUL-02			11-JUL-02			10-JUL-02		
User Test Group													
Parameter	*Flt* *Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES													
Bis(2-chloroisopropyl)ether	ug/L	10	U	U	10	U	U				10	U	U
Bis(2-ethylhexyl)phthalate	ug/L	4.3	J B	B	10	U	U				10	U	U
Bromophenyl phenyl ether, 4-	ug/L	10	U	U	10	U	U				10	U	U
Butyl benzyl phthalate	ug/L	10	U	U	10	U	U				10	U	U
Carbazole	ug/L	10	U	U	10	U	U				10	U	U
Chloro-3-methylphenol, 4-	ug/L	10	U	U	10	U	U				10	U	U
Chloroaniline, 4-	ug/L	10	U	U	10	U	U				10	U	U
Chloronaphthalene, 2-	ug/L	10	U	U	10	U	U				10	U	U
Chlorophenol, 2-	ug/L	10	U	U	10	U	U				10	U	U
Chlorophenyl phenyl ether, 4-	ug/L	10	U	U	10	U	U				10	U	U
Chrysene	ug/L	10	U	U	10	U	U				10	U	U
Di-n-butyl phthalate	ug/L	10	U	U	10	U	U				10	U	U
Di-n-octyl phthalate	ug/L	10	U	U	10	U	U				10	U	U
Dibenz(a,h)anthracene	ug/L	10	U	U	10	U	U				10	U	U
Dibenzofuran	ug/L	10	U	U	10	U	U				10	U	U
Dichlorobenzene, 1,2-	ug/L	10	U	U	10	U	U				10	U	U
Dichlorobenzene, 1,3-	ug/L	10	U	U	10	U	U				10	U	U
Dichlorobenzene, 1,4-	ug/L	10	U	U	10	U	U				10	U	U
Dichlorobenzidine, 3,3'-	ug/L	50	U	U	50	U	U				50	U	U
Dichlorophenol, 2,4-	ug/L	10	U	U	10	U	U				10	U	U
Diethyl phthalate	ug/L	10	U	U	10	U	U				10	U	U
Dimethyl phthalate	ug/L	10	U	U	10	U	U				10	U	U
Dimethylphenol, 2,4-	ug/L	10	U	U	10	U	U				10	U	U
Dinitro-2-methylphenol, 4,6-	ug/L	50	U	U	50	U	U				50	U	U
Dinitrophenol, 2,4-	ug/L	50	U	UJ	50	U	UJ				50	U	UJ
Dinitrotoluene, 2,4-	ug/L	10	U	U	10	U	U				10	U	U
Dinitrotoluene, 2,6-	ug/L	10	U	U	10	U	U				10	U	U
Fluoranthene	ug/L	10	U	U	10	U	U				10	U	U
Fluorene	ug/L	10	U	U	10	U	U				10	U	U
Hexachlorobenzene	ug/L	10	U	U	10	U	U				10	U	U

Report Date: 08/21/02

	Location Code:		PB-BED-MW24			PB-BED-MW25		
	Associated Site:		BCG			BCG		
	Sample No:		CC3004			CC3005		
	Sample Date:		12-JUL-02			11-JUL-02		
User Test Group								
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES								
Bis(2-chloroisopropyl)ether		ug/L	10	U	U	10	U	U
Bis(2-ethylhexyl)phthalate		ug/L	4.6	J B	B	3.0	J B	B
Bromophenyl phenyl ether, 4-		ug/L	10	U	U	10	U	U
Butyl benzyl phthalate		ug/L	10	U	U	10	U	U
Carbazole		ug/L	10	U	U	10	U	U
Chloro-3-methylphenol, 4-		ug/L	10	U	U	10	U	U
Chloroaniline, 4-		ug/L	10	U	U	10	U	U
Chloronaphthalene, 2-		ug/L	10	U	U	10	U	U
Chlorophenol, 2-		ug/L	10	U	U	10	U	U
Chlorophenyl phenyl ether, 4-		ug/L	10	U	U	10	U	U
Chrysene		ug/L	10	U	U	10	U	U
Di-n-butyl phthalate		ug/L	10	U	U	10	U	U
Di-n-octyl phthalate		ug/L	10	U	U	10	U	U
Dibenz(a,h)anthracene		ug/L	10	U	U	10	U	U
Dibenzofuran		ug/L	10	U	U	10	U	U
Dichlorobenzene, 1,2-		ug/L	10	U	U	10	U	U
Dichlorobenzene, 1,3-		ug/L	10	U	U	10	U	U
Dichlorobenzene, 1,4-		ug/L	10	U	U	10	U	U
Dichlorobenzidine, 3,3'-		ug/L	50	U	U	50	U	U
Dichlorophenol, 2,4-		ug/L	10	U	U	10	U	U
Diethyl phthalate		ug/L	10	U	U	10	U	U
Dimethyl phthalate		ug/L	10	U	U	10	U	U
Dimethylphenol, 2,4-		ug/L	0.76	J	J	10	U	U
Dinitro-2-methylphenol, 4,6-		ug/L	50	U	U	50	U	U
Dinitrophenol, 2,4-		ug/L	50	U	UJ	50	U	UJ
Dinitrotoluene, 2,4-		ug/L	10	U	U	10	U	U
Dinitrotoluene, 2,6-		ug/L	10	U	U	10	U	U
Fluoranthene		ug/L	10	U	U	10	U	U
Fluorene		ug/L	10	U	U	10	U	U
Hexachloroben		ug/L	10	U	U	10	U	U

	Location Code:	IT-BG8-BEDGW-001			IT-MW01			MK-MW20			PB-BED-MW20		
	Associated Site:	BCG			BCG			UTTA			BCG		
	Sample No:	CC3001			CC3009			CC3002			CC3003		
	Sample Date:	12-JUL-02			10-JUL-02			11-JUL-02			10-JUL-02		
User Test Group													
Parameter	*Flt* *Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES													
Hexachlorobutadiene	ug/L	10	U	U	10	U	U				10	U	U
Hexachlorocyclopentadiene	ug/L	50	U	UJ	50	U	UJ				50	U	UJ
Hexachloroethane	ug/L	10	U	U	10	U	U				10	U	U
Indeno(1,2,3-cd)pyrene	ug/L	10	U	U	10	U	U				10	U	U
Isophorone	ug/L	10	U	U	10	U	U				10	U	U
Methylnaphthalene, 2-	ug/L	10	U	UJ	10	U	UJ				10	U	UJ
Methylphenol, 2-	ug/L	10	U	U	10	U	U				10	U	U
Methylphenol, 4-	ug/L	10	U	U	10	U	U				10	U	U
Naphthalene	ug/L	10	U	U	10	U	U				10	U	U
Nitroaniline, 2-	ug/L	50	U	U	50	U	U				50	U	U
Nitroaniline, 3-	ug/L	50	U	U	50	U	U				50	U	U
Nitroaniline, 4-	ug/L	50	U	U	50	U	U				50	U	U
Nitrobenzene	ug/L	10	U	U	10	U	U				10	U	U
Nitrophenol, 2-	ug/L	10	U	U	10	U	U				10	U	U
Nitrophenol, 4-	ug/L	50	U	U	50	U	U				50	U	U
Pentachlorophenol	ug/L	50	U	U	50	U	U				50	U	U
Phenanthrene	ug/L	10	U	U	10	U	U				10	U	U
Phenol	ug/L	10	U	U	10	U	U				10	U	U
Pyrene	ug/L	10	U	U	10	U	U				10	U	U
Trichlorobenzene, 1,2,4-	ug/L	10	U	U	10	U	U				10	U	U
Trichlorophenol, 2,4,5-	ug/L	10	U	U	10	U	U				10	U	U
Trichlorophenol, 2,4,6-	ug/L	10	U	U	10	U	U				10	U	U
n-Nitroso-di-n-propylamine	ug/L	10	U	U	10	U	U				10	U	U
n-Nitrosodiphenylamine	ug/L	10	U	U	10	U	U				10	U	U
VOLATILES													
Acetone	ug/L	2.6	J B	B	3.5	J B	B				10	B	B
Benzene	ug/L	1.0	U	U	1.0	U	U	1000	U	U	3.2		
Bromodichloromethane	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Bromoform	ug/L	1.0	U	UJ	1.0	U	UJ				1.0	U	UJ

		Location Code:	PB-BED-MW24			PB-BED-MW25		
		Associated Site:	BCG			BCG		
		Sample No:	CC3004			CC3005		
		Sample Date:	12-JUL-02			11-JUL-02		
User Test Group								
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
SEMIVOLATILES								
Hexachlorobutadiene		ug/L	10	U	U	10	U	U
Hexachlorocyclopentadiene		ug/L	50	U	UJ	50	U	UJ
Hexachloroethane		ug/L	10	U	U	10	U	U
Indeno(1,2,3-cd)pyrene		ug/L	10	U	U	10	U	U
Isophorone		ug/L	10	U	U	10	U	U
Methylnaphthalene, 2-		ug/L	10		J	10	U	U
Methylphenol, 2-		ug/L	10	U	U	10	U	U
Methylphenol, 4-		ug/L	10	U	U	10	U	U
Naphthalene		ug/L	8.7	J	J	10	U	U
Nitroaniline, 2-		ug/L	50	U	U	50	U	U
Nitroaniline, 3-		ug/L	50	U	U	50	U	U
Nitroaniline, 4-		ug/L	50	U	U	50	U	U
Nitrobenzene		ug/L	10	U	U	10	U	U
Nitrophenol, 2-		ug/L	10	U	U	10	U	U
Nitrophenol, 4-		ug/L	50	U	U	50	U	U
Pentachlorophenol		ug/L	50	U	U	50	U	U
Phenanthrene		ug/L	10	U	U	10	U	U
Phenol		ug/L	10	U	U	10	U	U
Pyrene		ug/L	10	U	U	10	U	U
Trichlorobenzene, 1,2,4-		ug/L	10	U	U	10	U	U
Trichlorophenol, 2,4,5-		ug/L	10	U	U	10	U	U
Trichlorophenol, 2,4,6-		ug/L	10	U	U	10	U	U
n-Nitroso-di-n-propylamine		ug/L	10	U	U	10	U	U
n-Nitrosodiphenylamine		ug/L	10	U	U	10	U	U
VOLATILES								
Acetone		ug/L	60	B		1.4	J B	B
Benzene		ug/L	14		J	1.0	U	U
Bromodichlor ane		ug/L	1.0	U	U	1.0	U	U
Bromoform		ug/L	1.0	U	UJ	1.0	U	UJ

Plum Brook C .nce Works
Monitoring Well Groundwater
Data Summary

Report Date: 08/21/02

	Location Code:	IT-BG8-BEDGW-001			IT-MW01			MK-MW20			PB-BED-MW20		
	Associated Site:	BCG			BCG			UTTA			BCG		
	Sample No:	CC3001			CC3009			CC3002			CC3003		
	Sample Date:	12-JUL-02			10-JUL-02			11-JUL-02			10-JUL-02		
User Test Group													
Parameter	*Flt* *Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES													
Bromomethane	ug/L	2.0	U	U	2.0	U	U				0.27	J	J
Butanone, 2-	ug/L	3.2	J	B	5.0	U	U				9.8		
Carbon disulfide	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Carbon tetrachloride	ug/L	1.0	U	U	1.0	U	UJ				1.0	U	UJ
Chlorobenzene	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Chloroethane	ug/L	2.0	U	U	2.0	U	U				2.0	U	U
Chloroform	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Chloromethane	ug/L	2.0	U	U	2.0	U	U				2.0	U	U
Dibromochloromethane	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Dichloroethane, 1,1-	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Dichloroethane, 1,2-	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Dichloroethene, 1,1-	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Dichloroethene, 1,2-	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Dichloropropane, 1,2-	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Dichloropropene, cis-1,3-	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Dichloropropene, trans-1,3-	ug/L	1.0	U	UJ	1.0	U	UJ				1.0	U	UJ
Ethylbenzene	ug/L	1.0	U	U	1.0	U	U	1000	U	U	1.0	U	U
Hexanone, 2-	ug/L	5.0	U	U	5.0	U	U				5.0	U	U
Methyl-2-pentanone, 4-	ug/L	5.0	U	U	5.0	U	U				5.0	U	U
Methylene chloride	ug/L	2.0	U	U	0.19	J B	B				2.0	U	U
Styrene	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Tetrachloroethane, 1,1,2,2-	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Tetrachloroethene	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Toluene	ug/L	1.0	U	U	1.0	U	U	37000			0.76	J	B
Trichloroethane, 1,1,1-	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Trichloroethane, 1,1,2-	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Trichloroethene	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Vinyl chloride	ug/L	1.0	U	U	1.0	U	U				1.0	U	U
Xylene, o-	ug/L							1000	U	U			
Xylenes, m,p-	ug/L							1000	U	U			

Report Date: 08/21/02

		Location Code:	PB-BED-MW24			PB-BED-MW25		
		Associated Site:	BCG			BCG		
		Sample No:	CC3004			CC3005		
		Sample Date:	12-JUL-02			11-JUL-02		
User Test Group								
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES								
Bromomethane		ug/L	2.0	U	U	2.0	U	U
Butanone, 2-		ug/L	12		B	5.0	U	U
Carbon disulfide		ug/L	1.0	U	U	0.17	J	J
Carbon tetrachloride		ug/L	1.0	U	U	1.0	U	UJ
Chlorobenzene		ug/L	1.0	U	U	1.0	U	U
Chloroethane		ug/L	2.0	U	U	2.0	U	U
Chloroform		ug/L	1.0	U	U	1.0	U	U
Chloromethane		ug/L	2.0	U	U	2.0	U	U
Dibromochloromethane		ug/L	1.0	U	U	1.0	U	U
Dichloroethane, 1,1-		ug/L	1.0	U	U	1.0	U	U
Dichloroethane, 1,2-		ug/L	1.0	U	U	1.0	U	U
Dichloroethene, 1,1-		ug/L	1.0	U	U	1.0	U	U
Dichloroethene, 1,2-		ug/L	1.0	U	U	1.0	U	U
Dichloropropane, 1,2-		ug/L	1.0	U	U	1.0	U	U
Dichloropropene, cis-1,3-		ug/L	1.0	U	U	1.0	U	U
Dichloropropene, trans-1,3-		ug/L	1.0	U	UJ	1.0	U	UJ
Ethylbenzene		ug/L	8.0		J	1.0	U	U
Hexanone, 2-		ug/L	5.0	U	U	5.0	U	U
Methyl-2-pentanone, 4-		ug/L	5.0	U	U	5.0	U	U
Methylene chloride		ug/L	2.0	U	U	2.0	U	U
Styrene		ug/L	1.0	U	U	1.0	U	U
Tetrachloroethane, 1,1,2,2-		ug/L	1.0	U	U	1.0	U	U
Tetrachloroethene		ug/L	1.0	U	U	1.0	U	U
Toluene		ug/L	17		J	1.0	U	U
Trichloroethane, 1,1,1-		ug/L	1.0	U	U	1.0	U	U
Trichloroethane, 1,1,2-		ug/L	1.0	U	U	1.0	U	U
Trichloroethene		ug/L	1.0	U	U	1.0	U	U
Vinyl chloride		ug/L	1.0	U	U	1.0	U	U
Xylene, o-		ug/L						
Xylenes, m,p-		ug/L						

Plum Brook (.ance Works
Monitoring Well Groundwater
Data Summary

Report Date: 08/21/02

	Location Code:		IT-BG8-BEDGW-001			IT-MW01			MK-MW20			PB-BED-MW20		
	Associated Site:		BCG			BCG			UTTA			BCG		
	Sample No:		CC3001			CC3009			CC3002			CC3003		
	Sample Date:		12-JUL-02			10-JUL-02			11-JUL-02			10-JUL-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES														
Xylenes, total		ug/L	1.0	U	U	1.0	U	U				1.0	U	U

Plum Brook Ordnance Works
Monitoring Well Groundwater
Data Summary

		Location Code:	PB-BED-MW24			PB-BED-MW25		
		Associated Site:	BCG			BCG		
		Sample No:	CC3004			CC3005		
		Sample Date:	12-JUL-02			11-JUL-02		
User Test Group								
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES								
Xylenes, total		ug/L	55			1.0	U	U

APPENDIX J

DETECTED HITS SUMMARY EXCLUDING "B" QUALIFIERS

APRIL 2002

NON-BACKGROUND DETECTED HITS SUMMARY EXCLUDING "B" QUALIFIERS

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

		Location Code:	IT-AA2-BEDGW-001			IT-AA3-BEDGW-001			IT-ABG-BEDGW-01			IT-MNTA-BEDGW-001		
		Associated Site:	AA2			AA3			ABG			MSA		
		Sample No:	CB3030			CB3033			CB3016			CB3039		
		Sample Date:	10-APR-02			10-APR-02			05-APR-02			12-APR-02		
User Test Group		*Purpose:*	REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Amino-4,6-dinitrotoluene, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrobenzene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrotoluene, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrotoluene, 3-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
RDX		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Trinitrotoluene, 2,4,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
GEN CHEMISTRY														
Alkalinity		ug/L	586000	J		650000	J		250000	J		691000	J	
Chloride		ug/L	56000			369000			10000		J	3480000		
Cyanide, total		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Hardness		ug/L	700000			480000			440000			1580000		
Nitrate		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate		ug/L	32700			-	-	-	292000	J		1400	B	J
Total dissolved solids		ug/L	712000			1200000			731000			6010000		
Total organic carbon		ug/L	3100			1000			3300			5900		
Total suspended solids		ug/L	22000			16000			24000			24000		
Turbidity		NTU	137			118			151		J	277		
METALS														
Aluminum	Y	ug/L	42.6	B	J	49.2	B	J				51.1	B	J
Aluminum		ug/L							39.2	B	J			
Arsenic	Y	ug/L	9.0	B	J	-	-	-	-	-	-	-	-	-
Arsenic		ug/L	6.6	B	J	-	-	-	-	-	-	-	-	-
Barium	Y	ug/L	336			78.1	B	J	78.2	B	J	398		
Barium		ug/L	368			80.2	B	J	82.7	B	J	388		
Beryllium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

	Location Code:		IT-TNTB-BEDGW-001			IT-TNTB-BEDGW-002			MK-MW16			MK-MW17		
	Associated Site:		TNTB			TNTB			TNTB			TNTB		
	Sample No:		CB3019			CB3018			CB3017			CB3038		
	Sample Date:		05-APR-02			05-APR-02			08-APR-02			12-APR-02		
User Test Group	*Purpose:*		REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	-	-	-	-	-	-	-	-	-	22		
Amino-4,6-dinitrotoluene, 2-		ug/L	-	-	-	-	-	-	-	-	-	26		
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	5.8		
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	4.0		J
Nitrobenzene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrotoluene, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrotoluene, 3-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
RDX		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Trinitrotoluene, 2,4,6-		ug/L	-	-	-	-	-	-	-	-	-	68		
GEN CHEMISTRY														
Alkalinity		ug/L	375000	J		365000	J							
Chloride		ug/L	761000		J	117000		J	1700		J	2100		
Cyanide, total		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Hardness		ug/L	420000			390000			430000			272000		
Nitrate		ug/L	-	-	-	-	-	-	42	B	J	-	-	-
Sulfate		ug/L	32100	J		165000	J		719000	J		286000		
Total dissolved solids		ug/L	1520000			740000			868000			518000		
Total organic carbon		ug/L	3400			3000			2000			1600		
Total suspended solids		ug/L	-	-	-	-	-	-	150000			-	-	-
Turbidity		NTU	38.4		J	72.6		J	156			0.98		
METALS														
Aluminum	Y	ug/L							1480			4680		
Aluminum		ug/L	54.8	B	J	45.4	B	J	2380			4600		
Arsenic	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Barium	Y	ug/L	974			403			8.4	B	J	14.1	B	J
Barium		ug/L	1080			411			13.1	B	J	14.6	B	J
Beryllium	Y	ug/L	-	-	-	-	-	-	0.76	B	J	2.0	B	J

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

Location Code:			PB-BED-MW13			PB-BED-MW14			PB-BED-MW15			PB-BED-MW16		
Associated Site:			TNTC			WARP			PRRP			UTTA		
Sample No:			CB3025			CB3022			CB3041			CB3037		
Sample Date:			10-APR-02			08-APR-02			15-APR-02			11-APR-02		
Purpose:			REG			REG			REG			REG		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	-	-	-	-	-	-	0.97			-	-	-
Amino-4,6-dinitrotoluene, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	11		
Nitrobenzene		ug/L	-	-	-	-	-	-	0.35			-	-	-
Nitrotoluene, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrotoluene, 3-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
RDX		ug/L	-	-	-	-	-	-	0.51			-	-	-
Trinitrotoluene, 2,4,6-		ug/L	-	-	-	-	-	-	1.3			-	-	-
GEN CHEMISTRY														
Alkalinity		ug/L	476000	J		481000	J		501000	J				
Chloride		ug/L	4220000			75600		J	2100000			75900		
Cyanide, total		ug/L	-	-	-	38			-	-	-	-	-	-
Hardness		ug/L	1960000			1230000			1490000			700000		
Nitrate		ug/L	-	-	-	79300			-	-	-	-	-	-
Sulfate		ug/L	66600			2660000	J		103000			734000		
Total dissolved solids		ug/L	4810000			7360000			3720000			1450000		
Total organic carbon		ug/L	7400			937000			6500			5500		
Total suspended solids		ug/L	32000			54000			25000			14000		
Turbidity		NTU	585			-	-	-	140			8.0		
METALS														
Aluminum	Y	ug/L	86.4	B	J									
Aluminum		ug/L												
Arsenic	Y	ug/L	2.5	B	J	9.0	B	J	-	-	-	-	-	-
Arsenic		ug/L	-	-	-	9.5	B	J	-	-	-	-	-	-
Barium	Y	ug/L	2680			51.4	B	J	855			18.4	B	J
Barium		ug/L	2680			51.4	B	J	856			19.2	B	J
Beryllium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

Location Code:			PB-BED-MW17			PB-BED-MW18			PB-BED-MW19			PB-BED-MW22		
Associated Site:			TNTA			TNTA			AA2			DGP		
Sample No:			CB3014			CB3015			CB3013			CB3009		
Sample Date:			11-APR-02			05-APR-02			04-APR-02			04-APR-02		
Purpose:			REG			REG			REG			REG		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Amino-4,6-dinitrotoluene, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrobenzene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrotoluene, 2-		ug/L	0.55			0.31			-	-	-	-	-	-
Nitrotoluene, 3-		ug/L	-	-	-	0.30			-	-	-	-	-	-
RDX		ug/L	-	-	-	-	-	-	0.17	J	J	-	-	-
Trinitrotoluene, 2,4,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
GEN CHEMISTRY														
Alkalinity		ug/L	874000	J		350000	J		302000	J		416000	J	
Chloride		ug/L	2210000			12900000		J	373000		J	86300		J
Cyanide, total		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Hardness		ug/L	1330000			7000000			424000			388000		
Nitrate		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate		ug/L	42700						32200	J		-	-	-
Total dissolved solids		ug/L	3020000			15200000			651000			476000		
Total organic carbon		ug/L	5300			1400			5900			2200		
Total suspended solids		ug/L	18000			4000			44000			4000		
Turbidity		NTU	9.2			69.0		J	164			76.4		
METALS														
Aluminum	Y	ug/L	53.2	B	J									
Aluminum		ug/L				79.2	B	J	56.2	B	J	71.3	B	J
Arsenic	Y	ug/L	4.0	B	J	-	-	-	-	-	-	-	-	-
Arsenic		ug/L	4.5	B	J	-	-	-	-	-	-	-	-	-
Barium	Y	ug/L	1070			1330			852			617		
Barium		ug/L	1090			1290			892			620		
Beryllium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

Location Code:			PB-BED-MW23			PB-TNTA-MW10			PB-TNTA-MW11			PB-TNTC-MW3		
Associated Site:			PRRP			TNTA			TNTA			TNTC		
Sample No:			CB3040			CB3042			CB3043			CB3027		
Sample Date:			11-APR-02			15-APR-02			15-APR-02			10-APR-02		
Purpose:			REG			REG			REG			REG		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	-	-	-	-	-	-	16			-	-	-
Amino-4,6-dinitrotoluene, 2-		ug/L	-	-	-	-	-	-	46			-	-	-
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrobenzene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrotoluene, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrotoluene, 3-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
RDX		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Trinitrotoluene, 2,4,6-		ug/L	-	-	-	-	-	-	110			-	-	-
GEN CHEMISTRY														
Alkalinity		ug/L	246000	J		378000	J		402000	J		233000	J	
Chloride		ug/L	6400000			40100			10500			4500		
Cyanide, total		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Hardness		ug/L	5740000			738000			611000			496000		
Nitrate		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate		ug/L	218000			261000			309000			248000		
Total dissolved solids		ug/L	12500000			792000			848000			670000		
Total organic carbon		ug/L	6400	J		4000			9000			2000		
Total suspended solids		ug/L	1660000			14000			74000			21000		
Turbidity		NTU	6500			36.2			78.5			59.0		
METALS														
Aluminum	Y	ug/L	38.1	B	J							57.2	B	J
Aluminum		ug/L							807					
Arsenic	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Barium	Y	ug/L	104	B	J	56.6	B	J	27.3	B	J	31.2	B	J
Barium		ug/L	106	B	J	56.0	B	J	24.0	B	J	27.5	B	J
Beryllium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

Location Code:			PB-TNTC-MW4			PB-TNTC-MW5			TNTA-BEDGW-001			TNTB-BEDGW-003		
Associated Site:			TNTC			TNTC			TNTA			TNTB		
Sample No:			CB3028			CB3029			CB3044			CB3024		
Sample Date:			10-APR-02			08-APR-02			15-APR-02			10-APR-02		
User Test Group *Purpose:*			REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES														
Amino-2,6-dinitrotoluene, 4-		ug/L	-	-	-	-	-	-	1.3			-	-	-
Amino-4,6-dinitrotoluene, 2-		ug/L	-	-	-	-	-	-	0.55			-	-	-
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrobenzene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrotoluene, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitrotoluene, 3-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
RDX		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Trinitrotoluene, 2,4,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
GEN CHEMISTRY														
Alkalinity		ug/L	351000	J		229000	J		282000	J		68600	J	
Chloride		ug/L	20000			4800		J	4810000			3720000		
Cyanide, total		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Hardness		ug/L	980000			284000			5020000			2500000		
Nitrate		ug/L	120			-	-	-	-	-	-	-	-	-
Sulfate		ug/L	749000			163000	J		388000			31100		
Total dissolved solids		ug/L	784000			506000			7960000			5370000		
Total organic carbon		ug/L	1100			2900			10700			4600		
Total suspended solids		ug/L	37000			75000			1080000			115000		
Turbidity		NTU	147			112			605			9250		
METALS														
Aluminum	Y	ug/L	59.5	B	J				74.0	B	J	56.7	B	J
Aluminum		ug/L	1190			164	B	J	8300		J	6410		
Arsenic	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic		ug/L	-	-	-	-	-	-	17.3		J	12.5		
Barium	Y	ug/L	14.9	B	J	21.3	B	J	398		J	1750		
Barium		ug/L	28.6	B	J	24.0	B	J	471		J	1780		
Beryllium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-

Report Date: 03/26/03

		Location Code:	TNTB-BEDGW-004			TNTC-BEDGW-001		
		Associated Site:	TNTB			TNTC		
		Sample No:	CB3023			CB3026		
		Sample Date:	08-APR-02			09-APR-02		
		Purpose:	REG			REG		
User Test Group								
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
EXPLOSIVES								
Amino-2,6-dinitrotoluene, 4-		ug/L	-	-	-	-	-	-
Amino-4,6-dinitrotoluene, 2-		ug/L	-	-	-	-	-	-
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-
Nitrobenzene		ug/L	-	-	-	-	-	-
Nitrotoluene, 2-		ug/L	-	-	-	-	-	-
Nitrotoluene, 3-		ug/L	-	-	-	-	-	-
RDX		ug/L	-	-	-	-	-	-
Trinitrotoluene, 2,4,6-		ug/L	-	-	-	-	-	-
GEN CHEMISTRY								
Alkalinity		ug/L	123000	J		562000	J	
Chloride		ug/L	2800		J	242000		
Cyanide, total		ug/L	-	-	-	-	-	-
Hardness		ug/L	330000			1450000		
Nitrate		ug/L	-	-	-	-	-	-
Sulfate		ug/L	160000	J		1030000		
Total dissolved solids		ug/L	378000			2200000		
Total organic carbon		ug/L	2900			1400		
Total suspended solids		ug/L	26000			11000		
Turbidity		NTU	53.6			158		
METALS								
Aluminum	Y	ug/L				64.1	B	J
Aluminum		ug/L	163	B	J			
Arsenic	Y	ug/L	-	-	-	-	-	-
Arsenic		ug/L	-	-	-	-	-	-
Barium	Y	ug/L	39.2	B	J	18.0	B	J
Barium		ug/L	39.9	B	J	16.5	B	J
Beryllium	Y	ug/L	-	-	-	-	-	-

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

	Location Code:		IT-AA2-BEDGW-001			IT-AA3-BEDGW-001			IT-ABG-BEDGW-01			IT-MNTA-BEDGW-001		
	Associated Site:		AA2			AA3			ABG			MSA		
	Sample No:		CB3030			CB3033			CB3016			CB3039		
	Sample Date:		10-APR-02			10-APR-02			05-APR-02			12-APR-02		
User Test Group	*Purpose:*		REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Beryllium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	Y	ug/L	89900			104000			184000			316000		
Calcium		ug/L	99400			104000			186000			305000		
Chromium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Chromium		ug/L	1.3	B	J	-	-	-	-	-	-	-	-	-
Cobalt	Y	ug/L	3.4	B	J	-	-	-	-	-	-	-	-	-
Cobalt		ug/L	9.2	B	J	-	-	-	-	-	-	-	-	-
Copper	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Copper		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Iron	Y	ug/L	124		J	-	-	-	5630			-	-	-
Iron		ug/L	2020		J	118		J	9130			376		J
Lead	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Lead		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	Y	ug/L	57100			67100			36600			239000		
Magnesium		ug/L	58000			69300			36700			236000		
Manganese	Y	ug/L	207			17.0			860			380		
Manganese		ug/L	228			20.7			872			388		
Nickel	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nickel		ug/L	4.0	B	J	-	-	-	-	-	-	-	-	-
Potassium	Y	ug/L	29600			40000			432	B	J	96300		
Potassium		ug/L	28900			40400			444	B	J	92000		
Selenium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Selenium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	Y	ug/L	103000			237000			5070			1280000		
Sodium		ug/L	100000			237000			4900	B	J	1210000		
Thallium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Thallium		ug/L							-	-	-			
Vanadium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-

Plum Brook Ordnance Works
Monitoring Wells Groundwater
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Report Date: 03/26/03

		Location Code:	IT-TNTB-BEDGW-001			IT-TNTB-BEDGW-002			MK-MW16			MK-MW17		
		Associated Site:	TNTB			TNTB			TNTB			TNTB		
		Sample No:	CB3019			CB3018			CB3017			CB3038		
		Sample Date:	05-APR-02			05-APR-02			08-APR-02			12-APR-02		
User Test Group		*Purpose:*	REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Beryllium		ug/L	-	-	-	-	-	-	0.82	B	J			
Cadmium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium		ug/L	-	-	-	-	-	-	0.59	B	J	-	-	-
Calcium	Y	ug/L	91800			105000			127000			78200		
Calcium		ug/L	91500			110000			125000			79400		
Chromium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Chromium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	Y	ug/L	-	-	-	-	-	-	45.3	B	J	95.5		
Cobalt		ug/L	-	-	-	-	-	-	47.3	B	J	95.7		
Copper	Y	ug/L	-	-	-	-	-	-				-	-	-
Copper		ug/L	-	-	-	-	-	-	7.4	B	J	-	-	-
Iron	Y	ug/L	-	-	-	-	-	-	695			11500		J
Iron		ug/L	-	-	-	-	-	-	11300			11800		J
Lead	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Lead		ug/L	-	-	-	-	-	-	1.9	B	J	-	-	-
Magnesium	Y	ug/L	52600			41400			47900			22200		
Magnesium		ug/L	55500			43000			48600			23000		
Manganese	Y	ug/L	51.1		J	32.2			8290			1330		
Manganese		ug/L	33.2			33.8			8520			1350		
Nickel	Y	ug/L	-	-	-	-	-	-	76.0			214		
Nickel		ug/L	-	-	-	-	-	-	80.4			208		
Potassium	Y	ug/L	38300		J	5790		J	1120	B	J	1460	B	J
Potassium		ug/L	43400		J	6070		J	1360	B	J	1470	B	J
Selenium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Selenium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	Y	ug/L	366000			106000			6040			3260	B	J
Sodium		ug/L	435000			109000			6030			3240	B	J
Thallium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Thallium		ug/L	-	-	-	-	-	-	-	-	-			
Vanadium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-

Plum Brook Ordnance Works
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Report Date: 03/26/03

Location Code:			PB-BED-MW13			PB-BED-MW14			PB-BED-MW15			PB-BED-MW16		
Associated Site:			TNTC			WARP			PRRP			UTTA		
Sample No:			CB3025			CB3022			CB3041			CB3037		
Sample Date:			10-APR-02			08-APR-02			15-APR-02			11-APR-02		
User Test Group *Purpose:*			REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Beryllium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	Y	ug/L	364000			321000			286000			330000		
Calcium		ug/L	351000			325000			287000			318000		
Chromium	Y	ug/L	-	-	-	3.0	B	J	-	-	-	-	-	-
Chromium		ug/L	-	-	-	3.4	B	J	-	-	-	-	-	-
Cobalt	Y	ug/L	-	-	-	265			-	-	-	-	-	-
Cobalt		ug/L	-	-	-	267			-	-	-	-	-	-
Copper	Y	ug/L	-	-	-	92.0			-	-	-	-	-	-
Copper		ug/L	-	-	-	94.8			-	-	-	-	-	-
Iron	Y	ug/L	-	-	-	417			-	-	-	-	-	-
Iron		ug/L	335		J	438			142			-	-	-
Lead	Y	ug/L	-	-	-	3.6			-	-	-	-	-	-
Lead		ug/L	-	-	-	3.6			-	-	-	-	-	-
Magnesium	Y	ug/L	347000			229000			236000			32000		
Magnesium		ug/L	334000			230000			234000			31700		
Manganese	Y	ug/L	18.0			136			6.3	B	J	6.8	B	J
Manganese		ug/L	23.7			136			7.0	B	J	17.0		
Nickel	Y	ug/L	-	-	-	276			-	-	-	-	-	-
Nickel		ug/L	-	-	-	278			-	-	-	3.2	B	J
Potassium	Y	ug/L	95000			57000		J	75900		J	4700	B	J
Potassium		ug/L	89000			56800		J	75100		J	4420	B	J
Selenium	Y	ug/L	-	-	-	7.4			-	-	-	-	-	-
Selenium		ug/L	-	-	-	7.8			-	-	-	-	-	-
Sodium	Y	ug/L	1210000			1010000			716000			31700		
Sodium		ug/L	1150000			1020000			705000			30100		
Thallium	Y	ug/L	-	-	-	-	-	-	-	-	-			
Thallium		ug/L				-	-	-	-	-	-			
Vanadium	Y	ug/L	-	-	-	5.8	B	J	-	-	-	-	-	-

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

		Location Code:	PB-BED-MW17			PB-BED-MW18			PB-BED-MW19			PB-BED-MW22		
		Associated Site:	TNTA			TNTA			AA2			DGP		
		Sample No:	CB3014			CB3015			CB3013			CB3009		
		Sample Date:	11-APR-02			05-APR-02			04-APR-02			04-APR-02		
User Test Group		*Purpose:*	REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Beryllium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	Y	ug/L	273000			1370000			109000			121000		
Calcium		ug/L	268000			1390000			121000			123000		
Chromium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Chromium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Copper	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Copper		ug/L	-	-	-	-	-	-	15.6	B	J	-	-	-
Iron	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Iron		ug/L	-	-	-	-	-	-	-	-	-	43.2	B	J
Lead	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Lead		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	Y	ug/L	243000			929000			44000			35700		
Magnesium		ug/L	250000			943000			41900			35800		
Manganese	Y	ug/L	10.2	B	J	107			2.5	B	J	43.3		
Manganese		ug/L	8.4	B	J	109			2.2	B	J	45.1		
Nickel	Y	ug/L	-	-	-	-	-	-	4.3	B	J	-	-	-
Nickel		ug/L	-	-	-	-	-	-	3.5	B	J	-	-	-
Potassium	Y	ug/L	66900			187000		J	42900		J	2470	B	J
Potassium		ug/L	67200			188000		J	41500		J	2500	B	J
Selenium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Selenium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	Y	ug/L	582000			4000000			92900			19100		
Sodium		ug/L	583000			4050000			88400			19200		
Thallium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Thallium		ug/L				-	-	-	-	-	-	-	-	-
Vanadium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-

Plum Brook Ordnance Works
Monitoring Wells Groundwater
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		Location Code:	PB-BED-MW23			PB-TNTA-MW10			PB-TNTA-MW11			PB-TNTC-MW3		
		Associated Site:	PRRP			TNTA			TNTA			TNTC		
		Sample No:	CB3040			CB3042			CB3043			CB3027		
		Sample Date:	11-APR-02			15-APR-02			15-APR-02			10-APR-02		
User Test Group		*Purpose:*	REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Beryllium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	Y	ug/L	857000			177000			226000			117000		
Calcium		ug/L	859000			174000			206000			86600		
Chromium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Chromium		ug/L	6.1	B	J	-	-	-	2.0	B	J	-	-	-
Cobalt	Y	ug/L	-	-	-	-	-	-	2.4	B	J	-	-	-
Cobalt		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Copper	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Copper		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Iron	Y	ug/L	4450		J	3270			-	-	-	-	-	-
Iron		ug/L	5640		J	4710			1700			61.3	B	J
Lead	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Lead		ug/L	-	-	-	-	-	-	3.0			-	-	-
Magnesium	Y	ug/L	575000			45900			42500			36400		
Magnesium		ug/L	591000			45100			35200			25000		
Manganese	Y	ug/L	212			625			80.7			6.7	B	J
Manganese		ug/L	219			607			86.5			8.1	B	J
Nickel	Y	ug/L	4.8	B	J	-	-	-	3.4	B	J	-	-	-
Nickel		ug/L	7.2	B	J	2.1	B	J	3.9	B	J	-	-	-
Potassium	Y	ug/L	91900			1450	B	J	176	B	J	1000	B	J
Potassium		ug/L	96000			1420	B	J	-	-	-	406	B	J
Selenium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Selenium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	Y	ug/L	1810000			28600			11500			24400		
Sodium		ug/L	1810000			28600			7210			16300		
Thallium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Thallium		ug/L	-	-	-	-	-	-	-	-	-			
Vanadium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-

		Location Code:	PB-TNTC-MW4			PB-TNTC-MW5			TNTA-BEDGW-001			TNTB-BEDGW-003		
		Associated Site:	TNTC			TNTC			TNTA			TNTB		
		Sample No:	CB3028			CB3029			CB3044			CB3024		
		Sample Date:	10-APR-02			08-APR-02			15-APR-02			10-APR-02		
User Test Group		*Purpose:*	REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Beryllium		ug/L	-	-	-	-	-	-	1.1	B	J			
Cadmium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium		ug/L	-	-	-	-	-	-	1.2	B	J	-	-	-
Calcium	Y	ug/L	262000			117000			577000		J	156000		
Calcium		ug/L	254000			122000			1780000		J	180000		
Chromium	Y	ug/L	-	-	-	-	-	-	6.8	B	J	-	-	-
Chromium		ug/L	2.4	B	J	-	-	-	37.2		J	14.8		
Cobalt	Y	ug/L	3.1	B	J	-	-	-	-	-	-	-	-	-
Cobalt		ug/L	10.3	B	J	-	-	-	12.7	B	J	10.1	B	J
Copper	Y	ug/L	-	-	-	-	-	-	-	-	-	3.2	B	J
Copper		ug/L	-	-	-	-	-	-	53.1		J	49.4		
Iron	Y	ug/L	-	-	-	-	-	-	152		J	-	-	-
Iron		ug/L	3060		J	199			33400		J	17100		J
Lead	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Lead		ug/L	2.0	B	J	-	-	-	18.4		J	7.0		
Magnesium	Y	ug/L	127000			21200			349000		J	67000		
Magnesium		ug/L	128000			22200			408000		J	58900		
Manganese	Y	ug/L	448			24.2			26.7		J	-	-	-
Manganese		ug/L	684			56.3			1830		J	509		
Nickel	Y	ug/L	6.6	B	J	-	-	-	-	-	-	-	-	-
Nickel		ug/L	9.2	B	J	2.2	B	J	48.8		J	37.7	B	J
Potassium	Y	ug/L	15200			326	B	J	310000		J	137000		
Potassium		ug/L	15500			451	B	J	334000		J	136000		
Selenium	Y	ug/L	-	-	-	-	-	-	4.5	B	J	-	-	-
Selenium		ug/L	-	-	-	-	-	-	-	-	-	5.6		
Sodium	Y	ug/L	63300			28400			1540000		J	1120000		
Sodium		ug/L	62600			29600			1610000		J	849000		
Thallium	Y	ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Thallium		ug/L	-	-	-	-	-	-	-	-	-			
Vanadium	Y	ug/L	-	-	-	-	-	-	-	-	-	6.3	B	J

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	Location Code:		TNTB-BEDGW-004			TNTC-BEDGW-001		
	Associated Site:		TNTB			TNTC		
	Sample No:		CB3023			CB3026		
	Sample Date:		08-APR-02			09-APR-02		
User Test Group	*Purpose:*		REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS								
Beryllium		ug/L	-	-	-	-	-	-
Cadmium	Y	ug/L	-	-	-	-	-	-
Cadmium		ug/L	-	-	-	-	-	-
Calcium	Y	ug/L	78000			462000		
Calcium		ug/L	76500			434000		
Chromium	Y	ug/L	-	-	-	-	-	-
Chromium		ug/L	-	-	-	-	-	-
Cobalt	Y	ug/L	-	-	-	-	-	-
Cobalt		ug/L	-	-	-	-	-	-
Copper	Y	ug/L	-	-	-	-	-	-
Copper		ug/L	-	-	-	-	-	-
Iron	Y	ug/L	5550			-	-	-
Iron		ug/L	6560			-	-	-
Lead	Y	ug/L	-	-	-	-	-	-
Lead		ug/L	-	-	-	-	-	-
Magnesium	Y	ug/L	23400			157000		
Magnesium		ug/L	22900			152000		
Manganese	Y	ug/L	641			5.2	B	J
Manganese		ug/L	634			5.1	B	J
Nickel	Y	ug/L	-	-	-	-	-	-
Nickel		ug/L	-	-	-	-	-	-
Potassium	Y	ug/L	850	B	J	10900		
Potassium		ug/L	851	B	J	9610		
Selenium	Y	ug/L	-	-	-	-	-	-
Selenium		ug/L	-	-	-	-	-	-
Sodium	Y	ug/L	6840			57100		
Sodium		ug/L	6660			51900		
Thallium	Y	ug/L	-	-	-	-	-	-
Thallium		ug/L	-	-	-			
Vanadium	Y	ug/L	-	-	-	-	-	-

Location Code:			IT-AA2-BEDGW-001			IT-AA3-BEDGW-001			IT-ABG-BEDGW-01			IT-MNTA-BEDGW-001		
Associated Site:			AA2			AA3			ABG			MSA		
Sample No:			CB3030			CB3033			CB3016			CB3039		
Sample Date:			10-APR-02			10-APR-02			05-APR-02			12-APR-02		
User Test Group *Purpose:*			REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Vanadium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	Y	ug/L	5.0	B	J	-	-	-	35.4		J	2.6	B	J
Zinc		ug/L	6.2	B	J	-	-	-	35.3			12.9	B	J
SEMIVOLATILES														
Bis(2-ethylhexyl)phthalate		ug/L	2.0	J	J	-	-	-	-	-	-	0.91	J	J
Chrysene		ug/L	-	-	-	-	-	-	-	-	-	0.54	J	J
Diethyl phthalate		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dimethylphenol, 2,4-		ug/L	1.8	J	J	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene		ug/L	-	-	-	-	-	-	-	-	-	1.2	J	J
Methylnaphthalene, 2-		ug/L	3.2	J	J	-	-	-	-	-	-	23		
Methylphenol, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methylphenol, 4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene		ug/L	2.5	J	J	0.70	J	J	-	-	-	16		
Nitroaniline, 3-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene		ug/L	-	-	-	-	-	-	-	-	-	1.9	J	J
Phenol		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
VOLATILES														
Acetone		ug/L	-	-	-	-	-	-	-	-	-	140	J	J
Benzene		ug/L	4.8	J	J	8.0	J	J	-	-	-	36	J	J
Butanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Carbon disulfide		ug/L	0.84	J	J	-	-	-	-	-	-	-	-	-
Dichloroethane, 1,1-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene		ug/L	13			4.6	J	J	-	-	-	25	J	J
Hexanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methyl-2-pentanone, 4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methylene chloride		ug/L	3.9	J B	J	9.2	J	J				110	J	J

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		Location Code:	IT-TNTB-BEDGW-001			IT-TNTB-BEDGW-002			MK-MW16			MK-MW17		
		Associated Site:	TNTB			TNTB			TNTB			TNTB		
		Sample No:	CB3019			CB3018			CB3017			CB3038		
		Sample Date:	05-APR-02			05-APR-02			08-APR-02			12-APR-02		
User Test Group		*Purpose:*	REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Vanadium		ug/L	-	-	-	-	-	-	2.0	B	J	-	-	-
Zinc	Y	ug/L	-	-	-	-	-	-	70.1		J	200		
Zinc		ug/L	2.6	B	J	-	-	-	59.8			194		
SEMIVOLATILES														
Bis(2-ethylhexyl)phthalate		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Diethyl phthalate		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dimethylphenol, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	4.0	J	J
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	1.4	J	J
Fluorene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methylnaphthalene, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methylphenol, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methylphenol, 4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Nitroaniline, 3-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Phenol		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
VOLATILES														
Acetone		ug/L							-	-	-	2.4	J	J
Benzene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Butanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Carbon disulfide		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dichloroethane, 1,1-		ug/L	0.38	J	J	-	-	-	-	-	-	-	-	-
Ethylbenzene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Hexanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methyl-2-penta 4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methylene chlo		ug/L	-	-	-	-	-	-	-	-	-	-	-	-

	Location Code:		PB-BED-MW13			PB-BED-MW14			PB-BED-MW15			PB-BED-MW16		
	Associated Site:		TNTC			WARP			PRRP			UTTA		
	Sample No:		CB3025			CB3022			CB3041			CB3037		
	Sample Date:		10-APR-02			08-APR-02			15-APR-02			11-APR-02		
User Test Group	*Purpose:*		REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Vanadium		ug/L	-	-	-	5.5	B	J	-	-	-	-	-	-
Zinc	Y	ug/L	9.5	B	J	68.2		J	9.4	B	J	365		
Zinc		ug/L	7.1	B	J	64.8			-	-	-	-	-	-
SEMIVOLATILES														
Bis(2-ethylhexyl)phthalate		ug/L	5.2	J	J	-	-	-	1.8	J	J	2.1	J	J
Chrysene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Diethyl phthalate		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dimethylphenol, 2,4-		ug/L	21			-	-	-	6.8	J	J	13		
Dinitrotoluene, 2,4-		ug/L	-	-	-	19			-	-	-	-	-	-
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene		ug/L	1.4	J	J	-	-	-	-	-	-	1.8	J	J
Methylnaphthalene, 2-		ug/L	34			-	-	-	27			24		
Methylphenol, 2-		ug/L	6.0	J	J	-	-	-	3.9	J	J	0.88	J	J
Methylphenol, 4-		ug/L	5.8	J	J	-	-	-	5.6	J	J	-	-	-
Naphthalene		ug/L	34			-	-	-	25			5.0	J	J
Nitroaniline, 3-		ug/L	-	-	-	150			-	-	-	-	-	-
Phenanthrene		ug/L	1.9	J	J	-	-	-	1.3	J	J	2.6	J	J
Phenol		ug/L	11			-	-	-	15			1.0	J	J
VOLATILES														
Acetone		ug/L	-	-	-	-	-	-	87	J	J	60	J	J
Benzene		ug/L	410		J	-	-	-	600			150		J
Butanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Carbon disulfide		ug/L	-	-	-	-	-	-	3.1	J	J	-	-	-
Dichloroethane, 1,1-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene		ug/L	130		J	-	-	-	130			40		J
Hexanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methyl-2-pentanone, 4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methylene chloride		ug/L	49	J B	J				31	J B	J	11	J	J

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		Location Code:	PB-BED-MW17			PB-BED-MW18			PB-BED-MW19			PB-BED-MW22			
		Associated Site:	TNTA			TNTA			AA2			DGP			
		Sample No:	CB3014			CB3015			CB3013			CB3009			
		Sample Date:	11-APR-02			05-APR-02			04-APR-02			04-APR-02			
User Test Group		*Purpose:*	REG			REG			REG			REG			
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	
METALS															
Vanadium		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Zinc	Y	ug/L	10	B	J	9.1	B	J	3.1	B	J	12.7	B	J	
Zinc		ug/L	5.7	B	J	48.1			31.3			20.2			
SEMIVOLATILES															
Bis(2-ethylhexyl)phthalate		ug/L	4.0	J	J	-	-	-	9.7	J	J	-	-	-	
Chrysene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Diethyl phthalate		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Dimethylphenol, 2,4-		ug/L	3.0	J	J	12			-	-	-	-	-	-	
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Fluorene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Methylnaphthalene, 2-		ug/L	7.5	J	J	5.3	J	J	10			-	-	-	
Methylphenol, 2-		ug/L	-	-	-	4.7	J	J	-	-	-	-	-	-	
Methylphenol, 4-		ug/L	1.4	J	J	4.4	J	J	-	-	-	-	-	-	
Naphthalene		ug/L	10		J	9.9	J	J	6.1	J	J	-	-	-	
Nitroaniline, 3-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Phenanthrene		ug/L	-	-	-	-	-	-	0.74	J	J	-	-	-	
Phenol		ug/L	2.0	J	J	1.4	J	J	-	-	-	-	-	-	
VOLATILES															
Acetone		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Benzene		ug/L	13	J	J	14		J	42	J	J	-	-	-	
Butanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Carbon disulfide		ug/L	2.3	J	J	4.8	J	J	-	-	-	-	-	-	
Dichloroethane, 1,1-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Ethylbenzene		ug/L	100			100		J	16	J	J	-	-	-	
Hexanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Methyl-2-pent[illegible] 4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-	
Methylene chlor[illegible]		ug/L	20	J	J	-	-	-	9.7	J B	J	11	J	J	

Location Code:			PB-BED-MW23			PB-TNTA-MW10			PB-TNTA-MW11			PB-TNTC-MW3		
Associated Site:			PRRP			TNTA			TNTA			TNTC		
Sample No:			CB3040			CB3042			CB3043			CB3027		
Sample Date:			11-APR-02			15-APR-02			15-APR-02			10-APR-02		
User Test Group *Purpose:*			REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Vanadium		ug/L	-	-	-	-	-	-	1.9	B	J	-	-	-
Zinc	Y	ug/L	8.6	B	J	30.4		J	26.8		J	18.2	B	J
Zinc		ug/L	3.0	B	J	31.8		J	5.9	B	J	4.7	B	J
SEMIVOLATILES														
Bis(2-ethylhexyl)phthalate		ug/L	3.3	J	J	-	-	-	-	-	-	-	-	-
Chrysene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Diethyl phthalate		ug/L	0.68	J	J	-	-	-	-	-	-	-	-	-
Dimethylphenol, 2,4-		ug/L	51			-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene		ug/L	1.4	J	J	-	-	-	-	-	-	-	-	-
Methylnaphthalene, 2-		ug/L	32			-	-	-	-	-	-	-	-	-
Methylphenol, 2-		ug/L	37			-	-	-	-	-	-	-	-	-
Methylphenol, 4-		ug/L	43			-	-	-	-	-	-	-	-	-
Naphthalene		ug/L	31			-	-	-	-	-	-	-	-	-
Nitroaniline, 3-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene		ug/L	2.4	J	J	-	-	-	-	-	-	-	-	-
Phenol		ug/L	150			-	-	-	-	-	-	-	-	-
VOLATILES														
Acetone		ug/L	1400		J	6.8	J	J	1.7	J	J	13		J
Benzene		ug/L	2500			-	-	-	-	-	-	-	-	-
Butanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	4.9	J	J
Carbon disulfide		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dichloroethane, 1,1-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene		ug/L	230			-	-	-	-	-	-	-	-	-
Hexanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methyl-2-pentanone, 4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Methylene chloride		ug/L	100	J	J							-	-	-

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		Location Code:	PB-TNTC-MW4			PB-TNTC-MW5			TNTA-BEDGW-001			TNTB-BEDGW-003		
		Associated Site:	TNTC			TNTC			TNTA			TNTB		
		Sample No:	CB3028			CB3029			CB3044			CB3024		
		Sample Date:	10-APR-02			08-APR-02			15-APR-02			10-APR-02		
User Test Group		*Purpose:*	REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Vanadium		ug/L	2.1	B	J	-	-	-	36.9	B	J	23.2	B	J
Zinc	Y	ug/L	7.9	B	J	16.0	B	J	5.7	B	J	-	-	-
Zinc		ug/L	13.0	B	J	2.8	B	J	425		J	98.7		
SEMIVOLATILES														
Bis(2-ethylhexyl)phthalate		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene		ug/L	-	-	-	-	-	-	0.62	J	J	-	-	-
Diethyl phthalate		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dimethylphenol, 2,4-		ug/L	-	-	-	-	-	-	18		J	-	-	-
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene		ug/L	-	-	-	-	-	-	1.9	J	J	-	-	-
Methylnaphthalene, 2-		ug/L	-	-	-	-	-	-	47			4.8	J	J
Methylphenol, 2-		ug/L	-	-	-	-	-	-	12		J	-	-	-
Methylphenol, 4-		ug/L	-	-	-	-	-	-	15		J	-	-	-
Naphthalene		ug/L	-	-	-	-	-	-	39			2.8	J	J
Nitroaniline, 3-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene		ug/L	-	-	-	-	-	-	3.4	J	J	0.73	J	J
Phenol		ug/L	-	-	-	-	-	-	27		J	1.6	J	J
VOLATILES														
Acetone		ug/L	-	-	-	-	-	-	290	J	J	85		J
Benzene		ug/L	-	-	-	-	-	-	490		J	14		
Butanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	69		J
Carbon disulfide		ug/L	-	-	-	-	-	-	-	-	-	0.37	J	J
Dichloroethane, 1,1-		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene		ug/L	-	-	-	-	-	-	210		J	0.52	J	J
Hexanone, 2-		ug/L	-	-	-	-	-	-	-	-	-	0.56	J	J
Methyl-2-penta[illegible] 4-		ug/L	-	-	-	-	-	-	-	-	-	0.70	J	J
Methylene chl[illegible]		ug/L	-	-	-	-	-	-	170	J B	J			

Report Date: 03/26/03

User Test Group								
Location Code:			TNTB-BEDGW-004			TNTC-BEDGW-001		
Associated Site:			TNTB			TNTC		
Sample No:			CB3023			CB3026		
Sample Date:			08-APR-02			09-APR-02		
Purpose:			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS								
Vanadium		ug/L	-	-	-	-	-	-
Zinc	Y	ug/L	45.9		J	-	-	-
Zinc		ug/L	51.3			-	-	-
SEMIVOLATILES								
Bis(2-ethylhexyl)phthalate		ug/L	-	-	-	-	-	-
Chrysene		ug/L	-	-	-	-	-	-
Diethyl phthalate		ug/L	-	-	-	-	-	-
Dimethylphenol, 2,4-		ug/L	-	-	-	-	-	-
Dinitrotoluene, 2,4-		ug/L	-	-	-	-	-	-
Dinitrotoluene, 2,6-		ug/L	-	-	-	-	-	-
Fluorene		ug/L	-	-	-	-	-	-
Methylnaphthalene, 2-		ug/L	-	-	-	3.2	J	J
Methylphenol, 2-		ug/L	-	-	-	-	-	-
Methylphenol, 4-		ug/L	-	-	-	-	-	-
Naphthalene		ug/L	-	-	-	2.5	J	J
Nitroaniline, 3-		ug/L	-	-	-	-	-	-
Phenanthrene		ug/L	-	-	-	-	-	-
Phenol		ug/L	-	-	-	-	-	-
VOLATILES								
Acetone		ug/L				53	J	J
Benzene		ug/L	0.50	J	J	8.4	J	J
Butanone, 2-		ug/L	-	-	-	-	-	-
Carbon disulfide		ug/L	-	-	-	-	-	-
Dichloroethane, 1,1-		ug/L	-	-	-	-	-	-
Ethylbenzene		ug/L	-	-	-	12	J	J
Hexanone, 2-		ug/L	-	-	-	-	-	-
Methyl-2-pentanone, 4-		ug/L	-	-	-	-	-	-
Methylene chloride		ug/L	-	-	-	19	J B	J

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

	Location Code:	IT-AA2-BEDGW-001			IT-AA3-BEDGW-001			IT-ABG-BEDGW-01			IT-MNTA-BEDGW-001		
	Associated Site:	AA2			AA3			ABG			MSA		
	Sample No:	CB3030			CB3033			CB3016			CB3039		
	Sample Date:	10-APR-02			10-APR-02			05-APR-02			12-APR-02		
User Test Group	*Purpose:*	REG			REG			REG			REG		
Parameter	*Flt Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES													
Toluene	ug/L	2.2	J	J	12		J	-	-	-	40	J	J
Trichloroethene	ug/L	-	-	-	-	-	-	-	-	-	18	J	J
Xylenes, total	ug/L	98			31			-	-	-	310		

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

		Location Code:	IT-TNTB-BEDGW-001			IT-TNTB-BEDGW-002			MK-MW16			MK-MW17		
		Associated Site:	TNTB			TNTB			TNTB			TNTB		
		Sample No:	CB3019			CB3018			CB3017			CB3038		
		Sample Date:	05-APR-02			05-APR-02			08-APR-02			12-APR-02		
User Test Group		*Purpose:*	REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES														
Toluene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes, total		ug/L	-	-	-	-	-	-	-	-	-	-	-	-

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

	Location Code:		PB-BED-MW13			PB-BED-MW14			PB-BED-MW15			PB-BED-MW16		
	Associated Site:		TNTC			WARP			PRRP			UTTA		
	Sample No:		CB3025			CB3022			CB3041			CB3037		
	Sample Date:		10-APR-02			08-APR-02			15-APR-02			11-APR-02		
User Test Group	*Purpose:*		REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES														
Toluene		ug/L	300		J	-	-	-	460			150		J
Trichloroethene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes, total		ug/L	1300			-	-	-	880			610		

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

	Location Code:		PB-BED-MW17			PB-BED-MW18			PB-BED-MW19			PB-BED-MW22		
	Associated Site:		TNTA			TNTA			AA2			DGP		
	Sample No:		CB3014			CB3015			CB3013			CB3009		
	Sample Date:		11-APR-02			05-APR-02			04-APR-02			04-APR-02		
User Test Group	*Purpose:*		REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES														
Toluene		ug/L	150			74		J	18	J	J	-	-	-
Trichloroethene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes, total		ug/L	440			420		J	170			-	-	-

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

	Location Code:		PB-BED-MW23			PB-TNTA-MW10			PB-TNTA-MW11			PB-TNTC-MW3		
	Associated Site:		PRRP			TNTA			TNTA			TNTC		
	Sample No:		CB3040			CB3042			CB3043			CB3027		
	Sample Date:		11-APR-02			15-APR-02			15-APR-02			10-APR-02		
User Test Group	*Purpose:*		REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES														
Toluene		ug/L	1000			-	-	-	-	-	-	-	-	-
Trichloroethene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes, total		ug/L	1600			-	-	-	-	-	-	-	-	-

	Location Code:		PB-TNTC-MW4			PB-TNTC-MW5			TNTA-BEDGW-001			TNTB-BEDGW-003		
	Associated Site:		TNTC			TNTC			TNTA			TNTB		
	Sample No:		CB3028			CB3029			CB3044			CB3024		
	Sample Date:		10-APR-02			08-APR-02			15-APR-02			10-APR-02		
User Test Group	*Purpose:*		REG			REG			REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES														
Toluene		ug/L	-	-	-	-	-	-	630		J	4.7		
Trichloroethene		ug/L	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes, total		ug/L	-	-	-	-	-	-	1200			2.3		

Plum Brook Ordnance Works
Monitoring Wells Groundwater
Detected Hits

Report Date: 03/26/03

		Location Code:	TNTB-BEDGW-004			TNTC-BEDGW-001		
		Associated Site:	TNTB			TNTC		
		Sample No:	CB3023			CB3026		
		Sample Date:	08-APR-02			09-APR-02		
User Test Group		*Purpose:*	REG			REG		
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
VOLATILES								
Toluene		ug/L	-	-	-	8.8	J	J
Trichloroethene		ug/L	-	-	-	-	-	-
Xylenes, total		ug/L	-	-	-	90		

JULY 2002

BACKGROUND DETECTED HITS SUMMARY EXCLUDING "B" QUALIFIERS

Plum Brook ance Works
Monitoring Well Groundwater
Detected Hits Summary

Report Date: 07/31/02

		Location Code:	IT-BG8-BEDGW-001			IT-MW01			MK-MW20			PB-BED-MW20		
		Associated Site:	BCG			BCG			UTTA			BCG		
		Sample No:	CC3001			CC3009			CC3002			CC3003		
		Sample Date:	12-JUL-02			10-JUL-02			11-JUL-02			10-JUL-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
GEN CHEMISTRY														
Alkalinity		ug/L	367000			90000						293000		
Chloride		ug/L	896000			3400						19000000		
Hardness		ug/L	647000			144000						8140000		
Nitrate		ug/L				190								
Sulfate		ug/L	9200			118000								
Total dissolved solids		ug/L	2040000			279000						35500000		
Total organic carbon		ug/L	1900			7100								
Total suspended solids		ug/L	21000			4000						33000		
Turbidity		NTU	39.0			1.7						7.4		
METALS														
Aluminum		ug/L				117	B	J						
Arsenic		ug/L	3.6	B	J									
Barium	Y	ug/L	236			82.5	B	J				23900		
Barium		ug/L	229			75.9	B	J				24000		
Calcium	Y	ug/L	133000			39300						2020000		
Calcium		ug/L	134000			39400						2000000		
Chromium		ug/L												
Cobalt	Y	ug/L	8.2	B	J	10.3	B	J				8.0	B	J
Cobalt		ug/L	12.1	B	J	7.5	B	J				8.0	B	J
Copper	Y	ug/L				2.8	B	J						
Copper		ug/L				9.1	B	J						
Iron	Y	ug/L	1160			745						5100		
Iron		ug/L	1490			563						4970		
Magnesium	Y	ug/L	76000			14600						969000		
Magnesium		ug/L	73500			15900						960000		
Manganese	Y	ug/L	728			326						193		
Manganese		ug/L	688			292						190		
Nickel	Y	ug/L	8.5	B	J	26.2	B	J						
Nickel		ug/L	8.6	B	J	15.0	B	J						

Plum Brook Ordnance Works
Monitoring Well Groundwater
Detected Hits Summary

Report Date: 07/31/02

		Location Code:	PB-BED-MW24			PB-BED-MW25		
		Associated Site:	BCG			BCG		
		Sample No:	CC3004			CC3005		
		Sample Date:	12-JUL-02			11-JUL-02		
User Test Group								
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
GEN CHEMISTRY								
Alkalinity		ug/L	979000			329000		
Chloride		ug/L	155000			219000		
Hardness		ug/L	1370000			772000		
Nitrate		ug/L						
Sulfate		ug/L	32300			416000		
Total dissolved solids		ug/L	1020000			1180000		
Total organic carbon		ug/L	3700			2700		
Total suspended solids		ug/L	124000			5000		
Turbidity		NTU	742			23.6		
METALS								
Aluminum		ug/L	1150			44.6	B	J
Arsenic		ug/L	4.3	B				
Barium	Y	ug/L	670			160	B	J
Barium		ug/L	680			164	B	J
Calcium	Y	ug/L	147000			187000		
Calcium		ug/L	346000			183000		
Chromium		ug/L	9.4	B				
Cobalt	Y	ug/L						
Cobalt		ug/L	2.9	B				
Copper	Y	ug/L						
Copper		ug/L	8.6	B				
Iron	Y	ug/L				59.8	B	J
Iron		ug/L	13400			103		
Magnesium	Y	ug/L	79400			74100		
Magnesium		ug/L	88800			69100		
Manganese	Y	ug/L	44.2			94.0		
Manganese		ug/L	420			95.6		
Nickel	Y	ug/L						
Nickel		ug/L	7.9	B				

Plum Brook .nance Works
Monitoring Well Groundwater
Detected Hits Summary

Report Date: 07/31/02

		Location Code:	IT-BG8-BEDGW-001			IT-MW01			MK-MW20			PB-BED-MW20		
		Associated Site:	BCG			BCG			UTTA			BCG		
		Sample No:	CC3001			CC3009			CC3002			CC3003		
		Sample Date:	12-JUL-02			10-JUL-02			11-JUL-02			10-JUL-02		
User Test Group														
Parameter	*Flt*	*Units*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*	*Result*	*Qual*	*VQ*
METALS														
Potassium	Y	ug/L	31000			6390		J				102000		J
Potassium		ug/L	30500			6780		J				101000		J
Sodium	Y	ug/L	392000			19200						8120000		
Sodium		ug/L	395000			19400						8380000		
Thallium	Y	ug/L												
Vanadium		ug/L												
Zinc	Y	ug/L	7.3	B	J	124						3.2	B	J
Zinc		ug/L	10.0	B		34.3						9.7	B	J
SEMIVOLATILES														
Dimethylphenol, 2,4-		ug/L												
Methylnaphthalene, 2-		ug/L												
Naphthalene		ug/L												
VOLATILES														
Acetone		ug/L												
Benzene		ug/L										3.2		
Bromomethane		ug/L										0.27	J	J
Butanone, 2-		ug/L										9.8		
Carbon disulfide		ug/L												
Ethylbenzene		ug/L												
Toluene		ug/L							37000					
Xylenes, total		ug/L												

APPENDIX K

DATA QUALITY EVALUATION – April 2002

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List of Acronyms

AR/COC	analysis request/chain of custody
DI	deionized
DQE	data quality evaluation
DQO	data quality objectives
EPA	U.S. Environmental Protection Agency
ID	identification
IT	IT Corporation
LCS	laboratory control sample
MB	material blank or method blank
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NFG	national functional guidelines
PQL	practical quanitation limit
PBOW	Plum Brook Ordnance Works
QA/QC	quality assurance/quality control
SAP	quality assurance project plan
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
Shaw	Shaw Environmental, Inc.
SDG	sample delivery group
SOP	standard operating procedures
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compounds

K.1.0 Introduction

This appendix of the Groundwater Investigation of TNT Areas and Red Water Ponds Report presents results of the quality assurance/quality control (QA/QC) measures implemented for the sampling and analysis activities at the Plum Brook Ordnance Works (PBOW) – Sandusky, Ohio. The quality indicators from every aspect of the data collection have been reviewed, and an assessment of the data with regard to project-specific objectives is presented. Successful execution of project-specific objectives and procedures provides strong support for the acceptance of the data generated as adequate for the purpose of evaluating the analytical results from this assessment at PBOW.

Shaw Environmental (Formerly IT Corporation) conducted field-sampling activities at PBOW in April 2002. Severn Trent Laboratories in Knoxville, Tennessee and North Canton, Ohio analyzed the project samples. Accutest Laboratories of Orlando, Florida analyzed the field split samples. All data analyzed were reviewed for accuracy and completeness. One hundred percent of the data analyzed were subjected to data validation following guidelines in the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, October 1999 (EPA, 1999) and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, February 1994. The criteria for blank evaluation were based on those detailed in *Region III Modifications to National Functional Guidelines for Organic Data Review* (September 1994) and *Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses,* (April 1993). Data were evaluated against specific criteria to verify the achievement of precision, accuracy, representativeness, completeness and comparability goals established to meet the project data quality objectives (DQO). To verify that these DQOs were met, field measurements, sampling and handling procedures, laboratory analysis and reporting, and all nonconformances and discrepancies in the data were examined to determine compliance with the appropriate and applicable procedures defined in the SAP. The results of this review are presented in the following sections, with all analytical outliers or nonconformances discussed where they occurred.

This report is divided into three subsections. Section K.2.0 discusses the field investigation and QC procedures used during the sampling effort. Section K.3.0 outlines the analytical program and the associated QC activities performed. The final part of this document, Section K.4.0, summarizes the data findings and their overall impact on the usability of the analytical data.

K.2.0 Field Sampling and QC Activities

Shaw Environmental was retained by the U. S. Army Corps of Engineers, Nashville District to conduct investigation and sampling activities at PBOW. Field activities at this site included collection of the groundwater samples. The collection of these samples along with their associated QA and QC samples are discussed in this section of the Data Quality Evaluation (DQE).

All project and field duplicate samples collected were submitted to STL. Sample shipments from the field were performed under custody and documented using standard Analysis Request/Chain of Custody (AR/COC) forms. These forms provided project-specific analytical specifications and QC instructions to the laboratory. A formal COC transfer record was prepared and included with these forms to document custody during sample transportation, storage, and disposition by the laboratory. Table K-1 summarizes the field sample number, location, sample type, date of collection, and sample delivery group for each sample collected. Table K-2 summarizes the detected compounds in the blanks associated with the PBOW samples.

K.2.1 Trip Blanks

Aqueous samples designated for volatile organic compound (VOC) analysis may be susceptible to contamination by diffusion of organic compounds into the sample container. Trip blanks are analyzed in order to assess the potential for contamination to be introduced to an aqueous volatile sample during transport and handling procedures. A trip blank is a sample of analyte-free deionized (DI) water that is prepared at the laboratory, shipped to the field with sample containers, and returned to the laboratory with the water matrix samples receiving VOC analysis. A trip blank is then analyzed for volatile organics using the same sample preparation and analysis procedures used for the actual field samples. Twelve trip blank samples were collected.

The data validator applied the 5X-10X rule to the samples for the analytes detected. The following samples were qualified "B" by the data validator indicating that sample results are indicative of blank contamination:

Lot Number	Sample Affected	Blank Contaminant	Validation Qualifier
CB001	CB3004, CB3005, CB3016, CB3022	Methylene Chloride	B
	CB3018, CB3019, CB3020, CB3023	Acetone	B
CB002	CB3024	Methylene Chloride	B
	CB3042, CB3043	Methylene Chloride	B

K.2.2 Field Duplicates

Field duplicate samples are collected and submitted to the laboratory for analysis along with their corresponding original sample. The data generated from the analysis of field duplicate samples are used to evaluate the precision of the sample collection and analysis procedures. It is difficult to collect and analyze soil samples in duplicate due to the heterogeneous nature of a soil. High relative percent difference (RPD) between an original sample and its field duplicate may indicate a difference in sample matrix or sample collection rather than true problems with precision of sample analysis. Also, when estimated "J" or nondetected "U" results are reported, there is a potential for increased variability between the primary and duplicate sample results

Field duplicate samples were collected at a frequency of approximately one for every ten samples collected (10 percent). Four field duplicate samples were collected during this sampling event. Table K-3 compares the original and field duplicate results and shows the RPDs calculated for those detected compounds. Compounds not presented in the table were not detected in either the original or field duplicate samples. In cases where duplicates were performed and one result is less than the reporting limit, but greater than the method detection limit, the RPD is reported, but should be considered an estimated value.

The acceptance criterion of 30 percent RPD was used to evaluate these sample results. In most cases, original and field duplicate data compared well as demonstrated by the RPDs calculated. RPD is calculated by using the following formula:

$$RPD = \left| \frac{A - B}{(A + B)/2} \right| \quad x \quad 100$$

where:

RPD	=	relative percent difference
A	=	original result
B	=	field duplicate result.

K.2.5 Field Split Samples

Split samples were collected in conjunction with field duplicate samples and sent to Accutest Laboratories. The split samples were submitted to the laboratory for the same analysis as their corresponding field duplicates and original field samples. The split samples are used to determine if data results are reproducible when analyzed by two different laboratories. Results are also evaluated to determine if a contracted laboratory's preparation and analysis procedures are in control and meet the approved method criteria.

Field split samples were collected at a frequency of approximately one for every ten regular samples. Five split samples were collected during this sampling event.

Table K-3 compares the original and field split results and shows the RPDs calculated for those detected compounds. Compounds not presented in the table were not detected in either the original or field split samples.

K.3.0 Analytical Program and QC Activities

The project QA/QC program described in the SAP was followed for the collection and laboratory analysis of samples. Each of the analytical methods used require that method-specific QA/QC protocols be followed during sample analysis. These protocols are a critical part of the methods employed and were followed by the laboratory during sample analysis. Specific measures included detailed record keeping procedures, instrument calibrations, and analysis of method blanks, blank spikes, MS/MSD, surrogates, and internal standards. The following SW-846 and USEPA Methods were used to analyze PBOW samples:

Parameter	Method
Volatiles	SW-846 5030/8260B
Semivolatiles	SW-846 3510C/8270C
Nitroaromatic Compounds	SW-846 8330
Metals	SW-846 3005A/6010B/7470A/7471A
Gasoline/Diesel Range Organics	SW-846 3580A/8015B
Turbidity	EPA 180.1
Alkalinity	EPA 310.1
TOC	SW-846 9060
Hardness	EPA 130.2
Total Dissolved Solids	EPA 160.1
Total Suspended Solids	EPA 160.2
Chloride	EPA 325.2
Total Cyanide	SW-846 9012A
Nitrate	EPA 353.2
Sulfate	EPA 375.4

Appendix I contains validated analytical data summaries for the samples collected during this field investigation. The validator used the QA/QC criteria defined in the SAP to evaluate the data for all parameters for which criteria were provided. If acceptance criteria were not provided in the SAP, the validator used laboratory-derived acceptance or the criteria established in the analytical method criteria to qualify data. Any qualifiers added to these data by the data validator are included in the summaries.

K.3.1 Laboratory QA/QC Procedures

The following sections discuss specific QA/QC protocols required and performed by the laboratory during this investigation.

K.3.1.1 Method/Calibration Blanks

Method blanks are analyzed with each analytical "batch" processed on a per matrix (i.e., soil and water) basis. Method blanks are carried step-wise through the same analytical procedure as their associated field samples including the addition of solvents, surrogate and standard spikes, and reagents as required in the analysis process. The purpose of a method blank is to identify any possible contaminants that may be introduced to the sample as a result of any part of the

analytical process. Table K-2 summarizes the compounds detected in associated blanks by lot number. The data validator evaluated all blank data associated with each sample. When estimated or positive concentrations of compounds/analytes were reported in the corresponding field samples, associated samples were evaluated and qualified using the 5X-10X rule.

For some analyses, an initial and continuing calibration blank are performed throughout the run sequence. These blanks verify the presence of carry over contamination for the analytes of interest.

Qualifiers applied to samples based on detects in the method or calibration blanks are summarized below:

Lot Number	Sample Number Affected	Blank Contaminant	Blank	Validation Qualifier
Volatiles				
CB001	CB3004, CB3005, CB3022	Methylene chloride	Method	B
	CB3023	Acetone	Method	B
CB002	CB3024	Methylene chloride	Method	B
CB003	CB3042, CB3043	Methylene chloride	Method	B
Metals				
CB001	CB3001, CB3004, CB3005, CB3007, CB3008, CB3009, CB3010, CB3013, CB3015, CB3016, CB3018, CB3019, CB3020, CB3022, CB3023, CB3029	Aluminum (dissolved)	Calibration	B
	CB3022	Aluminum (total)	Calibration	B
	CB3017	Copper (dissolved)	Calibration	B
CB002	CB3012, CB3014, CB3025, CB3026, CB3027, CB3030, CB3033, CB3034, CB3037, CB3039, CB3040	Aluminum (total)	Calibration	B
	CB3034, CB3037	Aluminum (dissolved)	Calibration	B
	CB3012	Copper (total)	Calibration	B
	CB3014, CB3024, CB025, CB3026, CB3027, CB3030, CB3033, CB3037, CB3038, CB3039, CB3046	Thallium (total)	Method/Calib	B
	CB3037	Thallium (dissolved)	Method	B
	CB3024, CB3038, CB3046	Beryllium (total)	Calibration	B

Lot Number	Sample Number Affected	Blank Contaminant	Blank	Validation Qualifier
	BD3010	Zinc	Method	B
CB003	CB3041, CB3042	Aluminum (total)	Calibration	B
	CB3041, CB3042, CB3043, CB3044	Aluminum (dissolved)	Calibration	B
	CB3044	Beryllium	Calibration	B
Alkalinity				
CB001	CB3017	Total Alkalinity	Method	B
CB002	CB3038	Total Alkalinity	Method	B
Sulfate				
CB001	CB3015	Sulfate	Method	B

K.3.1.2 Matrix Spikes and Laboratory Control Spikes

Two types of spikes were generally performed for all analyses: matrix spikes (MS) and laboratory control samples (LCS). MS compounds are spiked into an aliquot of a field sample. LCS compounds are spiked into a blank matrix. The spiked compounds are representative compounds that are quantified during performance of the method. Recovery of the spiked compound is used as an assessment of analytical accuracy on the sample matrix analyzed. These results are useful in distinguishing sample matrix interferences from analysis interferences through a comparison of MS and LCS recovery data. Often, spikes are performed in duplicate (as an MSD or LCS duplicate). In this manner, the precision of the assessment can be quantified as the RPD of the original and duplicate spike.

Matrix spikes were assigned at a frequency of 1 for every 20 field samples collected. One MS/MSD was assigned in the field to sample CB3038. This sample corresponds to location MK-MW17. Additional sample volume was provided to the laboratory for the MS/MSD analyses. This sampling frequency meets the collection criteria for this program as specified in the SAP. In addition to the overall collection frequency, the analytical method requires that the laboratory analyze 1 set of spikes per analytical batch. To comply with this method requirement, the laboratory may have to analyze "batch" QC with a work order. The validator evaluated the "batch" QC. The laboratory statistically determined target acceptance limits were used to assess the spike recovery and RPD.

The MS/MSD criteria were met with the exception of the following, which exhibited % recoveries and/or RPDs outside QC limits:

Lot Number	Sample Number Affected	Compound(s)	Validation Qualifier
Explosives			
CB001	CB3001, CB3004, CB3005, CB3007, CB3008, CB3009, CB3010, CB3013, CB3015, CB3016, CB3017, CB3018, CB3019, CB3020, CB3022, CB3023, CB3029	Tetryl	R*
Chloride			
CB001	CB3001, CB3004, CB3007, CB3008, CB3009, CB3013, CB3015, CB3016, CB3017, CB3018, CB3019, CB3022, CB3023, CB3029	Chloride	J

*R -Rejected due to 0% recovery of MS/MSD.

LCS results are used to evaluate lab method performance in the same manner as the MS/MSD results except the LCS is not performed on an actual field sample matrix. A LCS is prepared for each analytical "batch" for each parameter and matrix analyzed.

All LCS recoveries met the established QC criteria with the exception of the following:

Lot Number	Sample Number Affected	Compound(s)	Validation Qualifier
Semivolatiles			
CB003	CB3044	All Acid Compounds	J/UJ/R*

*R – Pentachlorophenol and 4-Nitrophenol results were R qualified due to LCS% recovery <10%.

K.3.1.3 Calibration

Several analytes were qualified because of unacceptable performance in the calibration standards. For specific examples refer to the validation report in Appendix H and Table K-5.

K.3.2 Reporting Limits

Practical quantitation limits (PQL) or RLs, used for this project are those statistically determined by the laboratories. The analytical program executed for this project required the use of SW-846 methods, which specify the procedure for calculating the PQLs presented. Each laboratory is required to demonstrate method performance through method detection limit (MDL) studies for every method employed. These studies are required to be laboratory-specific so that individual laboratory variables such as equipment brands, reagent suppliers, and chemist technique are factored into the performance study. MDLs are established using controlled matrices (i.e., DI water). The PQL calculation adjusts the limit by a predetermined mathematical factor for the analysis of actual environmental sample matrices (i.e. soil, groundwater, etc.). For purposes of clarity and consistency with respect to terminology, the term "reporting limit" has been substituted for PQL when referencing the limit of detection reported by the laboratory for each individual sample and parameter. The actual values reported have been corrected for all necessary dilutions, dryness, and interference factors as applicable based on the resulting analytical data for a sample.

Standard operating procedures (SOP) address MDLs, PQLs, and RLs when dealing with low concentrations of analytes in samples. These limits are generally defined as follows:

- ***MDL.*** The minimum concentration of an analyte that can be determined with 99 percent confidence that the true value is greater than zero.
- ***PQL.*** The lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.
- ***RL.*** This number is equivalent to the PQL.

An MDL is the lower limit at which the laboratory can differentiate a measurement from background. The MDL is determined in accordance with the procedures in 40 CFR Part 136. A PQL, or RL, is the lower limit at which a measurement becomes meaningful. This measurement (the PQL or the RL) is generally a multiple of three to five times the MDL.

All samples were handled and analyzed as expected without significant changes to the anticipated project RLs due to matrix interference or high dilutions.

K.3.3 Holding Times/Preservation

All laboratory results submitted for this investigation have been reviewed with respect to laboratory adherence to extraction and analysis holding times. Maximum sample extraction and analysis hold times were those specified in USACE document EM200-1-3.

Most holding time criteria were acceptable. CB3015, CB3016, CB3018, and CB3019 were qualified for missed holding times for turbidity and nitrate. CB3014 was qualified for the semivolatile analysis. Five samples were qualified because of improper sample preservation. They were CB3012, CB3025, CB3033, CB3037, and CB3044. The qualifiers were applied to benzene, toluene and ethylbenzene and metals (CB3044 only). CB3001 was qualified for cyanide.

K.4.0 Data Evaluation and Usability

The analytical data review process identified a few analytical nonconformance issues that were noted during this analytical program. These anomalies have been discussed in the previous sections of this appendix. Table K-4 summarizes all compounds requiring qualifier application due to anomalies discovered during data validation. Table K-5 defines the reason codes for qualification and Table K-6 defines the data validation qualifiers.

The following definitions are used for defining precision, accuracy, representativeness, completeness, and comparability as they have been applied to this evaluation.

Precision. Precision is a measurement of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision data were obtained through the analysis and evaluation of duplicate QA samples. Accuracy was determined through the analysis and evaluation of method blanks, LCSs, trip blanks, equipment rinsates, and MS samples.

Accuracy. Accuracy is a measurement of bias in a system and is expressed as a percent recovery. These QA samples were collected and/or analyzed at the frequency established in the SAP, verifying the completeness element of the DQOs along with the evaluation of holding times and reporting limits. Percent recovery is calculated as follows:

$$Percent\ \text{Recov}ery = \left(\frac{(x-s)}{T}\right) * 100$$

Where:

X = the lab determined concentration of a spiked sample

S = the sample native concentration prior to spike

T = the true concentration of the spike

Relative Percent Difference is calculated as follows:

$$\text{Re}lative\ Percent\ Difference = \left[\frac{|D1 - D2|}{\frac{D1 + D2}{2}}\right] * 100$$

Where:

D1 and D2 = the results of duplicate measurements

Representativeness. Representativeness is a qualitative parameter that expresses the degree to which sample data actually represent the matrix and site conditions. For example, in conducting ground water monitoring, representativeness requires proper location of wells and the collection of samples under consistent, documented procedures. Wells are located based upon the results of the hydrological study in progress and are designed to provide maximum coverage of the flow conditions. Requirements and procedures for sample collection and handling are designed to maximize sample representativeness. Representativeness also can be monitored by reviewing field documentation and by performing field audits.

The samples were collected using Shaw SOPs and were fully documented through the use of standard Shaw field forms. Samples are representative of the matrix and site sampled.

Completeness. Completeness is a measure of the amount of valid data that are obtained during a sampling event as compared to the amount of data planned to be collected under optimum conditions. Some data for this project were qualified as estimated in the validation process because of the outliers noted in the MS recoveries, duplicate results for certain elements, and various other calibration and inductively coupled plasma serial dilution results. A total of 76

data points were qualified as rejected in the validation process due to various QC criteria as described in the previous sections of this report. Completeness is calculated as follows:

$$Completeness\ \% = \left(\frac{D_r}{D_c}\right) X\ 100$$

Where:

D_r = the number of data points for which valid results are reported

D_c = the number of valid samples/data points that are collected and reach the laboratory for analysis.

During this task, 42 well samples were collected resulting in approximately 6760 targeted analytical records. Less than 2 percent of the data points were rejected due to anomalies discovered during the validation process. Using the above calculation, 98% completeness is achieved for the task.

Comparability. Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability ensures that results for the sampling event can be compared with data from other past and/or future sampling programs. Comparability for this sampling event was achieved through the use of established and recognized techniques and accepted standard EPA methods. All samples collected and analyzed were subjected to the same sampling, handling, preparation, analysis, reporting, and validation criteria for the purpose of achieving comparability goals within the data set.

K.4.1 Statement of Data Usability

The overall results of the analyses, as discussed in this evaluation, suggest that representative samples were collected and analyzed, and the results are indicative of the media analyzed, with the exception of the few anomalies noted. The data do reflect expected site conditions and are usable for their intended purpose.

Tables K-1 through K-6 summarize the analytical program and the results for the data validation effort for all samples collected by Shaw at PBOW.

Table K-1

Sample Cross-Reference
April 2002 Background/Non-Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Sample Type	Sample Location	Sample Number	Sample Date	Sample Purpose	Lot Number
GW	PB-BED-MW20	CB3001	04-APR-02	REG	CB001
GW	PB-BED-MW25	CB3004	03-APR-02	REG	CB002
GW	PB-BED-MW25	CB3005	03-APR-02	FD	CB001
GW	PB-BED-MW25	CB3006	03-APR-02	FS	F12806
GW	IT-BG8-BEDGW-001	CB3007	03-APR-02	REG	CB001
GW	PB-BED-MW24	CB3008	03-APR-02	REG	CB002
GW	PB-BED-MW22	CB3009	04-APR-02	REG	CB001
GW	PB-BED-MW22	CB3010	04-APR-02	FD	CB001
GW	PB-BED-MW22	CB3011	04-APR-02	FS	F12806
GW	PB-BED-MW27	CB3012	09-APR-02	REG	CB002
GW	PB-BED-MW19	CB3013	04-APR-02	REG	CB001
GW	PB-BED-MW17	CB3014	11-APR-02	REG	CB002
GW	PB-BED-MW18	CB3015	05-APR-02	REG	CB001
GW	IT-ABG-BEDGW-01	CB3016	05-APR-02	REG	CB001
GW	MK-MW16	CB3017	08-APR-02	REG	CB001
GW	IT-TNTB-BEDGW-002	CB3018	05-APR-02	REG	CB001
GW	IT-TNTB-BEDGW-001	CB3019	05-APR-02	REG	CB001
GW	IT-TNTB-BEDGW-001	CB3020	05-APR-02	FD	CB001
GW	PB-BED-MW14	CB3022	08-APR-02	REG	CB001
GW	TNTB-BEDGW-004	CB3023	08-APR-02	REG	CB001
GW	TNTB-BEDGW-003	CB3024	10-APR-02	REG	CB002
GW	PB-BED-MW13	CB3025	10-APR-02	REG	CB002
GW	TNTC-BEDGW-001	CB3026	09-APR-02	REG	CB002
GW	PB-TNTC-MW3	CB3027	10-APR-02	REG	CB002
GW	PB-TNTC-MW4	CB3028	10-APR-02	REG	CB002
GW	PB-TNTC-MW5	CB3029	08-APR-02	REG	CB001
GW	IT-AA2-BEDGW-001	CB3030	10-APR-02	REG	CB002
GW	IT-AA3-BEDGW-001	CB3033	10-APR-02	REG	CB002
GW	IT-AA3-BEDGW-001	CB3034	10-APR-02	FD	CB002
GW	IT-AA3-BEDGW-001	CB3035	10-APR-02	FS	F12883
GW	PB-BED-MW16	CB3037	11-APR-02	REG	CB002
GW	MK-MW17	CB3038	12-APR-02	REG	CB002
GW	IT-MNTA-BEDGW-001	CB3039	12-APR-02	REG	CB002
GW	PB-BED-MW23	CB3040	11-APR-02	REG	CB002
GW	PB-BED-MW15	CB3041	15-APR-02	REG	CB003
GW	PB-TNTA-MW10	CB3042	15-APR-02	REG	CB003

Table K-1

Sample Cross-Reference
April 2002 Background/Non-Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Sample Type	Sample Location	Sample Number	Sample Date	Sample Purpose	Lot Number
GW	PB-TNTA-MW11	CB3043	15-APR-02	REG	CB003
GW	TNTA-BEDGW-001	CB3044	15-APR-02	REG	CB003
GW	TNTC-BEDGW-001	CB3045	09-APR-02	FS	F12851
GW	MK-MW17	CB3046	12-APR-02	FD	CB002
GW	MK-MW17	CB3047	12-APR-02	FS	F12898

Table K-2

Summary of Analytes Detected in Blanks
April 2002 Background/Non-Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Lot Number	Sample Number	Sample Date	Sample Purpose	Parameter	Result	Units	Lab Qualifier
CB001	CB5006	04-APR-02	TB	Methylene chloride	0.23	ug/L	J B
CB001	CB5008	05-APR-02	TB	Methylene chloride	0.18	ug/L	J B
CB001	CB5008	05-APR-02	TB	Acetone	2.8	ug/L	J
CB001	CB5010	08-APR-02	TB	Acetone	2.1	ug/L	J
CB001	CB5010	08-APR-02	TB	Methylene chloride	0.24	ug/L	J B
CB001	EXFEGBW	31-MAR-02	BLK	Methylene chloride	0.30	ug/L	J
CB001	EXHCTBW	03-APR-02	BLK	Alkalinity	3900	ug/L	B
CB001	EXKF7BW	05-APR-02	BLK	Alkalinity	3900	ug/L	B
CB001	EXLDXBW	04-APR-02	BLK	Sulfate	380	ug/L	B
CB001	EXMJRBW	08-APR-02	BLK	Alkalinity	4200	ug/L	B
CB001	EXNW7BW	08-APR-02	BLK	Methylene chloride	0.52	ug/L	J
CB001	EXP82BW	31-MAR-02	BLK	Methylene chloride	0.21	ug/L	J
CB002	CB5001	12-APR-02	FB	Aluminum	67.1	ug/L	B
CB002	CB5001	12-APR-02	FB	Thallium	7.2	ug/L	B J
CB002	CB5001	12-APR-02	FB	Bis(2-ethylhexyl)phthalate	1.0	ug/L	J
CB002	CB5001	12-APR-02	FB	Toluene	0.52	ug/L	J
CB002	CB5001	12-APR-02	FB	Methylene chloride	1.7	ug/L	J
CB002	CB5001	12-APR-02	FB	Acetone	2.5	ug/L	J
CB002	CB5012	09-APR-02	TB	Methylene chloride	0.19	ug/L	J B
CB002	CB5012	09-APR-02	TB	Acetone	1.5	ug/L	J
CB002	CB5013	10-APR-02	TB	Methylene chloride	0.18	ug/L	J B
CB002	CB5016	11-APR-02	TB	Methylene chloride	0.22	ug/L	J
CB002	E0CA6BW	11-APR-02	BLK	Alkalinity	4300	ug/L	B
CB002	E0GNNBW	17-APR-02	BLK	Total organic carbon	620	ug/L	B
CB002	EX15NBW	09-APR-02	BLK	Methylene chloride	0.24	ug/L	J
CB002	EX1KJBW	04-APR-02	BLK	Alkalinity	4300	ug/L	B
CB002	EX1KKBW	12-APR-02	BLK	Alkalinity	3900	ug/L	B
CB002	EX3KXBW	12-APR-02	BLK	Alkalinity	3900	ug/L	B
CB002	EXR08BW	10-APR-02	BLK	Alkalinity	3200	ug/L	B
CB002	EXVVFBW	11-APR-02	BLK	Alkalinity	3800	ug/L	B
CB002	EXWHHBW	12-APR-02	BLK	Thallium	7.7	ug/L	B
CB002	EXXG7BW	12-APR-02	BLK	Thallium	6.7	ug/L	B
CB003	BC5019	15-APR-02	TB	Methylene chloride	0.85	ug/L	J B
CB003	E0NGRBW	15-APR-02	BLK	Gasoline Range Organics	2300	ug/kg	J
CB003	EX2QGBW	15-APR-02	BLK	Acetone	0.53	mg/kg	J
CB003	EX2QGBW	15-APR-02	BLK	Chloromethane	0.62	mg/kg	J
CB003	EX2QGBW	15-APR-02	BLK	Butanone, 2-	2.5	mg/kg	J
CB003	EX2QGBW	15-APR-02	BLK	Xylenes, total	0.32	mg/kg	J
CB003	EX2QGBW	15-APR-02	BLK	Bromomethane	0.57	mg/kg	J
CB003	EX2QGBW	15-APR-02	BLK	Hexanone, 2-	0.57	mg/kg	J
CB003	EX2QGBW	15-APR-02	BLK	Methylene chloride	0.15	mg/kg	J
CB003	EX56RBW	15-APR-02	BLK	Thallium	6.7	ug/L	B
CB003	EX6MDBW	15-APR-02	BLK	Methylene chloride	0.26	ug/L	J

Table K-3

Summary of Original, Field Duplicate, and Field Split Results and RPD Calculations
April 2002 Background/Non-Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

		Location Code:	IT-AA3-BEDGW-001									Relative Percent Difference between REG and FD	Relative Percent Difference between REG and FS
		Sample No.:	CB3033			CB3034			CB3035				
		Sample Date:	10-Apr-02			10-Apr-02			10-Apr-02				
		Sample Type:	REG			FD			FS				
Parameter	Units	Filtered	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ		
Aluminum	µg/L	N	104	B	B	104	B	B	200	U	U	0.00	63.16
Aluminum	µg/L	Y	49.2	B	J	61.2	B	B	200	U	U	21.74	121.03
Barium	µg/L	N	80.2	B	J	77.7	B	J	200	U	U	3.17	85.51
Barium	µg/L	Y	78.1	B	J	78.5	B	J	200	U	U	0.51	87.67
Calcium	µg/L	N	104000			101000			109000			2.93	4.69
Calcium	µg/L	Y	104000			105000			107000			0.96	2.84
Iron	µg/L	N	118		J	91.8	B	J	333			24.98	95.34
Magnesium	µg/L	N	69300			67200			70200			3.08	1.29
Magnesium	µg/L	Y	67100			67900			69500			1.19	3.51
Manganese	µg/L	N	20.7			20			20.2			3.44	2.44
Manganese	µg/L	Y	17			17.2			16.3			1.17	4.20
Potassium	µg/L	N	40400			39300			47900			2.76	16.99
Potassium	µg/L	Y	40000			40700			47600			1.73	17.35
Sodium	µg/L	N	237000			231000			263000			2.56	10.40
Sodium	µg/L	Y	237000			241000			261000			1.67	9.64
Thallium	µg/L	N	6.9	B J	B	10	U	U	10	U	U	36.69	36.69
3 & 4-Methylphenol	µg/L	N	10	U	U	10	U	U	5.9			0.00	51.57
Naphthalene	µg/L	N	0.7	J	J	0.72	J	J	5	U	U	2.82	150.88
Benzene	µg/L	N	8	J	J	7.5	J	J	6.4			6.45	22.22
Ethylbenzene	µg/L	N	4.6	J	J	4.1	J	J	3.4			11.49	30.00
Methylene chloride	µg/L	N	9.2	J	J	9.6	J	J	5	U	U	4.26	59.15
Toluene	µg/L	N	12		J	11			9.2			8.70	26.42
Xylenes, total	µg/L	N	31			28			25.2			10.17	20.64

		Location Code:	PB-BED-MW22									Relative Percent Difference between REG and FD	Relative Percent Difference between REG and FS
		Sample No.:	CB3009			CB3010			CB3011				
		Sample Date:	4-Apr-02			4-Apr-02			4-Apr-02				
		Sample Type:	REG			FD			FS				
Parameter	Units	Filtered	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ		
Aluminum	µg/L	N	71.3	B	J	65.8	B	J	200	U	U	8.02	94.88
Aluminum	µg/L	Y	64.5	B	B	77.9	B	B	200	U	U	18.82	102.46
Barium	µg/L	N	620			575			606			7.53	2.28
Barium	µg/L	Y	617			631			596			2.24	3.46
Calcium	µg/L	N	123000			116000			121000			5.86	1.64
Calcium	µg/L	Y	121000			124000			114000			2.45	5.96
Iron	µg/L	N	43.2	B	J	103		J	300	U	U	81.81	149.65
Magnesium	µg/L	N	35800			33400			34900			6.94	2.55
Magnesium	µg/L	Y	35700			36500			33700			2.22	5.76
Manganese	µg/L	N	45.1			44			45.2			2.47	0.22
Manganese	µg/L	Y	43.3			44.6			39.3			2.96	9.69
Potassium	µg/L	N	2500	B	J	2230	B	J	5340			11.42	72.45
Potassium	µg/L	Y	2470	B	J	2560	B	J	5480			3.58	75.72
Sodium	µg/L	N	19200			17900			16900			7.01	12.74
Sodium	µg/L	Y	19100			19500			16400			2.07	15.21
Zinc	µg/L	N	20.2			19.9	B	J	20	U	U	1.50	1.00
Zinc	µg/L	Y	12.7	B	J	13.3	B	J	20	U	U	4.62	44.65
Acetone	µg/L	N	400	U	R	19	J	J	50	U	U	181.86	155.56
Benzene	µg/L	N	40	U	U	10	U	U	0.6	J	J	120.00	194.09
Ethylbenzene	µg/L	N	40	U	U	10	U	U	0.52	J	J	120.00	194.87
Methylene chloride	µg/L	N	11	J	J	10	J B	J	5	U	U	9.52	75.00
Toluene	µg/L	N	40	U	U	10	U	U	0.85	J	J	120.00	191.68
Xylenes, total	µg/L	N	40	U	U	10	U	U	2.8	J	J	120.00	173.83

Table K-3

Summary of Original, Field Duplicate, and Field Split Results and RPD Calculations
April 2002 Background/Non-Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

		Location Code:	IT-TNTB-BEDGW-001							Relative Percent Difference between REG and FD
		Sample No.:	CB3019			CB3020				
		Sample Date:	5-Apr-02			5-Apr-02				
		Sample Type:	REG			FD				
Parameter	Units	Filtered	Result	Qual	VQ	Result	Qual	VQ		
Aluminum	µg/L	N	54.8	B	J	51.4	B	J		6.40
Aluminum	µg/L	Y	66.6	B	B	67	B	B		0.60
Barium	µg/L	N	1080			1040				3.77
Barium	µg/L	Y	974			1010				3.63
Calcium	µg/L	N	91500			88000				3.90
Calcium	µg/L	Y	91800			87800				4.45
Magnesium	µg/L	N	55500			53400				3.86
Magnesium	µg/L	Y	52600			52600				0.00
Manganese	µg/L	N	33.2			32.1				3.37
Manganese	µg/L	Y	51.1		J	36.7		J		32.80
Potassium	µg/L	N	43400		J	41500		J		4.48
Potassium	µg/L	Y	38300		J	40100		J		4.59
Sodium	µg/L	N	435000			420000				3.51
Sodium	µg/L	Y	366000			399000				8.63
Zinc	µg/L	N	2.6	B	J	5	B	J		63.16
Acetone	µg/L	N	2.3	J	B	2.7	J	B		16.00
Dichloroethane, 1,1-	µg/L	N	0.38	J	J	0.42	J	J		10.00

		Location Code:	MK-MW17									Relative Percent Difference between REG and FD	Relative Percent Difference between REG and FS
		Sample No.:	CB3038			CB3046			CB3047				
		Sample Date:	12-Apr-02			12-Apr-02			12-Apr-02				
		Sample Type:	REG			FD			FS				
Parameter	Units	Filtered	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ		
Amino-2,6-dinitrotoluene, 4-	µg/L	N	22			20			17.1			9.52	25.06
Amino-4,6-dinitrotoluene, 2-	µg/L	N	26			23			23			12.24	12.24
itrotoluene, 2,4-	µg/L	N	5.8			5			4.6			14.81	23.08
rotoluene, 2,6-	µg/L	N	4		J	2.7	J	J	1.4		J	38.81	96.30
nitrotoluene, 2,4,6-	µg/L	N	68			60			59.8			12.50	12.83
Aluminum	µg/L	N	4600			4490			4340			2.42	5.82
Aluminum	µg/L	Y	4680			4740			4340			1.27	7.54
Arsenic	µg/L	Y	10	U	U	3.7	B	J	10	U	U	91.97	0.00
Barium	µg/L	N	14.6	B	J	14.4	B	J	200	U	U	1.38	172.79
Barium	µg/L	Y	14.1	B	J	15.1	B	J	200	U	U	6.85	173.66
Beryllium	µg/L	N	2.4	B	B	2.4	B	B	5	U	U	0.00	70.27
Beryllium	µg/L	Y	2	B	J	2.1	B	J	5	U	U	4.88	85.71
Calcium	µg/L	N	79400			77500			78400			2.42	1.27
Calcium	µg/L	Y	78200			82400			78200			5.23	0.00
Cobalt	µg/L	N	95.7			93.9			90.9			1.90	5.14
Cobalt	µg/L	Y	95.5			98.7			91.3			3.30	4.50
Iron	µg/L	N	11800		J	11600		J	12000			1.71	1.68
Iron	µg/L	Y	11500		J	12300		J	11900			6.72	3.42
Magnesium	µg/L	N	23000			22600			22200			1.75	3.54
Magnesium	µg/L	Y	22200			23500			22100			5.69	0.45
Manganese	µg/L	N	1350			1320			1350			2.25	0.00
Manganese	µg/L	Y	1330			1400			1340			5.13	0.75
Nickel	µg/L	N	208			209			216			0.48	3.77
Nickel	µg/L	Y	214			221			217			3.22	1.39
Potassium	µg/L	N	1470	B	J	1430	B	J	5000	U	U	2.76	109.12
Potassium	µg/L	Y	1460	B	J	1540	B	J	5000	U	U	5.33	109.60
Sodium	µg/L	N	3240	B	J	3500	B	J	5000	U	U	7.72	42.72
Sodium	µg/L	Y	3260	B	J	3650	B	J	5000	U	U	11.29	42.13
Thallium	µg/L	N	8.6	B J	B	5.2	B J	B	10	U	U	49.28	15.05
Zinc	µg/L	N	194			191			187			1.56	3.67
Zinc	µg/L	Y	200			214			185			6.76	7.79
Dinitrotoluene, 2,4-	µg/L	N	4	J	J	3.7	J	J	5.4	J	J	7.79	29.79
Dinitrotoluene, 2,6-	µg/L	N	1.4	J	J	8.7	J	J	5.5	U	U	144.55	118.84
Acetone	µg/L	N	2.4	J	J	2.4	J	J	50	U	U	0.00	181.68

Table K-3

Summary of Original, Field Duplicate, and Field Split Results and RPD Calculations
April 2002 Background/Non-Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

		Location Code:	TNTC-BEDGW-001						Relative
		Sample No.:	CB3026			CB3045			Percent
		Sample Date:	9-Apr-02			9-Apr-02			Difference
		Sample Type:	REG			FS			between
Parameter	Units	Filtered	Result	Qual	VQ	Result	Qual	VQ	REG and FS
Aluminum	µg/L	N	90.6	B	B	200	U	U	75.29
Aluminum	µg/L	Y	64.1	B	J	200	U	U	102.92
Barium	µg/L	N	16.5	B	J	200	U	U	169.52
Barium	µg/L	Y	18	B	J	200	U	U	166.97
Calcium	µg/L	N	434000			419000			3.52
Calcium	µg/L	Y	462000			438000			5.33
Magnesium	µg/L	N	152000			150000			1.32
Magnesium	µg/L	Y	157000			157000			0.00
Manganese	µg/L	N	5.1	B	J	15	U	U	98.51
Manganese	µg/L	Y	5.2	B	J	15	U	U	97.03
Potassium	µg/L	N	9610			15900			49.31
Potassium	µg/L	Y	10900			16900			43.17
Sodium	µg/L	N	51900			55700			7.06
Sodium	µg/L	Y	57100			58700			2.76
Thallium	µg/L	N	4.8	B J	B	10	U	U	70.27
Methylnaphthalene, 2-	µg/L	N	3.2	J	J	2.6	J	J	20.69
Naphthalene	µg/L	N	2.5	J	J	5	U	U	66.67
Acetone	µg/L	N	53	J	J	44.5	J	J	17.44
Benzene	µg/L	N	8.4	J	J	9.6			13.33
Carbon disulfide	µg/L	N	20	U	U	10.9			58.90
Ethylbenzene	µg/L	N	12	J	J	13.9			14.67
Methylene chloride	µg/L	N	19	J B	J	5	U	U	116.67
Toluene	µg/L	N	8.8	J	J	9.3			5.52
Xylenes, total	µg/L	N	90			95.1			5.51

		Location Code:	PB-BED-MW25									Relative	Relative
		Sample No.:	CB3004			CB3005			CB3006			Percent	Percent
		Sample Date:	3-Apr-02			3-Apr-02			3-Apr-02			Difference	Difference
		Sample Type:	REG			FD			FS			between	between
Parameter	Units	Filtered	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ	REG and FD	REG and FS
Nitrobenzene	ug/L	N	0.076	J	J	0.2	U	U	0.2	U		89.86	89.86
Aluminum	ug/L	N	41.3	B	J	46.7	B	J	200	U		12.27	131.54
Aluminum	ug/L	Y	52.7	B	B	66.9	B	B	200	U		23.75	116.58
Barium	ug/L	N	434			422			438			2.80	0.92
Barium	ug/L	Y	452			437			434			3.37	4.06
Calcium	ug/L	N	173000			169000			175000			2.34	1.15
Calcium	ug/L	Y	176000			172000			165000			2.30	6.45
Iron	ug/L	N	91.1	B	J	74.2	B	J	300	U		20.45	106.83
Magnesium	ug/L	N	68000			65900			68700			3.14	1.02
Magnesium	ug/L	Y	69700			67600			65900			3.06	5.60
Manganese	ug/L	N	68.8			65.8			66.7			4.46	3.10
Manganese	ug/L	Y	65.6			64.1			59.9			2.31	9.08
Potassium	ug/L	N	14500		J	14000		J	21100			3.51	37.08
Potassium	ug/L	Y	14900		J	13600		J	20700			9.12	32.58
Sodium	ug/L	N	196000			191000			218000			2.58	10.63
Sodium	ug/L	Y	196000			191000			203000			2.58	3.51
Zinc	ug/L	N	79.5			77.1			71.3			3.07	10.88
Zinc	ug/L	Y	19.9	B	J	32.8		J	20	U		48.96	0.50
Acetone	ug/L	N	10	U	R	2.2	J	J	50	U		127.87	133.33
Carbon disulfide	ug/L	N	0.36	J	J	0.63	J	J	10	U		54.55	186.10
Methylene chloride	ug/L	N	0.21	J B	B	0.2	J B	B	5	U		4.88	183.88
Toluene	ug/L	N	0.25	J	J	0.27	J	J	2	U		7.69	155.56

Table K-4

Summary of Data Validation Reason Codes
April 2002 Background/Non-Background Wells
Plum Brook Ordnance Works, Sandusky, Ohio

Reason Code	Description
01	Sample received outside of 4+/-2 degrees Celsius
01A	Improper sample preservation
02	Holding Time Exceeded
02A	Extraction
02B	Analysis
03	Instrument Performance - Outside Criteria
03A	BFB
03B	DFTPP
03C	DDT and/or Endrin % breakdown exceeds criteria
03D	retention time windows
03E	Resolution
04	Initial Calibration results outside specified criteria
04A	Compound mean RRF<0.05
04B	Compound %RSD>30
04C	Correlation Coefficient<0.995
05	Continuing Calibration results outside specified criteria
05A	Compound mean RRF<0.05
05B	Compound %D>25
06	Result qualified as a result of the 5x/10x blank correction
06A	Method or Preparation Blank
06B	ICB or CCB
06C	ER
06D	TB
06E	FB
07	Surrogate Recoveries outside control limits
07A	Sample
07B	Associated method blank or LCS
08	MS/MSD/Duplicate results outside criteria
08A	MS and/or MSD recovery not within control limits (accuracy)
08B	%RPD outside acceptance criteria (precision)
09	Post Digestion Spike outside criteria (GFAA)
10	Internal Standards outside specified control limits
10A	Recovery
10B	Retention Time
11	Laboratory Control Sample recoveries outside specified control limits
11A	Recovery
11B	%RPD (if run in duplicate)
12	Interference Check Standard
13	Serial Dilution
14	Tentatively Identified Compounds
15	Quantitation
16	Multiple results available; alternate analysis preferred
17	Field duplicate RPD criteria exceeded
18	Percent difference between original and second column > 25%
19	Professional judgement was used to qualify the data
20	Pesticide clean-up checks
21	Target compound identification
22	Radiological calibration
23	Radiological quantitation
24	Reported result and/or lab qualifier revised to reflect validation findings
999	See hard copy for details.

Table K-5

Summary of Data Validation Qualifiers Assigned and Reason Codes for Qualification
April 2002 Background/Non-Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes (1,2) R1	R2	R3	R4
CB001	CB3001	Chloride	Chloride	J	08A			
CB001	CB3001	Cyanide	Cyanide, total	UJ	01A			
CB001	CB3001	Explosives	Tetryl	R	08A			
CB001	CB3001	Metals	Aluminum	B	06B	15		
CB001	CB3001	Metals	Potassium	J	13			
CB001	CB3001	Metals	Potassium	J	13			
CB001	CB3001	Metals	Zinc	J	13			
CB001	CB3001	Volatiles	Acetone	J	04A	05A	15	
CB001	CB3001	Volatiles	Bromomethane	R	05A	05B		
CB001	CB3001	Volatiles	Butanone, 2-	UJ	05B			
CB001	CB3001	Volatiles	Chloromethane	UJ	05B			
CB001	CB3001	Volatiles	Dichloroethene, 1,2-	UJ	05B			
CB001	CB3004	Chloride	Chloride	J	08A			
CB001	CB3004	Explosives	Tetryl	R	08A			
CB001	CB3004	Metals	Aluminum	B	06B	15		
CB001	CB3004	Metals	Potassium	J	13			
CB001	CB3004	Metals	Potassium	J	13			
CB001	CB3004	Metals	Zinc	J	13	17	15	
CB001	CB3004	Volatiles	Acetone	R	04A	05A		
CB001	CB3004	Volatiles	Bromomethane	R	05A	05B		
CB001	CB3004	Volatiles	Butanone, 2-	UJ	05B			
CB001	CB3004	Volatiles	Chloromethane	UJ	05B			
CB001	CB3004	Volatiles	Dichloroethene, 1,2-	UJ	05B			
CB001	CB3004	Volatiles	Methylene chloride	B	06A	06D	15	
CB001	CB3004	Volatiles	Carbon disulfide	J	17	15		
CB001	CB3005	Explosives	Tetryl	R	08A			
CB001	CB3005	Metals	Aluminum	B	06B	15		
CB001	CB3005	Metals	Potassium	J	13			
CB001	CB3005	Metals	Potassium	J	13			
CB001	CB3005	Metals	Zinc	J	13	17		
CB001	CB3005	Volatiles	Acetone	J	04A	05A	15	
CB001	CB3005	Volatiles	Bromomethane	R	05A	05B		
CB001	CB3005	Volatiles	Butanone, 2-	UJ	05B			
CB001	CB3005	Volatiles	Chloromethane	UJ	05B			
CB001	CB3005	Volatiles	Dichloroethene, 1,2-	UJ	05B			
CB001	CB3005	Volatiles	Methylene chloride	B	06A	06D	15	
CB001	CB3005	Volatiles	Carbon disulfide	J	17	15		
CB001	CB3007	Chloride	Chloride	J	08A			
CB001	CB3007	Explosives	Tetryl	R	08A			
CB001	CB3007	Metals	Aluminum	B	06B	15		
CB001	CB3007	Metals	Potassium	J	13	15		
CB001	CB3007	Metals	Potassium	J	13	15		
CB001	CB3007	Metals	Zinc	J	13	15		
CB001	CB3007	Volatiles	Acetone	J	04A	05A	15	
CB001	CB3007	Volatiles	Butanone, 2-	R	04A	05A		
CB001	CB3007	Volatiles	Methylene chloride	UJ	04B			
CB001	CB3008	Chloride	Chloride	J	08A			

Table K-5

Summary of Data Validation Qualifiers Assigned and Reason Codes for Qualification
April 2002 Background/Non-Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes (1,2) R1	R2	R3	R4
CB001	CB3008	Explosives	Tetryl	R	08A			
CB001	CB3008	Metals	Aluminum	B	06B	15		
CB001	CB3008	Metals	Potassium	J	13			
CB001	CB3008	Metals	Potassium	J	13			
CB001	CB3008	Metals	Zinc	J	13	15		
CB001	CB3008	Volatiles	Acetone	J	04A	05A		
CB001	CB3008	Volatiles	Bromomethane	R	05A	05B		
CB001	CB3008	Volatiles	Butanone, 2-	J	05B	15		
CB001	CB3008	Volatiles	Chloromethane	UJ	05B			
CB001	CB3008	Volatiles	Dichloroethene, 1,2-	UJ	05B			
CB001	CB3009	Chloride	Chloride	J	08A			
CB001	CB3009	Explosives	Tetryl	R	08A			
CB001	CB3009	Metals	Aluminum	B	06B	15		
CB001	CB3009	Metals	Potassium	J	13	15		
CB001	CB3009	Metals	Potassium	J	13	15		
CB001	CB3009	Metals	Zinc	J	13	15		
CB001	CB3009	Metals	Iron	J	17	15		
CB001	CB3009	Volatiles	Acetone	R	04A	05A		
CB001	CB3009	Volatiles	Butanone, 2-	R	04A	05A		
CB001	CB3010	Explosives	Tetryl	R	08A			
CB001	CB3010	Metals	Aluminum	B	06B	15		
CB001	CB3010	Metals	Potassium	J	13	15		
CB001	CB3010	Metals	Potassium	J	13	15		
CB001	CB3010	Metals	Zinc	J	13	15		
CB001	CB3010	Metals	Iron	J	17			
CB001	CB3010	Volatiles	Acetone	J	04A	05A	15	
CB001	CB3010	Volatiles	Butanone, 2-	R	04A	05A		
CB001	CB3013	Chloride	Chloride	J	08A			
CB001	CB3013	Explosives	Tetryl	R	08A			
CB001	CB3013	Metals	Aluminum	B	06B	15		
CB001	CB3013	Metals	Potassium	J	13			
CB001	CB3013	Metals	Potassium	J	13			
CB001	CB3013	Metals	Zinc	J	13	15		
CB001	CB3013	Volatiles	Acetone	R	04A	05A		
CB001	CB3013	Volatiles	Butanone, 2-	R	04A	05A		
CB001	CB3013	Volatiles	Methylene chloride	J	04B	15		
CB001	CB3015	Chloride	Chloride	J	08A			
CB001	CB3015	Cyanide	Cyanide, total	UJ	01A			
CB001	CB3015	Explosives	Tetryl	R	08A			
CB001	CB3015	Metals	Aluminum	B	06B	15		
CB001	CB3015	Metals	Potassium	J	13			
CB001	CB3015	Metals	Potassium	J	13			
CB001	CB3015	Metals	Zinc	J	13	15		
CB001	CB3015	Nitrate	Nitrate	UJ	02B			
CB001	CB3015	Sulfate	Sulfate	B	06A	15		
CB001	CB3015	Turbidity	Turbidity	J	02B			
CB001	CB3015	Volatiles	Acetone	R	04A	05A	07A	
CB001	CB3015	Volatiles	Bromomethane	R	05A	05B	07A	
CB001	CB3015	Volatiles	Butanone, 2-	UJ	05B	07A		

Table K-5

Summary of Data Validation Qualifiers Assigned and Reason Codes for Qualification
April 2002 Background/Non-Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes (1,2) R1	R2	R3	R4
CB001	CB3015	Volatiles	Chloromethane	UJ	05B	07A		
CB001	CB3015	Volatiles	Dichloroethene, 1,2-	UJ	05B	07A		
CB001	CB3015	Volatiles	Benzene	J	07A			
CB001	CB3015	Volatiles	Bromodichloromethane	UJ	07A			
CB001	CB3015	Volatiles	Bromoform	UJ	07A			
CB001	CB3015	Volatiles	Carbon disulfide	J	07A	15		
CB001	CB3015	Volatiles	Carbon tetrachloride	UJ	07A			
CB001	CB3015	Volatiles	Chlorobenzene	UJ	07A			
CB001	CB3015	Volatiles	Chloroethane	UJ	07A			
CB001	CB3015	Volatiles	Chloroform	UJ	07A			
CB001	CB3015	Volatiles	Dibromochloromethane	UJ	07A			
CB001	CB3015	Volatiles	Dichloroethane, 1,1-	UJ	07A			
CB001	CB3015	Volatiles	Dichloroethane, 1,2-	UJ	07A			
CB001	CB3015	Volatiles	Dichloroethene, 1,1-	UJ	07A			
CB001	CB3015	Volatiles	Dichloropropane, 1,2-	UJ	07A			
CB001	CB3015	Volatiles	Dichloropropene, cis-1,3-	UJ	07A			
CB001	CB3015	Volatiles	Dichloropropene, trans-1,3-	UJ	07A			
CB001	CB3015	Volatiles	Ethylbenzene	J	07A			
CB001	CB3015	Volatiles	Hexanone, 2-	UJ	07A			
CB001	CB3015	Volatiles	Methyl-2-pentanone, 4-	UJ	07A			
CB001	CB3015	Volatiles	Methylene chloride	UJ	07A			
CB001	CB3015	Volatiles	Styrene	UJ	07A			
CB001	CB3015	Volatiles	Tetrachloroethane, 1,1,2,2-	UJ	07A			
CB001	CB3015	Volatiles	Tetrachloroethene	UJ	07A			
CB001	CB3015	Volatiles	Toluene	J	07A			
CB001	CB3015	Volatiles	Trichloroethane, 1,1,1-	UJ	07A			
CB001	CB3015	Volatiles	Trichloroethane, 1,1,2-	UJ	07A			
CB001	CB3015	Volatiles	Trichloroethene	UJ	07A			
CB001	CB3015	Volatiles	Vinyl chloride	UJ	07A			
CB001	CB3015	Volatiles	Xylenes, total	J	07A			
CB001	CB3016	Chloride	Chloride	J	08A			
CB001	CB3016	Explosives	Tetryl	R	08A			
CB001	CB3016	Metals	Aluminum	B	06B	15		
CB001	CB3016	Metals	Potassium	J	13	15		
CB001	CB3016	Metals	Potassium	J	13	15		
CB001	CB3016	Metals	Zinc	J	13			
CB001	CB3016	Nitrate	Nitrate	UJ	02B			
CB001	CB3016	Turbidity	Turbidity	J	02B			
CB001	CB3016	Volatiles	Acetone	R	04A	05A		
CB001	CB3016	Volatiles	Butanone, 2-	R	04A	05A		
CB001	CB3016	Volatiles	Methylene chloride	B	06D	15		
CB001	CB3017	Alkalinity	Alkalinity	B	06A	15		
CB001	CB3017	Chloride	Chloride	J	08A			
CB001	CB3017	Explosives	Tetryl	R	08A			
CB001	CB3017	Metals	Copper	B	06B	15		
CB001	CB3017	Metals	Potassium	J	13	15		
CB001	CB3017	Metals	Potassium	J	13	15		
CB001	CB3017	Metals	Zinc	J	13			
CB001	CB3017	Volatiles	Acetone	R	04A			

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Summary of Data Validation Qualifiers Assigned and Reason Codes for Qualification
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Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes (1,2) R1	R2	R3	R4
CB001	CB3018	Chloride	Chloride	J	08A			
CB001	CB3018	Explosives	Tetryl	R	08A			
CB001	CB3018	Metals	Aluminum	B	06B	15		
CB001	CB3018	Metals	Potassium	J	13			
CB001	CB3018	Metals	Potassium	J	13			
CB001	CB3018	Nitrate	Nitrate	UJ	02B			
CB001	CB3018	Turbidity	Turbidity	J	02B			
CB001	CB3018	Volatiles	Acetone	B	04A	06D	15	
CB001	CB3019	Chloride	Chloride	J	08A			
CB001	CB3019	Explosives	Tetryl	R	08A			
CB001	CB3019	Metals	Aluminum	B	06B	15		
CB001	CB3019	Metals	Potassium	J	13			
CB001	CB3019	Metals	Potassium	J	13			
CB001	CB3019	Metals	Manganese	J	17			
CB001	CB3019	Metals	Zinc	J	17	15		
CB001	CB3019	Nitrate	Nitrate	UJ	02B			
CB001	CB3019	Turbidity	Turbidity	J	02B			
CB001	CB3019	Volatiles	Acetone	B	04A	06D	15	
CB001	CB3020	Explosives	Tetryl	R	08A			
CB001	CB3020	Metals	Aluminum	B	06B	15		
CB001	CB3020	Metals	Potassium	J	13			
CB001	CB3020	Metals	Potassium	J	13			
CB001	CB3020	Metals	Manganese	J	17			
CB001	CB3020	Metals	Zinc	J	17	15		
CB001	CB3020	Volatiles	Acetone	B	04A	06D	15	
CB001	CB3022	Chloride	Chloride	J	08A			
CB001	CB3022	Explosives	Tetryl	R	08A			
CB001	CB3022	Metals	Aluminum	B	06B	15		
CB001	CB3022	Metals	Aluminum	B	06B	15		
CB001	CB3022	Metals	Potassium	J	13			
CB001	CB3022	Metals	Potassium	J	13			
CB001	CB3022	Metals	Zinc	J	13			
CB001	CB3022	Volatiles	Acetone	R	04A	05A		
CB001	CB3022	Volatiles	Bromomethane	R	05A	05B		
CB001	CB3022	Volatiles	Butanone, 2-	UJ	05B			
CB001	CB3022	Volatiles	Chloromethane	UJ	05B			
CB001	CB3022	Volatiles	Dichloroethene, 1,2-	UJ	05B			
CB001	CB3022	Volatiles	Methylene chloride	B	06A	06D	15	
CB001	CB3023	Chloride	Chloride	J	08A			
CB001	CB3023	Explosives	Tetryl	R	08A			
CB001	CB3023	Metals	Aluminum	B	06B	15		
CB001	CB3023	Metals	Potassium	J	13	15		
CB001	CB3023	Metals	Potassium	J	13	15		
CB001	CB3023	Metals	Zinc	J	13			
CB001	CB3023	Volatiles	Acetone	B	04A	06A	06D	15
CB001	CB3029	Chloride	Chloride	J	08A			
CB001	CB3029	Explosives	Tetryl	R	08A			
CB001	CB3029	Metals	Aluminum	B	06B	15		
CB001	CB3029	Metals	Potassium	J	13	15		

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Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes (1,2) R1	R2	R3	R4
CB001	CB3029	Metals	Potassium	J	13	15		
CB001	CB3029	Metals	Zinc	J	13	15		
CB001	CB3029	Volatiles	Acetone	R	04A			
CB002	CB3012	Metals	Aluminum	B	06B			
CB002	CB3012	Metals	Copper	B	06B	15		
CB002	CB3012	Metals	Iron	J	13			
CB002	CB3012	Metals	Iron	J	13			
CB002	CB3012	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3012	Volatiles	Benzene	J	01A			
CB002	CB3012	Volatiles	Ethylbenzene	J	01A			
CB002	CB3012	Volatiles	Toluene	J	01A			
CB002	CB3012	Volatiles	Acetone	J	04A	05A	15	
CB002	CB3012	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3014	Metals	Thallium	B	06A	06B	15	
CB002	CB3014	Metals	Aluminum	B	06B	15		
CB002	CB3014	Semivolatiles	Acenaphthene	UJ	02A			
CB002	CB3014	Semivolatiles	Acenaphthylene	UJ	02A			
CB002	CB3014	Semivolatiles	Anthracene	UJ	02A			
CB002	CB3014	Semivolatiles	Benzo(a)anthracene	UJ	02A			
CB002	CB3014	Semivolatiles	Benzo(a)pyrene	UJ	02A			
CB002	CB3014	Semivolatiles	Benzo(b)fluoranthene	UJ	02A			
CB002	CB3014	Semivolatiles	Benzo(ghi)perylene	UJ	02A			
CB002	CB3014	Semivolatiles	Benzo(k)fluoranthene	UJ	02A			
CB002	CB3014	Semivolatiles	Bis(2-chloroethoxy)methane	UJ	02A			
CB002	CB3014	Semivolatiles	Bis(2-chloroethyl)ether	UJ	02A			
CB002	CB3014	Semivolatiles	Bis(2-chloroisopropyl)ether	UJ	02A			
CB002	CB3014	Semivolatiles	Bis(2-ethylhexyl)phthalate	J	02A	15		
CB002	CB3014	Semivolatiles	Bromophenyl phenyl ether, 4-	UJ	02A			
CB002	CB3014	Semivolatiles	Butyl benzyl phthalate	UJ	02A			
CB002	CB3014	Semivolatiles	Carbazole	UJ	02A			
CB002	CB3014	Semivolatiles	Chloro-3-methylphenol, 4-	UJ	02A			
CB002	CB3014	Semivolatiles	Chloroaniline, 4-	UJ	02A			
CB002	CB3014	Semivolatiles	Chloronaphthalene, 2-	UJ	02A			
CB002	CB3014	Semivolatiles	Chlorophenol, 2-	UJ	02A			
CB002	CB3014	Semivolatiles	Chlorophenyl phenyl ether, 4-	UJ	02A			
CB002	CB3014	Semivolatiles	Chrysene	UJ	02A			
CB002	CB3014	Semivolatiles	Di-n-butyl phthalate	UJ	02A			
CB002	CB3014	Semivolatiles	Di-n-octyl phthalate	UJ	02A			
CB002	CB3014	Semivolatiles	Dibenz(a,h)anthracene	UJ	02A			
CB002	CB3014	Semivolatiles	Dibenzofuran	UJ	02A			
CB002	CB3014	Semivolatiles	Dichlorobenzene, 1,2-	UJ	02A			
CB002	CB3014	Semivolatiles	Dichlorobenzene, 1,3-	UJ	02A			
CB002	CB3014	Semivolatiles	Dichlorobenzene, 1,4-	UJ	02A			
CB002	CB3014	Semivolatiles	Dichlorobenzidine, 3,3'-	UJ	02A			
CB002	CB3014	Semivolatiles	Dichlorophenol, 2,4-	UJ	02A			
CB002	CB3014	Semivolatiles	Diethyl phthalate	UJ	02A			
CB002	CB3014	Semivolatiles	Dimethyl phthalate	UJ	02A			
CB002	CB3014	Semivolatiles	Dimethylphenol, 2,4-	J	02A	15		
CB002	CB3014	Semivolatiles	Dinitro-2-methylphenol, 4,6-	UJ	02A			

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Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes (1,2) R1	R2	R3	R4
CB002	CB3014	Semivolatiles	Dinitrophenol, 2,4-	UJ	02A	04B		
CB002	CB3014	Semivolatiles	Dinitrotoluene, 2,4-	UJ	02A			
CB002	CB3014	Semivolatiles	Dinitrotoluene, 2,6-	UJ	02A			
CB002	CB3014	Semivolatiles	Fluoranthene	UJ	02A			
CB002	CB3014	Semivolatiles	Fluorene	UJ	02A			
CB002	CB3014	Semivolatiles	Hexachlorobenzene	UJ	02A			
CB002	CB3014	Semivolatiles	Hexachlorobutadiene	UJ	02A			
CB002	CB3014	Semivolatiles	Hexachlorocyclopentadiene	UJ	02A			
CB002	CB3014	Semivolatiles	Hexachloroethane	UJ	02A			
CB002	CB3014	Semivolatiles	Indeno(1,2,3-cd)pyrene	UJ	02A			
CB002	CB3014	Semivolatiles	Isophorone	UJ	02A			
CB002	CB3014	Semivolatiles	Methylnaphthalene, 2-	J	02A			
CB002	CB3014	Semivolatiles	Methylphenol, 2-	UJ	02A			
CB002	CB3014	Semivolatiles	Methylphenol, 4-	J	02A	15		
CB002	CB3014	Semivolatiles	Naphthalene	J	02A			
CB002	CB3014	Semivolatiles	Nitroaniline, 2-	UJ	02A			
CB002	CB3014	Semivolatiles	Nitroaniline, 3-	UJ	02A			
CB002	CB3014	Semivolatiles	Nitroaniline, 4-	UJ	02A			
CB002	CB3014	Semivolatiles	Nitrobenzene	UJ	02A			
CB002	CB3014	Semivolatiles	Nitrophenol, 2-	UJ	02A			
CB002	CB3014	Semivolatiles	Nitrophenol, 4-	UJ	02A			
CB002	CB3014	Semivolatiles	Pentachlorophenol	UJ	02A			
CB002	CB3014	Semivolatiles	Phenanthrene	UJ	02A			
CB002	CB3014	Semivolatiles	Phenol	J	02A	15		
CB002	CB3014	Semivolatiles	Pyrene	UJ	02A			
CB002	CB3014	Semivolatiles	Trichlorobenzene, 1,2,4-	UJ	02A			
CB002	CB3014	Semivolatiles	Trichlorophenol, 2,4,5-	UJ	02A			
CB002	CB3014	Semivolatiles	Trichlorophenol, 2,4,6-	UJ	02A			
CB002	CB3014	Semivolatiles	n-Nitroso-di-n-propylamine	UJ	02A			
CB002	CB3014	Semivolatiles	n-Nitrosodiphenylamine	UJ	02A			
CB002	CB3014	Volatiles	Acetone	R	04A	05A		
CB002	CB3014	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3024	Metals	Thallium	B	06A	06B	15	
CB002	CB3024	Metals	Beryllium	B	06B	15		
CB002	CB3024	Metals	Iron	J	13			
CB002	CB3024	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3024	Volatiles	Acetone	J	04A	05A		
CB002	CB3024	Volatiles	Butanone, 2-	J	04A	05A		
CB002	CB3024	Volatiles	Methylene chloride	B	06A	06D	15	
CB002	CB3025	Metals	Thallium	B	06A	06B	15	
CB002	CB3025	Metals	Aluminum	B	06B	15		
CB002	CB3025	Metals	Iron	J	13			
CB002	CB3025	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3025	Volatiles	Benzene	J	01A			
CB002	CB3025	Volatiles	Ethylbenzene	J	01A			
CB002	CB3025	Volatiles	Toluene	J	01A			
CB002	CB3025	Volatiles	Acetone	R	04A	05A		
CB002	CB3025	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3026	Metals	Thallium	B	06A	06B	15	

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Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes (1,2) R1	R2	R3	R4
CB002	CB3026	Metals	Aluminum	B	06B	15		
CB002	CB3026	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3026	Volatiles	Acetone	J	04A	05A	15	
CB002	CB3026	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3027	Metals	Thallium	B	06A	06B	15	
CB002	CB3027	Metals	Aluminum	B	06B	15		
CB002	CB3027	Metals	Iron	J	13	15		
CB002	CB3027	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3027	Volatiles	Acetone	J	04A	05A		
CB002	CB3027	Volatiles	Butanone, 2-	J	04A	05A	15	
CB002	CB3028	Metals	Iron	J	13			
CB002	CB3028	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3028	Volatiles	Acetone	R	04A	05A		
CB002	CB3028	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3030	Metals	Thallium	B	06A	06B	15	
CB002	CB3030	Metals	Aluminum	B	06B	15		
CB002	CB3030	Metals	Iron	J	13			
CB002	CB3030	Metals	Iron	J	13			
CB002	CB3030	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3030	Volatiles	Acetone	R	04A	05A		
CB002	CB3030	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3033	Metals	Thallium	B	06A	06B	15	
CB002	CB3033	Metals	Aluminum	B	06B	15		
CB002	CB3033	Metals	Iron	J	13			
CB002	CB3033	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3033	Volatiles	Benzene	J	01A	15		
CB002	CB3033	Volatiles	Ethylbenzene	J	01A	15		
CB002	CB3033	Volatiles	Toluene	J	01A			
CB002	CB3033	Volatiles	Acetone	R	04A	05A		
CB002	CB3033	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3034	Metals	Aluminum	B	06B	15		
CB002	CB3034	Metals	Aluminum	B	06B	15		
CB002	CB3034	Metals	Iron	J	13	15		
CB002	CB3034	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3034	Volatiles	Acetone	R	04A	05A		
CB002	CB3034	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3037	Metals	Thallium	B	06A	15		
CB002	CB3037	Metals	Thallium	B	06A	06B	15	
CB002	CB3037	Metals	Aluminum	B	06B	15		
CB002	CB3037	Metals	Aluminum	B	06B	15		
CB002	CB3037	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3037	Volatiles	Benzene	J	01A			
CB002	CB3037	Volatiles	Ethylbenzene	J	01A			
CB002	CB3037	Volatiles	Toluene	J	01A			
CB002	CB3037	Volatiles	Acetone	J	04A	05A	15	
CB002	CB3037	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3038	Alkalinity	Alkalinity	B	06A	15		
CB002	CB3038	Explosives	Dinitrotoluene, 2,6-	J	17			
CB002	CB3038	Metals	Thallium	B	06A	06B	17	15

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Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes (1,2) R1	R2	R3	R4
CB002	CB3038	Metals	Beryllium	B	06B	15		
CB002	CB3038	Metals	Iron	J	13			
CB002	CB3038	Metals	Iron	J	13			
CB002	CB3038	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3038	Volatiles	Acetone	J	04A	05A	15	
CB002	CB3038	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3039	Metals	Thallium	B	06A	06B	15	
CB002	CB3039	Metals	Aluminum	B	06B	15		
CB002	CB3039	Metals	Iron	J	13			
CB002	CB3039	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3039	Volatiles	Acetone	J	04A	05A	15	
CB002	CB3039	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3040	Metals	Aluminum	B	06B	15		
CB002	CB3040	Metals	Iron	J	13			
CB002	CB3040	Metals	Iron	J	13			
CB002	CB3040	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3040	Volatiles	Acetone	J	04A	05A		
CB002	CB3040	Volatiles	Butanone, 2-	R	04A	05A		
CB002	CB3046	Explosives	Dinitrotoluene, 2,6-	J	17	15		
CB002	CB3046	Metals	Thallium	B	06A	06B	17	15
CB002	CB3046	Metals	Beryllium	B	06B	15		
CB002	CB3046	Metals	Iron	J	13			
CB002	CB3046	Metals	Iron	J	13			
CB002	CB3046	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B		
CB002	CB3046	Volatiles	Acetone	J	04A	05A	15	
CB002	CB3046	Volatiles	Butanone, 2-	R	04A	05A		
CB003	CB3041	Metals	Aluminum	B	06B	15		
CB003	CB3041	Metals	Aluminum	B	06B	15		
CB003	CB3041	Metals	Potassium	J	13			
CB003	CB3041	Metals	Potassium	J	13			
CB003	CB3041	Metals	Zinc	J	13	15		
CB003	CB3041	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B			
CB003	CB3041	Volatiles	Acetone	J	04A	05A	05B	15
CB003	CB3041	Volatiles	Butanone, 2-	R	04A	05A		
CB003	CB3042	Metals	Aluminum	B	06B	15		
CB003	CB3042	Metals	Aluminum	B	06B	15		
CB003	CB3042	Metals	Potassium	J	13	15		
CB003	CB3042	Metals	Potassium	J	13	15		
CB003	CB3042	Metals	Zinc	J	13			
CB003	CB3042	Metals	Zinc	J	13			
CB003	CB3042	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B			
CB003	CB3042	Volatiles	Acetone	J	04A	05A	05B	15
CB003	CB3042	Volatiles	Butanone, 2-	R	04A	05A		
CB003	CB3042	Volatiles	Methylene chloride	B	06A	06D	15	
CB003	CB3043	Metals	Aluminum	B	06B	15		
CB003	CB3043	Metals	Potassium	J	13	15		
CB003	CB3043	Metals	Zinc	J	13			
CB003	CB3043	Metals	Zinc	J	13	15		
CB003	CB3043	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B			

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Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes (1,2) R1	R2	R3	R4
CB003	CB3043	Volatiles	Acetone	J	04A	05A	05B	15
CB003	CB3043	Volatiles	Butanone, 2-	R	04A	05A		
CB003	CB3043	Volatiles	Methylene chloride	B	06A	06D	15	
CB003	CB3044	Metals	Aluminum	J	01A			
CB003	CB3044	Metals	Aluminum	J	06B	15	01A	
CB003	CB3044	Metals	Antimony	UJ	01A			
CB003	CB3044	Metals	Antimony	UJ	01A			
CB003	CB3044	Metals	Arsenic	J	01A			
CB003	CB3044	Metals	Arsenic	UJ	01A			
CB003	CB3044	Metals	Barium	J	01A			
CB003	CB3044	Metals	Barium	J	01A			
CB003	CB3044	Metals	Beryllium	J	06B	15	01A	
CB003	CB3044	Metals	Beryllium	UJ	01A			
CB003	CB3044	Metals	Cadmium	J	15	01A		
CB003	CB3044	Metals	Cadmium	UJ	01A			
CB003	CB3044	Metals	Calcium	J	01A			
CB003	CB3044	Metals	Calcium	J	01A			
CB003	CB3044	Metals	Chromium	J	01A			
CB003	CB3044	Metals	Chromium	J	15	01A		
CB003	CB3044	Metals	Cobalt	J	15	01A		
CB003	CB3044	Metals	Cobalt	UJ	01A			
CB003	CB3044	Metals	Copper	J	01A			
CB003	CB3044	Metals	Copper	UJ	01A			
CB003	CB3044	Metals	Iron	J	01A			
CB003	CB3044	Metals	Iron	J	01A			
CB003	CB3044	Metals	Lead	J	01A			
CB003	CB3044	Metals	Lead	UJ	01A			
CB003	CB3044	Metals	Magnesium	J	01A			
CB003	CB3044	Metals	Magnesium	J	01A			
CB003	CB3044	Metals	Manganese	J	01A			
CB003	CB3044	Metals	Manganese	J	01A			
CB003	CB3044	Metals	Mercury	UJ	01A			
CB003	CB3044	Metals	Mercury	UJ	01A			
CB003	CB3044	Metals	Nickel	J	01A			
CB003	CB3044	Metals	Nickel	UJ	01A			
CB003	CB3044	Metals	Potassium	J	13	01A		
CB003	CB3044	Metals	Potassium	J	13	01A		
CB003	CB3044	Metals	Selenium	J	13	01A		
CB003	CB3044	Metals	Selenium	UJ	01A			
CB003	CB3044	Metals	Silver	UJ	01A			
CB003	CB3044	Metals	Silver	UJ	01A			
CB003	CB3044	Metals	Sodium	J	01A			
CB003	CB3044	Metals	Sodium	J	01A			
CB003	CB3044	Metals	Thallium	UJ	01A			
CB003	CB3044	Metals	Thallium	UJ	01A			
CB003	CB3044	Metals	Vanadium	J	15	01A		
CB003	CB3044	Metals	Vanadium	UJ	01A			
CB003	CB3044	Metals	Zinc	J	13	01A		
CB003	CB3044	Metals	Zinc	J	13	15	01A	

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Summary of Data Validation Qualifiers Assigned and Reason Codes for Qualification
April 2002 Background/Non-Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes [1,2]			
					R1	R2	R3	R4
CB003	CB3044	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B	05B	11A	
CB003	CB3044	Semivolatiles	Chloro-3-methylphenol, 4-	UJ	11A			
CB003	CB3044	Semivolatiles	Chlorophenol, 2-	UJ	11A	11B		
CB003	CB3044	Semivolatiles	Dichlorophenol, 2,4-	UJ	11A			
CB003	CB3044	Semivolatiles	Dimethylphenol, 2,4-	J	11A			
CB003	CB3044	Semivolatiles	Dinitro-2-methylphenol, 4,6-	UJ	11A			
CB003	CB3044	Semivolatiles	Methylphenol, 2-	J	11A			
CB003	CB3044	Semivolatiles	Methylphenol, 4-	J	11A			
CB003	CB3044	Semivolatiles	Nitrophenol, 2-	UJ	11A			
CB003	CB3044	Semivolatiles	Nitrophenol, 4-	R	11A			
CB003	CB3044	Semivolatiles	Pentachlorophenol	R	11A			
CB003	CB3044	Semivolatiles	Phenol	J	11A	11B		
CB003	CB3044	Semivolatiles	Trichlorophenol, 2,4,5-	UJ	11A			
CB003	CB3044	Semivolatiles	Trichlorophenol, 2,4,6-	UJ	11A			
CB003	CB3044	Volatiles	Benzene	J	01A			
CB003	CB3044	Volatiles	Ethylbenzene	J	01A			
CB003	CB3044	Volatiles	Toluene	J	01A			
CB003	CB3044	Volatiles	Acetone	J	04A	05A	05B	15
CB003	CB3044	Volatiles	Butanone, 2-	R	04A	05A		

Footnotes:

(1) Table L-4 defines all reason codes.

(2) Reason code are assigned in order of their importance to the validation qualifiers applied with R1 being most important.

Definitions:

VQ = validation qualifier

Table K-6

Laboratory and Validation Qualifier Definitions
April 2002 Background/Non-Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Qualifier	Definition
Laboratory - Organic	
B	The compound was detected in the sample and in an associated method blank.
G	Elevated reporting limit due to matrix interference.
J	The compound was positively identified; the reported value is an estimated concentration between the method detection limit and the reporting limit.
I	Matrix interference
U	Not detected. The compound was analyzed for, but not detected above the associated reporting limit.
Laboratory - Inorganic	
B	The analyte was positively identified; the reported value is an estimated concentration between the method detection limit and the reporting limit.
J	The compound was detected in the sample and in an associated method blank.
N	Spiked sample recovery not within control limits
U	Not detected. The analyte was analyzed for, but not detected above the associated reporting limit.
Validation - All	
B	The analyte was not detected significantly above the levels found in the associated method blank or field blanks
J	The compound/analyte was positively identified; the reported value is an estimated concentration.
R	Rejected due to severe deficiencies in the analytical process or supporting quality control data. The presence or absence of the compound/analyte cannot be verified.
U	Not detected. The compound/analyte was analyzed for, but not detected above the associated reporting limit.
UJ	Not detected. The associated reporting limit may be inaccurate or imprecise.

Samples with 'nv' denotation have not been validated.

APPENDIX K

DATA QUALITY EVALUATION – July 2002

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List of Acronyms

AR/COC	analysis request/chain of custody
DI	deionized
DQE	data quality evaluation
DQO	data quality objectives
EPA	U.S. Environmental Protection Agency
ID	identification
IT	IT Corporation
LCS	laboratory control sample
MB	material blank or method blank
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NFG	national functional guidelines
PQL	practical quanitation limit
PBOW	Plum Brook Ordnance Works
QA/QC	quality assurance/quality control
SAP	sampling and analysis plan
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
SDG	sample delivery group
SOP	standard operating procedures
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compounds

K.1.0 Introduction

This appendix of the Groundwater Investigation of TNT Areas and Red Water Ponds Report presents results of the quality assurance/quality control (QA/QC) measures implemented for the sampling and analysis activities at the Former Plum Brook Ordnance Works (PBOW) – Sandusky, Ohio. The quality indicators from every aspect of the data collection have been reviewed, and an assessment of the data with regard to project-specific objectives is presented. Successful execution of project-specific objectives and procedures provides strong support for the acceptance of the data generated as adequate for the purpose of evaluating the analytical results from this assessment at PBOW.

Shaw Environmental (formerly IT Corporation) conducted field-sampling activities at PBOW in July 2002. Severn Trent Laboratories in Knoxville, Tennessee and North Canton, Ohio analyzed the project samples. Accutest Laboratories of Orlando, Florida analyzed the field split samples. All data analyzed were reviewed for accuracy and completeness. One hundred percent of the data analyzed were subjected to data validation following guidelines in the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review*, October 1999 (EPA, 1999) and *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, February 1994. The criteria for blank evaluation were based on those detailed in *Region III Modifications to National Functional Guidelines for Organic Data Review* (September 1994) and *Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses,* (April 1993). Data were evaluated against specific criteria to verify the achievement of precision, accuracy, representativeness, completeness and comparability goals established to meet the project data quality objectives (DQO). To verify that these DQOs were met, field measurements, sampling and handling procedures, laboratory analysis and reporting, and all nonconformances and discrepancies in the data were examined to determine compliance with the appropriate and applicable procedures defined in the SAP. The results of this review are presented in the following sections, with all analytical outliers or nonconformances discussed where they occurred.

This report is divided into three subsections. Section K.2.0 discusses the field investigation and QC procedures used during the sampling effort. Section K.3.0 outlines the analytical program and the associated QC activities performed. The final part of this document, Section K.4.0, summarizes the data findings and their overall impact on the usability of the analytical data.

K.2.0 Field Sampling and QC Activities

Shaw Environmental was retained by the U. S. Army Corps of Engineers, Nashville District to conduct investigation and sampling activities at PBOW. Field activities at this site included collection of the background groundwater samples. The collection of these samples along with their associated QA and QC samples are discussed in this section of the Data Quality Evaluation (DQE).

All project and field duplicate samples collected were submitted to STL. Sample shipments from the field were performed under custody and documented using standard Shaw Environmental Analysis Request/Chain of Custody (AR/COC) forms. These forms provided project-specific analytical specifications and QC instructions to the laboratory. A formal COC transfer record was prepared and included with these forms to document custody during sample transportation, storage, and disposition by the laboratory. Table K-1 summarizes the field sample number, location, sample type, date of collection, and sample delivery group for each sample collected. Table K-2 summarizes the detected compounds in the method blanks associated with the PBOW samples.

K.2.1 Trip Blanks

Aqueous samples designated for volatile organic compound (VOC) analysis may be susceptible to contamination by diffusion of organic compounds into the sample container. Trip blanks are analyzed in order to assess the potential for contamination to be introduced to an aqueous volatile sample during transport and handling procedures. A trip blank is a sample of analyte-free deionized (DI) water that is prepared at the laboratory, shipped to the field with sample containers, and returned to the laboratory with the water matrix samples receiving VOC analysis. A trip blank is then analyzed for volatile organics using the same sample preparation and analysis procedures used for the actual field samples. Four trip blank samples were collected.

The data validator applied the 5X-10X rule to the samples for the analytes detected. The following samples were qualified "B" by the data validator indicating that sample results are indicative of blank contamination:

Lot	Sample Affected	Blank Contaminant	Validation

Number			Qualifier
H2G110121	CC3003, CC3009	Acetone	B
	CC3003	Toluene	B
	CC3009	Methylene Chloride	B
H2G120173	CC3005, CC3006	Acetone	B
	CC3006	Bromomethane	B
H2G130120	CC3001, CC3004	2-Butanone	B
	CC3001	Acetone	B

K.2.2 Field Duplicates

Field duplicate samples are collected and submitted to the laboratory for analysis along with their corresponding original sample. The data generated from the analysis of field duplicate samples are used to evaluate the precision of the sample collection and analysis procedures. It is difficult to collect and analyze soil samples in duplicate due to the heterogeneous nature of a soil. High relative percent difference (RPD) between an original sample and its field duplicate may indicate a difference in sample matrix or sample collection rather than true problems with precision of sample analysis. Also, when estimated "J" or nondetected "U" results are reported, there is a potential for increased variability between the primary and duplicate sample results

Field duplicate samples were collected at a frequency of approximately one for every ten samples collected (10 percent). One field duplicate sample was collected during this sampling event. Table K-3 compares the original and field duplicate results and shows the RPDs calculated for those detected compounds. Compounds not presented in the table were not detected in either the original or field duplicate samples. In cases where duplicates were performed and one result is less than the reporting limit, but greater than the method detection limit, the RPD is reported, but should be considered an estimated value.

The acceptance criterion of 30 percent RPD was used to evaluate these sample results. In most cases, original and field duplicate data compared well as demonstrated by the RPDs calculated. RPD is calculated by using the following formula:

$$RPD = \left| \frac{A - B}{(A + B)/2} \right| \quad x \quad 100$$

where:

RPD = relative percent difference
A = original result
B = field duplicate result.

K.2.5 Field Split Samples

Split samples were collected in conjunction with field duplicate samples and sent to Accutest Laboratories. The split samples were submitted to the laboratory for the same analysis as their corresponding field duplicates and original field samples. The split samples are used to determine if data results are reproducible when analyzed by two different laboratories. Results are also evaluated to determine if a contracted laboratory's preparation and analysis procedures are in control and meet the approved method criteria.

Field split samples were collected at a frequency of approximately one for every ten regular samples. One split sample was collected during this sampling event.

Table K-3 compares the original and field split results and shows the RPDs calculated for those detected compounds. Compounds not presented in the table were not detected in either the original or field split samples.

K.3.0 Analytical Program and QC Activities

The project QA/QC program described in the SAP was followed for the collection and laboratory analysis of samples. Each of the analytical methods used require that method-specific QA/QC protocols be followed during sample analysis. These protocols are a critical part of the methods employed and were followed by the laboratory during sample analysis. Specific measures included detailed record keeping procedures, instrument calibrations, and analysis of method blanks, blank spikes, MS/MSD, surrogates, and internal standards. The following SW-846 and USEPA Methods were used to analyze PBOW samples:

Parameter	Method
Volatiles	SW-846 5030/8260B
Semivolatiles	SW-846 3510C/8270C
Nitroaromatic Compounds	SW-846 8330

Metals	SW-846 3005A/6010B/7470A/7471A
Gasoline Range Organics	SW-846 5030/8015B
Diesel Range Organics	SW-846 3580/8015B
Turbidity	EPA 180.1
Alkalinity	EPA 310.1
TOC	SW-846 9060
Hardness	EPA 130.2
Total Dissolved Solids	EPA 160.1
Total Suspended Solids	EPA 160.2
Chloride	EPA 325.2
Total Cyanide	SW-846 9012A
Nitrate	EPA 353.2
Sulfate	EPA 375.4

Appendix I contains validated analytical data summaries for the samples collected during this field investigation. The validator used the QA/QC criteria defined in the SAP to evaluate the data for all parameters for which criteria were provided. If acceptance criteria were not provided in the SAP, the validator used the laboratory-derived acceptance criteria or analytical method criteria to qualify data. Any qualifiers added to these data by the data validator are included in the summaries.

K.3.1 Laboratory QA/QC Procedures

The following sections discuss specific QA/QC protocols required and performed by the laboratory during this investigation.

K.3.1.1 Method/Calibration Blanks

Method blanks are analyzed with each analytical "batch" processed on a per matrix (i.e., soil and water) basis. Method blanks are carried step-wise through the same analytical procedure as their associated field samples including the addition of solvents, surrogate and standard spikes, and reagents as required in the analysis process. The purpose of a method blank is to identify any possible contaminants that may be introduced to the sample as a result of any part of the analytical process. Table K-2 summarizes the compounds detected in associated blanks by lot number. The data validator evaluated all blank data associated with each sample. When estimated or positive concentrations of compounds/analytes were reported in the corresponding field samples, associated samples were evaluated and qualified using the 5X-10X rule.

For some analyses, an initial and continuing calibration blank are performed throughout the run sequence. These blanks verify the presence of carry over contamination for the analytes of interest.

Qualifiers applied to samples based on detects in the method or calibration blanks are summarized below:

Lot Number	Sample Number Affected	Blank Contaminant	Blank	Validation Qualifier
Volatiles				
H2G110121	CC3003, CC3009	Acetone	Method	B
	CC3009	Methylene chloride	Method	B
H2G120173	CC3005, CC3006	Acetone	Method	B
H2G130120	CC3001	Acetone	Method	B
Semivolatiles				
H2G120173	CC3005, CC3006	Bis(2-Ethylexyl)phthalate	Method	B
H2G130120	CC3001, CC3004	Bis(2-Ethylexyl)phthalate	Method	B
Metals				
H2G110121	CC3003, CC3009	Aluminum (dissolved)	Calibration	B
	CB3003	Aluminum (total)	Calibration	B
H2G120173	CC3005, CC3006	Aluminum (dissolved)	Method/Calibration	B
H2G130120	CC3001, CC3004	Aluminum (dissolved)	Method/Calibration	B
	CC3001	Aluminum (total)	Calibration	B
	CC3004	Lead (total)	Calibration	B

K.3.1.2 Matrix Spikes and Laboratory Control Spikes

Two types of spikes were generally performed for all analyses: matrix spikes (MS) and laboratory control samples (LCS). MS compounds are spiked into an aliquot of a field sample. LCS compounds are spiked into a blank matrix. The spiked compounds are representative compounds that are quantified during performance of the method. Recovery of the spiked compound is used as an assessment of analytical accuracy on the sample matrix analyzed. These results are useful in distinguishing sample matrix interferences from analysis interferences through a comparison of MS and LCS recovery data. Often, spikes are performed in duplicate (as an MSD or LCS duplicate). In this manner, the precision of the assessment can be quantified as the RPD of the original and duplicate spike.

Matrix spikes were assigned at a frequency of 1 for every 20 field samples collected. Two MS/MSDs were assigned in the field to sample CB3005. This sample corresponds to location PB-BED-MW25. Additional sample volume was provided to the laboratory for the MS/MSD analyses. This sampling frequency meets the collection criteria for this program as specified in the SAP. In addition to the overall collection frequency, the analytical method requires that the laboratory analyze 1 set of spikes per analytical batch. To comply with this method requirement, the laboratory may have to analyze "batch" QC with a work order. The validator evaluated the "batch" QC. The laboratory statistically determined target acceptance limits were used to assess the spike recovery and RPD.

The MS/MSD criteria were met with the exception of the following, which exhibited % recoveries and/or RPDs outside QC limits:

Lot Number	Sample Number Affected	Compound(s)	Validation Qualifier
Explosives			
H2G120173	CC3005, CC3006	Tetryl	R*
Cyanide			
H2G120173	CC3005	Cyanide	UJ
H2G130120	CC3001, CC3004	Cyanide	UJ

*R -Rejected due to 0% recovery of MS/MSD.

LCS results are used to evaluate lab method performance in the same manner as the MS/MSD results except the LCS is not performed on an actual field sample matrix. A LCS is prepared for each analytical "batch" for each parameter and matrix analyzed.

All LCS recoveries met the established QC criteria.

K.3.1.3 Calibration

Several analytes were qualified because of unacceptable performance in the calibration standards. For specific examples refer to the validation report in Appendix H and Table K-5.

K.3.2 Reporting Limits

Practical quantitation limits (PQL) or RLs, used for this project are those statistically determined by the laboratories. The analytical program executed for this project required the use of SW-846 methods, which specify the procedure for calculating the PQLs presented. Each laboratory is required to demonstrate method performance through method detection limit (MDL) studies for every method employed. These studies are required to be laboratory-specific so that individual laboratory variables such as equipment brands, reagent suppliers, and chemist technique are factored into the performance study. MDLs are established using controlled matrices (i.e., DI water). The PQL calculation adjusts the limit by a predetermined mathematical factor for the analysis of actual environmental sample matrices (i.e. soil, groundwater, etc.). For purposes of clarity and consistency with respect to terminology, the term "reporting limit" has been substituted for PQL when referencing the limit of detection reported by the laboratory for each individual sample and parameter. The actual values reported have been corrected for all necessary dilutions, dryness, and interference factors as applicable based on the resulting analytical data for a sample.

Standard operating procedures (SOP) address MDLs, PQLs, and RLs when dealing with low concentrations of analytes in samples. These limits are generally defined as follows:

- ***MDL.*** The minimum concentration of an analyte that can be determined with 99 percent confidence that the true value is greater than zero.
- ***PQL.*** The lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.
- ***RL.*** This number is equivalent to the PQL.

An MDL is the lower limit at which the laboratory can differentiate a measurement from background. The MDL is determined in accordance with the procedures in 40 CFR Part 136. A PQL, or RL, is the lower limit at which a measurement becomes meaningful. This measurement (the PQL or the RL) is generally a multiple of three to five times the MDL.

All samples were handled and analyzed as expected without significant changes to the anticipated project RLs due to matrix interference or high dilutions.

K.3.3 Holding Times/Preservation

All laboratory results submitted for this investigation have been reviewed with respect to laboratory adherence to extraction and analysis holding times. Maximum sample extraction and analysis hold times were those specified in USACE document EM200-1-3.

All holding time criteria were acceptable for the samples collected.

CC3004 was the only sample qualified due to improper sample preservation. The qualifiers were applied to benzene, toluene and ethylbenzene.

K.4.0 Data Evaluation and Usability

The analytical data review process identified a few analytical nonconformance issues that were noted during this analytical program. These anomalies have been discussed in the previous sections of this appendix. Table K-4 summarizes all compounds requiring qualifier application due to anomalies discovered during data validation. Table K-5 defines the reason codes for qualification and Table K-6 defines the data validation qualifiers.

The following definitions are used for defining precision, accuracy, representativeness, completeness, and comparability as they have been applied to this evaluation.

Precision. Precision is a measurement of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision data were obtained through the analysis and evaluation of duplicate QA samples. Accuracy was determined through the analysis and evaluation of method blanks, LCSs, trip blanks, equipment rinsates, and MS samples.

Accuracy. Accuracy is a measurement of bias in a system and is expressed as a percent recovery. These QA samples were collected and/or analyzed at the frequency established in the SAP, verifying the completeness element of the DQOs along with the evaluation of holding times and reporting limits. Percent recovery is calculated as follows:

$$Percent\ \text{Recov}ery = \left(\frac{(x-s)}{T}\right) * 100$$

Where:

X = the lab determined concentration of a spiked sample

S = the sample native concentration prior to spike

T = the true concentration of the spike

Relative Percent Difference is calculated as follows:

$$\text{Re}lative\ Percent\ Difference = \left[\frac{|D1 - D2|}{\frac{D1 + D2}{2}}\right] * 100$$

Where:

D1 and D2 = the results of duplicate measurements

Representativeness. Representativeness is a qualitative parameter that expresses the degree to which sample data actually represent the matrix and site conditions. For example, in conducting ground water monitoring, representativeness requires proper location of wells and the collection of samples under consistent, documented procedures. Wells are located based upon the results of the hydrological study in progress and are designed to provide maximum coverage of the flow conditions. Requirements and procedures for sample collection and handling are designed to maximize sample representativeness. Representativeness also can be monitored by reviewing field documentation and by performing field audits.

The samples were collected using Shaw Environmental SOPs and were fully documented through the use of standard field forms. Samples are representative of the matrix and site sampled.

Completeness. Completeness is a measure of the amount of valid data that are obtained during a sampling event as compared to the amount of data planned to be collected under optimum conditions. Some data for this project were qualified as estimated in the validation process because of the outliers noted in the MS recoveries, duplicate results for certain elements,

and various other calibration and inductively coupled plasma serial dilution results. A total of 76 data points were qualified as rejected in the validation process due to various QC criteria as described in the previous sections of this report. Completeness is calculated as follows:

$$Completeness\ \% = \left(\frac{D_r}{D_c}\right) X\ 100$$

Where:

D_r = the number of data points for which valid results are reported

D_c = the number of valid samples/data points that are collected and reach the laboratory for analysis.

During this task, 7 background well samples were collected resulting in approximately 1160 targeted analytical records. Less than 1 percent of the data points were rejected due to anomalies discovered during the validation process. Using the above calculation, 99% completeness is achieved for the task.

Comparability. Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability ensures that results for the sampling event can be compared with data from other past and/or future sampling programs. Comparability for this sampling event was achieved through the use of established and recognized techniques and accepted standard EPA methods. All samples collected and analyzed were subjected to the same sampling, handling, preparation, analysis, reporting, and validation criteria for the purpose of achieving comparability goals within the data set.

K.4.1 Statement of Data Usability

The overall results of the analyses, as discussed in this evaluation, suggest that representative samples were collected and analyzed, and the results are indicative of the media analyzed, with the exception of the few anomalies noted. The data do reflect expected site conditions and are usable for their intended purpose.

Tables K-1 through K-6 summarize the analytical program and the results for the data validation effort for all samples collected by Shaw Environmental at PBOW.

Table K-1

Sample Cross-Reference
July 2002 Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Sample Type	Sample Location	Sample Number	Sample Date	Sample Purpose	Lot Number
GW	IT-BG8-BEDGW-001	CC3001	12-JUL-02	REG	H2G130120
GW	IT-MW01	CC3009	10-JUL-02	REG	H2G110121
GW	PB-BED-MW20	CC3003	10-JUL-02	REG	H2G110121
GW	PB-BED-MW24	CC3004	12-JUL-02	REG	H2G130120
GW	PB-BED-MW25	CC3005	11-JUL-02	REG	H2G120173
GW	PB-BED-MW25	CC3006	11-JUL-02	FD	H2G120173
GW	PB-BED-MW25	CC3007	11-JUL-02	FS	F13829

Table K-2

Summary of Analytes Detected in Blanks
July 2002 Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Lot Number	Sample Number	Sample Date	Sample Purpose	Parameter	Result	Units	Lab Qualifier
H2G110121	CC5001	10-JUL-02	TB	Toluene	4.9	µg/L	
H2G110121	CC5001	10-JUL-02	TB	Acetone	3.6	µg/L	J B
H2G110121	CC5001	10-JUL-02	TB	Methylene chloride	17	µg/L	B
H2G110121	E4HXVBW	10-JUL-02	BLK	Acetone	1.3	µg/L	J
H2G110121	E4HXVBW	10-JUL-02	BLK	Methylene chloride	0.57	µg/L	J
H2G110121	E4KG0BW	10-JUL-02	BLK	Thallium	7.1	µg/L	B
H2G110121	E4KG4BW	10-JUL-02	BLK	Thallium	6.2	µg/L	B
H2G110121	E4KG4BW	10-JUL-02	BLK	Selenium	4.0	µg/L	B
H2G120173	CC5002	11-JUL-02	TB	Toluene	4.3	µg/L	
H2G120173	CC5002	11-JUL-02	TB	Bromomethane	0.53	µg/L	J
H2G120173	CC5002	11-JUL-02	TB	Acetone	4.8	µg/L	J B
H2G120173	CC5002	11-JUL-02	TB	Methylene chloride	15	µg/L	B
H2G120173	E4MXRBW	11-JUL-02	BLK	Bis(2-ethylhexyl)phthalate	3.3	µg/L	J
H2G120173	E4NJ8BW	11-JUL-02	BLK	Aluminum	56.9	µg/L	B
H2G130120	CC5005	12-JUL-02	TB	Butanone, 2-	5.1	µg/L	
H2G130120	CC5005	12-JUL-02	TB	Acetone	4.3	µg/L	J B
H2G130120	E4N60BW	12-JUL-02	BLK	Methylene chloride	1.6	µg/L	J
H2G130120	E4N60BW	12-JUL-02	BLK	Acetone	1.2	µg/L	J

Table K-3

Summary of Original, Field Duplicate, and Field Split Results and RPD Calculations
July 2002 Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

		Sample Location:	PB-BED-MW25									Relative Percent Difference between REG and FD	Relative Percent Difference between REG and FS
		Sample No.:	CC3005			CC3006			CC3007				
		Sample Date:	11-Jul-02			11-Jul-02			11-Jul-02				
		Sample Type:	REG			FD			FS				
Parameter	Units	Filtered	Result	Qual	VQ	Result	Qual	VQ	Result	Qual	VQ		
Aluminum	µg/L	N	44.6	B	J	59.8	B	J	492			29.12	166.75
Aluminum	µg/L	Y	97.8	B J	B	105	B J	B	200	U		7.10	68.64
Barium	µg/L	N	164	B	J	167	B	J	200	U		1.81	19.78
Barium	µg/L	Y	160	B	J	162	B	J	200	U		1.24	22.22
Calcium	µg/L	N	183000			188000			191000			2.70	4.28
Calcium	µg/L	Y	187000			172000			194000			8.36	3.67
Cobalt.	µg/L	N	50	U	U	5.2	B	J	50	U		162.32	0.00
Iron	µg/L	N	103			111			704			7.48	148.95
Iron	µg/L	Y	59.8	B	J	65.3	B	J	300	U		8.79	133.52
Magnesium	µg/L	N	69100			71100			73900			2.85	6.71
Magnesium	µg/L	Y	74100			67800			74100			8.88	0.00
Manganese	µg/L	N	95.6			98.3			97.8			2.78	2.28
Manganese	µg/L	Y	94			88.4			93.2			6.14	0.85
Potassium	µg/L	N	11400		J	11900		J	16300			4.29	35.38
Potassium	µg/L	Y	12100		J	11100		J	16100			8.62	28.37
Sodium	µg/L	N	92300			96600			101000			4.55	9.00
Sodium	µg/L	Y	97600			89700			104000			8.44	6.35
Thallium	µg/L	Y	6.4	B	J	10	U	U	10	U		43.90	43.90
Bis(2-ethylhexyl)phthalat	µg/L	N	3	J B	B	3.3	J B	B	5	U		9.52	50.00
Acetone	µg/L	N	1.4	J B	B	1.7	J B	B	50	U		19.35	189.11
Bromomethane	µg/L	N	2	U	U	0.35	J	B	2	U		140.43	0.00
Butanone, 2-	µg/L	N	5	U	U	1.7	J	J	10	U		98.51	66.67
Carbon disulfide	µg/L	N	0.17	J	J	1	U	U	2	U		141.88	168.66

Table K-4

Summary of Data Validation Reason Codes
July 2002 Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Reason Code	Description
01	Sample received outside of 4+/-2 degrees Celsius
01A	Improper sample preservation
02	Holding Time Exceeded
02A	Extraction
02B	Analysis
03	Instrument Performance - Outside Criteria
03A	BFB
03B	DFTPP
03C	DDT and/or Endrin % breakdown exceeds criteria
03D	retention time windows
03E	Resolution
04	Initial Calibration results outside specified criteria
04A	Compound mean RRF<0.05
04B	Compound %RSD>30
04C	Correlation Coefficient<0.995
05	Continuing Calibration results outside specified criteria
05A	Compound mean RRF<0.05
05B	Compound %D>25
06	Result qualified as a result of the 5x/10x blank correction
06A	Method or Preparation Blank
06B	ICB or CCB
06C	ER
06D	TB
06E	FB
07	Surrogate Recoveries outside control limits
07A	Sample
07B	Associated method blank or LCS
08	MS/MSD/Duplicate results outside criteria
08A	MS and/or MSD recovery not within control limits (accuracy)
08B	%RPD outside acceptance criteria (precision)
09	Post Digestion Spike outside criteria (GFAA)
10	Internal Standards outside specified control limits
10A	Recovery
10B	Retention Time
11	Laboratory Control Sample recoveries outside specified control limits
11A	Recovery
11B	%RPD (if run in duplicate)
12	Interference Check Standard
13	Serial Dilution
14	Tentatively Identified Compounds
15	Quantitation
16	Multiple results available; alternate analysis preferred
17	Field duplicate RPD criteria exceeded
18	Percent difference between original and second column > 25%
19	Professional judgement was used to qualify the data
20	Pesticide clean-up checks
21	Target compound identification
22	Radiological calibration
23	Radiological quantitation
24	Reported result and/or lab qualifier revised to reflect validation findings
999	See hard copy for details.

Table K-5

Summary of Data Validation Qualifiers Assigned and Reason Codes for Qualification
July 2002 Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes (1,2) R1	R2	R3	R4
H2G110121	CC3003	Metals	Aluminum	B	06B	15		
H2G110121	CC3003	Metals	Aluminum	B	06B	15		
H2G110121	CC3003	Metals	Potassium	J	13			
H2G110121	CC3003	Metals	Potassium	J	13			
H2G110121	CC3003	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B			
H2G110121	CC3003	Semivolatiles	Hexachlorocyclopentadiene	UJ	04B			
H2G110121	CC3003	Semivolatiles	Methylnaphthalene, 2-	UJ	05B			
H2G110121	CC3003	Volatiles	Bromoform	UJ	05B			
H2G110121	CC3003	Volatiles	Carbon tetrachloride	UJ	05B			
H2G110121	CC3003	Volatiles	Dichloropropene, trans-1,3-	UJ	05B			
H2G110121	CC3003	Volatiles	Acetone	B	06A	06D	15	
H2G110121	CC3003	Volatiles	Toluene	B	06D	15		
H2G110121	CC3009	Metals	Aluminum	B	06B	15		
H2G110121	CC3009	Metals	Potassium	J	13			
H2G110121	CC3009	Metals	Potassium	J	13			
H2G110121	CC3009	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B			
H2G110121	CC3009	Semivolatiles	Hexachlorocyclopentadiene	UJ	04B			
H2G110121	CC3009	Semivolatiles	Methylnaphthalene, 2-	UJ	05B			
H2G110121	CC3009	Volatiles	Bromoform	UJ	05B			
H2G110121	CC3009	Volatiles	Carbon tetrachloride	UJ	05B			
H2G110121	CC3009	Volatiles	Dichloropropene, trans-1,3-	UJ	05B			
H2G110121	CC3009	Volatiles	Acetone	B	06A	06D	15	
H2G110121	CC3009	Volatiles	Methylene chloride	B	06A	06D	15	
H2G120173	CC3005	Cyanide	Cyanide, total	UJ	08A	08B		
H2G120173	CC3005	Explosives	Tetryl	R	08A			
H2G120173	CC3005	Metals	Aluminum	B	06A	06B	15	
H2G120173	CC3005	Metals	Potassium	J	13			
H2G120173	CC3005	Metals	Potassium	J	13			
H2G120173	CC3005	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B			
H2G120173	CC3005	Semivolatiles	Hexachlorocyclopentadiene	UJ	04B			
H2G120173	CC3005	Semivolatiles	Bis(2-ethylhexyl)phthalate	B	06A	15		
H2G120173	CC3005	Volatiles	Bromoform	UJ	05B			
H2G120173	CC3005	Volatiles	Carbon tetrachloride	UJ	05B			
H2G120173	CC3005	Volatiles	Dichloropropene, trans-1,3-	UJ	05B			
H2G120173	CC3005	Volatiles	Acetone	B	06A	06D	15	
H2G120173	CC3006	Explosives	Tetryl	R	08A			
H2G120173	CC3006	Metals	Aluminum	B	06A	06B	15	
H2G120173	CC3006	Metals	Potassium	J	13			
H2G120173	CC3006	Metals	Potassium	J	13			
H2G120173	CC3006	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B			
H2G120173	CC3006	Semivolatiles	Hexachlorocyclopentadiene	UJ	04B			
H2G120173	CC3006	Semivolatiles	Bis(2-ethylhexyl)phthalate	B	06A	15		
H2G120173	CC3006	Volatiles	Bromoform	UJ	05B			
H2G120173	CC3006	Volatiles	Carbon tetrachloride	UJ	05B			

Table K-5

Summary of Data Validation Qualifiers Assigned and Reason Codes for Qualification
July 2002 Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Lot Number	Sample Number	Analysis	Parameter	VQ	Reason Codes (1,2)			
					R1	R2	R3	R4
H2G120173	CC3006	Volatiles	Dichloropropene, trans-1,3-	UJ	05B			
H2G120173	CC3006	Volatiles	Acetone	B	06A	06D	15	
H2G120173	CC3006	Volatiles	Bromomethane	B	06D	15		
H2G130120	CC3001	Cyanide	Cyanide, total	UJ	08A			
H2G130120	CC3001	Metals	Aluminum	B	06A	06B	15	
H2G130120	CC3001	Metals	Aluminum	B	06B	15		
H2G130120	CC3001	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B			
H2G130120	CC3001	Semivolatiles	Hexachlorocyclopentadiene	UJ	04B			
H2G130120	CC3001	Semivolatiles	Methylnaphthalene, 2-	UJ	05B			
H2G130120	CC3001	Semivolatiles	Bis(2-ethylhexyl)phthalate	B	06A	15		
H2G130120	CC3001	Volatiles	Bromoform	UJ	05B			
H2G130120	CC3001	Volatiles	Dichloropropene, trans-1,3-	UJ	05B			
H2G130120	CC3001	Volatiles	Acetone	B	06A	06D	15	
H2G130120	CC3001	Volatiles	Butanone, 2-	B	06D	15		
H2G130120	CC3004	Cyanide	Cyanide, total	UJ	08A			
H2G130120	CC3004	Metals	Aluminum	B	06A	06B	15	
H2G130120	CC3004	Metals	Lead	B	06B			
H2G130120	CC3004	Semivolatiles	Dinitrophenol, 2,4-	UJ	04B			
H2G130120	CC3004	Semivolatiles	Hexachlorocyclopentadiene	UJ	04B			
H2G130120	CC3004	Semivolatiles	Methylnaphthalene, 2-	J	05B			
H2G130120	CC3004	Semivolatiles	Bis(2-ethylhexyl)phthalate	B	06A	15		
H2G130120	CC3004	Volatiles	Benzene	J	01A			
H2G130120	CC3004	Volatiles	Ethylbenzene	J	01A			
H2G130120	CC3004	Volatiles	Toluene	J	01A			
H2G130120	CC3004	Volatiles	Bromoform	UJ	05B			
H2G130120	CC3004	Volatiles	Dichloropropene, trans-1,3-	UJ	05B			
H2G130120	CC3004	Volatiles	Butanone, 2-	B	06D			

Table K-6

Laboratory and Validation Qualifier Definitions
July 2002 Background Wells
Former Plum Brook Ordnance Works, Sandusky, Ohio

Qualifier	Definition
Laboratory - Organic	
B	The compound was detected in the sample and in an associated method blank.
G	Elevated reporting limit due to matrix interference.
J	The compound was positively identified; the reported value is an estimated concentration between the method detection limit and the reporting limit.
I	Matrix interference
U	Not detected. The compound was analyzed for, but not detected above the associated reporting limit.
Laboratory - Inorganic	
B	The analyte was positively identified; the reported value is an estimated concentration between the method detection limit and the reporting limit.
J	The compound was detected in the sample and in an associated method blank.
N	Spiked sample recovery not within control limits
U	Not detected. The analyte was analyzed for, but not detected above the associated reporting limit.
Validation - All	
B	The analyte was not detected significantly above the levels found in the associated method blank or field blanks
J	The compound/analyte was positively identified; the reported value is an estimated concentration.
R	Rejected due to severe deficiencies in the analytical process or supporting quality control data. The presence or absence of the compound/analyte cannot be verified.
U	Not detected. The compound/analyte was analyzed for, but not detected above the associated reporting limit.
UJ	Not detected. The associated reporting limit may be inaccurate or imprecise.

Samples with 'nv' denotation have not been validated.

APPENDIX L

BACKGROUND SUMMARY STATISTICS FOR GROUNDWATER

Appendix L

Methods Related to the Evaluation of Background Former Plum Brook Ordnance Works

This appendix describes the methods to be used in the evaluation of potentially background-related contributions to site groundwater, as referenced in Section 5.4.2 of the 2002 Groundwater Data Evaluation and Summary Report. Section L.1 describes the methodology and theory behind the derivation of PBOW background screening concentrations (BSC). Section L.2 discusses the use of statistical population testing. Various aspects of geochemical analysis are described in Section L.3, and spatial evaluation is discussed in Section L.4. Potentially background-related organics are discussed in Section L.5. Note that Sections L.2 through L.4 may potentially apply to organics as well as inorganics. Section L.6 provides a discussion of wells that have been and/or may be included as sampling locations for the finalized background data set.

Analytical data may have associated qualifiers. Data will be used in the evaluation of background following the protocol consistent with baseline human health risk assessments (BHHRA) performed for other PBOW sites. Nonqualified and estimated (i.e., "J") values will used directly in the evaluation of background. Rejected (i.e., "R") and blank contaminated (i.e., "B") will not be used. For nondetects (i.e., "U"), the chemical is assumed to be present at one-half the detection limit, unless the chemical is not detected in any of the site samples in which case it is regarded as not present in background above the detection limit. In the BHHRA, background data will be presented in summary tables and will be accompanied by an appendix and/or appendices that contains the information in the following subsections.

L.1 Derivation of Background Screening Concentrations

The use of BSC for inorganics is discussed in Section 5.4.2 of the 2002 Groundwater Data Evaluation and Summary Report. The text states that for each inorganic detected in the background data set, the maximum detected concentration (MDC) or the upper tolerance limit on the 95th percentile (UTL), whichever is less, will be used as the BSC for that analyte. This Appendix section describes the concept and methodology employed to calculate the UTL. Note that BSC apply only to inorganics.

The UTL will be derived from the Chebychev inequality (EPA, 1997) which is shown in Equation L.1. This inequality holds over all distributions with finite mean and variance.

$$\Pr\left(\left|\frac{X-\mu}{\sigma}\right| \geq b\right) \leq \frac{1}{b^2} \qquad \text{Eq. L.1}$$

Where:

Pr	=	probability
X	=	random sample from a population
μ	=	population mean
σ	=	standard deviation
b	=	function of the probability

The Chebychev UTL is calculated based on the mean and standard deviation of the sample as shown in Equation L.1. Let μ denote the mean and σ the standard deviation of the distribution from which the X observations are taken. By the Chebychev inequality: setting $1/b^2 = 0.05$, then $b = \sqrt{20}$, which is approximated by 4.47. This indicates that the interval $[\mu - 4.47\sigma, \mu + 4.47\sigma]$ holds at least 95 percent of the probability of the distribution. Therefore, $\mu + 4.47\sigma$ is an upper bound for the 95th percentile. The calculated 95th UTL is in some cases larger than the MDC, especially if relatively few background samples (e.g., <30) are in the data set and/or the upper end of the distribution is not well defined by the data.

It is noted that BSC values are used for screening and are only a preliminary determination as to the classification of site-relatedness for an inorganic constituent; the exceedance of a BSC indicates only that further evaluation is warranted in the BHHRA. The first step of this further evaluation is the population testing described in Section L.2. It is also emphasized that BSCs are not developed for organic compounds, even those which may be associated with background (refer to Section L.5).

L.2 Statistical Population Testing

Statistical population testing may be performed in cases where the site MDC exceeds the BSC. Population testing is not necessary for site data sets whose results indicate obvious site-related contamination; such data sets may be judged as exceeding background without needlessly expending the effort to perform a statistical analysis. Also, population testing may not be necessary for those data sets whose MDC marginally exceeds the MDC, but whose analytical data (as evidenced by a data summary information including mean, standard deveiation, and frequency of detection) do not exceed those of background.

The Wilcoxon rank-sum test (WRS), also known as the Mann-Whitney U test, will be used for population testing because it is independent of distribution type and in many cases has greater statistical power than parametric tests such as the t-test for independent samples, which can be run only on two normally or two lognormally distributed populations (StatSoft, 1995). Further statistical population comparison may be performed on a case-by-case basis, depending on specific data set characteristics such as the detection frequencies of the two data sets (i.e., site and background), magnitude of site detections versus background, and spatial variability (Section L.4) of the two data sets.

L.3 Geochemical Analysis

Geochemical characteristics of the site groundwater are evaluated as a matter of course in the remedial investigation. Pertinent geochemical characteristics of site groundwater may be evaluated with respect to background groundwater. These may include parameters such as total dissolved solids, total suspended solids, pH, and dissolved oxygen. Also, filtered versus unfiltered analytical results may be compared to differentiate between the inorganic analytes that are likely to be transported with groundwater flow through the aquifer material and those that may not. A geochemical analysis is generally performed for inorganics, but groundwater impact of organics may effect aquifer conditions (e.g., pH, dissolved oxygen [DO]) that result in changes in concentrations of inorganics dissolved in groundwater. Also, as mentioned in Section L.5, petroliferous shale may be a source of polynuclear aromatic hydrocarbons (PAH), benzene, toluene, ethylbenzene, and xylene (BTEX) in groundwater. Natural reducing conditions associated with the petroliferous shale could also result in higher concentrations of certain inorganics.

A geochemical analysis may also consider the impact of sorption of certain trace inorganics to suspended "clays" (i.e., clay minerals, hydrous aluminum oxides, and aluminum hydroxides) and "iron oxides" (i.e., iron oxide, iron hydroxide, and iron oxyhydroxide). The presence of suspended clays or iron oxides in groundwater samples has particular importance in the interpretation of trace element concentrations. Most clay particles maintain a negative surface charge under neutral pH conditions, and have a strong tendency to adsorb positively charged (cationic) aqueous species, such as barium, lead, and zinc. Iron oxides display the opposite behavior, maintaining a positive surface charge under neutral pH conditions, and have a strong tendency to adsorb negatively charged (anionic) aqueous species, such as arsenic, selenium, and vanadium. Under neutral pH, aluminum concentrations exceeding approximately 1 milligrams per liter (mg/L) (1000 micrograms per liter [μg/L]) indicate the presence of suspended clays. Likewise, under neutral pH and moderate-to-oxidizing redox conditions, aluminum and iron

concentrations exceeding approximately 1 mg/L (1000 μg/L) are indicative of suspended iron oxides.

L.4 Spatial Evaluation

Spatial evaluation of groundwater should be considered for the evaluation of both organic and inorganic chemicals, as appropriate, and may be performed in conjunction with a statistical and/or geochemical evaluation. A spatial evaluation may be performed where specific areas of chemicals of potential concern exhibit relatively high concentrations and may be necessary even when the WRS statistical test (which) indicates that site concentrations do not exceed background; note that the WRS is nonparametric and does not consider absolute magnitude on the detected concentrations. With respect to background, a spatial evaluation may provide information to indicate whether an apparently elevated concentration on site might in fact be related to background. Also, the spatial evaluation may suggest the presence of a hot spot; it may be expedient to perform some of the above comparisons to background (e.g., statistical) excluding the hot spot, presuming that remediation or an informed site management decision is made regarding the hot spot.

L.5 Potentially Background-Related Organics

Detected organics, including PAHs and BTEX compounds, will not be screened out of the BHHRA on the basis of background concentrations. Instead, compounds with concentrations exceeding risk-based screening concentrations (RBSC) will be carried through the BHHRA. Further evaluation will be performed if the presence of these compounds is shown to contribute significantly to risk.

As mentioned in Section L.3, PAHs and BTEX detected in site groundwater may be at least partially attributable to background sources. Petroliferous shale formations, including the Delaware Limestone, underlie the site. In the general vicinity of PBOW, quarries mine limestone from the Delaware; traces of natural petroleum-derived BTEX and hydrogen sulfide (indicative of reducing conditions associated with petroleum) are common in these quarries. Further, oil wells are actively producing in Erie County. These wells are reportedly pumping from the Delaware Limestone and Columbus Limestone (Swinford, 2002).

As part of the remedial investigation (RI), a spatial evaluation of BTEX and PAHs will be performed for site and background groundwater. Vertical correlation—especially with regard to lithologic unit—will be considered as well as horizontal correlation, utilizing multiple lines of evidence. Existing information will be gathered, as available, concerning regional variations,

again, with respect to lithologic units. As part of this evaluation, the monitoring wells may be evaluated for hydrogen sulfide content. Site versus background statistical population testing may also be applied if applicable.

It is anticipated that the results of the study will have to be interpreted qualitatively as well as quantitatively, and that it will yield no obvious "bright-line" concentration that will unequivocably define the contribution of background sources. Instead, the intent is that information from this background evaluation of PAHs and BTEX be used to facilitate informed site management agreements.

L.6 Discussion of Background Monitoring Well Locations

As mentioned, the background data set has not yet been finalized. This is because some of the wells installed to monitor regional background groundwater at PBOW have yielded results that may not be consistent with background conditions. The following wells have been designated as background wells:

- IT-MW01
- IT-BG8-BEDGW-001
- PB-BED-MW20
- PB-BED-MW24
- PB-BED-MW25
- PB-BED-MW26.

Table 6-21 (Volume 1) presents analytical results of the background monitoring wells. Of these, IT-MW01 is an overburden well and should not be used to evaluate the bedrock aquifer. It was agreed during the September 11, 2002 teleconference that monitoring well PB-BED-MW26 should be removed from the background data set because it had basically been dry since installation in September 2001, had never been properly developed, and the single (unfiltered) metals sample collected exhibited significantly higher levels of metals compared to background wells. Monitoring well PB-BED-MW-24 probably should not be included because based on groundwater flow data to date, it is possible that this well may not be an upgradient (background) well. Monitoring wells PB-BED-MW20 and PB-BED-MW25 would appear to be background wells based on their locations, but trace levels of nitroaromatics compounds were detected in these wells, casting some doubt on their representativeness for use as background; it is noted that the low levels of nitroaromatics detected in these latter two wells (less than 1 µg/L total nitroaromatics) are unlikely to affect the behavior of background inorganics in groundwater and the associated matrix.

APPENDIX M

TELECONFERENCE NOTES ON BTEX IN QUARRY
E-MAIL MESSAGE ON ACTIVE OIL/GAS FIELD

INTERNATIONAL TECHNOLOGY CORPORATION

RECORD OF ☒ TELECON ☐ MEETING

Project Name	Number	Phase	Task	Subtask
PBOW				

Date 11/18/98 Time 1315

CALL FROM ☒ CALL TO ☐ NAME: DAVID Kessler

Other Participants — Name/Location/Representing:

CALL FROM ☐ CALL TO ☒ NAME: Martin Jones (V.P.)

Telephone Number: 419-625-8141

Company Name: Wagoner Quarry

Address:

Topic BTEX in Bedrock

City Sandusky

State OH Zip Code

Summary (Decisions & Specific Actions Required by Named Persons):

Inquired about H_2S and BTEX in bedrock.

Martin Jones (VP-mechincal Engineer) said that the BTEX and H_2S in the bedrock is all natural. Very common in the limestone in the area. Hydrogen sulfide is particularly noticed from zones (in the quarry) around depths of ~90-120 ft and 130-160 ft. Oil can be found (in the area) in the limestone at the surface all the way to the base of the limestone. The organics are very common throughout this entire region. LCW levels are seen as far away as Sandusky Rocks Co. (near intersection of Rt 4 and turnpike)

Required Action:

Prepared by (Signature): David Kessler

Distribution:
Original to Project File
Copy to Project Manager
Copy to Preparer

☒ Other Distribution (By Preparer)
Mike Springberg, Rick Ellis
Mike Gunderson,

PAGE ___ OF ___

548A-8-87

Kessler, Dave

Subject: RE: Erie County limestone

From: "Swinford, Mac" <Mac.Swinford@dnr.state.oh.us>
To: "'djkessler1@juno.com'" <djkessler1@juno.com>
Date: Thu, 29 Aug 2002 09:55:04 -0400
Subject: Erie County limestone
Message-ID:
<83E473D76ECF8240B3F513CE308CA9E8C8156C@nrxchg2.dnr.state.oh.us>

David Kessler:

There is an actively producing oil and gas field producing from the Delaware
Limestone and the underlying Columbus Limestone in Florence and Berlin Townships, Erie County. Information on the individual wells are on file here at the Ohio Geological Survey. We also have maps depicting the general
outline of the fields in this area. Please call Ron Riley 614-265-6573 for
this information.

Regional, the Columbus and to a lesser extent the Delaware Limestone commonly can have a slight to moderate petroleum smell and may have a sulfur odor.

If you require additional information please contact me.

Thank you,
Mac Swinford
Geologist and Supervisor,
Geologic Mapping Group
ODNR, Division of Geological Survey
614-265-6473
e-mail: mac.swinford@dnr.state.oh.us

APPENDIX N

RECHARGE CALCULATIONS

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NASHVILLE C.O.E.	~~773256~~ 825636

SUBJECT: CALCULATION OF MONTHLY RUNOFF @ PLUMBROOK ORDNANCE WORKS

BASED ON: SOIL CONSERVATION SERVICE TECH RELEASE #55, JUNE 1986 / ERIE COUNTY SOIL SURVEY REPORT OF PROGRESS, 1994 BY OHIO DEPT. OF NAT. RESOURCES

BY	CHECKED BY	APPROVED BY	DATE
LR ELLIS	Jane Li		1/12/98

* Information updated February 2002.

CALCULATION ASSUMPTIONS:

1. RUNOFF EQUATION FOR A STORM EVENT CAN BE USED FOR MONTHLY RUNOFF RATES

2. LAND USES CAN BE LARGELY DEFINED BY USING AN AERIAL PHOTO

3. THE SOIL NAMES IN THE 1994 ERIE COUNTY PROGRESS REPORT (FOR THE ERIE COUNTY SOIL SURVEY) CAN BE USED FOR CHARACTERIZATION OF THE ~~CN NUMBE~~ HYDROLOGIC SOIL GROUP (e.g. THE NAMES PEWAMO & BENNINGTON [IN THE PEWAMO-BENNINGTON ASSOC] CAN BE LOOKED UP & THOSE TWO ARE CHARACTERISTIC OF THE WHOLE ASSOCIATION) – SEE ~~ATTACHED~~ DKK Attachment 1 ~~ERIE COUNTY REPORT~~ DKK

Eq.1 $$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

Eq.2 $$S = 1000/CN - 10$$

Eq.3 $$I_a = 0.2S$$

Q = RUNOFF IN INCHES
P = RAINFALL IN INCHES
S = POTENTIAL MAXIMUM RETENTION AFTER RAINFALL BEGINS (INCHES)
I_a = INITIAL ABSTRACTION (INCHES) [WHICH IS ALL LOSSES BEFORE RUNOFF BEGINS]
CN = CURVE NUMBER [OBTAINED BY FIRST GETTING THE HYDROLOGIC NUMBER FOR EACH SOIL TYPE ON SCS TECH REPT TABLE 2.2a, THEN USING IT ON TABLE 2.2.

NOTES

* SEE CALC. SHEET 2 OF 5 FOR DERIVATION OF CN

* SEE ATTACHED EXCEL SPREADSHEET FOR MONTHLY RUNOFF CALCULATIONS USING $Q = \frac{(P - 0.2S)^2}{(P + 0.8S)}$

INTERNATIONAL TECHNOLOGY CORPORATION

By Rick Ellis Date 1/8/99 Subject Determining CN for PBOW Soil for Runoff Calc. Sheet No. 2 of 5

Chkd. By J. Li Date 1/12/99 Proj. No.

USE TO YIELD THIS w/ TECH RPT 55

Soil Name	General Location	Approx. Percentage PBOW of Site		Approx Curve No (Rounded)		Land Use	Hydrol. Soil Group
		Assoc	Each	Assoc	Each		
Pewamo-Bennington Assoc.	Extreme Southeast & Extreme Northeast	1/5		75		Thinly Wooded	
Pewamo					80		C/D
Bennington					70		C
Horatio-Fries-Colwood Assoc.	Central	1/2		75		1/2 Open Spaces (Good Cover); 1/2 Wooded (Good Cover)	
Horatio					80		D
Fries					77		D
Colwood					66		B/D
Castalia-Millsdale-Milton-Ritchey Assoc.	North-Central (West to East Strip)	1/10		75		2/3 Open Spaces (Good Cover); 1/3 Wooded (Good Cover)	
Castalia					74		C
Millsdale					70		B/D
Milton					74		C
Ritchey					80		D
Kibbie-Elnora-Tuscola-Colwood Assoc.	North-Western Portion of Site	1/5		58		Wooded (Good Cover)	
Kibbie					55		B
Elnora					55		B
Tuscola					55		B
Colwood					66		B/D
			Total Avg CN	72			

108-10-85

Month	Rain (P)	*Ia*	*S*	*Curve Number (CN)*	Runoff (Q)	Evapo-transpir- ation (E)	Evapo*0.6 (E est.)	Monthly Rechge
	From Sandusky, OH rain gauge	*Ia=0.2S*	*S=1000/CN-10*	*(see Table in Appendix ??)*	Q=(P-0.2S)^2 /P+0.8S	(From National Weather Service (Cleveland)	Estimated	R = P-Q- E est
Jan-94	2.33	0.78	3.89	72	0.44	0.6	0.36	**1.53**
Feb-94	1.09	0.78	3.89	72	0.02	1.5	0.90	**0.17**
Mar-94	1.48	0.78	3.89	72	0.11	2.3	1.38	**-0.01**
Apr-94	2.62	0.78	3.89	72	0.59	5	3.00	**-0.97**
May-94	1.92	0.78	3.89	72	0.26	5	3.00	**-1.34**
Jun-94	4.86	0.78	3.89	72	2.09	6	3.60	**-0.83**
Jul-94	1.38	0.78	3.89	72	0.08	5.9	3.54	**-2.24**
Aug-94	2.83	0.78	3.89	72	0.71	4.7	2.82	**-0.70**
Sep-94	2.83	0.78	3.89	72	0.71	4	2.40	**-0.28**
Oct-94	1.46	0.78	3.89	72	0.10	2.7	1.62	**-0.26**
Nov-94	2.38	0.78	3.89	72	0.47	2.1	1.26	**0.65**
Dec-94	2.1	0.78	3.89	72	0.34	0.6	0.36	**1.40**
Jan-95	3.22	0.78	3.89	72	0.94	0.6	0.36	**1.92**
Feb-95	0.82	0.78	3.89	72	0.00	1	0.60	**0.22**
Mar-95	1.39	0.78	3.89	72	0.08	2.3	1.38	**-0.07**
Apr-95	4.28	0.78	3.89	72	1.66	3.3	1.98	**0.64**
May-95	4.2	0.78	3.89	72	1.60	4.9	2.94	**-0.34**
Jun-95	2.48	0.78	3.89	72	0.52	5.2	3.12	**-1.16**
Jul-95	6.77	0.78	3.89	72	3.63	6.2	3.72	**-0.58**
Aug-95	3.68	0.78	3.89	72	1.24	5.1	3.06	**-0.62**
Sep-95	1.25	0.78	3.89	72	0.05	3.9	2.34	**-1.14**
Oct-95	3.84	0.78	3.89	72	1.35	2.9	1.74	**0.75**
Nov-95	2.6	0.78	3.89	72	0.58	1.4	0.84	**1.18**
Dec-95	1.09	0.78	3.89	72	0.02	NA	NA	**NA**
Jan-96	1.27	0.78	3.89	72	0.06	0.7	0.42	**0.79**
Feb-96	1	0.78	3.89	72	0.01	0.7	0.42	**0.57**
Mar-96	2.04	0.78	3.89	72	0.31	1.7	1.02	**0.71**
Apr-96	4.39	0.78	3.89	72	1.74	3.3	1.98	**0.67**
May-96	2.25	0.78	3.89	72	0.40	4.3	2.58	**-0.73**
Jun-96	4.66	0.78	3.89	72	1.94	5.4	3.24	**-0.52**
Jul-96	3.72	0.78	3.89	72	1.27	5.6	3.36	**-0.91**
Aug-96	0.4	0.78	3.89	72	0.04	5.1	3.06	**-2.70**
Sep-96	6.5	0.78	3.89	72	3.41	3.1	1.86	**1.23**
Oct-96	2.37	0.78	3.89	72	0.46	2.1	1.26	**0.65**
Nov-96	1.94	0.78	3.89	72	0.27	0.8	0.48	**1.19**
Dec-96	3.35	0.78	3.89	72	1.02	0.5	0.30	**2.03**
Jan-97	1.65	0.78	3.89	72	0.16	0.6	0.36	**1.13**
Feb-97	3.29	0.78	3.89	72	0.99	1	0.60	**1.70**
Mar-97	3.04	0.78	3.89	72	0.83	1.6	0.96	**1.25**
Apr-97	1.62	0.78	3.89	72	0.15	3	1.80	**-0.33**
May-97	5.19	0.78	3.89	72	2.34	3.9	2.34	**0.51**
Jun-97	6.79	0.78	3.89	72	3.65	5.2	3.12	**0.02**
Jul-97	2.26	0.78	3.89	72	0.41	4.9	2.94	**-1.09**
Aug-97	4.23	0.78	3.89	72	1.62	3.2	1.92	**0.69**

Month	Rain (P)	*Ia*	*S*	*Curve Number (CN)*	Runoff (Q)	Evapo-transpir- ation (E)	Evapo*0.6 (E est.)	Monthly Rechge
	From Sandusky, OH rain gauge	*Ia=0.2S*	*S=1000/CN-10*	*(see Table in Appendix ??)*	Q=(P-0.2S)^2 /P+0.8S	(From National Weather Service (Cleveland)	Estimated	R = P-Q- E est
Sep-97	4.11	0.78	3.89	72	1.54	2.8	1.68	**0.89**
Oct-97	1.58	0.78	3.89	72	0.14	2.3	1.38	**0.06**
Nov-97	2.24	0.78	3.89	72	0.40	0.9	0.54	**1.30**
Dec-97	1.95	0.78	3.89	72	0.27	0.3	0.18	**1.50**
Jan-98	3.85	0.78	3.89	72	1.36	0.4	0.24	**2.25**
Feb-98	2.67	0.78	3.89	72	0.62	0.5	0.30	**1.75**
Mar-98	3.45	0.78	3.89	72	1.09	1.9	1.14	**1.22**
Apr-98	1.62	0.78	3.89	72	0.15	2.6	1.56	**-0.09**
May-98	5.19	0.78	3.89	72	2.34	3.9	2.34	**0.51**
Jan-98	3.85	0.78	3.89	72	1.36	0.4	0.24	**2.25**
Feb-98	2.67	0.78	3.89	72	0.62	0.45	0.27	**1.78**
Mar-98	3.45	0.78	3.89	72	1.09	1.9	1.14	**1.22**
Apr-98	5.56	0.78	3.89	72	2.64	2.6	1.56	**1.36**
May-98	0.68	0.78	3.89	72	0.00	3.9	2.34	**-1.66**
Jun-98	3.71	0.78	3.89	72	1.26	4.1	2.46	**-0.01**
Jul-98	5.11	0.78	3.89	72	2.28	4.9	2.94	**-0.11**
Aug-98	4.91	0.78	3.89	72	2.13	4.2	2.52	**0.26**
Sep-98	1.18	0.78	3.89	72	0.04	3.6	2.16	**-1.02**
Oct-98	1.46	0.78	3.89	72	0.10	2.1	1.26	**0.10**
Nov-98	1.21	0.78	3.89	72	0.04	1.5	0.90	**0.27**
Dec-98	1.09	0.78	3.89	72	0.02	0.8	0.48	**0.59**
Jan-99	2.81	0.78	3.89	72	0.70	0.5	0.30	**1.81**
Feb-99	1.33	0.78	3.89	72	0.07	0.9	0.54	**0.72**
Mar-99	1.83	0.78	3.89	72	0.22	2	1.20	**0.41**
Apr-99	4.51	0.78	3.89	72	1.83	2.43	1.46	**1.22**
May-99	1.81	0.78	3.89	72	0.22	4.3	2.58	**-0.99**
Jun-99	1.72	0.78	3.89	72	0.18	4.8	2.88	**-1.34**
Jul-99	2.83	0.78	3.89	72	0.71	5.5	3.30	**-1.18**
Aug-99	2.48	0.78	3.89	72	0.52	4	2.40	**-0.44**
Sep-99	1.59	0.78	3.89	72	0.14	3.7	2.22	**-0.77**
Oct-99	2.2	0.78	3.89	72	0.38	2.5	1.50	**0.32**
Nov-99	2.84	0.78	3.89	72	0.71	1.7	1.02	**1.11**
Dec-99	2.11	0.78	3.89	72	0.34	0.8	0.48	**1.29**
Jan-00	1	0.78	3.89	72	0.01	0.6	0.36	**0.63**
Feb-00	1.21	0.78	3.89	72	0.04	0.9	0.54	**0.63**
Mar-00	2.26	0.78	3.89	72	0.41	2	1.20	**0.65**
Apr-00	2.4	0.78	3.89	72	0.48	2.1	1.26	**0.66**
May-00	6.12	0.78	3.89	72	3.09	3.5	2.10	**0.93**
Jun-00	8.32	0.78	3.89	72	4.98	3.7	2.22	**1.12**
Jul-00	5.31	0.78	3.89	72	2.44	3.5	2.10	**0.77**
Aug-00	4.69	0.78	3.89	72	1.96	3.5	2.10	**0.63**
Sep-00	5.05	0.78	3.89	72	2.24	3	1.80	**1.01**
Oct-00	1.93	0.78	3.89	72	0.26	1.8	1.08	**0.59**
Nov-00	1.23	0.78	3.89	72	0.05	0.7	0.42	**0.76**

Month	Rain (P)	*Ia*	*S*	*Curve Number (CN)*	Runoff (Q)	Evapo-transpir- ation (E)	Evapo*0.6 (E est.)	Monthly Rechge
	From Sandusky, OH rain gauge	*Ia=0.2S*	*S=1000/CN-10*	*(see Table in Appendix ??)*	Q=(P-0.2S)^2 /P+0.8S	(From National Weather Service (Cleveland)	Estimated	R = P-Q- E est
Dec-00	1.81	0.78	3.89	72	0.22	0.3	0.18	**1.41**
Jan-01	0.48	0.78	3.89	72	0.02	0.2	0.12	**0.34**
Feb-01	1.09	0.78	3.89	72	0.02	0.8	0.48	**0.59**
Mar-01	0.69	0.78	3.89	72	0.00	1	0.60	**0.09**
Apr-01	2.23	0.78	3.89	72	0.39	2.7	1.62	**0.22**
May-01	1.88	0.78	3.89	72	0.24	2.8	1.68	**-0.04**
Jun-01	0.98	0.78	3.89	72	0.01	4	2.40	**-1.43**
Jul-01	1.37	0.78	3.89	72	0.08	5	3.00	**-1.71**
Aug-01	1.87	0.78	3.89	72	0.24	4.5	2.70	**-1.07**
Sep-01	1.58	0.78	3.89	72	0.14	3.2	1.92	**-0.48**
Oct-01	0.15	0.78	3.89	72	0.12	2.6	1.56	**-1.53**
Nov-01	2.65	0.78	3.89	72	0.61	1.3	0.78	**1.26**
Dec-01	1.88	0.78	3.89	72	0.24	0.6	0.36	**1.28**
Jan-02	1.95	0.78	3.89	72	0.27	0.8	0.48	**1.20**

Attachment 1

Table 2-2.--Runoff curve numbers for selected agricultural, suburban, and urban land use. (Antecedent moisture condition II, and $I_a = 0.2S$)

LAND USE DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Cultivated land[1]: without conservation treatment	72	81	88	91
: with conservation treatment	62	71	78	81
Pasture or range land: poor condition	68	79	86	89
good condition	39	61	74	80
Meadow: good condition	30	58	71	78
Wood or Forest land: thin stand, poor cover, no mulch	45	66	77	83
good cover[2]	25	55	70	77
Open Spaces, lawns, parks, golf courses, cemeteries, etc.				
good condition: grass cover on 75% or more of the area	39	61	74	80
fair condition: grass cover on 50% to 75% of the area	49	69	79	84
Commercial and business areas (85% impervious)	89	92	94	95
Industrial districts (72% impervious)	81	88	91	93
Residential:[3]				
Average lot size — Average % Impervious[4]				
1/8 acre or less — 65	77	85	90	92
1/4 acre — 38	61	75	83	87
1/3 acre — 30	57	72	81	86
1/2 acre — 25	54	70	80	85
1 acre — 20	51	68	79	84
Paved parking lots, roofs, driveways, etc.[5]	98	98	98	98
Streets and roads:				
paved with curbs and storm sewers[5]	98	98	98	98
gravel	76	85	89	91
dirt	72	82	87	89

1/ For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, Aug. 1972.

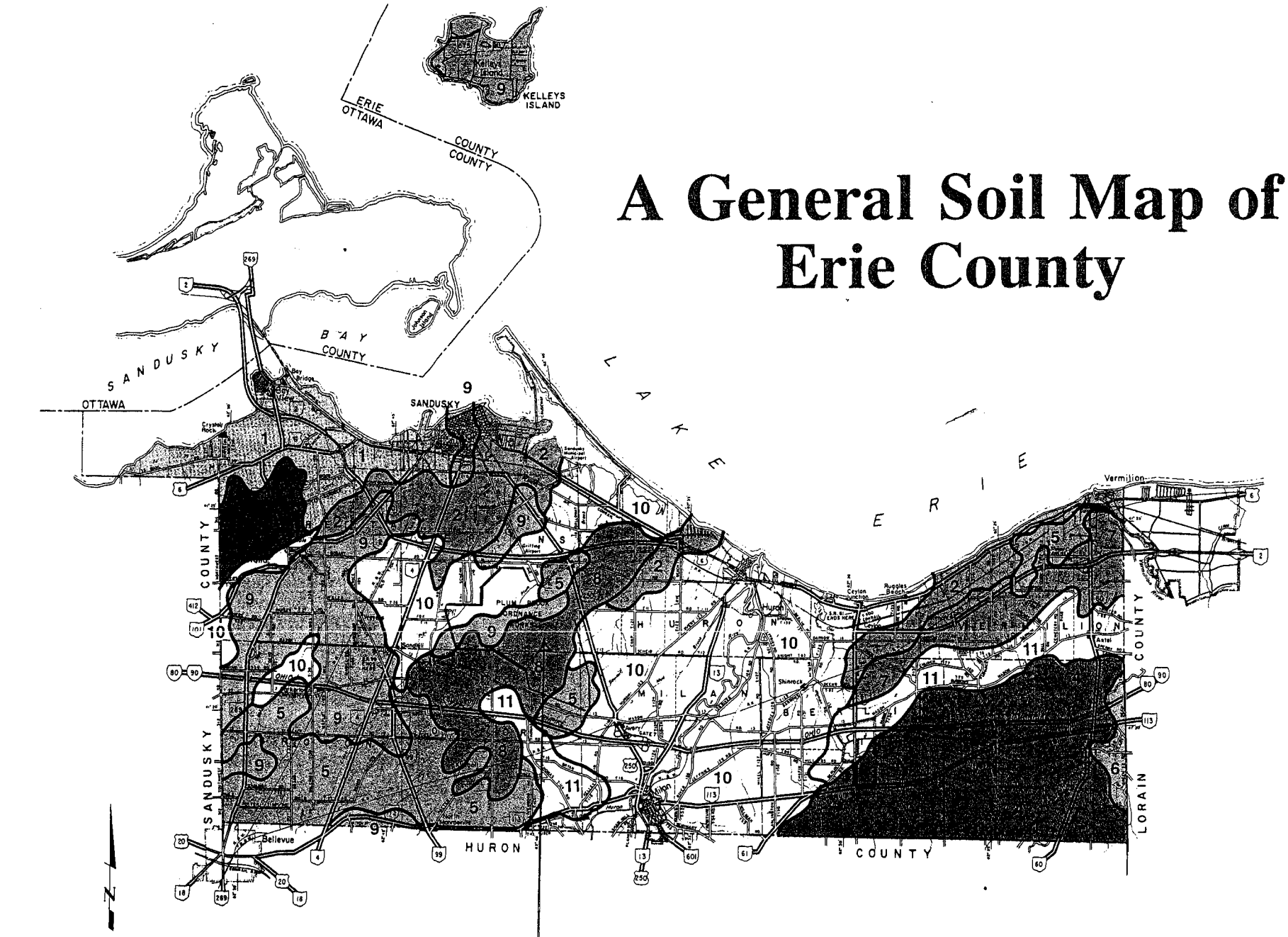
2/ Good cover is protected from grazing and litter and brush cover soil.

3/ Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

4/ The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

5/ In some warmer climates of the country a curve number of 95 may be used.

A General Soil Map of Erie County



Plum Brook
Ordnance
Works

Soil Legend

VERY DEEP SOILS ON LAKE PLAINS

1 Toledo-Fulton Association: Nearly level, very poorly drained and somewhat poorly drained soils formed in lacustrine sediments.

2 Del Rey-Milford Association: Nearly level, somewhat poorly drained and very poorly drained soils formed in lacustrine sediments.

Weyers-Haplaquents-Sandusky Association: Level, very poorly drained soils formed in calcareous tufa and marl over lacustrine sediments.

VERY DEEP SOILS PRIMARILY ON TILL PLAINS

Bennington-Cardington-Haskins Association: Nearly level to sloping, somewhat poorly drained and moderately well drained soils formed in glacial till and loamy outwash sediments over glacial till or lacustrine sediments.

5 Pewamo-Bennington Association: Nearly level to gently sloping, very poorly drained and somewhat poorly drained soils formed in glacial till and lacustrine sediments.

6 Mahoning-Rawson-Ellsworth Association: Nearly level to sloping, somewhat poorly drained and moderately well drained soils formed in glacial till and loamy outwash over glacial till or lacustrine sediments.

SHALLOW TO DEEP SOILS ON BEDROCK-CONTROLLED TILL PLAINS AND LAKE PLAINS

7 Allis-Fries Association: Moderately deep, nearly level, somewhat poorly drained to very poorly drained soils formed in glacial till or lacustrine sediments over shale bedrock.

Hornell-Fries-Colwood Association: Moderately deep and deep, nearly level to gently sloping, somewhat poorly drained and very poorly drained soils formed in glacial till and lacustrine sediments over shale bedrock.

9 Castalia-Millsdale-Milton-Ritchey Association: Shallow to moderately deep, nearly level to moderately steep, well drained and very poorly drained soils formed in glacial till, lacustrine sediments and limestone residuum.

VERY DEEP SOILS ON OUTWASH PLAINS, LAKE PLAINS, DELTAS AND BEACH RIDGES

10 Kibbie-Elnora-Tuscola-Colwood Association: Nearly level to gently sloping, somewhat poorly drained, moderately well drained and very poorly drained soils formed in outwash, lacustrine and deltaic sediments.

11 Jimtown-Oshtemo-Millgrove Association: Nearly level to gently sloping, somewhat poorly drained, well drained and very poorly drained soils formed in outwash and beach sediments.

The general soil map shows the location of the 11 soil associations or general soil areas in Erie County. Each association typically consists of two to four major soils for which it is named and some soils of minor extent. The soils in each association occur together in a distinct and repetitive landscape pattern.

The general soil map is most useful for providing generalized information about the soil resources of Erie County. It is **not** suitable for planning the management of a farm or for selection of a building site because of its small scale.

Information on how to obtain more detailed soil maps in the county is given elsewhere in this publication. The following information about the 28 soils identified on the General Soil Map plus 32 other soil series in the county can also be obtained by request:

- Slope range
- Drainage class
- Permeability
- Available water capacity
- Seasonal high water table depth
- Depth to bedrock
- Shrink-swell potential

Some of the more common management concerns that can be identified in places from the detailed soil maps are slope, erosion, shallowness to bedrock, slow permeability, seasonal wetness, ponding, droughtiness, poor filtration, and flooding. Information about recommended management practices can be obtained from the Erie SWCD.

APPENDIX O

CHROMATOGRAMS

IT CORPORATION - KNOXVILLE

Client Sample ID: FP7002
PB-BED-MW16

GC/MS Volatiles

Lot-Sample #...: H1J120206-002 Work Order #...: EL3LF1AD Matrix.....: WASTE
Date Sampled...: 10/10/01 Date Received..: 10/12/01
Prep Date.....: 10/16/01 Analysis Date..: 10/19/01
Prep Batch #...: 1289275
Dilution Factor: 25
% Moisture.....: Method.....: SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chloromethane	ND	62	mg/kg
Bromomethane	ND	62	mg/kg
Vinyl chloride	ND	62	mg/kg
Chloroethane	ND	62	mg/kg
Methylene chloride	**42 B**	**30**	**mg/kg**
Acetone	**30 J,B**	**120**	**mg/kg**
Carbon disulfide	ND	30	mg/kg
1,1-Dichloroethene	ND	30	mg/kg
1,1-Dichloroethane	ND	30	mg/kg
1,2-Dichloroethene (total)	ND	30	mg/kg
Chloroform	ND	30	mg/kg
2-Dichloroethane	ND	30	mg/kg
-Butanone	ND	120	mg/kg
1,1,1-Trichloroethane	ND	30	mg/kg
Carbon tetrachloride	ND	30	mg/kg
Bromodichloromethane	ND	30	mg/kg
1,2-Dichloropropane	ND	30	mg/kg
cis-1,3-Dichloropropene	ND	30	mg/kg
Trichloroethene	**4.6 J**	**30**	**mg/kg**
Dibromochloromethane	ND	30	mg/kg
1,1,2-Trichloroethane	ND	30	mg/kg
Benzene	**25 J**	**30**	**mg/kg**
trans-1,3-Dichloropropene	ND	30	mg/kg
Bromoform	ND	30	mg/kg
4-Methyl-2-pentanone	ND	120	mg/kg
2-Hexanone	ND	120	mg/kg
Tetrachloroethene	ND	30	mg/kg
1,1,2,2-Tetrachloroethane	ND	30	mg/kg
Toluene	**120**	**30**	**mg/kg**
Chlorobenzene	ND	30	mg/kg
Ethylbenzene	**200**	**30**	**mg/kg**
Styrene	ND	30	mg/kg
Xylenes (total)	**1600 B**	**30**	**mg/kg**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	NC,DIL	(62 - 133)
,2-Dichloroethane-d4	NC,DIL	(67 - 131)
Toluene-d8	NC,DIL	(72 - 129)
Bromofluorobenzene	NC,DIL	(64 - 148)

(Continued on next page)

IT CORPORATION - KNOXVILLE

Client Sample ID: FP7002
PB-BED-MW16

GC/MS Volatiles

Lot-Sample #...: H1J120206-002 Work Order #...: EL3LF1AD Matrix.....: WASTE

NOTE(S) :

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

B Method blank contamination. The associated method blank contains the target analyte at a reportable level.

J Estimated result. Result is less than RL.

Data File: /chem/gcms/mx.i/X101901.b/el3lf1ad.d
Report Date: 19-Oct-2001 13:12

PB-BGD-MW16

STL Knoxville

SW-846 Method 8260A - Volatile Organics

Data file : /chem/gcms/mx.i/X101901.b/el3lf1ad.d
Lab Smp Id: EL3LF1AD Client Smp ID: FP7002
Inj Date : 19-OCT-2001 12:58
Operator : 22980 Inst ID: mx.i
Smp Info : EL3LF1AD,25,0,,
Misc Info : X101901,MS8260NS,s.sub,,
Comment :
Method : /var/chem/gcms/mx.i/X101901.b/MS8260NS.m
Meth Date : 19-Oct-2001 11:37 gosss Quant Type: ISTD
Cal Date : 28-AUG-2001 12:04 Cal File: icx8271.d
Als bottle: 1
Dil Factor: 25.00000
Integrator: HP RTE Compound Sublist: s.sub
Target Version: 3.50
Processing Host: qmidhp01

Concentration Formula: Amt * DF * ((Wd*(Vt/0.001))/((Ws)*Va) * CpndVariable

Vt	10000.00000	Final Extract Volume (ul)
Ws	1.74000	Weight of Sample Extracted (g)
Wd	0.00500	Default Amount of Water Purged (L)
Va	100.00000	Volume of Extract Analyzed (ul)

Cpnd Variable Local Compound Variable

	Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/L)	FINAL (ug/Kg)
*	1 Fluorobenzene	96	6.194	6.193	(1.000)	2056244	50.0000	
*	2 Chlorobenzene-d5	117	9.362	9.361	(1.000)	1341297	50.0000	
*	3 1,4 Dichlorobenzene-d4	152	11.673	11.672	(1.000)	574203	50.0000	
$	4 1,2-Dichloroethane-d4	65	5.780	5.779	(0.933)	22527	2.15078	618.04(R)
$	5 Dibromofluoromethane	113	5.391	5.390	(0.870)	18827	1.98883	571.50(R)
$	6 Toluene-d8	98	7.915	7.914	(0.845)	118357	3.17226	911.57(R)
$	7 4-Bromofluorobenzene	95	10.530	10.529	(0.902)	30923	2.39063	686.96(R)
M	9 Xylene (total)	106				3313624	220.036	1580700
	22 Acetone	43	2.448	2.448	(0.395)	13410	4.23583	30430
	27 Methylene Chloride	84	2.923	2.922	(0.472)	77479	5.88263	42260
	39 2-Butanone	43	4.796	4.783	(0.774)	4762	0.84683	6083.5
	46 Benzene	78	5.841	5.846	(0.943)	145068	3.45407	24814
	47 1,2-Dichloroethane	62	6.194	5.870	(1.000)	26754	2.01254	~~14458~~
	49 Trichloroethene	130	6.613	6.612	(1.068)	6864	0.63619	4570.3
	50 1,2-Dichloropropane (ccc)	63	6.820	6.843	(1.101)	11298	0.96641	~~6942.6~~
	55 4-Methyl-2-pentanone	43	7.878	7.829	(0.842)	154722	13.5686	~~97475~~
	56 Toluene (ccc)	91	7.982	7.981	(0.853)	657506	16.0452	115270

10/19/01

Data File: /chem/gcms/mx.i/X101901.b/el3lf1ad.d
Report Date: 19-Oct-2001 13:12

PB-BED-MW16

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/L)	FINAL (ug/Kg)
57 trans-1,3-Dichloropropene	75	8.115	8.224	(0.867)	9097	0.67406	~~4842.4~~
58 1,1,2-Trichloroethane	97	8.371	8.400	(0.894)	362837	43.0012	~~308920~~
61 2-Hexanone	43	8.644	8.680	(0.923)	656606	83.8043	~~602040~~
64 Chlorobenzene (spcc)	112	9.198	9.385	(0.982)	21398	0.85554	~~6146.1~~
66 Ethylbenzene (ccc)	106	9.514	9.513	(1.016)	380260	27.7979	199700
67 m&p-Xylene	106	9.636	9.635	(1.029)	2425255	160.588	1153600
68 o-Xylene	106	10.025	10.024	(1.071)	888369	59.4484	427070
69 Styrene	104	10.025	10.036	(1.071)	40108	1.63825	~~11769~~
74 1,1,2,2-Tetrachloroethane(sp)	83	10.852	10.687	(0.930)	37273	3.36434	~~24169~~

QC Flag Legend

R - Spike/Surrogate failed recovery limits.

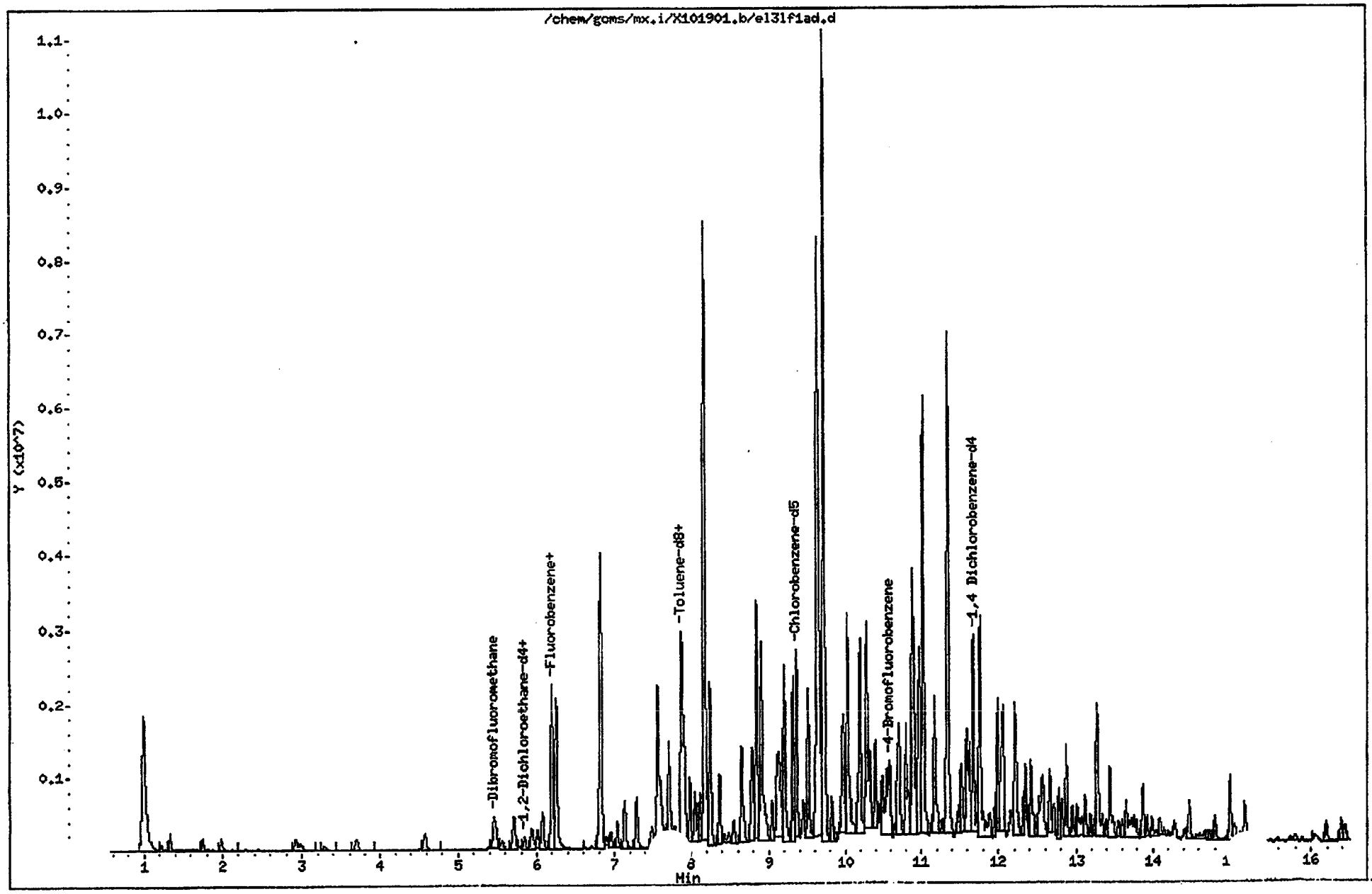
10/19/01

Data File: /chem/gcms/mx.i/X101901.b/el3lf1ad.d
Date : 19-OCT-2001 12:58
Client ID: FP7002, PB-BED-KW16
Sample Info: EL3LF1AD,25,0,,

Column phase: J&W-624

Instrument: mx.i

Operator: 22980
Column diameter: 0.18



IT CORPORATION - KNOXVILLE

Lab Name: Severn Trent Laboratories, Inc. SDG Number:

Matrix: (soil/water) WASTE Lab Sample ID: H1J120206 002
PB-BED-MW16
Method: SW846 8015B
Hydrocarbons, Volatile Petroleum (8015B)

Sample WT/Vol: 0.77 / mL Date Received: 10/12/01
Work Order: EL3LF1AC Date Extracted: 10/22/01
Dilution factor: 649.35 Date Analyzed: 10/22/01

QC Batch: 1296324

Client Sample Id: FP7002, PB-BED-MW16
Soil Extract Vol: 5 / mL Soil Aliquot Vol: 5 / mL

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
Q796	Gasoline Range Organics	52000000	

SURROGATE RECOVERY	%	ACCEPTABLE LIMITS
Bromofluorobenzene		(75 - 125)

FORM I

E120 Severn Trent Laboratories, Inc. Date 10/24/2001
e: 1 Data Review Time 10:52:05

Lot/Sample: H1J120206-002 FP7002 TICs.....: N Report Results: Y
WO#.....: EL3LF-1-AC PB-BED-MW/6 Est. Results: Y Sig Fig Alg...: A
SAC.....: XX N 73 KJ 01 Dry Weight..: N Upload.....:
Method....: WASTE / Hydrocarbons, Volatile Petroleum (8015B) / SW846 / 8015B

Analysis Date: 10/22/01
Inject Time..: 21:51 Inject Vol: 5.0 Units: mL
Analyst.....: 001952 Mark Shafer
Dil Factor: 649.35 Instr File: FA22112A.
Instr ID: F1A Column: RTX-502.2 ID: .53
Sampling date.....:10/10/01
Leach Date.....: 0/00/00
Leach Batch.....:
Buffer Type.....:
Leach Weight.....: .0
Leach Volume.....: 0 Units:
Entered by.....:KIRKLINS 10/24/01 9:50:01
Prep Comments.....:
Analysis Comments...:
Result Units.....:ug/kg

Prep Date....: 10/22/01
QC Batch.....: 1296324
MS Run Number: 1296162
Prep Time....: 10:05-23:50
Init Wgt/Vol.: .77 Units: mL
Final Wgt/Vol: 5.00 Units: mL
pH Values.: I) .0 1) .0 2) .0
Extract Solv.: Amt..: .0
Exchange Solv: Amt..: .0
Spike....:
Surrogate: 01GCV0297,01GCV0299
PSRL Flag: N

Total Solids.: .00

#	Analyte	* SPK	Exc Code	Result	Limit	MDL	Data Qual	Report Qual
61	Gasoline Range Organics			52399480.3333	6493500	696752.55		
					PSRL..... 10000		SRL.....	10000

SYN#	Surrogate Recovery	Exc Code	Spike Amount	Measured Amount	Percent Recovery	Data Qual	Report Qual
02730	Bromofluorobenzene	NC		DIL			NC;DIL
03185	a,a,a-Trifluorotoluene (TFT	NA					
03679	p-Chlorofluorobenzene	NA					

Notes:

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

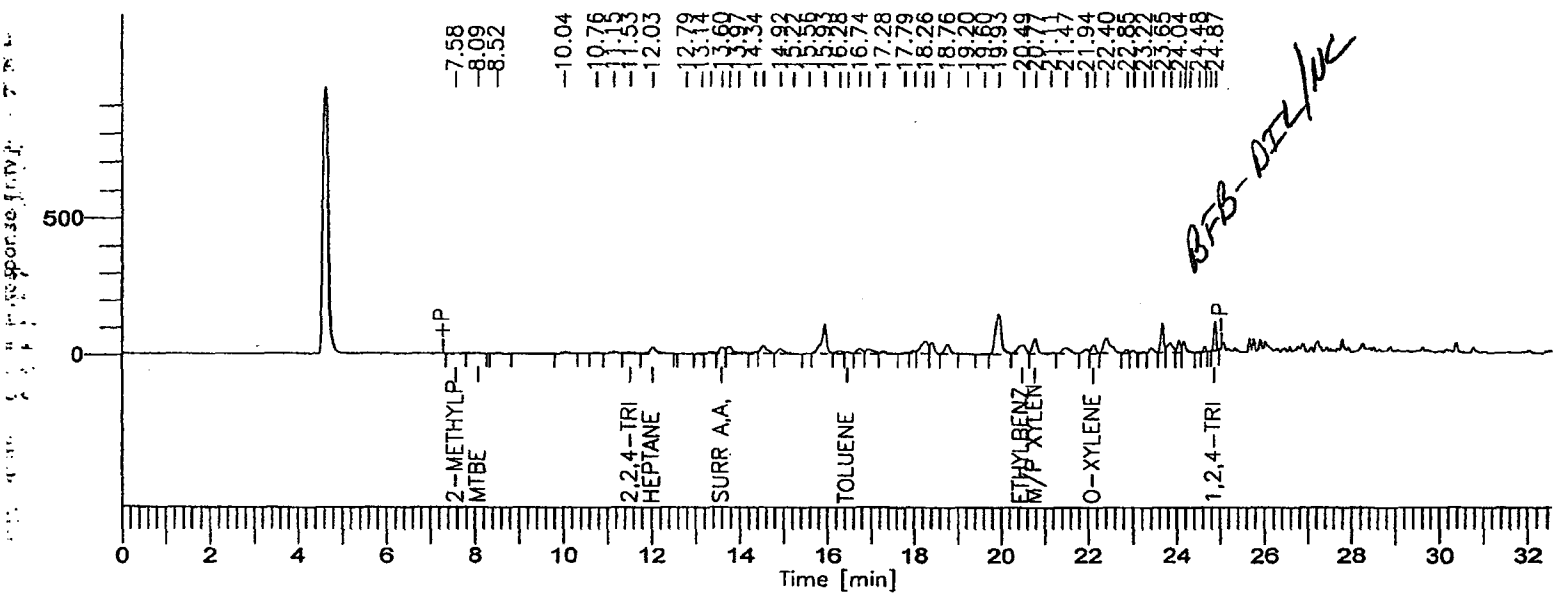
Software Version: 4.1<1L22>
Sample Name : H1J120206-002 Time : 10/23/01 14:17
Sample Number: EL3LF1AC Study :
Operator : PB-BED-MW16

Instrument : GCF Channel : B A/D mV Range : 1000
AutoSampler :
Rack/Vial : 0/0

Interface Serial # : 2199570186 Data Acquisition Time: 10/22/01 21:51
Delay Time : 0.00 min.
End Time : 32.50 min.
Sampling Rate : 1.1110 pts/sec

Raw Data File : L:\GCF\FA22112.RAW
Result File : L:\GCF\FA22112A.RST
Inst Method : L:\GCF\AF102201 from L:\GCF\FA22112A.RST
Proc Method : L:\GCF\BF1022RG.mth
Calib Method : L:\GCF\BF1022RG.mth
Sequence File : L:\GCF\AF102201.SEQ

Sample Volume : 1.0000 mL Area Reject : 0.000000
Sample Amount : 1.0000 Dilution Factor : 5000.00



GCF Total Purgeable Hydrocarbons

Time [min]	Component Name	Raw AMT	Adjusted Amount	Area [µV·s]	Height [µV]	DIVISOR	MULTIPLIER	Cal. Range	Delta RT [%]
13.597	QC comp	-30.7756	-999208.9898	172407.75	23034.33	0.77	5.00		0.0000
16.155	8015B/GRO	1644.6796	53398689.3231	9213635.95	1.18e+06	0.77	5.00		0.0000
		1613.9040	52399480.3333	9386043.70	1.21e+06	1.54	10.00		

Group Report For : QC comp

Time [min]	Component Name	Raw AMT	Adjusted Amount	Area [µV·s]	Height [µV]	DIVISOR	MULTIPLIER	Cal. Range	Delta RT [%]
13.597	SURR a,a,a-TFT	28.3956	921935.4660	172407.75	23034.33	0.77	5.00		0.1316
19.851	ISD 1-Cl-4-Fluoroben	0.0000	0.0000	0.00	0.00	0.77	5.00		--------
23.506	BFB	0.0000	0.0000	0.00	0.00	0.77	5.00		--------
		28.3956	921935.4660	172407.75	23034.33	2.31	15.00		

Report stored in ASCII file: L:\GCF\FA22112A.TXO

GCF FID

Result File : FA22112A.RST, Printed On 10/23/01 14:17

Group Report For : 8015B/GRO PB-BED-MW16

Time [min]	Component Name	Raw AMT	Adjusted Amount	Area [µV·s]	Height [µV]	DIVISOR	MULTIPLIER	Cal. Range	Delta RT [%]
7.	-METHYLPENTANE	1.8140	58896.5686	12591.68	1381.52	0.77	5.00		0.1999
8.	ITBE	3.8675	125567.6927	12950.18	1238.47	0.77	5.00		-0.2020
8.		8.5393	277249.7955	28593.61	4020.81	0.77	5.00		--------
10.039		-0.4552	-14780.8104	26755.63	3103.21	0.77	5.00		--------
10.763		-1.2522	-40656.4620	21321.67	2642.34	0.77	5.00		--------
11.153		1.7026	55279.4112	41441.26	4110.53	0.77	5.00		--------
11.532	2,2,4-TRIMETHYLPENTA	1.3630	44251.6358	39132.32	3616.82	0.77	5.00		-0.3219
12.032	HEPTANE	28.3298	919798.2290	230459.41	24355.99	0.77	5.00		0.1692
12.789		0.3356	10896.2863	3254.28	258.10	0.77	5.00		--------
13.140		1.8463	59945.7417	11210.23	1531.11	0.77	5.00		--------
13.341		6.8617	222783.3493	41661.89	3463.65	0.77	5.00		--------
13.597	SURR a,a,a-TFT	28.3956	921935.4660	172407.75	23034.33	0.77	5.00		0.1316
13.766		35.6687	1158073.9366	216567.13	25395.03	0.77	5.00		--------
13.967		7.6963	249879.6714	46729.08	3647.63	0.77	5.00		--------
14.336		7.4595	242191.6567	45291.37	5371.92	0.77	5.00		--------
14.527		41.9147	1360866.2056	254490.57	26542.58	0.77	5.00		--------
14.919		24.7172	802508.0703	150074.07	16399.59	0.77	5.00		--------
15.215		2.0770	67435.8839	19385.24	2076.55	0.77	5.00		--------
15.562		0.9443	30659.2026	8813.35	1200.03	0.77	5.00		--------
15.932		97.5384	3166831.3467	910342.99	105798.89	0.77	5.00		--------
16.278		11.4525	371833.5277	106887.93	10281.33	0.77	5.00		--------
16.460	TOLUENE	5.5974	181734.2853	52241.66	6481.80	0.77	5.00		0.1147
16.744		14.0411	455881.2618	131048.44	15303.31	0.77	5.00		--------
16.942		18.8835	613101.1875	176243.16	15033.90	0.77	5.00		--------
17.283		9.1078	295707.7282	85004.67	6871.46	0.77	5.00		--------
17.786		3.6093	117186.6258	33686.68	3241.95	0.77	5.00		--------
18.002		6.2403	202608.5552	58242.22	7999.73	0.77	5.00		--------
18.256		55.1408	1790285.0085	514638.52	45106.61	0.77	5.00		--------
18.409		27.8429	903991.8199	259863.10	39367.56	0.77	5.00		--------
18.761		27.8250	903408.6586	271281.71	34225.73	0.77	5.00		--------
19.199		1.9042	61825.1947	18565.29	1450.60	0.77	5.00		--------
19.598		1.8957	61547.9063	18482.02	1985.09	0.77	5.00		--------
19.932		137.9918	4480252.6791	1345360.81	143892.18	0.77	5.00		--------
20.487	ETHYLBENZENE	37.7120	1224416.0916	367676.01	29000.14	0.77	5.00		-0.0483
20.770	M/P XYLENE	41.6249	1351457.4470	386073.53	53175.93	0.77	5.00		0.0705
21.108		5.1974	168746.4160	48206.12	3830.55	0.77	5.00		--------
21.467		24.5824	798129.8779	234984.92	17586.34	0.77	5.00		--------
21.936		11.4211	370815.6841	109175.33	13136.20	0.77	5.00		--------
22.107	O-XYLENE	18.8720	612727.0384	180398.73	28618.19	0.77	5.00		0.0827
22.396		57.8608	1878597.1062	553095.44	52209.21	0.77	5.00		--------
22.846		14.3480	465844.7357	65015.30	11841.37	0.77	5.00		--------
22.988		8.7425	283845.9202	39614.76	7991.06	0.77	5.00		--------
23.219		6.2898	204213.2656	28500.89	4671.20	0.77	5.00		--------
23.3[illegible]		24.9653	810563.0083	113125.68	14205.93	0.77	5.00		--------
23.		112.5815	3655244.2131	510141.68	106541.63	0.77	5.00		--------
23.		62.9533	2043937.1214	285260.70	31253.05	0.77	5.00		--------
24.0[illegible]		51.8348	1682949.0825	234879.65	44076.93	0.77	5.00		--------
24.152		40.4617	1313691.0590	183344.40	39777.60	0.77	5.00		--------
24.269		3.5654	115759.1201	33215.12	4541.98	0.77	5.00		--------
24.477		2.0276	65830.1180	18888.84	4391.12	0.77	5.00		--------
24.625		7.0943	230333.2635	66090.24	17743.96	0.77	5.00		--------
24.737		0.7716	25050.7667	7187.89	2230.63	0.77	5.00		--------
24.865	1,2,4-TRIMETHYLBENZE	41.1915	1337387.6815	383740.79	107139.52	0.77	5.00		0.0264
		1194.9943	38798516.3330	9213635.95	1.18e+06	40.81	265.00		

IT CORPORATION - KNOXVILLE

Lab Name: Severn Trent Laboratories, Inc. SDG Number:

Matrix: (soil/water) WASTE Lab Sample ID: H1J120206 002
Method: SW846 8015B
Hydrocarbons, Extractable Petroleum (8015B)

Sample WT/Vol: 1 / g
Work Order: EL3LF1AA
Dilution factor: 1
Moisture %:

Client Sample Id: FP7002
PB-BED-mw/16

Date Received: 10/12/01
Date Extracted: 10/22/01
Date Analyzed: 11/02/01

QC Batch: 1297361

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) mg/kg	Q
Q797	Diesel Range Organics	4800	

SURROGATE RECOVERY	%	ACCEPTABLE LIMITS
o-Terphenyl	95	(40 - 144)
Dotriacontane	135	(42 - 159)

FORM I

PDE120 Severn Trent Laboratories, Inc. Date 11/02/2001
a: 1 Data Review Time 16:00:12

Lot/Sample: H1J120206-002 FP7002 TICs.....: N Report Results: Y
WO#.....: EL3LF-1-AA PB-BED-MW16 Est. Results: Y Sig Fig Alg...: A
SAC.....: XX N 14 KI 01 Dry Weight..: N Upload.....:
Method....: WASTE / Hydrocarbons, Extractable Petroleum (8015B) / SW846 / 8015B

Analysis Date: 11/02/01
Inject Time..: 8:07 Inject Vol: 1.0 Units: uL
Analyst.....: 014902 Ellen Grett
Dil Factor: 1.00 Instr File: A1101036
Instr ID: A2E Column: DB-35 ID: .53
Sampling date.....:10/10/01
Leach Date.....: 0/00/00
Leach Batch.....:
Buffer Type.....:
Leach Weight.....: .0
Leach Volume.....: 0 Units:
Entered by.....:GRETTE 11/02/01 15:00:05
Prep Comments.....:
Analysis Comments...:
Result Units.....:mg/kg

Prep Date....: 10/22/01
QC Batch.....: 1297361
MS Run Number: 1297209
Prep Time....: 13:00-14:00
Init Wgt/Vol.: 1 Units: g
Final Wgt/Vol: 10.00 Units: mL
pH Values.: I) 7.0 1) .0 2) .0
Extract Solv.: MECL2 Amt..: 10.0
Exchange Solv: Amt..: .0
Spike....:
Surrogate: 100 UL 01GCSV0369
PSRL Flag: N

Total Solids.: .00

#	Analyte	* SPK	Exc Code	Result	Limit	MDL	Data Qual	Report Qual
62	Diesel Range Organics			~~481.7~~ 4817	500		J	J

SYN#	Surrogate Recovery	Exc Code	Spike Amount	Measured Amount	Percent Recovery	Data Qual	Report Qual
02425	o-Terphenyl		20	19	95		
03388	Dotriacontane		20	27	135		

Notes:

J Estimated result. Result is less than RL.

Software Version: 4.1<1L22>
Sample Name : EL3LF1AA
Sample Number: J120206-2
Operator : PB-BED-MW16

Time : 11/2/01 10:20 AM
Study : 1297361

Instrument : GCA
AutoSampler :
Rack/Vial : 0/0

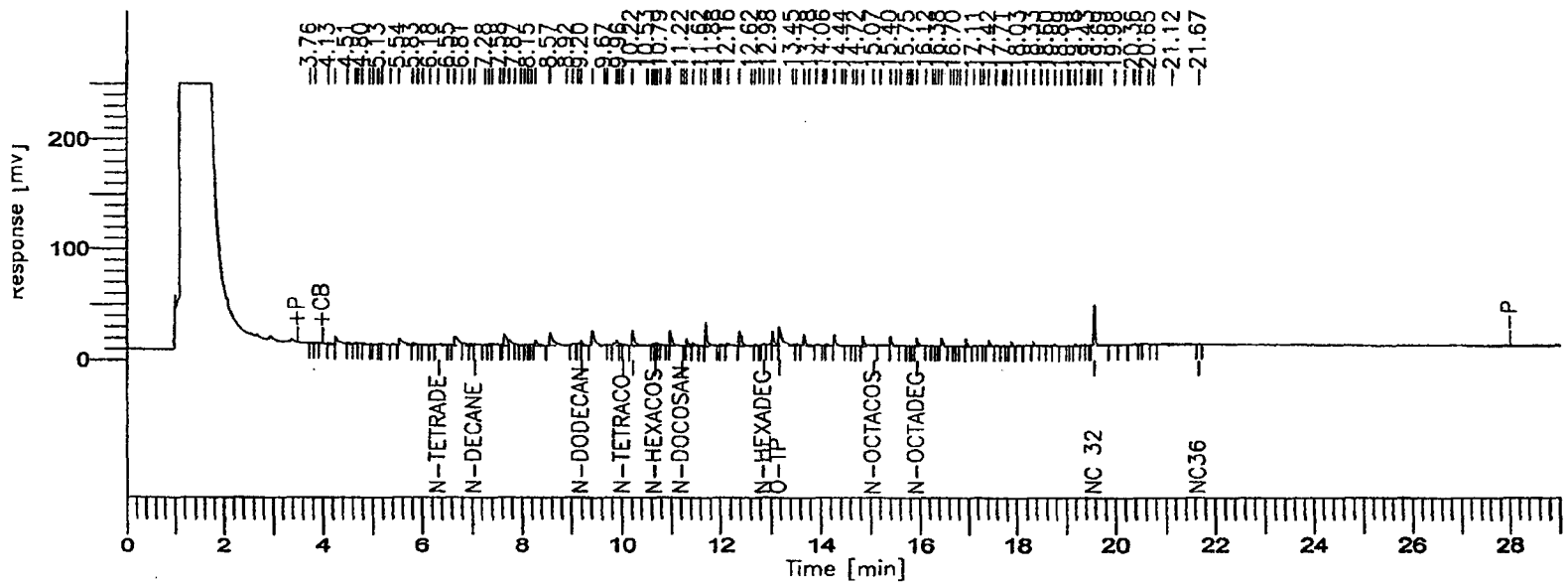
Channel : B A/D mV Range : 1000

Interface Serial # : 2351570994 Data Acquisition Time: 11/2/01 08:07 AM
Delay Time : 0.00 min.
End Time : 28.99 min.
Sampling Rate : 3.1250 pts/sec

Raw Data File : E:\GCA\A110101\AB01036.RAW
Result File : E:\GCA\A110101\AB01036.RST
Inst Method : I:\GCA\A110101\110101 from E:\GCA\A110101\AB01036.RST
Proc Method : .\110101.mth
Calib Method : .\110101.mth
Sequence File : E:\GCA\A110101\110101.SEQ

Sample Volume : 1.0000 ul
Sample Amount : 1.0000

Area Reject : 0.000000
Dilution Factor : 1.00



TPH STANDARD REPORT

C10-C28 = AREA 1087 C10-C28 RESULT = 481.7 VOL = 1 G/ML

C9-C40 AREA = _____ C9-C40 RESULT = _____ OTP/NC32 = 19/27

C8-C24 AREA = _____ C8-C24 RESULT = _____

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
	10.09	C10 - C22	0.98	1.0	0.98	259627.1	978787.75	979
	11.62	C10-C28	1.14	1.0	1.14	324698.3	1141431.53	1141 -54
	13.64	C9-C40	94.60	1.0	94.60	396393.3	1361936.22	1362
			96.72	3.0	96.72	980718.6	3482155.50	3482

Group Report For : synthetic diesel components

Result File : AB01036.RST, Printed On 11/2/01 10:20 AM

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
19	6.34	n-tetradecane	1.72	1.0	1.72	1326.8	13709.71	14
24	7.06	n-decane	0.85	1.0	0.85	1286.5	6654.84	7
41	9.20	n-dodecane	1.67	1.0	1.67	4956.4	12866.81	13
47	10.03	n-tetracosane	0.73	1.0	0.73	1287.1	5686.19	6
48	10.22	n-eicosane	6.05	1.0	6.05	13491.5	49006.45	49
51	10.67	n-hexacosane	0.79	1.0	0.79	2070.4	5920.67	6
56	11.22	n-docosane	0.24	1.0	0.24	476.9	1973.12	2
70	12.87	n-hexadecane	0.89	1.0	0.89	1537.0	7123.59	7
87	15.07	n-octacosane	0.77	1.0	0.77	1126.7	5166.72	5
95	15.94	n-octadecane	2.32	1.0	2.32	7719.5	18780.63	19
			16.01	10.0	16.01	35278.8	126888.73	127

Group Report For : SURROGATES

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
73	13.17	O-TP	29.53	1.0	29.53	16652.3	85206.15	85
127	19.57	NC 32	28.06	1.0	28.06	35887.3	64005.28	64
			57.59	2.0	57.59	52539.6	149211.43	149

PB-BED-M016

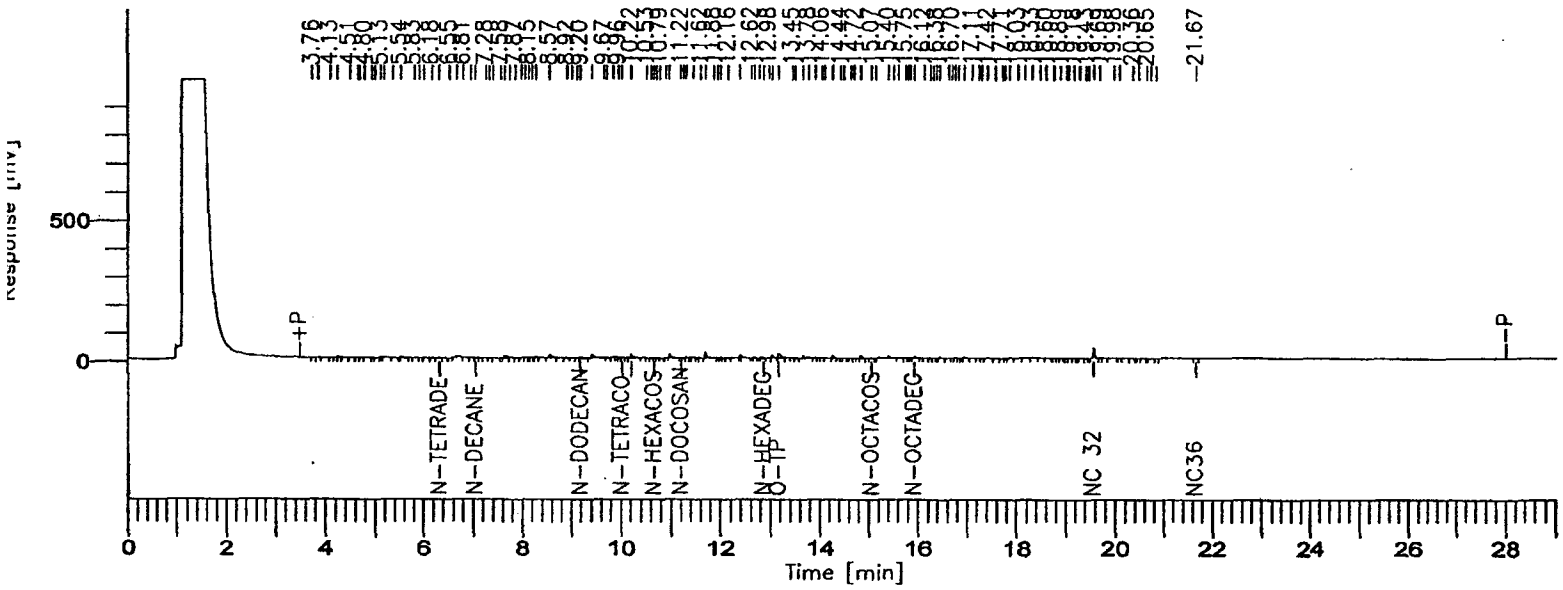
Software Version: 4.1<1L22>
Sample Name : EL3LF1AA Time : 11/2/01 08:44 AM
Sample Number: J120206-2 Study : 1297361
Operator : PB-BED-MW16

Instrument : GCA Channel : B A/D mV Range : 1000
AutoSampler :
Rack/Vial : 0/0

Interface Serial # : 2351570994 Data Acquisition Time: 11/2/01 08:07 AM
Delay Time : 0.00 min.
End Time : 28.99 min.
Sampling Rate : 3.1250 pts/sec

Raw Data File : E:\GCA\A110101\AB01036.RAW
Result File : E:\GCA\A110101\AB01036.RST
Inst Method : I:\GCA\A110101\110101 from E:\GCA\A110101\AB01036.RST
Proc Method : .\110101.mth
Calib Method : .\110101.mth
Sequence File : E:\GCA\A110101\110101.SEQ

Sample Volume : 1.0000 ul Area Reject : 0.000000
Sample Amount : 1.0000 Dilution Factor : 1.00



TPH STANDARD REPORT

C10-C28 = AREA_____ C10-C28 RESULT = _____ VOL = _____G/ML

C9-C40 AREA = _____ C9-C40 RESULT = _____ OTP/NC32 = _____

C8-C24 AREA = _____ C8-C24 RESULT = _____

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
	10.09	C10 - C22	0.65	1.0	0.65	219609.0	652134.08	652
	11.62	C10-C28	0.78	1.0	0.78	280410.7	779274.35	779
	13.64	C9-C40	68.50	1.0	68.50	347097.9	928193.44	928
			69.93	3.0	69.93	847117.6	2359601.87	2360

Group Report For : synthetic diesel components

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
19	6.34	n-tetradecane	0.33	1.0	0.33	403.8	2606.08	3
24	7.06	n-decane	0.22	1.0	0.22	773.0	1758.28	2
41	9.20	n-dodecane	1.60	1.0	1.60	4868.0	12341.73	12
47	10.03	n-tetracosane	0.27	1.0	0.27	748.3	2098.72	2
48	10.22	n-eicosane	5.62	1.0	5.62	13369.9	45548.16	46
51	10.67	n-hexacosane	0.66	1.0	0.66	1749.6	4941.53	5
56	11.22	n-docosane	0.04	1.0	0.04	145.8	359.20	0
70	12.87	n-hexadecane	0.52	1.0	0.52	1055.2	4186.87	4
87	15.07	n-octacosane	0.28	1.0	0.28	706.0	1908.64	2
95	15.94	n-octadecane	1.94	1.0	1.94	7550.1	15724.16	16
			11.49	10.0	11.49	31369.7	91473.36	91

Group Report For : SURROGATES

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
73	13.17	O-TP	18.57	1.0	18.57	15317.1	53601.28	54
127	19.57	NC 32	27.39	1.0	27.39	35707.0	62476.64	62
			45.97	2.0	45.97	51024.2	116077.92	116

PB-BED-MW16

IT CORPORATION - KNOXVILLE

Client Sample ID: FP7001
TNTA-BEDGW-001

GC/MS Volatiles

Lot-Sample #...: H1J120206-001 **Work Order #...:** EL21J1AD **Matrix.....:** WASTE
Date Sampled...: 10/08/01 **Date Received..:** 10/12/01
Prep Date.....: 10/16/01 **Analysis Date..:** 10/19/01
Prep Batch #...: 1289275
Dilution Factor: 100
% Moisture.....: **Method.....:** SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS
Chloromethane	ND	250	mg/kg
Bromomethane	ND	250	mg/kg
Vinyl chloride	ND	250	mg/kg
Chloroethane	ND	250	mg/kg
Methylene chloride	**210 B**	**120**	**mg/kg**
Acetone	ND	500	mg/kg
Carbon disulfide	ND	120	mg/kg
1,1-Dichloroethene	ND	120	mg/kg
1,1-Dichloroethane	ND	120	mg/kg
1,2-Dichloroethene (total)	ND	120	mg/kg
Chloroform	ND	120	mg/kg
1,2-Dichloroethane	ND	120	mg/kg
-Butanone	ND	500	mg/kg
,1,1-Trichloroethane	ND	120	mg/kg
Carbon tetrachloride	ND	120	mg/kg
Bromodichloromethane	ND	120	mg/kg
1,2-Dichloropropane	ND	120	mg/kg
cis-1,3-Dichloropropene	ND	120	mg/kg
Trichloroethene	ND	120	mg/kg
Dibromochloromethane	ND	120	mg/kg
1,1,2-Trichloroethane	ND	120	mg/kg
Benzene	**89 J**	**120**	**mg/kg**
trans-1,3-Dichloropropene	ND	120	mg/kg
Bromoform	ND	120	mg/kg
4-Methyl-2-pentanone	ND	500	mg/kg
2-Hexanone	ND	500	mg/kg
Tetrachloroethene	ND	120	mg/kg
1,1,2,2-Tetrachloroethane	ND	120	mg/kg
Toluene	**610**	**120**	**mg/kg**
Chlorobenzene	ND	120	mg/kg
Ethylbenzene	**680**	**120**	**mg/kg**
Styrene	ND	120	mg/kg
Xylenes (total)	**3800 B**	**120**	**mg/kg**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	NC,DIL	(62 - 133)
1,2-Dichloroethane-d4	NC,DIL	(67 - 131)
oluene-d8	NC,DIL	(72 - 129)
romofluorobenzene	NC,DIL	(64 - 148)

(Continued on next page)

IT CORPORATION - KNOXVILLE

Client Sample ID: FP7001

GC/MS Volatiles

Lot-Sample #...: H1J120206-001 Work Order #...: EL21J1AD Matrix.....: WASTE

TNTA-BED GW-001

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

B Method blank contamination. The associated method blank contains the target analyte at a reportable level.

J Estimated result. Result is less than RL.

Data File: /chem/gcms/mx.i/X101901.b/el21j1ad.d
Report Date: 19-Oct-2001 13:38

TNTA-BEDGW-001

STL Knoxville

SW-846 Method 8260A - Volatile Organics

Data file : /chem/gcms/mx.i/X101901.b/el21j1ad.d
Lab Smp Id: EL21J1AD Client Smp ID: FP7001
Inj Date : 19-OCT-2001 13:23
Operator : 22980 Inst ID: mx.i
Smp Info : EL21J1AD,100,0,,
Misc Info : X101901,MS8260NS,s.sub,,
Comment :
Method : /var/chem/gcms/mx.i/X101901.b/MS8260NS.m
Meth Date : 19-Oct-2001 11:37 gosss Quant Type: ISTD
Cal Date : 28-AUG-2001 12:04 Cal File: icx8271.d
Als bottle: 1
Dil Factor: 100.00000
Integrator: HP RTE Compound Sublist: s.sub
Target Version: 3.50
Processing Host: qmidhp01

Matrix

Concentration Formula: Amt * DF * ((Wd*(Vt/0.001))/((Ws)*Va) * CpndVariable

Vt	10000.00000	Final Extract Volume (ul)
Ws	1.59000	Weight of Sample Extracted (g)
Wd	0.00500	Default Amount of Water Purged (L)
Va	100.00000	Volume of Extract Analyzed (ul)

Cpnd Variable Local Compound Variable

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/L)	FINAL (ug/Kg)
* 1 Fluorobenzene	96	6.193	6.193	(1.000)	2202477	50.0000	
* 2 Chlorobenzene-d5	117	9.361	9.361	(1.000)	1440512	50.0000	
* 3 1,4 Dichlorobenzene-d4	152	11.672	11.672	(1.000)	610118	50.0000	
$ 4 1,2-Dichloroethane-d4	65	5.780	5.779	(0.933)	7522	0.67050	210.85(R)
$ 5 Dibromofluoromethane	113	5.390	5.390	(0.870)	5786	0.57071	179.47(R)
$ 6 Toluene-d8	98	7.878	7.914	(0.841)	157694	3.93547	1237.6(R)
$ 7 4-Bromofluorobenzene	95	10.511	10.529	(0.900)	12910	0.93929	295.37(R)
M 9 Xylene (total)	106				1958742	121.031	3806000
11 Chloromethane (spcc)	50	1.221	1.256	(0.197)	40719	2.13189	~~67041~~
12 Vinyl Chloride (ccc)	62	1.750	1.335	(0.283)	8267	0.56589	~~17795~~
22 Acetone	43	2.419	2.448	(0.391)	92458	27.2646	~~857300~~
27 Methylene Chloride	84	2.924	2.922	(0.472)	93935	6.65856	209390
39 2-Butanone	43	4.797	4.783	(0.775)	6179	1.02586	32260
46 Benzene	78	5.846	5.846	(0.944)	127052	2.82425	88813
47 1,2-Dichloroethane	62	6.193	5.870	(1.000)	27510	1.93200	~~60755~~
50 1,2-Dichloropropane (ccc)	63	6.819	6.843	(1.101)	39938	3.18932	~~100290~~
55 4-Methyl-2-pentanone	43	7.878	7.829	(0.841)	211192	17.2451	~~542300~~

10/22/01

10/19/01

Data File: /chem/gcms/mx.i/X101901.b/el21j1ad.d
Report Date: 19-Oct-2001 13:38

TNTA-BEDGW-001

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/L)	FINAL (ug/Kg)
56 Toluene (ccc)	91	7.981	7.981	(0.853)	855045	19.4286	610960
57 trans-1,3-Dichloropropene	75	8.115	8.224	(0.867)	7655	0.52817	~~16609~~
58 1,1,2-Trichloroethane	97	8.370	8.400	(0.894)	428164	47.2484	~~1485800~~
61 2-Hexanone	43	8.650	8.680	(0.924)	704481	83.7219	~~2632800~~
64 Chlorobenzene (spcc)	112	9.203	9.385	(0.983)	17454	0.64980	~~20434~~
66 Ethylbenzene (ccc)	106	9.513	9.513	(1.016)	316608	21.5507	677700
67 m&p-Xylene	106	9.635	9.635	(1.029)	1552914	95.7439	3010800
68 o-Xylene	106	10.024	10.024	(1.071)	405828	25.2870	795190
69 Styrene	104	10.024	10.036	(1.071)	19252	0.73220	~~23025~~
74 1,1,2,2-Tetrachloroethane(sp)	83	10.699	10.687	(0.917)	88281	7.49937	~~235830~~

QC Flag Legend

R - Spike/Surrogate failed recovery limits.

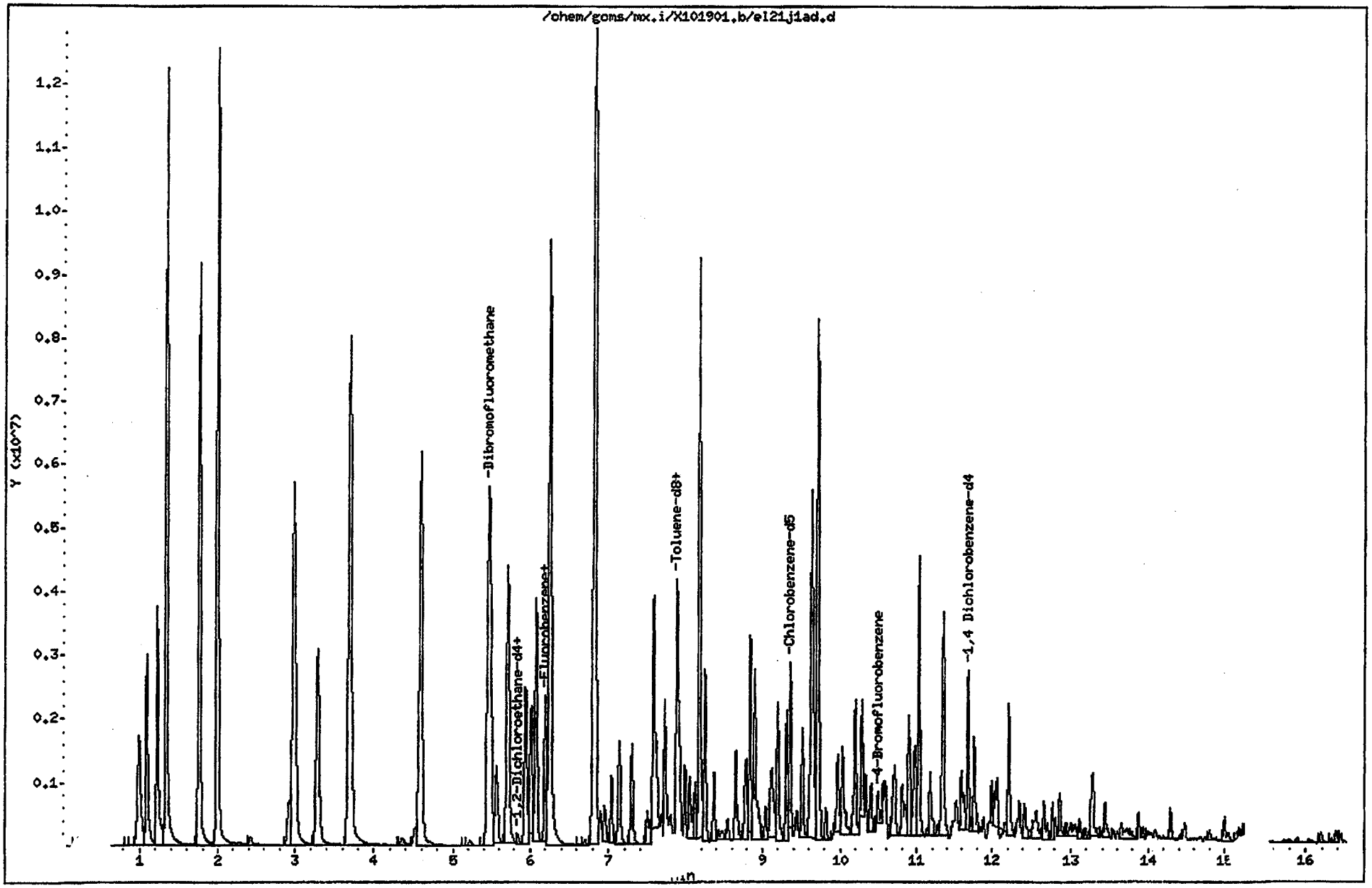
10/19/01

Data File: /chem/gcms/mx.i/X101901.b/el21j1ad.d
Date : 19-OCT-2001 13:23
Client ID: FP7001 , TNTA-BEDGW-001
Sample Info: EL21J1AD,100,0,,

Column phase: J&W-624

Instrument: mx.i

Operator: 22980
Column diameter: 0.18



IT CORPORATION - KNOXVILLE

Lab Name:Severn Trent Laboratories, Inc. SDG Number:

Matrix: (soil/water) WASTE Lab Sample ID:H1J120206 001
Method: SW846 8015B TNTA-BED6W-001
Hydrocarbons, Volatile Petroleum (8015B)

Sample WT/Vol: 0.62 / mL Date Received: 10/12/01
Work Order: EL21J1AC Date Extracted:10/22/01
Dilution factor: 806.45 Date Analyzed: 10/22/01

QC Batch: 1296324

Client Sample Id: FP7001
Soil Extract Vol: 5 / mL Soil Aliquot Vol: 5 / mL

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
Q796	Gasoline Range Organics	160000000	

SURROGATE RECOVERY	%	ACCEPTABLE LIMITS
Bromofluorobenzene		(75 - 125)

FORM I

DE120 Severn Trent Laboratories, Inc. Date 10/24/2001
ge: 1 Data Review Time 10:52:05

Lot/Sample: H1J120206-001 FP7001 TICs.....: N Report Results: Y
WO#.....: EL21J-1-AC TNTA-BED6W-601 Est. Results: Y Sig Fig Alg...: A
SAC.....: XX N 73 KJ 01 Dry Weight..: N Upload.....:
Method....: WASTE / Hydrocarbons, Volatile Petroleum (8015B) / SW846 / 8015B

Analysis Date: 10/22/01 **Prep Date....: 10/22/01**
Inject Time..: 18:46 Inject Vol: 5.0 Units: mL **QC Batch.....: 1296324**
Analyst.....: 001952 Mark Shafer MS Run Number: 1296162
Dil Factor: 806.45 Instr File: FA22108A. Prep Time....: 10:05-23:50
Instr ID: F1A Column: RTX-502.2 ID: .53 **Init Wgt/Vol.: .62** Units: mL
Sampling date.....:10/08/01 **Final Wgt/Vol: 5.00** Units: mL
Leach Date.....: 0/00/00 pH Values.: I) .0 1) .0 2) .0
Leach Batch.....: Extract Solv.: Amt..: .0
Buffer Type.....: Exchange Solv: Amt..: .0
Leach Weight.....: .0 Spike....:
Leach Volume.....: 0 Units: Surrogate: 01GCV0297,01GCV0299
Entered by.....:KIRKLINS 10/24/01 9:48:38 PSRL Flag: N
Prep Comments.....:
Analysis Comments...:
Result Units.....:ug/kg Total Solids.: .00

I#	Analyte	* SPK	Exc Code	Result	Limit	MDL	Data Qual	Report Qual
861	Gasoline Range Organics			164466289.3941	8064500	865320.85		
					PSRL.....	10000	SRL.....	10000

SYN#	Surrogate Recovery	Exc Code	Spike Amount	Measured Amount	Percent Recovery	Data Qual	Report Qual
02730	Bromofluorobenzene	NC		DIL			NC;DIL
03185	a,a,a-Trifluorotoluene (TFT	NA		DIL			
03679	p-Chlorofluorobenzene	NA					

Notes:

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

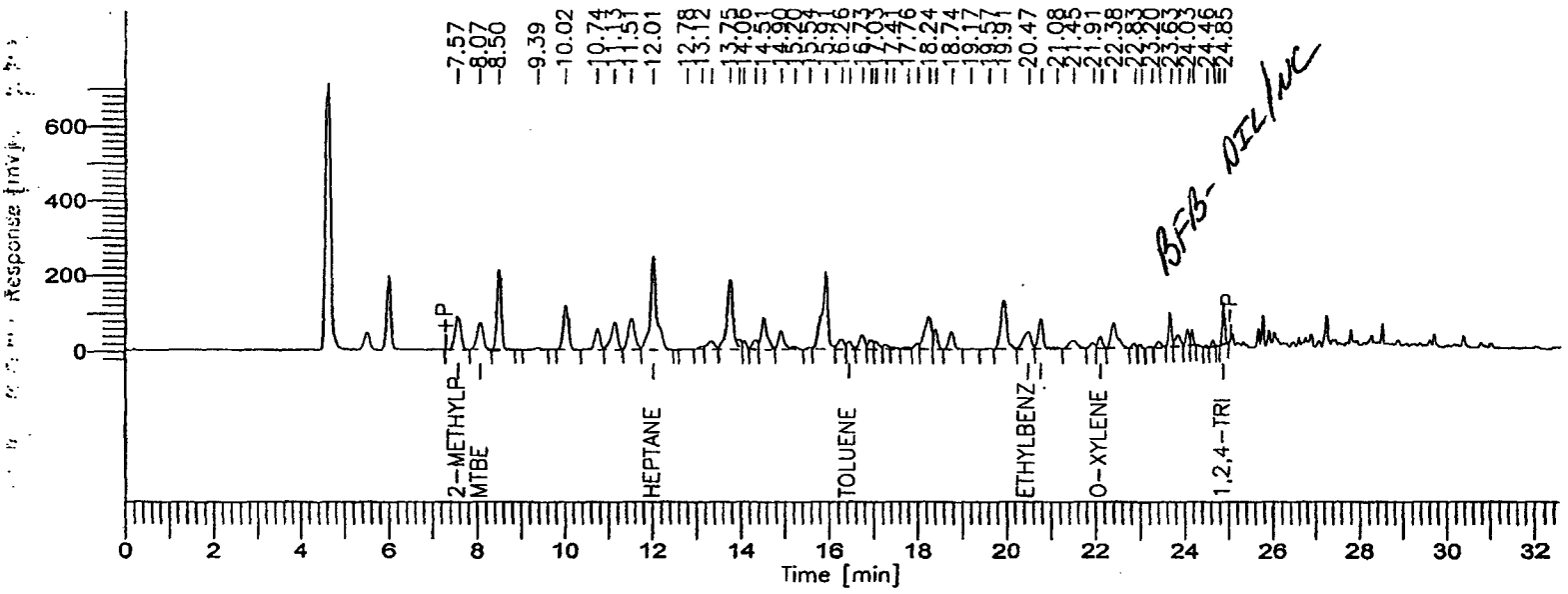
Software Version: 4.1<1L22>
Sample Name : H1J120206-001 Time : 10/23/01 14:16
Sample Number: EL21J1AC Study :
Operator : TNTA-BEDGW-001

Instrument : GCF Channel : B A/D mV Range : 1000
AutoSampler :
Rack/Vial : 0/0

Interface Serial # : 2199570186 Data Acquisition Time: 10/22/01 18:46
Delay Time : 0.00 min.
End Time : 32.50 min.
Sampling Rate : 1.1110 pts/sec

Raw Data File : L:\GCF\FA22108.RAW
Result File : L:\GCF\FA22108A.RST
Inst Method : L:\GCF\AF102201 from L:\GCF\FA22108A.RST
Proc Method : L:\GCF\BF1022RG.mth
Calib Method : L:\GCF\BF1022RG.mth
Sequence File : L:\GCF\AF102201.SEQ

Sample Volume : 1.0000 mL Area Reject : 0.000000
Sample Amount : 1.0000 Dilution Factor : 5000.00



GCF Total Purgeable Hydrocarbons

Time [min]	Component Name	Raw AMT	Adjusted Amount	Area [µV·s]	Height [µV]	DIVISOR	MULTIPLIER	Cal. Range	Delta RT [%]
16.155	8015B/GRO	4078.7640	164466289.3941	22849585.35	2.69e+06	0.62	5.00		0.0000
		4078.7640	164466289.3941	22849585.35	2.69e+06	0.62	5.00		

Group Report For : QC comp

Time [min]	Component Name	Raw AMT	Adjusted Amount	Area [µV·s]	Height [µV]	DIVISOR	MULTIPLIER	Cal. Range	Delta RT [%]
13.579	SURR a,a,a-TFT	0.0000	0.0000	0.00	0.00	0.62	5.00		--------
19.851	ISD 1-Cl-4-Fluoroben	0.0000	0.0000	0.00	0.00	0.62	5.00		--------
23.506	BFB	0.0000	0.0000	0.00	0.00	0.62	5.00		--------
		0.0000	0.0000	0.00	0.00	1.86	15.00		

Report stored in ASCII file: L:\GCF\FA22108A.TXO

GCF FID

Result File : FA22108A.RST, Printed On 10/23/01 14:16

TNTA- BEDGW-001

Group Report For : 8015B/GRO

Time [min]	Component Name	Raw AMT	Adjusted Amount	Area [µV·s]	Height [µV]	DIVISOR	MULTIPLIER	Cal. Range	Delta RT [%]
7.	-METHYLPENTANE	111.4697	4494746.1128	773748.47	85617.10	0.62	5.00		-0.0488
8.[illegible]	MTBE	202.2635	8155784.2723	677274.11	69949.83	0.62	5.00		-0.4455
[illegible]8.501		433.1140	17464274.6310	1450271.45	211472.11	0.62	5.00		--------
9.391		16.0034	645296.8951	53586.86	4555.85	0.62	5.00		--------
10.020		156.1918	6298057.7304	989568.01	116508.01	0.62	5.00		--------
10.741		61.6444	2485661.0293	433499.69	53896.34	0.62	5.00		--------
11.131		106.7616	4304901.2768	708367.52	70911.81	0.62	5.00		--------
11.512		127.8691	5156010.1108	830995.72	80592.92	0.62	5.00		--------
12.013	HEPTANE	307.9928	12419065.2130	2505484.74	247272.97	0.62	5.00		0.0076
12.780		1.3750	55442.4888	13332.74	1465.09	0.62	5.00		--------
13.117		10.0883	406788.0085	61252.72	7870.26	0.62	5.00		--------
13.332		40.9231	1650123.2463	248469.81	20579.44	0.62	5.00		--------
13.748		293.2955	11826432.0916	1780782.92	184498.63	0.62	5.00		--------
13.947		22.7578	917655.2231	138177.32	17730.91	0.62	5.00		--------
14.060		20.2336	815870.0735	122850.87	20568.50	0.62	5.00		--------
14.316		33.5815	1354094.3882	203894.81	23927.67	0.62	5.00		--------
14.505		130.8809	5277456.8312	794661.05	82801.91	0.62	5.00		--------
14.897		71.4118	2879506.3676	433586.03	48009.36	0.62	5.00		--------
15.202		6.8629	276731.8307	64053.11	6802.97	0.62	5.00		--------
15.542		3.1286	126152.2881	29199.55	3886.52	0.62	5.00		--------
15.911		213.8962	8624847.2842	1996330.81	203793.66	0.62	5.00		--------
16.259		29.6063	1193800.9519	276320.44	26832.38	0.62	5.00		--------
16.434	TOLUENE	15.9226	642042.2965	148608.87	20551.04	0.62	5.00		-0.0423
16.725		33.6830	1358185.7156	314369.39	36457.09	0.62	5.00		--------
16.924		20.6614	833120.3104	192836.31	23726.69	0.62	5.00		--------
17.027		15.2485	614857.6382	142316.64	19390.76	0.62	5.00		--------
17.258		9.8484	397114.2936	91917.16	10761.91	0.62	5.00		--------
17.413		4.4574	179733.8441	41601.69	4762.98	0.62	5.00		--------
17.762		6.3788	257209.9659	59534.52	5510.74	0.62	5.00		--------
17.978		12.4356	501433.5077	116063.18	15268.61	0.62	5.00		--------
18.237		101.3127	4085189.4639	945569.16	84178.71	0.62	5.00		--------
18.385		35.4403	1429045.8233	330770.87	52186.45	0.62	5.00		--------
18.736		37.7401	1521779.1544	367950.06	45954.99	0.62	5.00		--------
19.165		2.6541	107019.7792	25876.25	2072.56	0.62	5.00		--------
19.574		3.2335	130382.6363	31525.14	3318.16	0.62	5.00		--------
19.912		123.3804	4975015.2106	1202905.90	129337.53	0.62	5.00		--------
20.466	ETHYLBENZENE	56.2456	2267968.5423	548370.73	45791.08	0.62	5.00		-0.1532
20.741	M/P XYLENE	61.2104	2468162.7480	567730.75	79253.91	0.62	5.00		-0.0673
21.084		5.5747	224786.1614	51705.67	4214.21	0.62	5.00		--------
21.452		30.8006	1241960.5247	294425.35	20971.30	0.62	5.00		--------
21.913		12.4451	501816.7744	118963.18	14547.44	0.62	5.00		--------
22.084	O-XYLENE	21.3422	860574.3363	204012.04	31015.45	0.62	5.00		-0.0192
22.375		70.0923	2826303.9320	670017.69	65486.52	0.62	5.00		--------
22.[illegible]		15.6737	632003.8628	71022.36	12639.65	0.62	5.00		--------
22.[illegible]		11.4191	460447.9569	51743.52	10673.65	0.62	5.00		--------
23.[illegible]		5.0236	202562.6654	22763.28	3981.78	0.62	5.00		--------
23.375		24.3003	979850.8386	110112.18	14988.18	0.62	5.00		--------
23.632		95.5860	3854273.3302	433129.64	91632.85	0.62	5.00		--------
23.820		53.3246	2150184.1208	241630.10	29588.17	0.62	5.00		--------
24.029		46.0382	1856377.8978	208613.20	42171.73	0.62	5.00		--------
24.137		33.9010	1366974.3536	153615.75	40232.47	0.62	5.00		--------
24.462		2.2913	92392.4789	21346.09	4881.63	0.62	5.00		--------
24.612		7.5067	302690.9951	69932.83	18383.49	0.62	5.00		--------
24.722		0.8767	35349.6534	8167.08	2547.72	0.62	5.00		--------
24.853	1,2,4-TRIMETHYLBENZE	43.4446	1751796.9303	404729.99	111875.60	0.62	5.00		-0.0199
[illegible]		3420.8452	137937306.0879	22849585.35	2.69e+06	34.10	275.00		

IT CORPORATION - KNOXVILLE

Lab Name: Severn Trent Laboratories, Inc. SDG Number:

Matrix: (soil/water) WASTE Lab Sample ID: H1J120206 001
Method: SW846 8015B TNTA-BEDGW-001
Hydrocarbons, Extractable Petroleum (8015B)

Sample WT/Vol: 1 / g Date Received: 10/12/01
Work Order: EL21J1AA Date Extracted: 10/22/01
Dilution factor: 20 Date Analyzed: 10/25/01
Moisture %:

QC Batch: 1297361

Client Sample Id: FP7001

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) mg/kg	Q
Q797	Diesel Range Organics	31000	

SURROGATE RECOVERY	%	ACCEPTABLE LIMITS
o-Terphenyl		(40 - 144)
Dotriacontane		(42 - 159)

FORM I

DDE120 Severn Trent Laboratories, Inc. Date 11/01/2001
e: 1 Data Review Time 14:47:11

Lot/Sample: H1J120206-001 FP7001 TICs.....: N Report Results: Y
WO#.....: EL21J-1-AA TNTA-BEDGW-001 Est. Results: Y Sig Fig Alg...: A
SAC.....: XX N 14 KI 01 Dry Weight..: N Upload.....:
Method....: WASTE / Hydrocarbons, Extractable Petroleum (8015B) / SW846 / 8015B

Analysis Date: 10/25/01
Inject Time..: 5:54 Inject Vol: 1.0 Units: uL
Analyst.....: 014902 Ellen Grett
Dil Factor: 20.00 Instr File: A1024033
Instr ID: A2E Column: DB-35 ID: .53
Sampling date.....:10/08/01
Leach Date.....: 0/00/00
Leach Batch.....:
Buffer Type.....:
Leach Weight.....: .0
Leach Volume.....: 0 Units:
Entered by.....:GRETTE 11/01/01 13:44:14
Prep Comments.....:
Analysis Comments...:
Result Units.....:mg/kg

Prep Date....: 10/22/01
QC Batch.....: 1297361
MS Run Number: 1297209
Prep Time....: 13:00-14:00
Init Wgt/Vol.: 1 Units: g
Final Wgt/Vol: 10.00 Units: mL
pH Values.: I) 7.0 1) .0 2) .0
Extract Solv.: MECL2 Amt..: 10.0
Exchange Solv: Amt..: .0
Spike....:
Surrogate: 100 UL 01GCSV0369
PSRL Flag: N

Total Solids.: .00

#	Analyte	* SPK	Exc Code	Result	Limit	MDL	Data Qual	Report Qual
62	Diesel Range Organics			30760	10000			

SYN#	Surrogate Recovery	Exc Code	Spike Amount	Measured Amount	Percent Recovery	Data Qual	Report Qual
02425	o-Terphenyl	NC	100	DIL	0		NC,DIL
03388	Dotriacontane	NC	100	DIL	0		NC,DIL

Notes:

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

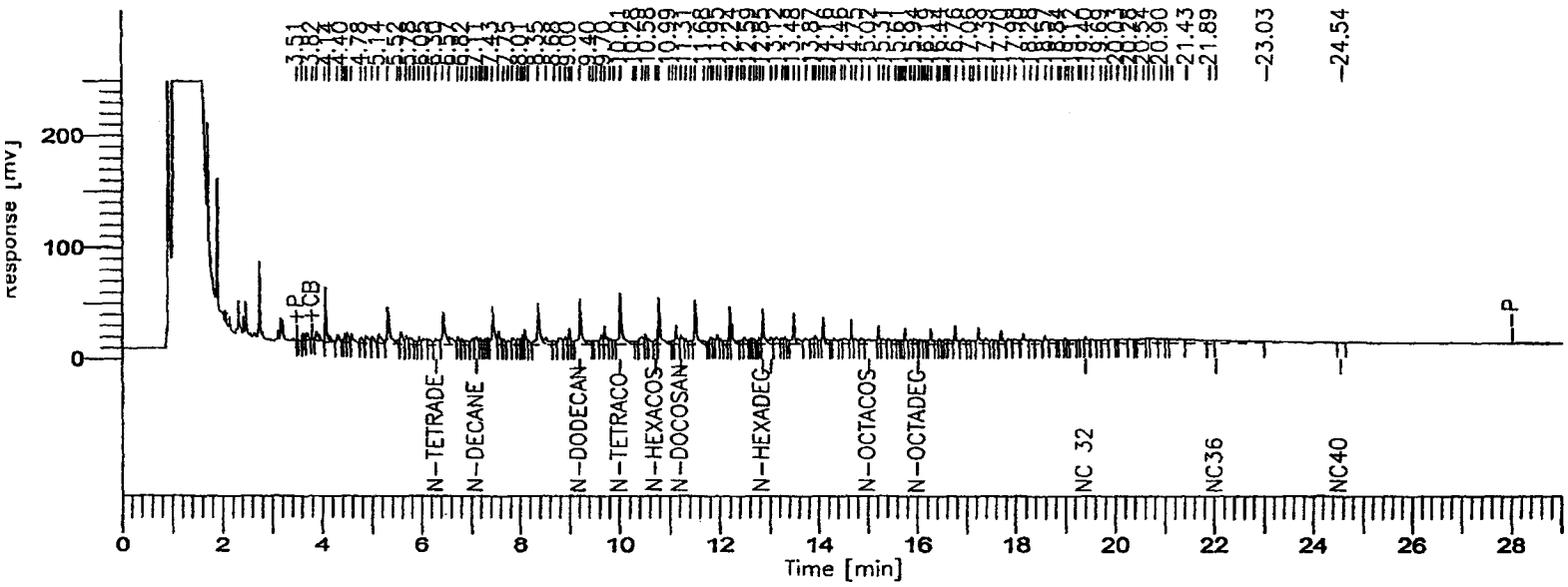
Software Version: 4.1<1L22>
Sample Name : EL21J1AA Time : 11/1/01 12:36 PM
Sample Number: J120206-1 Study : 1297361
Operator : TNTA-BEDGW-001

Instrument : GCA Channel : B A/D mV Range : 1000
AutoSampler :
Rack/Vial : 0/0

Interface Serial # : 2351570994 Data Acquisition Time: 10/25/01 05:54 AM
Delay Time : 0.00 min.
End Time : 28.99 min.
Sampling Rate : 3.1250 pts/sec

Raw Data File : E:\GCA\A102401\AA24033.RAW
Result File : E:\GCA\A102401\AA24033.RST
Inst Method : I:\GCA\A102401\102401 from E:\GCA\A102401\AA24033.RST
Proc Method : .\102401.mth
Calib Method : .\102401.mth
Sequence File : E:\GCA\A102401\102401.SEQ

Sample Volume : 1.0000 ul Area Reject : 0.000000
Sample Amount : 1.0000 Dilution Factor : 20.00



TPH STANDARD REPORT

:10-C28 = AREA 3770 C10-C28 RESULT = 30760 (320) VOL = 1 G/ML

:9-C40 AREA = _____ C9-C40 RESULT = _____ OTP/NC32 = ——

:8-C24 AREA = _____ C8-C24 RESULT = _____

eak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
	11.50	C10-C28	3.78	20.0	75.56	1122340.6	3778023.82	3778
	13.46	C9-C40	182.18	20.0	3643.59	1365085.4	5004112.31	5004
9	24.54	NC40	0.00	20.0	0.02	192.9	1073.84	1
			185.96	60.0	3719.17	2487618.9	8783209.97	8783

roup Report For : synthetic diesel components

Result File : AA24033.RST, Printed On 11/1/01 12:36 PM TWTA-BEDGW-001

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
26	6.30	n-tetradecane	4.56	20.0	91.22	6114.5	36426.99	36
33	7.11	n-decane	4.10	20.0	82.09	6765.7	32307.49	32
55	9.21	n-dodecane	17.83	20.0	356.60	41200.9	137575.60	138
63	0.01	n-tetracosane	19.01	20.0	380.29	46207.7	148482.92	148
0	10.14	n-eicosane	0.00	20.0	0.00	0.0	0.00	0
69	10.72	n-hexacosane	2.16	20.0	43.15	4203.0	16237.12	16
74	11.22	n-docosane	3.70	20.0	73.92	7765.2	29886.49	30
95	12.85	n-hexadecane	9.28	20.0	185.53	31946.0	74526.42	75
116	15.02	n-octacosane	7.30	20.0	145.96	4246.8	49279.86	49
127	16.02	n-octadecane	0.68	20.0	13.55	2999.5	5479.49	5
			68.62	200.0	1372.32	151449.4	530202.38	530

Group Report For : SURROGATES

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
96	13.01	O-TP	9.80	20.0	196.09	5804.3	28293.44	28
160	19.40	NC 32	11.30	20.0	225.95	5882.9	25765.86	26
			21.10	40.0	422.04	11687.2	54059.30	54

Software Version: 4.1<1L22>
Sample Name : EL21J1AA
Sample Number: J120206-1
Operator : TNTA-BEDGW-001

Time : 10/25/01 06:23
Study : 1297361

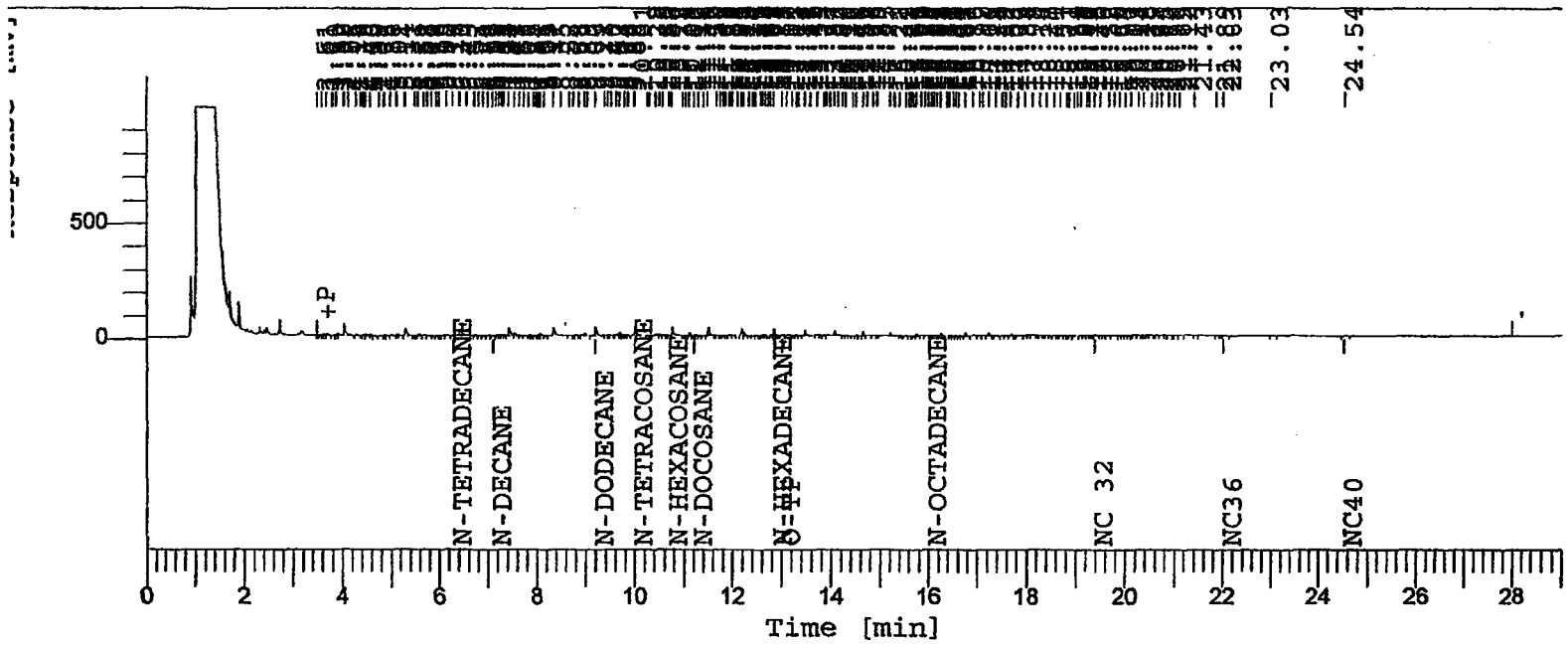
Instrument : GCA
AutoSampler :
Rack/Vial : 0/0

Channel : B A/D mV Range : 1000

Interface Serial # : 2351570994 Data Acquisition Time: 10/25/01 05:54
Delay Time : 0.00 min.
End Time : 28.99 min.
Sampling Rate : 3.1250 pts/sec

Raw Data File : I:\GCA\A102401\AA24033.RAW
Result File : I:\GCA\A102401\AA24033.RST
Inst Method : I:\GCA\A102401\102401 from I:\GCA\A102401\AA24033.RST
Proc Method : I:\GCA\A102401\102401
Calib Method : I:\GCA\A102401\102401
Sequence File : I:\GCA\A102401\102401.SEQ

Sample Volume : 1.0000 ul Area Reject : 0.000000
Sample Amount : 1.0000 Dilution Factor : 20.00



TPH STANDARD REPORT

10-C28 = AREA_____ C10-C28 RESULT = _____ VOL = _____G/ML

9-C40 AREA = _____ C9-C40 RESULT = _____ OTP/NC32 = _____

8-C24 AREA = _____ C8-C24 RESULT = _____

ak	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
	11.50	C10-C28	1.78	20.0	35.56	785617.5	1777771.80	1778
	13.46	C9-C40	113.84	20.0	2276.71	921264.4	2049816.92	2050
9	24.54	NC40	7.08e-04	20.0	0.01	146.3	708.48	1
			115.61	60.0	2312.28	1707028.2	3828297.20	3828

roup Report For : synthetic diesel components

Result File : AA24033.RST, Printed On 10/25/01 06:23

TNTA-BEDGW-001

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
26	6.30	n-tetradecane	0.52	20.0	10.33	2393.3	4125.89	4
33	7.11	n-decane	2.13	20.0	42.58	4336.5	16756.41	17
55	9.21	n-dodecane	13.05	20.0	260.99	38712.7	100688.32	101
63	10.01	n-tetracosane	13.33	20.0	266.54	43502.4	104069.11	104
0	10.14	n-eicosane	0.00	20.0	0.00	0.0	0.00	0
69	10.72	n-hexacosane	0.75	20.0	15.00	1991.2	5643.69	6
74	11.22	n-docosane	0.51	20.0	10.12	3378.2	4090.40	4
95	12.85	n-hexadecane	5.71	20.0	114.12	28629.4	45839.68	46
0	15.07	n-octacosane	0.00	20.0	0.00	0.0	0.00	0
127	16.02	n-octadecane	0.13	20.0	2.56	684.6	1035.00	1
			36.11	200.0	722.23	123628.3	282248.49	282

Group Report For : SURROGATES

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
96	13.01	O-TP	2.90	20.0	58.03	2958.1	8372.46	8
160	19.40	NC 32	2.41	20.0	48.27	3132.6	5504.32	6
			5.31	40.0	106.29	6090.7	13876.78	14

SHAW E & I INC

Client Sample ID: CC3002
NK-MW20

GC/MS Volatiles

Lot-Sample #...: H2G120173-006 **Work Order #...:** E4K851AA **Matrix.....:** WATER
Date Sampled...: 07/11/02 **Date Received..:** 07/12/02
Prep Date.....: 07/12/02 **Analysis Date..:** 07/12/02
Prep Batch #...: 2192323
Dilution Factor: 1000 **Method.....:** SW846 8260B

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Benzene	ND	1000	ug/L	240
Toluene	**37000**	**1000**	**ug/L**	**250**
Ethylbenzene	ND	1000	ug/L	190
m-Xylene & p-Xylene	ND	1000	ug/L	390
o-Xylene	ND	1000	ug/L	230

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
Dibromofluoromethane	103	(80 - 120)
1,2-Dichloroethane-d4	102	(77 - 128)
Toluene-d8	87	(80 - 120)
Bromofluorobenzene	113	(72 - 129)

Data File: /chem/gcms/mj.i/J071202.b/e4k851aa.d
Report Date: 12-Jul-2002 16:41

MK-MW20

STL Knoxville

SW-846 Method 8260A - Volatile Organics

Data file : /chem/gcms/mj.i/J071202.b/e4k851aa.d
Lab Smp Id: E4K851AA Client Smp ID: CC3002
Inj Date : 12-JUL-2002 16:32
Operator : 22980 Inst ID: mj.i
Smp Info : E4K851AA,1000,0,,,
Misc Info : J071202,8260B_LL,s.sub
Comment :
Method : /var/chem/gcms/mj.i/J071202.b/8260B_LL.m
Meth Date : 12-Jul-2002 11:31 gosss Quant Type: ISTD
Cal Date : 09-JUL-2002 19:04 Cal File: icvjg095.d
Als bottle: 1
Dil Factor: 1000.00000
Integrator: HP RTE Compound Sublist: s.sub
Target Version: 3.50
Processing Host: qmidhp01

07/16/02

Concentration Formula: Amt * DF * Uf*Vt/(Vo*1000) * CpndVariable

Name	Value	Description
DF	1000.00000	Dilution Factor
Uf	1.00000	Unit Correction factor
Vt	5000.00000	Sample Volume Purged
Vo	5.00000	Sample Volume Used

Cpnd Variable Local Compound Variable

BTXE only

Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/L)	FINAL (ug/L)
* 1 Fluorobenzene	96	2.418	2.422	(1.000)	423426	10.0000	
* 2 Chlorobenzene-d5	119	4.322	4.326	(1.000)	84307	10.0000	
* 3 1,4 Dichlorobenzene-d4	152	6.105	6.102	(1.000)	110334	10.0000	
$ 5 1,2-Dichloroethane-d4	65	2.248	2.245	(0.930)	195937	10.1923	10.192
$ 4 Dibromofluoromethane	113	2.071	2.075	(0.857)	118508	10.3323	10.332
$ 6 Toluene-d8	98	3.331	3.328	(0.771)	359911	8.66620	8.6662
$ 7 4-Bromofluorobenzene	95	5.216	5.214	(0.854)	153221	11.3299	11.330
11 Chloromethane (spcc)	50	0.709	0.706	(0.293)	2887	0.21904	219.04
14 Bromomethane	94	0.830	0.822	(0.343)	1675	0.50166	501.66
15 Chloroethane	64	0.727	0.846	(0.301)	2325	0.47160	471.60
20 1,1-Dichloroethene (ccc)	96	0.824	1.108	(0.341)	1866	0.18374	183.74
24 Carbon Disulfide	76	1.226	1.223	(0.507)	4783	0.13465	134.65
22 Acetone	43	1.110	1.114	(0.459)	14121	1.86571	1865.7
27 Methylene Chloride	84	1.305	1.303	(0.540)	4410	0.32788	327.88

NA

Data File: /chem/gcms/mj.i/J071202.b/e4k851aa.d
Report Date: 12-Jul-2002 16:41

MK-MW20

	Compounds	QUANT SIG MASS	RT	EXP RT	REL RT	RESPONSE	CONCENTRATIONS ON-COLUMN (ug/L)	CONCENTRATIONS FINAL (ug/L)
	32 *Hexane	57	1.536	1.528	(0.635)	3116	0.12000	120.00
	45 1,1-Dichloropropene	75	2.418	2.179	(1.000)	32081	1.58554	1585.5
	47 1,2-Dichloroethane	62	2.418	2.288	(1.000)	8121	0.26758	267.58
	49 Trichloroethene	130	2.619	2.617	(1.083)	1924	0.15702	157.02
	50 1,2-Dichloropropane (ccc)	63	2.424	2.738	(1.002)	20772	0.87639	876.39
	54 cis-1,3-Dichloropropene	75	3.373	3.152	(1.395)	12072	0.48766	487.66
	55 4-Methyl-2-pentanone	43	3.227	3.237	(1.335)	4409	0.19989	199.89
	56 Toluene (ccc)	91	3.373	3.371	(0.780)	2017081	36.7712	36771
	57 trans-1,3-Dichloropropene	75	3.416	3.499	(0.790)	2640	0.11819	118.18
	60 1,3-Dichloropropane	76	3.373	3.742	(0.780)	9663	0.44751	447.51
	61 2-Hexanone	43	3.410	3.785	(0.789)	3812	0.23765	237.65
	66 Ethylbenzene (ccc)	106	4.511	4.423	(1.044)	1912	~~0.11737~~	~~117.37~~
	68 o-Xylene	106	4.511	4.819	(1.044)	1912	~~0.10235~~	~~102.35~~
M	9 Xylene (total)	106				1912	~~0.10235~~	~~102.35~~

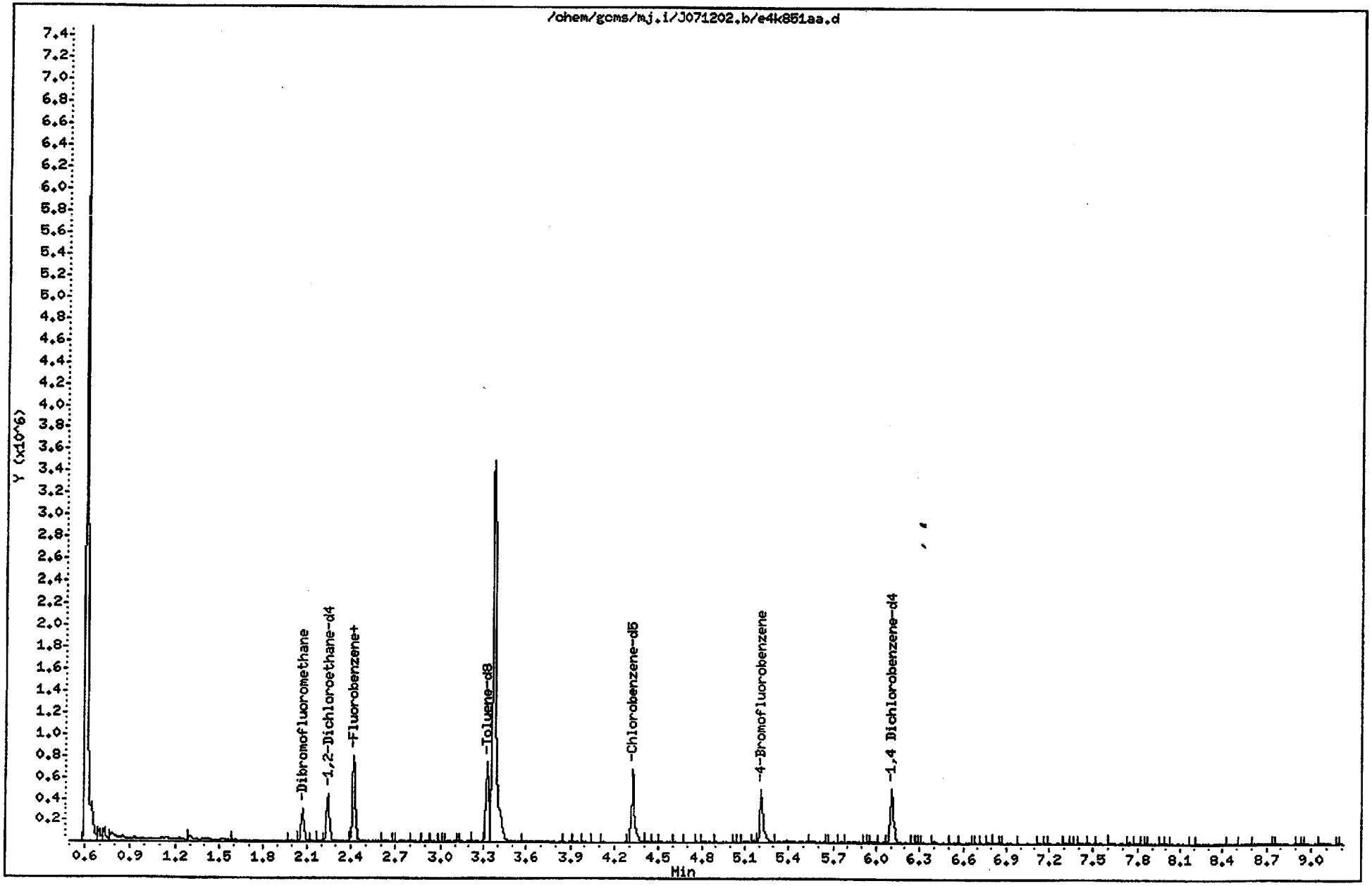
NA

NA

MT 7/15/02

Data File: /chem/gcms/mj.i/J071202.b/e4k851aa.d
Date : 12-JUL-2002 16:32
Client ID: CC3002 , MK-MW20
Sample Info: E4K851AA,1000,0,,,
Purge Volume: 5.0
Column phase: J+W 624

Instrument: mj.i
Operator: 22980
Column diameter: 0.18



SHAW E & I INC

Client Sample ID: CC3002, MK-MW20

GC Volatiles

Lot-Sample #...:	H2G120123-001	**Work Order #...:**	E4KQX1AC	**Matrix.....:**	WATER
Date Sampled...:	07/11/02	**Date Received..:**	07/12/02		
Prep Date.....:	07/22/02	**Analysis Date..:**	07/23/02		
Prep Batch #...:	2204349				
Dilution Factor:	200	**Method.....:**	SW846 8015B		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Gasoline Range Organics	**65000**	**20000**	**ug/L**	**3800**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
4-Bromofluorobenzene (GRO)	105	(75 - 125)

PDE120 Severn Trent Laboratories, Inc. Date 7/23/2
Page: 1 Data Review Time 14:30

Lot/Sample: H2G120123-001 CC3002 TICs.....: N Report Results: Y
WO#.....: E4KQX-1-AC MK-MW20 Est. Results: N Sig Fig Alg...: A
SAC.....: XX I 15 KJ 01 Dry Weight...: N Upload.....: Y
Method....: WATER / Hydrocarbons, Volatile Petroleum (8015B) / SW846 / 8015B

Analysis Date: 7/23/02
Inject Time..: 10:50 Inject Vol: 1.0 Units: mL
Analyst.....: 400784 Lili Ao
Dil Factor: 200.00 Instr File: F722119.R
Instr ID: F1A Column: RTX-502.2 ID: .53
Sampling date.....: 7/11/02
Leach Date.....: 0/00/00
Leach Batch.....:
Buffer Type.....:
Leach Weight.....: .0
Leach Volume.....: 0 Units:
Entered by.....:HERMANK 7/23/02 13:30:25
Prep Comments.....:
Analysis Comments...:
Result Units.....:ug/L

Prep Date....: 07/22-07/23/02
QC Batch.....: 2204349
MS Run Number: 2204141
Prep Time....: 9:30-11:44
Init Wgt/Vol.: 5 Units: mL
Final Wgt/Vol: 5.00 Units: mL
pH Values.: I) .0 1) .0 2) .0
Extract Solv.: Amt..: .0
Exchange Solv: Amt..: .0
Spike....:
Surrogate: 02GCV0128
PSRL Flag: N

Total Solids.: .00

SYN#	Analyte	* SPK	Exc Code	Result	Limit	MDL	Data Qual	Report Qual
02861	Gasoline Range Organics			65371.2717	20000	3828.2		

SYN#	Surrogate Recovery	Exc Code	Spike Amount	Measured Amount	Percent Recovery	Data Qual	Report Qual
03770	4-Bromofluorobenzene (GRO)		4000	4188.2	104.70541		

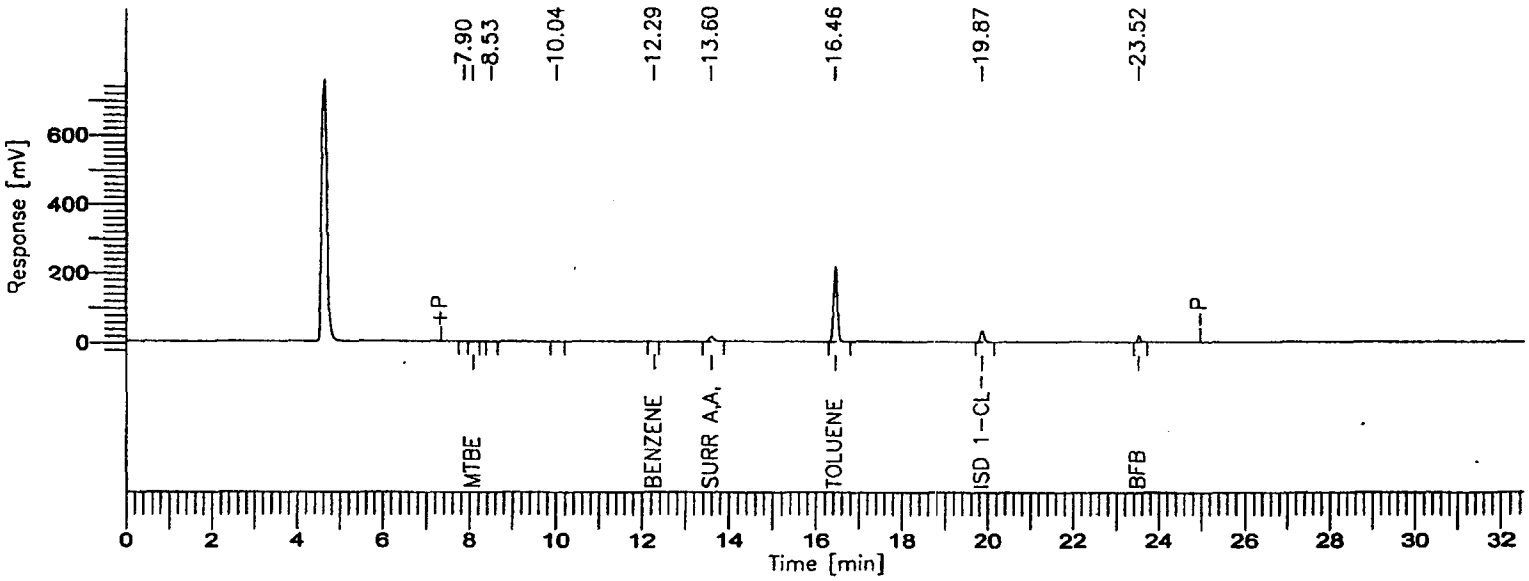
Software Version: 4.1<1L22>
Sample Name : H2G120123-001 Time : 7/23/02 13:35
Sample Number: E4KQX1AC Study : PH<2
Operator : MK-MW20

Instrument : GCF Channel : B A/D mV Range : 1000
Autosampler :
Rack/Vial : 0/0

Interface Serial # : 2199570186 Data Acquisition Time: 7/23/02 10:50
Delay Time : 0.00 min.
End Time : 32.50 min.
Sampling Rate : 1.1110 pts/sec

Raw Data File : E:\GCF\F722119.RAW
Result File : E:\GCF\F722119.RST
Inst Method : E:\GCF\AF072202 from E:\GCF\F722119.RST
Proc Method : E:\GCF\BF0722RG.mth
Calib Method : E:\GCF\BF0722RG.mth
Sequence File : E:\GCF\AF072202.SEQ

Sample Volume : 1.0000 mL Area Reject : 0.000000
Sample Amount : 1.0000 Dilution Factor : 200.00



GCF Total Purgeable Hydrocarbons

Time [min]	Component Name	Raw AMT	Adjusted Amount	Area [µV·s]	Height [µV]	DIVISOR	MULTIPLIER	Cal. Range	Delta RT [%]
16.155	8015B/GRO	422.6156	84523.1130	1658256.61	283527.45	1.00	1.00		0.0000
19.874	QC comp	-95.7592	-19151.8413	375739.44	65565.36	1.00	1.00		0.0000
		326.8564	65371.2717	2033996.06	349092.81	2.00	2.00		

Group Report For : QC comp

Time [min]	Component Name	Raw AMT	Adjusted Amount	Area [µV·s]	Height [µV]	DIVISOR	MULTIPLIER	Cal. Range	Delta RT [%]
13.600	SURR a,a,a-TFT	21.2643	4252.8537	98284.88	13935.46	1.00	1.00		0.0998
19.874	ISD 1-Cl-4-Fluoroben	42.7609	----------	202042.31	33154.76	1.00	1.00		0.0816
23.521	BFB	20.9411	4188.2164	75412.25	18475.14	1.00	1.00		0.0502
		84.9662	8441.0701	375739.44	65565.36	3.00	3.00		

Report stored in ASCII file: E:\GCF\F722119.TXO

GCF FID

Result File : F722119.RST, Printed On 7/23/02 13:35

Group Report For : 8015B/GRO MK-MW20

Time [min]	Component Name	Raw AMT	Adjusted Amount	Area [µV·s]	Height [µV]	DIVISOR	MULTIPLIER	Cal. Range	Delta RT [%]
7.899		0.2621	52.4206	760.29	132.04	1.00	1.00		-------
8.094	MTBE	0.6607	132.1432	1916.57	225.25	1.00	1.00		-0.4153
8.530		0.8148	162.9672	2363.64	341.56	1.00	1.00		-------
10.038		-2.2671	-453.4159	2156.62	271.55	1.00	1.00		-------
12.288	BENZENE	0.1644	32.8796	1254.28	208.93	1.00	1.00		0.2140
13.600	SURR a,a,a-TFT	21.2643	4252.8537	98284.88	13935.46	1.00	1.00		0.0998
16.462	TOLUENE	172.7789	34555.7792	1274065.77	216782.74	1.00	1.00		0.0896
19.874	ISD 1-Cl-4-Fluorobenzene	42.7609	----------	202042.31	33154.76	1.00	1.00		0.0816
23.521	BFB	20.9411	4188.2164	75412.25	18475.14	1.00	1.00		0.0502
		257.3801	42923.8440	1658256.61	283527.45	9.00	9.00		

Report stored in ASCII file: E:\GCF\F722119.TX1

SHAW E & I INC

Client Sample ID: CC3002, MK-MW20

GC Semivolatiles

Lot-Sample #...:	H2G120123-001	**Work Order #...:**	E4KQX1AA	**Matrix.....:**	WATER
Date Sampled...:	07/11/02	**Date Received..:**	07/12/02		
Prep Date.....:	07/16/02	**Analysis Date..:**	07/18/02		
Prep Batch #...:	2197266				
Dilution Factor:	1	**Method.....:**	SW846 8015B		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Diesel Range Organics	**140**	**50**	**ug/L**	**12**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
o-Terphenyl	98	(28 - 131)
Dotriacontane	115	(37 - 139)

PDE120 Severn Trent Laboratories, Inc. Date 7/23/ 2
Page: 1 Data Review Time 9:4 J

Lot/Sample: H2G120123-001 CC3002 TICs.....: N Report Results: Y
WO#.....: E4KQX-1-AA MK. MW20 Est. Results: N Sig Fig Alg...: A
SAC.....: XX I 10 KI 01 Dry Weight..: N Upload.....:
Method....: WATER / Hydrocarbons, Extractable Petroleum (8015B) / SW846 / 8015B

Analysis Date: 7/18/02
Inject Time..: 13:54 Inject Vol: 1.0 Units: uL
Analyst.....: 014902 Ellen Grett
Dil Factor: 1.00 Instr File: A718008
Instr ID: A2E Column: DB-35 ID: .53
Sampling date.....: 7/11/02
Leach Date.....: 0/00/00
Leach Batch.....:
Buffer Type.....:
Leach Weight.....: .0
Leach Volume.....: 0 Units:
Entered by.....:GRETTE 7/23/02 8:47:46
Prep Comments.....:
Analysis Comments...:
Result Units.....:ug/L

Prep Date....: 07/16-07/17/02
QC Batch.....: 2197266
MS Run Number:
Prep Time....: 11:20- 8:00
Init Wgt/Vol.: 1040 Units: mL
Final Wgt/Vol: 1.00 Units: mL
pH Values.: I) 7.0 1) .0 2) .0
Extract Solv.: MECL2 Amt..: 500.0
Exchange Solv: Amt..: .0
Spike....:
Surrogate: 100UL 02GCSV0670
PSRL Flag: N

Total Solids.: .00

SYN#	Analyte	* SPK	Exc Code	Result	Limit	MDL	Data Qual	Report Qual
02862	Diesel Range Organics			138.8	50	11.815		

SYN#	Surrogate Recovery	Exc Code	Spike Amount	Measured Amount	Percent Recovery	Data Qual	Report Qual
02425	o-Terphenyl		96	93.83	97.7395833		
03388	Dotriacontane		96	110.54	115.145833		

Software Version: 4.1<1L22>
Sample Name : E4KQX1AA
Sample Number: G120123-1
Operator : MK-MW20

Time : 7/23/02 08:32 AM
Study : 2197266

I rument : GCA
A. Sampler :
Rack/Vial : 0/0

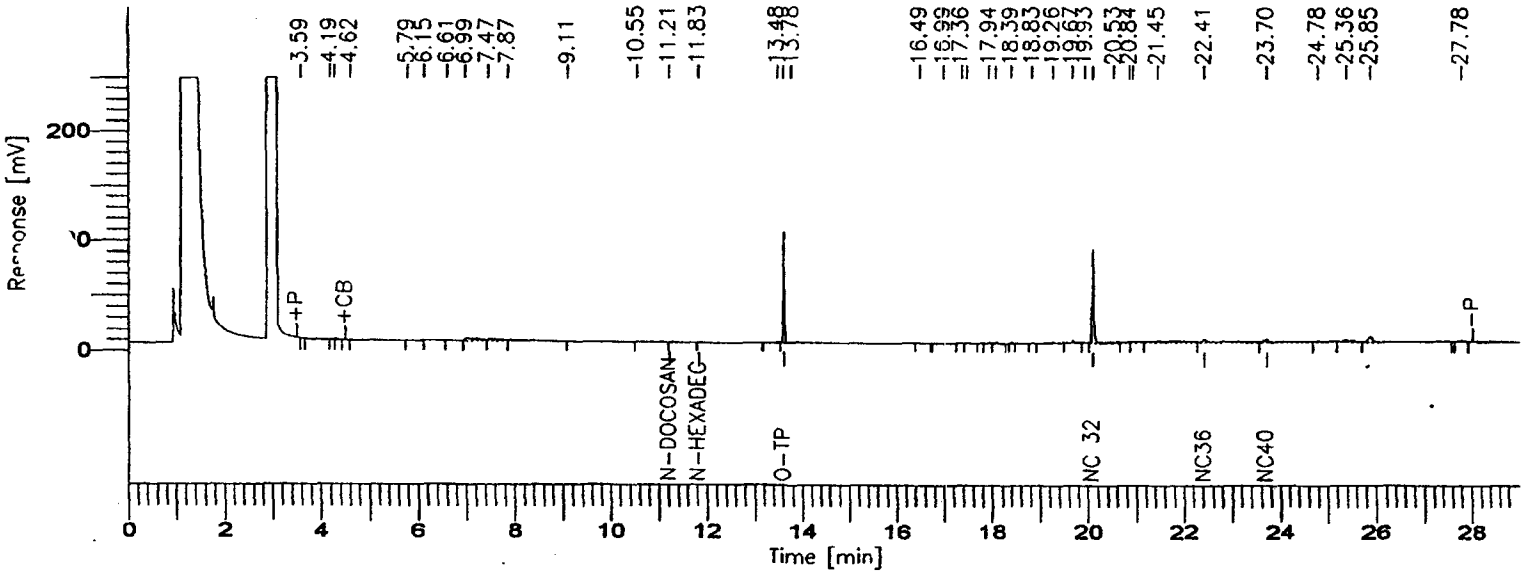
Channel : B A/D mV Range : 1000

Interface Serial # : 2351570994 Data Acquisition Time: 7/18/02 01:54 PM
Delay Time : 0.00 min.
End Time : 28.99 min.
Sampling Rate : 3.1250 pts/sec

Raw Data File : E:\GCA\A071802\A718008.RAW
Result File : E:\GCA\A071802\A718008.RST
Inst Method : I:\GCA\A071802\071802 from E:\GCA\A071802\A718008.RST
Proc Method : .\071802.mth
Calib Method : .\071802.mth
Sequence File : E:\GCA\A071802\071802.SEQ

Sample Volume : 1.0000 ul
Sample Amount : 1.0000

Area Reject : 0.000000
Dilution Factor : 0.96



TPH STANDARD REPORT

C10-C28 = AREA 148 C10-C28 RESULT = 138.8 VOL = 1040 G/ML

C9-C40 AREA = _____ C9-C40 RESULT = _____ OTP/NC32 = 93.83 / 110.54

C8-C24 AREA = _____ C8-C24 RESULT = _____ .96

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
	12.18	C10-C28	0.35	1.0	0.33	117413.0	348795.87	349 -161
	14.63	C9-C40	917.53	1.0	880.83	221839.1	847594.46	848
			917.88	1.9	881.16	339252.0	1196390.33	1196

gw 7/23/02

Group Report For : synthetic diesel components

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor

0	6.30	n-tetradecane	0.00	1.0	0.00	0.0	0.00	0
0	7.14	n-decane	0.00	1.0	0.00	0.0	0.00	0
0	9.21	n-dodecane	0.00	1.0	0.00	0.0	0.00	0
0	10.07	n-tetracosane	0.00	1.0	0.00	0.0	0.00	0
0	10.15	n-eicosane	0.00	1.0	0.00	0.0	0.00	0
0	10.69	n-hexacosane	0.00	1.0	0.00	0.0	0.00	0
13	11.21	n-docosane	0.15	1.0	0.14	195.5	1205.03	1
14	11.83	n-hexadecane	0.14	1.0	0.13	142.5	1106.72	1
0	15.08	n-octacosane	0.00	1.0	0.00	0.0	0.00	0
0	16.01	n-octadecane	0.00	1.0	0.00	0.0	0.00	0
			0.29	9.6	0.28	338.0	2311.75	2

Group Report For : SURROGATES

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
16	13.61	O-TP	98.84	1.0	94.89	102465.6	163103.63	163
29	20.09	NC 32	119.60	1.0	114.82	85132.4	171124.85	171
			218.44	1.9	209.70	187598.0	334228.48	334

Report stored in ASCII file: E:\GCA\A071802\A718008.TXO

Software Version: 4.1<1L22>
Sample Name : E4KQX1AA
Sample Number: G120123-1
Operator : MK-MW20

Time : 7/18/02 14:24
Study : 2197266

Instrument : GCA
AutoSampler :
Rack/Vial : 0/0

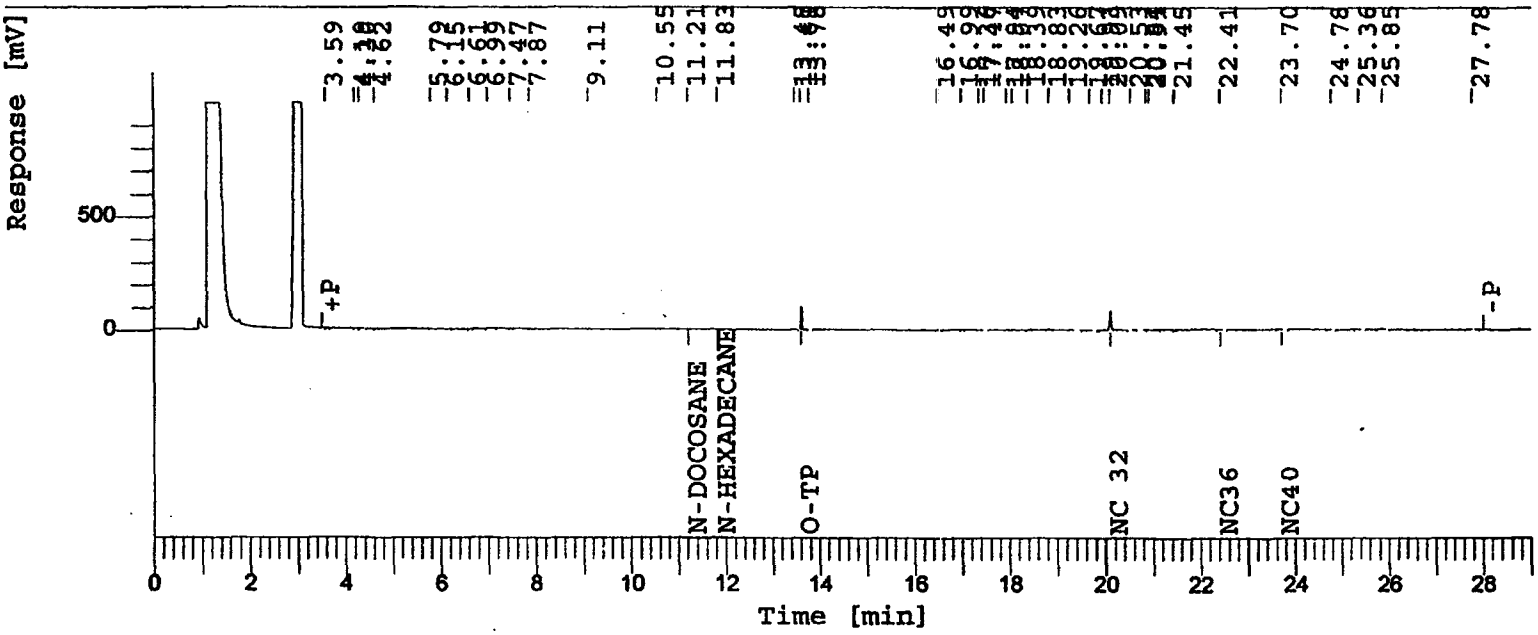
Channel : B A/D mV Range : 1000

Interface Serial # : 2351570994 Data Acquisition Time: 7/18/02 13:54
Delay Time : 0.00 min.
End Time : 28.99 min.
Sampling Rate : 3.1250 pts/sec

Raw Data File : I:\GCA\A071802\A718008.RAW
Result File : I:\GCA\A071802\A718008.RST
Inst Method : I:\GCA\A071802\071802 from I:\GCA\A071802\A718008.RST
Proc Method : I:\GCA\A071802\071802
Calib Method : I:\GCA\A071802\071802
Sequence File : I:\GCA\A071802\071802.SEQ

Sample Volume : 1.0000 ul
Sample Amount : 1.0000

Area Reject : 0.000000
Dilution Factor : 0.96



TPH STANDARD REPORT

C10-C28 = AREA_____ C10-C28 RESULT = _____ VOL = _____G/ML

C9-C40 AREA = _____ C9-C40 RESULT = _____ OTP/NC32 = _____

C8-C24 AREA = _____ C8-C24 RESULT = _____

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
	12.18	C10-C28	0.20	1.0	0.19	112739.4	196692.00	197
	14.63	C9-C40	419.68	1.0	402.89	209265.4	393682.08	394
			419.87	1.9	403.08	322004.9	590374.08	590

Group Report For : synthetic diesel components

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor

106

MK-MW20

0	6.30	n-tetradecane	0.00	1.0	0.00	0.0	0.00	0
0	7.14	n-decane	0.00	1.0	0.00	0.0	0.00	0
0	9.21	n-dodecane	0.00	1.0	0.00	0.0	0.00	0
0	10.07	n-tetracosane	0.00	1.0	0.00	0.0	0.00	0
0	10.15	n-eicosane	0.00	1.0	0.00	0.0	0.00	0
0	10.69	n-hexacosane	0.00	1.0	0.00	0.0	0.00	0
13	11.21	n-docosane	0.05	1.0	0.05	156.3	404.80	0
14	11.83	n-hexadecane	0.03	1.0	0.03	140.5	218.08	0
0	15.08	n-octacosane	0.00	1.0	0.00	0.0	0.00	0
0	16.01	n-octadecane	0.00	1.0	0.00	0.0	0.00	0
			0.08	9.6	0.07	296.9	622.88	1

Group Report For : SURROGATES

Peak #	Time [min]	Component Name	Raw Amount	Dilution Factor	Adjusted Amount	Height [µV]	Area [µV·s]	PEAK AREA Factor
16	13.61	O-TP	97.74	1.0	93.83	102189.1	161286.31	161
29	20.09	NC 32	115.15	1.0	110.54	84623.0	164753.15	165
			212.89	1.9	204.37	186812.1	326039.46	326

Report stored in ASCII file: I:\GCA\A071802\A718008.TXO

DW 7/23/02

APPENDIX P

COMMENTS AND RESPONSES

RESPONSE TO INTERNAL REVIEW COMMENTS
SHAW ENVIRONMENTAL, INC.
2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS, SANDUSKY, OHIO
(Report dated August 2002)

Reference: Comments received from Mike Gunderson and Tom Siard (dated March 31, 2003)

Comment 1: **Rename Tables 3-1 through 3-20 to include "Analytical Results" instead of "Constituents."**

Response: Tables 3-1 through 3-20 will be renamed according to Comment 1.

Comment 2: **Refer to background wells (except PB-BED-MW26) as "potential" background wells.**

Response 2: Background wells will be referred to as "potential" background wells.

Comment 3: **Change IT Corporation to Shaw Environmental, Inc. throughout document.**

Response 3: Concur. Reference to IT Corporation will be changed to Shaw Environmental, Inc.

Comment 4: **Page 1-1, Section 1.0, third paragraph, replace with the following text: "This report represents an interim document in the RI/FS process. The purpose of this report is to provide a comprehensive summary of all data collected through October 2002, document key decisions made by the USACE in conjunction with OEPA and to the extent practical, provide an evaluation of the data." In addition, add the following text: "This data evaluation and subsequent recommendations define the data needs to complete the RI. As such, this document represents the basis, both in format and content, that the RI report. The report of finals (Volume 1 of the RI/FS) is anticipated to be issued in 2004."**

Response 4: Concur. Text will be replaced and added.

Comment 5: **Page 1-1, Section 1.0, third paragraph, add the following sentence before the last sentence: "Note that the quarterly groundwater sampling was designed to monitor seasonal changes in groundwater quality. As discussed in Section 6.0 in this report, two general seasons exist in reference to groundwater recharge, a wet season (October) and a dry season (April)."**

Response 5: Concur. Sentence will be added.

Comment 6: **Page 1-2, Section 1.0, after first set of bullets, add the following text: "In addition, quarterly groundwater elevation measurements were also conducted by ICI to support ongoing investigation and remediation activities at PBOW. This information is critical in the evaluation of groundwater flow and contaminant transport and is incorporated into this report."**

Response 6: Concur. Text will be added.

Comment 7: **Page 1-2, Section 1.1, third bullet, change "completed in 2003" to "completed in 2004."**

Response 7: Concur. "2003" will be changed to "2004."

Comment 8: **Page 1-3, Section 1.1, first paragraph on page, change "both supplemental soil data and" to "both historical groundwater data (pre-2001) and." Also, move "Figure 1-2 identifies....other site features." to the last sentence in that paragraph.**

Response 8: Concur. Changes will be made.

Comment 9: **Page 1-3, "Report Organization" should be numbered 1.2. This will also change the remaining subsections in this section.**

Response 9: Subsections will be renumbered accordingly.

Comment 10: **Page 1-4, Section 1.3, third paragraph, add the following sentence after the second sentence: "Based on soil investigations completed at the TNT areas, at least portions of the concrete foundations remain in place."**

Response 10: Sentence will be added.

Comment 11: **Page 1-5, Section 1.3, item number 4, add the following sentence: "As previously noted, recent soil investigations completed at the TNT areas, at least portions of the concrete foundations remain in place."**

Response 11: Concur. Sentence will be added.

Comment 12: **Page 2-1, Section 2.1, second sentence, change "lake" to "lacustrine sediments" and remove "sediment" at the end of the sentence.**

Response 12: Concur. Changes will be made.

Comment 13: **Page 2-2, Section 2.2.2, second paragraph, fifth sentence, change "BTEX" to "hydrocarbons."**

Response 13: Concur. Change will be made.

Comment 14: **Page 3-2, Section 3.1.1.1, first paragraph on page, add "through the wastewater settling tanks and pump house" in the second complete sentence.**

Response 14: Concur. Text will be added.

Comment 15: **Throughout text, change "preliminary screening levels" to RBSCs.**

Response 16: Concur. Changes will be made.

Comment 17: **Page 3-3, Section 3.1.1.1, first complete paragraph on page, add "except wells PB-TNTA-MW10 and PB-TNTA-MW11" at end of first sentence.**

Response 17: Concur. Text will be added.

Comment 18: **Page 4-1, Section 4.1, first paragraph, change "chemical parameters above preliminary screening levels" to "nitroaromatic contamination."**

Response 18: Concur. Change will be made.

Comment 19: **Page 4-1, Section 4.1, last paragraph on page, remove "subsurface soil sampling."**

Response 19: Concur. Text will be removed.

Comment 20: **Page 4-2, Section 4.2, add the following text before last sentence: "Note that only the initial phase of sampling locations are shown on Figures 4-1, 4-2, and 4-3. Locations of remaining samples were to be based on field screening results."**

Response 20: Concur. Text will be added.

Comment 21: **Page 4-3, Section 4.2, add the following text at end of section: "It should be noted that this investigative technique was previously used at PBOW to collect groundwater samples. During the 2000 source area investigations, groundwater samples were collected at approximately 90% of all attempted sampling locations. This supports the validity of both the sampling method employed and the interpretation of the discontinuous nature of overburden groundwater."**

Response 21: Concur. Text will be added.

Comment 22: **Page 4-8, Section 4.6, add the following sentence before the first complete sentence on page: "As previously noted in Section 4.5, this well could not be properly developed and sample results, particularly for inorganic analyses, may not be representative of site conditions."**

Response 22: Concur. Sentence will be added.

Comment 23: **Page 6-1, Section 6.1, add the following sentence at end of paragraph: "Note that elevations were corrected for those wells with free product."**

Response 23: Concur. Sentence will be added.

Comment 24: **Page 6-2, Section 6.2, fist paragraph on page, text needs to be moved into appropriate subsections (6.2.1 and 6.2.2).**

Response 24: Concur. Text will be moved.

Comment 25: **Page 6-2, Section 6.2.1, first sentence, remove "is a water table aquifer that."**

Response 25: Concur. Text will be removed.

Comment 26: **Page 6-8, Section 6.4, first paragraph, third sentence, replace "November 2000 PRG screening levels and background 95th upper tolerance limits (UTL) have been used to evaluate" with "As discussed in Section 5.4, RBSCs are provided for comparison purposes for."**

Response 26: Concur. Text will be replaced.

Comment 27: **Page 7-7, Section 7.3.3, add the following text after the second paragraph: "The following paragraphs evaluate specific inorganics which exceed the RBSC and appear to be relatively elevated in one or more samples. The following discussion focuses on the MDCs."**

Response 27: Concur. Text will be added.

Comment 28: **Page 7-8 through 7-10, Section 7.3.3, replace "exceeds the background 95th UTL of ..." with "is elevated."**

Response 28: Concur. Changes will be made.

Reference: Comments received from Mary Hall (dated April 1, 2003)

Comment 1: **Make necessary changes to table of contents to match text.**

Response 1: Concur. Table of contents will be updated after all editing changes are made.

Comment 2: **Page ix, List of Figures, add spaces as necessary to Figures 3-1 through 3-3.**

Response 3: Concur. Spaces will be added.

Comment 4: **Page xii, List of Acronyms, update as necessary.**

Response 4: Concur. List of Acronyms will be updated after all editing changes are made.

Comment 5: **Change IT Corporation to Shaw Environmental, Inc. throughout document.**

Response 5: Concur. Reference to IT Corporation will be changed to Shaw Environmental, Inc..

Comment 6: **Page ES-4, first sub-bullet, change "20003" to "2003."**

Response 6: Concur. Change will be made.

Comment 7: **Page 3-4, Section 3.1.1.1, first paragraph, spell out µg/L the first time that it is used. Also same paragraph, third sentence, add a space between 1.3 and µg/L.**

Response 7: Concur. Changes will be made.

Comment 8: **Page 3-4, Section 3.1.1.1, last paragraph on page, add [ILCR] in the second sentence, change "TRTA" to "TNTA" and spell out FFS in the last sentence of the paragraph.**

Response 8: Concur. Changes will be made.

Comment 9: **Pages 4-3 through 4-11, subsections need to be renumbered.**

Response 9: Concur. Subsections will be renumbered.

Comment 10: **Table 4-2, H2S and pH need to be added and defined below the table.**

Response 10: Concur. These will be added and defined to Table 4-2.

Comment 11: **Table 5-1, IDW, T/D, and TCLP need to be added and defined below the table.**

Response 11: Concur. These will be added and defined to Table 5-1.

Reference: Comments received from Bill Hedberg (dated March 31, 2003)

Comment 1: **Page xiv, List of Acronyms, add TSS.**

Response 1: Concur. List of Acronyms will be updated after all editing changes are made.

Comment 2: **Page ES-2, first paragraph, third sentence, change "combined" to "connected."**

Response 2: Concur. Change will be made.

Comment 3: **Page ES-2, last paragraph on page, change "The similarity based upon the majority of wells with hydrocarbon detections screened in the Delaware Limestone, ...found in the Delaware Limestone" to "The similarity is based upon the majority of wells with hydrocarbon detections are screened in the Delaware Limestone, ...found in the Delaware Limestone."**

Response 3: Concur. Changes will be made.

Comment 4: **Page ES-4, second bullet, add the following sentence: "Prior to abandonment, an additional groundwater sample was collected and analyzed for nitroaromatic compounds, metals, and water quality parameters."**

Response 4: Concur. Sentence will be added.

Comment 5: **Page 4-10, first word on page, change "further" to "farther." Second sentence on page, change "Unlike the pumping test, it covers...site than slug test." to "Unlike the slug test, a pumping test covers...site than slug test."**

Response 5: Concur. Changes will be made.

Comment 6: **Page 6-1, Section 6.2, second paragraph, second sentence, add "overburden/weathered shale" after "shallow."**

Response 6: Concur. Text will be added.

Comment 7: **Page 6-2, Section 6.2, first complete sentence on page, change "Because bedrock groundwater level interpretations for November 2001 were very similar to May 2002, Figure 6-3 was constructed to show the new interpretation of groundwater flow as Figure 6.4" to "Because bedrock groundwater level interpretations for November 2001(Figure 6-3) were very similar to May 2002 (Figure 6-4), the November 2001 data was contoured to qualitatively honor the groundwater flow data obtained from the six wells screened in limestone bedrock installed in the Fall 2001."**

Response 7: Concur. Changes will be made.

Comment 8: **Page 6-5, Section 6.2.2, change "November 2002" to "November 2001."**

Response 8: Concur. Change will be made.

Comment 9: **Page 6-6, Section 6.2.4, third sentence, change "my" to "may."**

Response 9: Concur. Change will be made.

Comment 10: **Page 6-9 and throughout remaining subsections, insert commas as 1000 separator.**

Response 10: Concur. Commas will be added as necessary.

Comment 11: **Page 6-12, Section 6.4.3.2, 2002 Wet Season Sampling Event (April), change "e3xceeded" to "exceeded."**

Response 11: Concur. Change will be made.

Comment 12: **Page 6-13, Section 6.4.3.4, third sentence, add a space between "RBSCs" and "have."**

Response 12: Concur. Space will be added.

Comment 13: **Page 6-20, Section 6.4.6.4.2, 2002 Wet Season Sampling Event (April), third sentence, remove "(2-ethylhexyl)phthalate."**

Response 13: Concur. Text will be removed.

Comment 14: **Page 6-26, Section 6.4.10, second sentence, remove "PAHs."**

Response 14: Concur. Text will be removed.

Comment 15: **Page 6-27, Section 6.4.10, first complete paragraph on page, change "sufficient" to "insufficient."**

Response 15: Concur. Change will be made.

Comment 16: **Page 7-7, Section 7.3.3, third paragraph, add "sulfide" to last sentence after "hydrogen."**

Response 17: Concur. Text will be added.

Comment 18: **Page 8-1, second bullet, add the following sentence: "Prior to abandonment, an additional groundwater sample was collected and analyzed for nitroaromatic compounds, metals, and water quality parameters."**

Response 18: Concur. Sentence will be added.

Comment 19: **Page 8-2, fourth bullet, last sub-bullet, change "contaminate" to "contaminant."**

Response 19: Concur. Change will be made.

RESPONSE TO COMMENTS
OHIO ENVIRONMENTAL PROTECTION AGENCY, DIVISION OF EMERGENCY AND REMEDIAL RESPONSE
2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS, SANDUSKY, OHIO
(Report dated August 29, 2002)

Reference: Comments received from Ron Nabors (dated November 08, 2002).

Risk Assessment Comments

Comment 1: **<u>Appendix O and Tables in Appendix O.</u> For the background concentration, you should default to the maximum detected concentration of a constituent when the calculated 95% UTL exceeds the maximum detected concentration. Therefore, the background concentration for each individual constituent is the lower of the maximum detected value or the calculated 95% UTL. Revise these tables (specifically Table O-1, since screening should be conducted using unfiltered samples) to include a column titled "Background Concentration" or "Background Screening Concentration" that specifies the point value used as the screening concentration. Filtered samples are not used in the risk assessment for evaluating exposure, but can be discussed in the uncertainties section of the risk assessment. What conclusions can be made from comparing the unfiltered data to the filtered data? A discussion should be included which addresses this, especially since both sample types are presented in this report. All tables should be revised to address this comment. In addition, please state whether or not the information presented in Table O-3 and O-4 is filtered or unfiltered data?**

Response 1: Based on the agreements reached at the September 11, 2002 meeting in Sandusky, Ohio, the lesser of the MDC and UTL values will be used. This agreement is consistent with the approach used for background screening of soils at PBOW and is a conservative approach. The tables will be edited to reflect this agreement. Appendix L (former Appendix O) (Section L.1.4, Calculation of Summary of Statistics) will be modified to incorporate the revised background screening approach, the use of statistical population testing (as mentioned during the September 11, 2002 meeting), and pertinent uncertainties related to the statistical evaluation of background. Additionally, background data summary statistics tables will be removed and submitted in a future report pending additional background analytical data.

It is agreed that unfiltered samples will be quantitatively evaluated in the risk assessment. However, comparisons of filtered versus unfiltered data have great utility in distinguishing between metals that are associated with suspended particulates versus those that are truly in solution. Chapter 7.0 provides geochemical evaluations of several metals that exhibited elevated concentrations in site groundwater. As stated on Page 7-6:

"A standard graphical technique for comparison of a set of filtered and unfiltered samples is to plot the ratio of filtered to unfiltered concentrations on the X-axis, and the corresponding unfiltered concentrations on the Y-axis (only samples with detectable concentrations in the filtered and unfiltered splits can be plotted). If the majority of the detected concentrations of an analyte in the unfiltered samples are in true solution, then those samples will line up on a near-vertical trend that is centered around a filtered/unfiltered ratio of 1.0. The major elements with high solubilities, such as sodium and magnesium, commonly display this pattern.

If an analyte is mostly present in particulate form, then the filtered/unfiltered ratio will be lower than unity, and the departure from unity will increase at higher unfiltered concentrations. This effect can be identified on the graph as a trend with a negative slope (lower filtered/unfiltered ratio at higher unfiltered concentrations). Elements that are usually present as suspended particulates, such as aluminum, arsenic, and chromium, commonly display this pattern if no contamination is present. However, if some of the samples contain arsenic as a herbicide or chromium in hexavalent form, then those samples will have roughly equal filtered and unfiltered concentrations, and will plot off of the trend established by the uncontaminated samples."

The utility of the filtered/unfiltered comparison described in the above paragraph is demonstrated by the plot shown on Figure 7-2. This plot compares unfiltered iron concentrations versus filtered/unfiltered ratios for the site and background samples. As discussed on Pages 7-9 and 7-10, sample CB3012 contains the highest unfiltered iron concentration (257,000 µg/L) among site samples but exhibits the lowest filtered/unfiltered ratio (0.0007) and lies on the linear trend (with a negative slope) that is visible on the plot. These observations indicate that iron in sample CB3012 is associated with background-related contributions from suspended particulates. It is noted that an agreement was reached during the September 11, 2002 meeting to eliminate Sample CB3012 as an outlier.
A new subsection, Comparison of Filtered and Unfiltered Data Sets, will be added to the end of Appendix Section O.2 that will incorporate the above paragraph from Page 7-9 of the August 29, 2002 draft. Site-to-background comparisons will employ these plots, as appropriate, to distinguish between inorganic analytes that are associated with suspended particulates and those that are in solution.

Comment 2: **<u>Executive Summary, page ES-1, third paragraph</u>. Copy the last paragraph of Section 1.0 (i.e., "*The field activities were conducted pursuant to.....*) and add this information to the end of the third paragraph of the executive summary. Since some folks will only read the executive summary, it is important to state that all work was conducted following an approved work plan.**

Response 2: The last paragraph of Chapter 1.0 (i.e., "*The field activities were conducted pursuant to.....)* will be added to the end of the third paragraph of the executive summary.

Comment 3: **<u>Executive Summary, page ES-2, fourth paragraph</u>. Revise the second sentence to state (revisions in bold) "The analytical results from these samples were used to establish site-specific background concentrations for naturally occurring, inorganic constituents (i.e., metals, PAHs, BTEX)." The last sentence of this paragraph states that there may be a natural source of PAHs and BTEX, but does not indicate what that source may be. Please add to the end of the last sentence (bold) ".....but these compounds may have a natural source, such as (add in sentence about shale that appears in other portions of report).**

Response 3: IT made revisions to the statement to be inserted because BTEX and PAHs are not inorganics. The second and the last sentence of the fourth paragraph in the executive summary will be revised to "The analytical results from these samples were used to establish **site-specific** background **concentrations for naturally-occurring BTEX and polynuclear aromatic hydrocarbons (PAH) and for inorganic constituents."** The last sentence in the paragraph will be changed to "Detectable BTEX and PAHs are also present in background bedrock groundwater at the PBOW facility and are, therefore, believed to have a natural source, **such** as from the natural petroleum in the Delaware Limestone (PB-BED-MW24) and from the petroliferous shale (PB-BED-MW20, PB-BED-MW25, and BG8-BEDGW-001)."

Comment 4: **<u>Executive Summary, page ES-3, first paragraph</u>. Please note that this section may need to be revised based on specific comments regarding the background UTL. When discussing comparisons of site related data to background, revise text to clarify that comparisons are made to the background concentration, rather than stating background 95% UTL. The point value selected as that background concentration for a constituent may or may not be the calculated 95% UTL value if this calculated value exceeds that maximum concentration detected.**

Response 4: The text will be revised to state that background screening values will be evaluated after completion of the second round of background sampling, scheduled to be performed in April 2003.

Comment 5: **<u>Executive Summary, page ES-3, last paragraph</u>. First bullet should be revised to summarize path forward and additional sampling as discussed during the September 11, 2002 meeting at the NASA Plum Brook facility.**

Response 5: The recommendations will also be revised to include final September 11, 2002 meeting agreements. The recommendations will be as follows:

- Background data determinations:

  - Groundwater sampling of background wells will be conducted for two additional events to verify the reality of the nitroaromatic detections, to justify background well localities, and to obtain additional background analytical data. The sampling events should be conducted in October 2002 (dry season) and April 20003 (wet season).

  - Existing analytical results from monitoring well PB-BED-MW26 will not be used in the background calculations because data was determined to be "outlier" data.

  - Only unfiltered groundwater data (both on-site and background) will be used for screening and risk assessment purposes.

  - Background groundwater data values will be limited to include only data from 2001 through 2003 obtained by low-flow sample collection. Data collected by means of a bailer can be used in qualitative discussions of risk uncertainty or to provide further evidence in a risk assessment as needed.

  - If sufficient low-flow data is present for each AOC, then only that data will be used for statistical analysis. Bailer obtained data can be used in the absence of low-flow data but should be discussed in a risk uncertainty section.

  - The lesser value of the "Upper Tolerance Level" and the "Maximum Detected Concentration" should be used for background screening of inorganics.

  - Statistical population testing will be used to determine whether detected concentrations of inorganics are associated with background conditions.

- Abandon monitoring well PB-BED-MW27 due to potential hazardous gaseous emissions and public concerns.

- Toluene contamination is present in the shallow water-bearing zone at the Upper Toluene Tanks Area. Additional overburden soil and groundwater investigation activities should be conducted in the area to identify the extent of the toluene plume and prevent possible plume migration into Plum Brook.

- Monitoring wells have not been installed at the Middle Toluene Tanks Area, located approximately 1,500 feet southwest of the intersection of Fox Road and Taylor Road. Based upon the results from the Upper Toluene Tank Area, consideration should be given to the installation of overburden water-bearing zone wells at the Middle Toluene Tank Area (to assess possible toluene contamination in the overburden groundwater) and bedrock wells at the Middle and Lower Toluene Tank Areas (to assess possible toluene contamination in the bedrock groundwater), if deemed necessary.

- Install one additional bedrock monitoring well in the Pentolite Road Red Water Ponds Area to monitor bedrock contamination.

- Determine extent of nitroaromatics in groundwater downgradient of the north fence line by:

  - Conducting a local off-site private wells survey to determine the number of private wells, construction information, and availability for sampling.

  - Evaluating off-site nitroaromatic migration through private well sampling (if possible).

  - Installing downgradient bedrock monitoring wells for contaminant assessment, if necessary.

- Collect additional data on the Garage Maintenance Area pumping rates and the reactor sump well pumping rate/cycles to support groundwater modeling.

Planned Activities

- Complete site-wide groundwater model (2003).

- Complete site-wide groundwater risk assessment (2003).

Comment 6: **<u>Section 3.1.1.3 TNT Area C, page 3-11, last paragraph</u>. The path forward regarding soil remediation at TNT Area C should be summarized and included.**

Response 6: Information will be added following the last paragraph in Section 3.1.1.3 regarding soil remediation of TNTC. The paragraph will be "In 2002, IT prepared a Draft Feasibility Study for TNTC. The study recommended excavation, ex-situ stabilization and off-site disposal as a nonhazardous waste of 1,407 cubic yards of metal contaminated soil, excavation and off-site treatment/disposal at a Subtitle C

hazardous waste TSDF of 57 cubic yards of PCB-contaminated soil, and in situ chemical oxidation of 4,569 cubic yards of soil contaminated with nitroaromatics compounds. The total cost of the alternative is estimated to be $558,000 (IT, 2002e)."

Comment 7: **Section 3.1.2.2 Pentolite Road Red Water Ponds, page 3-15 to 3-16: When discussing the path forward regarding remedial action at this area, please state that the excavation and off site disposal is being proposed as the best remedial alternative and most cost effective since this FS report has not yet been reviewed or commented on by the Ohio EPA.**

Response 7: The alternative recommended for the soil remedial action of the PRRWP and the Interim Action Memorandum will be stated as being "proposed".

Comment 8: **Section 5.1 Analytical Program and Methodologies, page 5-1, first paragraph. Define SPLP and explain what this analysis is and how this data is going to be used in this investigation. Also, why was this analysis conducted only for nitroaromatics and not other COCs?**

Response 8: Synthetic precipitation leaching procedure (SPLP) is an analytical procedure performed on soil to determine what effect precipitation will have on contaminants and the possible analytical concentrations that may be "leached" or removed. The SPLP analytical procedures may or may not be used in final remedial action determinations. Based on comments from USACE-CX, it is agreed that the SPLP soil data is not pertinent to this report. All soil SPLP data will be removed from this report and provided to the USACE under separate cover at a later date.

Comment 9: **Section 5.4 Screening Criteria, second paragraph, page 5-4. Please provide the rationale for selection 20xResidential Tap Water PRG as the screening criteria for SPLP data? Use of the Region 9 Soil Screening Levels for the Migration of Soil Contaminants to Groundwater at a DAF=20 may be a more appropriate source to use for screening, since this value is specific to the evaluation of the potential for contaminants in soil to migrate to groundwater at levels that would result in unacceptable risks.**

Response 9: All soil SPLP data will be removed from the report and provided to the USACE under separate cover.

Comment 10: **Section 5.4 Screening Criteria, last paragraph, page 5-4. For risk purposes, background comparison is appropriate only for those constituents that are naturally occurring, inorganic chemicals. PAHs and BTEX can result from either anthropogenic or natural sources and at this stage of the investigation, it is not appropriate to eliminate further evaluation of these suspected anthropogenic compounds based on comparison to background. These constituents must be retained as contaminants of potential concern and**

evaluated in the risk assessment. Discussion of the concentrations of these constituents to the concentrations detected in background wells can be included in the uncertainties section, since it is very difficult to determine the site-specific contribution of these types of contaminants when multiple sources are present. Revise the discussion to address this comment or else include an uncertainties section and move this discussion to that section of the report. In addition, please note that only unfiltered groundwater data is used for comparison to PRGs and for decision-making regarding exposure. The comparison of unfiltered samples results to filtered sample results can be presented and discussed in the uncertainty section.

Response 10: Background data is not being evaluated in this report. This information will be included in a report following additional background sampling.

Comment 11: **<u>Section 6.4 Analytical Results, page 6-7.</u> Ensure that the correct point value is being used for the background concentration – see Comment No. ?? above. Analytes that were not detected should be evaluated to ensure that the detection limits were less than the level of concern (i.e., PRG screening level) and should be included in the report.**

Response 11: Two additional background sampling events are scheduled for additional background analytical data (October 2002 and April 2003). Because the background data has not yet been finalized, all background values will be removed from this report.

Comment 12: **<u>Section 6.4.1.3, Summary of Sampling Events, page 6-9.</u> Since nitroaromatics were detected at levels exceeding PRGs during the wet season, is there a possibility that a source of contamination in surrounding media, such as the soil, could be releasing contaminants and these contaminants migrating to groundwater during wet season, storm events, etc.?**

Response 12: There is a possibility that there is continued leaching of nitroaromatics from soil. The current plan is to execute soil remedial actions at TNTB, TNTA/TNTC, and PRRWP. Groundwater will be evaluated in a FS upon completion of the groundwater risk assessment.

Comment 13: **<u>Section 7.1.1 Background Distribution of Inorganics, PAHs, and BTEX in Bedrock Groundwater, page 7-1.</u> For risk purposes, background comparison is appropriate only for those constituents that are naturally occurring, inorganic chemicals. PAHs and BTEX can result from either anthropogenic or natural sources and at this stage of the investigation, it is not appropriate to eliminate further evaluation of these suspected anthropogenic compounds based on comparison to background. These constituents must be retained as contaminants of potential concern and evaluated in the risk assessment. However, this discussion can be included in**

the uncertainties section. Revise the discussion to address this comment or else include an uncertainties section and move this discussion to that section of the report. In addition, please note (at end of first paragraph) what the potential natural sources of PAHs in the groundwater could be.

Response 13: See response to Comment No. 10. The source for the PAHs would be from the naturally-occurring concentrations of petroleum hydrocarbons. Additional information for the potential source of contamination will be added to the report.

Comment 14: **<u>Section 7.0 Conclusions</u>. Ensure that the resolution of the above comments is incorporated into the appropriate discussion within the conclusions section of this report.**

Response 14: Previous information in the conclusions section concerning the background distribution of inorganics, PAHs, and BTEX will be moved to an individual section discussing the background (Section 5.4). Therefore, conclusions of the background summary including BTEX and PAH sources will be inserted into the conclusions section of the report.

Comment 15: **<u>Section 7.4, second paragraph, page 7-13</u>: How will groundwater flow be affected if the pumping ceases near the reactor facility? Is this a possibility in the future?**

Response 15: At present, it is unknown how the groundwater will be affected if pumping of the sump wells would be discontinued, but the thought would be that the long shaped trough would be affected and therefore water levels in trough vicinity wells increased. The groundwater flow direction would still basically be the same, northeast toward Lake Erie. A groundwater flow model is presently being prepared which will be calibrated to existing site conditions which will simulate the effects of the reactor wells sump pumps in operation. Simulation of nonpumping conditions can be done; however, the model will need to be further evaluated for accuracy once the sump wells pumping are turned off. Data from monitoring wells without the pumps operating, for an extended period of time, must be available to verify the accuracy of the groundwater model.

The pumping will eventually cease at the reactor facility. The reactor facility decontamination and decommission efforts are suspected to be complete by 2007 and at or before that time, the sump wells will be removed.

Comment 16: **<u>Section 8.0.</u> The recommendations should be revised to reflect discussions of path forward during the September 11, 2002 meeting, which was held at the NASA Plum Brook facility. In addition, state the objective (or what one hopes to accomplish or find out) of each of the bulleted recommendations. For instance, is the objective of the off-site private well survey to determine if contaminants are migrating off site and impacting private wells?**

Response 16: Agreed. The recommendations will be revised to reflect the September 11, 2002 meeting and the objectives of each of the recommendations will be included. Note that the revised recommendations are listed in response to OEPA Comment No. 5.

Comment 17: **<u>Section 8.0, Planned Activities, page 8-1.</u> A work plan (specific to each planned activity) should be produced and submitted for review prior to each planned activity.**

Response 17: A Risk Assessment Work Plan will be completed for the site-wide groundwater risk assessment. A work plan for the groundwater modeling effort is not required by the Scope of Work. However, periodic updates to the model will be provided to the USACE and OEPA as work progresses.

Ground Water Comments

Comment 18: **To date, IT has collected 21 ground water samples from a total of 5 monitoring wells over a 5-year period at the NPBS. The monitoring wells noted in the table below are located upgradient and along the southern and western edges of the NPBS property. Ohio EPA requests that IT review the table below to confirm its accuracy as the table was generated from data contained in Section 7.0, Tables 4-4 and 6-3, and Appendices D and O of the above report.**

Well	Installation Date	Depth/Monitored Unit	Sampling Date(s)
IT-BG8-BEDGW-001	09/20/97	20/Olentangy Fm. (limestone & shale)	11/17/97 05/15/98 09/27/01 01/16/02 04/03/02 07/12/02
PB-BED-MW20	11/13/94	48.5/Ohio Shale	11/17/97 05/28/98 09/26/01 01/15/02 04/04/02 07/10/02
PB-BED-MW24	09/13/01	41/Delaware Limestone	10/09/01 01/17/02 04/03/02 07/12/02
PB-BED-MW25	09/12/01	38/Olentangy Fm. (limestone & shale)	10/05/01 01/16/02 04/03/02 07/11/02
PB-BED-MW26	09/10/01	57.75/Olentangy Fm. (limestone & shale)	01/17/02

<u>Notes:</u> Depths in feet below land surface.

Response 18: The above noted table was reviewed and the following corrections made: 1) Well installation date of PB-BED-MW20 was revised from 1994 to 11/13/94, 2) Total depth of monitoring well PB-BED-MW20 was changed from 49.5 feet to 48.5 feet (from review of borelogs, 1 foot of rock core was left in borehole), 3) Monitoring well PB-BED-MW26 is believed to be screened in the Olentangy Formation, not the Ohio shale (contact between the Ohio shale and Olentangy at 41.5 feet bgs as shown by the borelog, photographs, and revised cross-sections).

Comment 19: **Per Appendix O of the above report, IT calculated filtered and unfiltered inorganic background concentrations in the bedrock saturated zone using 95% upper tolerance limit (UTL) statistical methodologies. IT appropriately utilized one-half of the value of the reporting limit for each analyte to replace non-detects in background calculations. IT also appropriately evaluated background distributions (normality) and outliers for each inorganic dataset from each background well.**

Ohio EPA attempted to recalculate several of the background concentrations noted on Tables O-1 and O-2 of Appendix O using 95% UTL methodologies noted in the USEPA document entitled, USEPA, 1989, Office of Solid Waste, Waste Management Division, Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance, April 1989, and also using the 95% UTL Chebychev Method utilized by IT. IT states that they utilized a total of 21 ground water samples from the background monitoring well network in the calculations but it is unclear exactly which ground water analytical results noted in Appendix O were used in the calculations. Ohio EPA requests that IT prepare a table that notes which ground water samples (laboratory ID#) and corresponding inorganic analytical results were used in the calculations.

Response 19: Because a set of background wells has not yet been finalized, summary statistics on background data will not be presented in the revised report. A discussion of methodology for deriving background screening criteria will be retained.

Comment 20: **As a result of the September 11, 2002 meeting at NPBS, the following resolutions and approaches to collecting and generating a background database for the bedrock saturated zone in support of the sitewide ground water investigation at the site were tentatively agreed upon. The USACE will submit a revised statistical approach in a future sitewide ground water investigation report to Ohio EPA for review and concurrence.**

Response 20: Agreed. See response 19.

Comment 20a: **Background monitoring well PB-BED-MW26 recharges very slowly and is very turbid. It was installed on September 9, 2001 and was never fully developed as its yield was very low. Therefore, this well will be removed**

from the background network. It will be utilized as a ground water surface elevation point only.

Response 20a: As discussed and agreed in the September 11 2002, meeting, groundwater analytical results from monitoring well PB-BED-MW26 will not be used in the background data calculations.

Comment 20b: **The USACE will sample the entire background bedrock monitoring well network (PB-BED-MW24, IT-BG8-BED-GW001, PB-BED-MW25, and BED-MW20), with the exception of PB-BED-MW26, in October 2002 and April 2003. The two sampling dates represent the dry and wet seasons at the NPBS. Ground water samples will be collected using low-flow methodologies. The purpose of this additional sampling is in part, to evaluate the presence of certain nitroaromatic compounds previously detected in background bedrock wells BED-MW20, PB-BED-MW24, and PB-BED-MW25 during the April 2002 sampling event. If nitroaromatic compounds are not detected in the above wells during either of the next two sampling events, then the USACE may exclude analytical results from the April 2002 sampling event in the background calculations. If they are detected, then the USACE will evaluate the above wells to determine they are truly representative of background conditions in the bedrock zone. Ohio EPA will work closely with the USACE to resolve this issue.**

Response 20b: As discussed and agreed in the September 11, 2002 meeting, the background monitoring wells will be sampled in October 2002 (activity complete) and April 2003. The monitoring wells will be sampled by low-flow methodology, if possible, or by a bailer if water drops below 0.5 feet (6 inches) from the initial static measurement. Results of the October 2002 sampling effort will be reported in the October 2002 Groundwater Background Report and results of the April 2003 sampling effort along with previous RI information will be reported in the 2003 Groundwater Annual Data Summary and Evaluation Report.

Comment 20c: **The USACE will calculate both filtered and unfiltered background bedrock ground water concentrations. However, only unfiltered background bedrock values will be used for the purposes of a risk evaluation in support of the sitewide ground water investigation.**

Response 20c: As discussed and agreed in the September 11, 2002, meeting, only the unfiltered groundwater will be used for purposes of risk evaluations.

Comment 20d: **The current background database consists of analytical results from ground water samples collected using both bailer and low-flow sampling methodologies. Per Ohio EPA direction, the USACE will only use low-flow sampling analytical results in background bedrock calculations as it is inappropriate to utilize different sampling techniques to generate a single**

database. Analytical results from background samples collected using a bailer will be utilized in a qualitative manner to characterize ground water quality at the NPBS on a sitewide and area of concern basis where appropriate and applicable.

Response 20d: Agreed. Only groundwater samples collected from the background wells by use of the low-flow sampling methodology will be used in the background data calculations. Groundwater samples collected by means of a bailer will be used to qualitatively address groundwater quality.

Comment 20e: **Due in part to the elimination of well PB-BED-MW26 from the background network, the collection of additional background samples, and the exclusion of analytical data from the background database which were collected using a bailer, the USACE will recalculate all of the background bedrock ground water concentrations for the purposes of the sitewide ground water investigation.**

Response 20e: Agreed. The USACE will submit background data calculations that exclude data from monitoring well PB-BED-MW26 and results from wells collected with a bailer and will include data from the October 2002 and April 2003 sampling events. Groundwater data for samples collected via bailer will be used qualitatively to evaluate groundwater quality.

Comment 20f: **Upon the completion of the proposed background bedrock ground water sampling events noted above, the USACE will compile all low-flow analytical results and determine if an adequate amount of data exists to calculate representative background concentrations. A determination will then be made if additional sampling and/or well installations are warranted.**

Response 20f: Agreed. Revised background summary statistics will be submitted following completion of the October 2002 and April 2003 sampling events. This deliverable is currently planned for submittal in late May 2003.

Comment 20g: **The USACE intends to calculate background bedrock concentrations for 23 target analyte list metals, 17 PAHs, and BTEX. As stated earlier, a background database for organic constituents will be developed to address the occurrence of natural hydrocarbons in the bedrock zone. Constituents for which background bedrock concentrations will be calculated are provided in Table 1 below.**

Response 20g: The electronic data table calculations were submitted to the OEPA by email September 25, 2002. Additional background data calculations will be submitted following the completion of the April 2003 groundwater sampling event. These calculations will be revised and adjusted according to agreements of the September 11, 2002 meeting.

Comment 20h: **The USACE has agreed to prepare and submit a table/text to Ohio EPA which includes each individual background bedrock dataset for each constituent under evaluation, trend analyses of several selected constituents from the background bedrock monitoring well network, data from background well PB-BED-MW26 to justify its exclusion from the network, and a description of each background dataset noting if the analytical result was filtered or unfiltered and how it was obtained (bailer or low-flow sampling methods).**

Response 20h: Agreed. As noted in the September 11, 2002 meeting, the above mentioned items will be included in the next report.

Comment 20i: **The USACE concurs with Ohio EPA that offsite sampling in the downgradient direction (north) is warranted to determine the full rate, extent, and concentrations of constituents of concern (COCs) in the bedrock saturated zone.**

Response 20i: Agreed.

Comment 21: **The USACE have agreed to submit a brief report to Ohio EPA noting recent analytical results from the background monitoring well network and supplemental statistical methodologies and rationales for review and concurrence.**

Response 21: The *5th Quarterly Background Report* that will be submitted to the OEPA will present analytical results for the latest round of background groundwater sampling, but it will not include background summary statistics. Complete background summary statistics will be calculated after the results of the April 2003 sampling event have been received and validated. Results will be included in the *Second Annual Data Summary and Evaluation Report* which is scheduled for submittal in late May 2003.

Comment 22: **Ohio EPA is unclear as to how the background bedrock concentrations will be utilized in downgradient ground water quality comparisons. Specifically, are the background values to be utilized on a sitewide basis or on an area of concern basis? This topic has been broached in the past by the USACE and Ohio EPA but no consensus was ever reached. Ohio EPA anticipates meeting with the USACE again in the near future to discuss this topic.**

Response 22: During the OEPA and USACE 20 November 2002 meeting in Dayton, Ohio, background groundwater well data (appropriate data that is deemed usable for risk assessment) and 2 new off-site background groundwater well data (4 quarters) will be looked at for data quality and then used as a background data set with calculated 95% UTL as the comparison statistic for metals on site. PAH data in

background groundwater will be looked at on a regional basis, but will not be used up front in a screening capacity for risk assessment for on-site areas. PAH background groundwater data will be used in uncertainty and management decisions after the risk assessment.

Proposed downgradient wells will be used to measure the extent of COCs from PBOW, which will most likely be nitroaromatics only. Background comparisons for downgradient concentrations will not be used because this comparison is usually for metals, and in our case, PAH data for discussion.

Comment 23: **In Section 8.0, page 8-1, the USACE recommends conducting an offsite private well survey and potentially performing sampling of private wells. It is the opinion of Ohio EPA that while an offsite well survey may yield some limited geologic/hydrogeologic information (i.e., depth to bedrock, yields, potable water zone, etc...), monies budgeted to the USACE may be utilized more efficiently by simply conducting an offsite investigation via Geoprobe and monitoring well installation. Any private wells currently in existence within a certain radii from the site may not be appropriate for the purpose of gathering information for the sitewide ground water investigation. Specifically, the private wells may be too far removed from the site to be representative, may not possess adequate installation logs, may not have been maintained, or were not installed or screened to a depth similarly as the current onsite bedrock monitoring wells for comparative purposes. Ohio EPA requests that the USACE consult with the agency on the use of offsite private wells and if budgeted funds couldn't be used in a more constructive manner.**

Response 23: Future downgradient and upgradient groundwater assessment is including installation of additional permanent monitoring wells but an off-site private well survey does need to be conducted for several reasons. The first is to see if there are any private wells near the site that are using private groundwater for drinking purposes and, therefore, may be using nitroaromatic contaminated PBOW groundwater. If any private wells are located near the site, at that time, determination can then be made as to whether or not a groundwater sample can and should be collected.

Comment 24: **Ohio EPA concurs with the USACE that the collection of sump-pump rates and recovery well rates from any onsite building which could affect bedrock ground water flow be performed to support any modeling efforts (Section 8.0, page 8-1). This is especially important around the Reactor Area and Garage Maintenance Area where pump and treat remediation systems are to be installed for the purposes of closure as overseen by Ohio EPA Division of Hazardous Waste Management.**

Response 24: Agreed. Continual pumping rates of the sump wells at the Reactor Facility and for the pump and treat system at the Garage Maintenance Area will be obtained for input into the groundwater model. These data are important in accurately predicting groundwater flow and contaminant fate and transport in the overburden and bedrock groundwater.

RESPONSE TO COMMENTS
U.S. ARMY CORPS OF ENGINEERS (CELRN-EC-R-D)
2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS, SANDUSKY, OHIO
(Report dated August 2002)

Reference: Comments received from Becky Terry and Jim Beaujon (dated 1 November 2002)

Comment 1: **Since two additional rounds of background sampling will be conducted (October 2002 and April 2003) this Draft Report will not become Volume I of the groundwater RI Report. The comments that follow are significant enough, however, that CELRN believes this Draft document should be revised and reissued.**

Response 1: Following concurrence of these responses to comments, the text will be revised and the report will be reissued and submitted to the Nashville USACE with the title "Review Copy - 2002 Groundwater Data Summary and Evaluation Report." In addition, text will be added to Section 1.0 clarifying that this document represents an interim document in the RI/FS process.

Comment 2: **The Executive Summary will need to be rewritten to reflect changes that occur due to these comments.**

Response 2: Agreed. The Executive Summary of the report will be rewritten to include changes by these and other comments.

Comment 3: **Section 3.1.2, Red Water Ponds Areas. The Red Water Ponds FFS was only Draft at the time this report was being written. Revise this section to reflect the Final FFS Report and change the reference for the FFS in the Reference section to be current.**

Response 3: This report is a revised version of the report submitted in August 2002 and includes only data and information prior to May 2002. Information of the final FFS report will be included in the next data summary and evaluation report.

Comment 4: **Page 4-6, 1st line. Change "Filter pack in the well was" to "Filter packs in screened wells were".**

Response 4: The above noted change will be made in Section 3.0, Monitoring Well Installation.

Comment 5: **Page 4-8. 1st paragraph. Last sentence states that if the well "did not recharge adequately to use low-flow sampling," ... "removal of 3 to 5 volumes of groundwater was performed". How was the water removed?**

Response 5: Low-flow (minimal drawdown) sampling is only utilized in situations where groundwater recharge to a monitoring well is adequate to limit the drawdown

to less than 6 inches (0.5 feet). In areas of lower hydraulic conductivity, drawdown may exceed 6 inches even at the lowest pumping rate achievable. There were cases where the drawdown in a well was greater than 6 inches but stabilized prior to the water level dropping below the top of the well screen. In these cases, three to five well volumes of groundwater were removed either by continued pumping or bailing. This information will be added to this section to clarify the purging and sampling methods.

Comment 6: **<u>Page 5-1, Section 5.0, beginning on 5th line.</u> Change relevant sentence to read- "Complete analytical data for the September-October 2001 sampling ... has already been presented in previous reports."**

Response 6: The 5th line on Page 5-1, Section 5.0 will be changed to incorporate Comment No. 6.

Comment 7: **<u>Page 5-3.</u> Reference National Functional Guidelines for Organic Data Review, page 24. For first bullet, according to guidelines, sample result should be "U" qualified. Second bullet. Sample result should be "J" qualified. Third bullet. According to National Functional Guidelines for Inorganic Data Review page 17, sample results should be "U" qualified.**

Response 7: As stated in Section 5.1, the blank data is evaluated using Region III guidelines not the National Functional Guidelines. National Functional Guidelines were used for all aspects of validation except blank evaluation. It was unclear to many parties how a 'detect' by the laboratory could become a 'nondetect' after validation. The use of the Region III guidelines was chosen to clarify the situation. Region III validation guidelines for blank evaluation has been used for several years. In order to maintain consistency between old and new data, the practice is continued.

Comment 8: **<u>Page 5-4 and numerous other locations, SPLP data.</u> The SPLP nitroaromatic data was not intended to be compared to regulatory criteria. It was collected to provide useful information to the process engineers as they evaluate potential remedies.**

Response 8: Agreed. While the SPLP method is widely utilized, there has been no standard method for the interpretation of the results. In general, most studies reviewed compare the SPLP results to state or federal drinking water standards. However, it is agreed that the SPLP data should be presented without interpretation at this time. The reason for this is pointed out in Doug Mullendore's comment (number 15 in this response document) that discussions need to be held with USACE and OEPA to determine the objectives for this data. All comparison to any regulatory criteria will be removed from the report. Further, based on comments by USACE-CX (Cheryl Groenjes, Comment No. 15) all SPLP data will be removed from the report and provided under separate cover.

Comment 9: **<u>Page 6-2, last paragraph on page.</u> "EB-risk assessment (RA) monitoring wells" should be "EB-Reactor Area (RA) monitoring wells".**

Response 9: The 2nd sentence in the last paragraph on Page 6-2 will be changed to "More recent water levels were not measured for the wells located at the Reactor Facility Area after November 2001 due to their location in a secured area."

Comment 10: **<u>Page 6-7, Section 6.3, 2nd paragraph.</u> Figure 6-12 presents precipitation data. There is no figure that presents "A quarterly sampling schedule".**

Response 10: The 2nd sentence in the 2nd paragraph, Section 6.3 will be changed to "A quarterly sampling schedule was chosen for these wells based upon precipitation data (Figure 6-12), which indicates a "wet" and "dry" time period for PBOW." The following will be added as the third sentence "The quarterly sampling will also obtain background bedrock groundwater data to determine if similar patterns or trends of chemical constituents are present throughout the wet and dry time periods and will characterize background distributions of metal constituents and PAHs in bedrock groundwater."

Comment 11: **<u>Page 6-11, 3rd sentence.</u> Edit the sentence that begins with "During the dry season".**

Response 11: The above noted sentence is now located in Section 6.4.3, second paragraph. It will be changed to "During the dry season sampling event, overburden monitoring well TNTA-MW10 was dry." Insert the following sentence after the fourth "Only a limited sample volume could be collected from TNTA-MW11 due to insufficient water."

Comment 12: **<u>Page 6-25, 6th line.</u> For those of us unfamiliar with the meaning of a "B" qualifier please change the relevant sentence to something that explains what it means. Something like- "All the thallium detections were noted with a "B" qualifier, meaning thallium was not detected at a level significantly greater than that found in the associated method or field blank."**

Response 12: The sentence will be updated to "All the thallium detections were noted with a "B" validation qualifier, meaning thallium was not detected at a level significantly greater than that found in the associated method blanks or field blanks."

Comment 13: **<u>Page 6-25, last part of paragraph at top of page, MW26.</u> Break discussion of MW26 off into its own paragraph. Delete "present". Expand the discussion to prepare the reader for us to eliminate MW26 data from background statistical calculations. This may not be the place where we actually declare it to be an "outlier" but it would seem to be the place to describe how the well conditions (never properly developed, low to no yield, high TDS, etc.) were not ideal. Basically we're presenting the**

justification for "outlier" status based on "improper sampling" criteria. Not that the sample was collected with improper methods per se but that the sample for various reasons was not representative of bedrock groundwater flowing onto PBOW.

Response 13: Agreed. Section 6.4.10.2, 2002 Second Quarterly Wet Season Sampling Event (January), Page 6-29, 2nd to last sentence in paragraph will be changed to "Due to a low water column, only unfiltered metals were sampled in well PB-BED-MW26." Discussion of well development problems for PB-BED-MW-26 will be included in Section 4.5. Specifically, the following text will be added: "One monitoring well, PB-BED-MW26, could not be properly developed due to a limited water column and poor recharge. The impact of the limited development is that any groundwater samples would be expected to have higher turbidity and not be representative of bedrock aquifer conditions." In Section 6.4.10, the text at the end of the 2nd paragraph will be expanded as follows: "As noted in Section 4.5, PB-BED-MW-26 could not be properly developed due to a low water column. This lack of proper development could account for the elevated metals seen in the groundwater samples."

The following text will be added to Appendix L, Section L.6: "It was agreed during the September 11, 2002 teleconference that monitoring well PD-BED-MW26 should be removed from the background data set because it had significantly higher levels of metals that the other wells that had been selected for background due to inadequate well development resulting in high turbidity."

Comment 14: **<u>Page 7-5, Section 7.2.1, 2nd paragraph.</u> Is the "37.000" correct or was it meant to be "37,000". Also, as I recall one of the early Dames and Moore reports mentions that NASA also used the Upper Toluene Tanks for hydrocarbon storage.**

Response 14: The information is now located in Section 7.1.2, Organic Compounds, and 2nd paragraph: The concentration will be changed from (37.000 µg/L) to (37,000 µg/L) as shown in Table 6-22. Because the Toluene Tanks were not a part of the scope of this investigation, the following text will be inserted in Section 3.1 after the last sentence:

"During field efforts conducted for the current groundwater investigation, it was reported that toluene was suspected in one well at the Upper Toluene Storage Tank Area. The existing well at the Upper Toluene Tanks Area was sampled to confirm or deny the presence of toluene. Therefore, although not a part of the scope of this investigation, background information and analytical results are included in this report."

The following information will be inserted into Chapter 3.0:

"3.1.3 Upper Toluene Tanks Area

The Upper Toluene Tanks served as bulk storage for toluene used in the production of TNT (ICI, 1995). The Upper Toluene Tanks are located west of TNTA (Figure 1-2). Two tanks were used at this site, each with a capacity of 200,000 gallons. The tanks are encircled by earthen dikes approximately 6 feet high. After TNT manufacturing processes were complete, the tanks were decommissioned by the DOD in 1945 by pumping out their remaining contents, draining the transfer lines, and opening top and bottom flanges for ventilation.

Sometime thereafter, NASA renumbered the Toluene Storage Tanks and used them for heating fuel storage. In January 1989, there was a leak reported from one of the Upper Toluene Tanks, which originally (in 1976) contained approximately 185,000 gallons of heating oil. The area around the tank was discolored, a fuel oil odor was noticed, and fuel oil seepage was observed on the eastern side of the tank. Six to eight inches of affected soil and vegetation were removed from the contaminated area and taken to a burn ground for incineration. Approximately 230 gallons of fuel oil and sludge were removed from the bottom of the drain valve and absorbent matting was used to soak up oil that seeped from underneath the tank. It was believed that the seepage was contained within the berm (ICI, 1995)."

Comment 15: **<u>Page 7-6, Section 7.3, 1st paragraph.</u> Change "contaminate" to "contaminant". Also, edit for clarity "and by the bedrock groundwater contours along the shale outcrops and the shale/limestone contact merging with contours of the overburden." You may be trying to say too much in a phrase where a sentence would be more clear.**

Response 15: First paragraph, Section 7.1.4, The word "contaminate" will be changed to "contaminant". The last sentence in the same paragraph will be changed to "The interpretation is based on:

- Similarity of shale and overburden groundwater elevations at well pairs
- Shallowness of wells completed in the shale
- Bedrock groundwater contours (along the shale outcrops and the shale/limestone contact) merging with contours of the overburden."

Comment 16: **<u>Page 7-6, Section 7.3, 2nd paragraph.</u> Change appropriate to "In the southeastern portion of the site, overburden/weathered shale groundwater ... east-northeast. Overburden/weathered shale groundwater in the central ...".**

Response 16: Text in Section 7.1.4, 2nd paragraph, Page 7-3 will be changed according to Comment No. 16.

Comment 17: **<u>Page 7-9, iron concentrations in samples from MW27.</u> MW27 is an open borehole well thus the well installation consists of only the borehole and the steel casing. I believe the odorous sulfur gas coming from MW27 is reacting with the steel casing and forming iron compounds (the soot),** which **fall into the well water to become part of the suspended solids load. If the chemists agree, perhaps this should be mentioned.**

Response 17: The following will be added "Monitoring well PB-BED-MW27 was an open borehole (no PVC piping, only steel casing). Because of the large volume of hydrogen sulfide present in PB-BED-MW27, the sulfuric gas was reacting with the steel casing. Iron compounds formed on the steel casing which flaked off and fell into the groundwater. This may be a reason for the increase of the suspended solids load. Because of the obnoxious hydrogen gas odor being a nuisance for nearby public residents, monitoring well PB-BED-MW27 will be abandoned in January 2003."

Comment 18: **<u>Page 7-14, paragraph just before Section 7.5.</u> Change the 1st sentence to begin with "To confirm that the petroleum hydrocarbon". However, even with that change this paragraph is a very weak argument that the petroleum hydrocarbon is "natural". What the paragraph says is that the BTEX from the two wells may have a common source- that doesn't exclude an anthropogenic source. And, since we don't know of there having been a fuel storage tank upgradient of TNTA-BEDGW-001 it must be natural. Wasn't there a more involved evaluation of the composition of the BTEX such as a comparison to the normal composition found in refined petroleum products that would better indicate a natural origin?**

Response 18: The intent of the comparison was to emphasize the fact that whether this is naturally-occurring petroleum hydrocarbons or from a leak in a storage tank, either condition would not be attributable to activities related to the manufacture of TNT. As stated, the fact that there was no known source present at these sites (i.e., fuel storage tanks) was the premise for concluding these hydrocarbons were from a natural source. Since this was not part of the scope of the investigation, the evaluation was limited to the extent presented to show that the source was probably the natural hydrocarbons present in the Delaware Limestone. However, recent comments at the PBOW RAB have requested additional information for the presence of natural concentrations of petroleum. To support the response to this comment as well as concerns of the RAB, further information will be provided in the revised report. As noted in the response to USACE-CX Comment No. 14, the lab was contacted and is unable to provide any additional information regarding the samples. Typically, laboratories deliver analytical results without interpretation. To verify the origin of naturally-occurring hydrocarbons requires specialized

testing beyond the capabilities of most analytical labs and standard EPA methods. The accepted methods allow identification of compounds for which standards are available and chromatographic patterns are recognizable. Identification is hindered by the alteration of established patterns due to evaporation, exposure, and biodegradation. Specialized labs with modified methods and petroleum-specific calibration standards, including weathered standards, should be used. A copy of the chromatograms will be inserted into the report.

The following text will be added to Section 6.5, page 6-32:

"Monitoring well MK-MW20, which is located downgradient from the Upper Toluene Tanks, had detections of toluene, gasoline range organics (GRO) and diesel range organics (DRO). Although the sample had detections of hydrocarbons in the gasoline and diesel ranges, the chromatograms did not resemble the gasoline and diesel standards (chromatographs provided in Appendix O). In the GRO chromatogram, the predominant peak was from toluene. The sample did not contain concentrations of several components of the gasoline standard such as the methylpentanes, heptane, ethylbenzene, xylenes, or trimethylbenzene. Although weathering of the hydrocarbons would lower the concentrations of the alkanes, the aromatic compounds should still be present. The lack of benzene, ethylbenzene, and xylenes in the 8260B analysis confirms that it is probably not gasoline. Only two single components of the diesel standard were present in the sample; therefore, a potential source of the contaminants in the groundwater is from the Upper Toluene Tanks."

"Monitoring well PB-BED-MW16 is also located downgradient from the Upper Toluene Tanks. The sample contains a mixture of hydrocarbons in the gasoline and diesel ranges. Early eluting compounds are not evident in the 8260B chromatogram. This may be due to weathering. Although many of the single components of gasoline are present, they do not appear in the same ratios as the gasoline standard. Usually, total xylenes and toluene are present in similar concentrations. Since the relative concentration of toluene is low, the Upper Toluene Tanks are an unlikely source. More specialized analytical methods are necessary to determine the exact nature of the product."

"Groundwater samples were collected from TNTA-BEDGW-001 and PB-BED-MW16. Their chromatograms are similar, and the concentrations of components are very similar. Since early eluting compounds are present, little weathering appears to have taken place. Although many of the single components of gasoline are present, they do not appear in the same ratios as the gasoline standard. The concentration of total xylenes compared to the other aromatics is high. More specialized analytical methods are necessary to determine the exact nature of the product. The presence of sulfur-like odors indicates that the source may also be naturally occurring."

Based on USACE-CX Comment No. 1, the following text will be added to the Executive Summary and to the conclusions of the report:

"Quarries mining the Delaware Limestone in the vicinity north of PBOW are reported to have encountered naturally occurring hydrocarbons. Free-phase hydrocarbons and benzene, toluene, ethyl benzene, and total xylene (BTEX) analytical compounds detected in the groundwater of PBOW bedrock monitoring wells are also interpreted to have a similar origin. This similarity is based upon the following observations:

- A majority of wells with hydrocarbon detections are screened in the Delaware Limestone.
- The hydrocarbon contaminated-monitoring wells (northeast side of site to far west side) are widespread.
- Drilling borelogs note hydrocarbons in the Delaware Limestone bedrock.
- Delaware Limestone rock core photographs show petroleum hydrocarbons.
- The detection of hydrogen sulfide that is typical to that found in the Delaware limestone.

A discussion with OEPA indicated there are producing oil wells in Erie County. These oil wells reportedly are pumping from the Delaware Limestone and the Columbus Limestone (Swinford, per. comm., 2002)."

Comment 19: **<u>Section 8.0, Recommendations.</u> This section will need revision. Perhaps we should limit it to what we decided in the September 11th, 2002 meeting, such as: two additional rounds of bedrock background sampling will be conducted and why; MW27 will be sampled once more then abandoned due to gaseous emissions and public concerns; existing MW26 data is "outlier" data and should be excluded from background consideration; etc. Of course the document itself will need to have presented the information we will cite to justify each recommendation.**

Response 19: As suggested by L. Long's Comment No. 23, the recommendations will be revised to present clearer rationale and specific objectives. The recommendations will also be revised to include final September 11, 2002 meeting agreements. The recommendations will be as follows:

➢ Background data determinations:

- Groundwater sampling of background wells will be conducted for two additional events to verify the reality of the nitroaromatic detections, to justify background well localities, and to obtain additional background analytical data. The sampling

events should be conducted in October 2002 (dry season) and April 2003 (wet season).

- Existing analytical results from monitoring well PB-BED-MW26 will not be used in the background calculations because data was determined to be "outlier" data.

- Only unfiltered groundwater data (both on site and background) will be used for screening and risk assessment purposes.

- Background groundwater data values will be limited to include only data from 2001 through 2003 obtained by low-flow sample collection. Data collected by means of a bailer can be used in qualitative discussions of risk uncertainty or to provide further evidence in a risk assessment as needed.

- If sufficient low-flow data is present for each AOC, then only that data will be used for statistical analysis. Bailer obtained data can be used in the absence of low-flow data but should be discussed in a risk uncertainty section.

- The lesser value of the "Upper Tolerance Level" and the "Maximum Detected Concentration" should be used for background screening of inorganics.

- Statistical population testing will be used to determine whether detected concentrations of inorganics are associated with background conditions.

➢ Abandon monitoring well PB-BED-MW27 due to potential hazardous gaseous emissions and public concerns.

➢ Toluene contamination is present in the shallow water-bearing zone at the Upper Toluene Tanks Area. Additional overburden soil and groundwater investigation activities should be conducted in the area to identify the extent of the toluene plume and prevent possible plume migration into Plum Brook.

➢ Monitoring wells have not been installed at the Middle Toluene Tanks Area, located approximately 1,500 feet southwest of the intersection of Fox Road and Taylor Road. Based upon the results from the Upper Toluene Tank Area, consideration should be given to the installation of overburden and bedrock water-bearing zone wells at the Middle Toluene Tank Area (to assess possible toluene contamination in the overburden and bedrock groundwater).

➢ Install one additional bedrock monitoring well in the Pentolite Road Red Water Ponds Area to monitor bedrock contamination.

➢ Determine extent of nitroaromatics in groundwater downgradient of the north fence line by:

- Conducting a local off-site private wells survey to determine the number of private wells, construction information, and availability for sampling.

- Evaluating off-site nitroaromatic migration through private well sampling (if possible).

- Installing downgradient bedrock monitoring wells for contaminate assessment, if necessary.

➢ Collect additional data on the Garage Maintenance Area pumping rates and the reactor sump well pumping rate/cycles to support groundwater modeling.

Planned Activities

➢ Complete site-wide groundwater model (2003).

➢ Complete site-wide groundwater risk assessment (2003).

Comment 20: **Figures 6-1 and 6-2. Are the contours in Figure 6-1 based strictly on the overburden wells and those in Figure 6-2 overburden and shale wells? If so, some distinction needs to be added so that it is clearly understood (for one thing the titles are the same but for the date). Or maybe the question should also be why wasn't the shale well data used in 6-1. If these figures are meant to allow us to determine whether there is a seasonal variation in flow direction then the same data points should be used in both. If the intent is to show that the overburden and shale groundwater is the same "aquifer" then the same data set (either November 2001 or May 2002) should be used in both with the only difference being that one includes the shale data and the other doesn't.**

Response 20: Figure 6-1 through 6-4 will be revised to include all available wells at the site. The intent of this sequence of figures was to show changes in the groundwater contours based on the additional data available at the site. However, in retrospect, the inclusion of these two sets do not provide any additional value to the study. As such, the figures will be revised to only include 2002 data. The new figures will be used to show seasonal variation in groundwater flow directions. Text on Page 6-1, Section 6.2 has been revised to clearly state that these figures are intended to show seasonal variations in groundwater flow direction.

Comment 21: **Figure 6-2. Note number 5 would be clearer if the information was presented in the legend in association with the "gray scaled" entry.**

Response 21: Note 5 will be incorporated into legend on Figure 6-2.

Comment 22: **Figure 6-3. According to the title this figure should at least show the location of all the bedrock wells and have contours based on their associated water level measurements. Why aren't the new bedrock wells plotted on the figure and used in the contouring? In light of Figure 6-2**

where the shale wells are included in the overburden contouring it is unclear whether the shale wells are excluded from the contouring in Figure 6-3 or included in it. Please clarify on the figure.

Response 22: The new bedrock wells (PB-BED-MW22, -23, 24, 25, 26, 27; TNTA-BEDGW-001; TNTB-BEDGW-003; TNTB-BEDGW-004, and TNTC-BEDGW-001) are not included on Figure 6-3 because water levels were not recorded site-wide until February 2002. The new updated Figures 6-2 and 6-3 will include water level readings from appropriate wells and identify wells not used in contouring.

Comment 23: **<u>Figure 6-4.</u> According to Table 6-1, the water elevation at BED-MW17 was 598.03 rather than 608.14. This correction will shift some of the contours but not change the overall configuration. Also, Notes 3 and 4 might be clearer if they were presented in the Legend similar to "NM".**

Response 23: Figure 6-4, BED-MW17 elevation will be corrected to 598.03 and contours will be adjusted. Legend will be updated to include Notes 3 and 4.

Comment 24: **<u>Figures 6-3 and 6-4.</u> As was the case with Figures 6-1 and 6-2 consider the intent of these two figures. If they're meant to be compared for seasonal differences both should use data from the same set of wells just differing in whether it's dry or wet conditions. If they're meant to illustrate the difference between bedrock groundwater contouring using all the bedrock wells versus strictly the limestone wells with the shale excluded then they should both be from the same measurement period (November 2001 or May 2002).**

Response 24: Figure 6-1 through 6-4 will be revised to include all available wells at the site to show seasonal variation in groundwater flow directions. The intent of Figures 6-1 and 6-2 was to show changes in the groundwater contours based on the additional data available, if any at the site. However, the inclusion of the November 2001 and May 2002 data did not provide any real value to the residuum study. Bedrock groundwater in the Delaware Limestone has also been drawn to show the seasonal variation in water levels (Figures 6-3 and 6-4, respectively). However a complete picture of the seasonal groundwater flow was not possible due to lack of site-wide groundwater level data. November 2001 (dry season) groundwater elevations of monitoring wells were very similar to May 2002 (wet season) groundwater level elevation data, so Figure 6-3 was constructed in include the similar interpretation. Text on Page 6-1, Section 6.2 has been revised to clearly state that these figures are intended to show seasonal variations in groundwater flow direction.

Comment 25: **<u>Appendix B, Groundwater Sampling Form.</u> On several the "Sample Number" fill-in boxes are not filled-in with the well number. In future efforts please have the field personnel understand that they need to complete the forms properly.**

Response 25: Concur.

Comment 26: **<u>Appendix E, Photographs.</u> The core photos are too poor to be of much use. For future efforts Shaw should consider using a good quality digital camera so that the images can be improved if necessary. Also, it is standard practice at the Corps to wet the core for the photo. Wetting the core brings out the color variations and thus some bedding features otherwise not observed.**

Response 26: Concur. All future work plans will include procedures for photographic documentation of all field activities. Procedures will adhere to all available USACE guidance. A good quality digital camera will be used, which will allow review of all photographs prior to demobilization from the field.

Comment 27: **<u>Appendix F, Well Development Logs.</u> In light of the fact that a fair number of well developments will take more than one day Shaw should consider adding a column on the left (next to the Time column) where the date can be entered.**

Response 27: The Well Development Log (Appendix E) will be edited for future well development tasks. However, it should be noted that if development required more than one day, it was documented on the form.

Comment 28: **<u>Appendix G: Section 6.0.</u> In the 1st paragraph change "meaning test" to "meaningful test" and in 2nd paragraph change "tested well are range from" to "tested wells range from".**

Response 28: Appendix F (former Appendix G), Chapter 6.0, 1st paragraph, 4th sentence, "meaning" will be changed to "meaningful". 2nd paragraph, 3rd sentence, "tested well are range from" will be changed to "tested wells range from".

Comment 29: **<u>Also concerning Appendix G.</u> In open borehole wells such as MW27, r_c will equal r_w. Please revise Table 1 for all open borehole wells; redo relevant calculations and Test Analyses printouts; revise Table 2; and change text discussions as necessary.**

Response 29: Correct. Changes will be made to Table 1, the calculations, and Table 2. Data revisions will be included in Appendix F (former Appendix G). Based on the table revisions, text discussions did not change.

Comment 30: **<u>Appendix O, O.1.3.</u> Edit to present the one sample from MW26 as an outlier based on the "improper sampling" criteria and the information we presented around page 6-25. Not that the sample was collected with improper methods per se but that the sample for various reasons was not representative of bedrock groundwater flowing onto PBOW. Elimination of the MW26 data from the background data set will require revision of other parts of Appendix O also. Please make necessary revisions.**

Response 30: Based on numerous comments and discussions with USACE and OEPA, Appendix L (former Appendix O) has been completely revised to reflect the current agreements for collecting additional background data. The specific concerns outlined in this comment will be included in Appendix L, Section L.6 as discussed in Response to Comment No. 13 from Becky Terry and Jim Beaujon.

Comment 31: **<u>Appendix O.</u> In the Appendix O figures there is significant scatter of the BG8-BEDGW-01 data points not evident with the other wells. The text makes no mention of this and offers no explanation. Please provide some rationale for this spread of the BG8-BEDGW-001 data. Also concerning the Appendix O figures: I realize the program limits how much you can put in the Legend labels, however, is there some way to enter a footnote that gives the full well numbers? Particularly since there are several BEDGW-001 wells at PBOW?**

Response 31: The set of background wells will be finalized after two additional background wells are installed and additional samples and water level measurements are collected from existing potential background wells. Because a set of background wells has not yet been finalized, the discussion referenced by this comment will be deleted from this appendix.

Reference: Comments received from Lannae Long (dated 1 November 2002)

Comment 1: **<u>Exec Sum, 8th para. starting with Twenty-one.</u> Nitroaromatics were analyzed too. Provide rationale for the inclusion of nitroaromatics.**

Response 1: Agreed. The following text will be inserted after the second sentence: "The background groundwater samples were also analyzed for nitroaromatic explosives to confirm that PBOW activities had not impacted sites selected for determining background groundwater quality."

Comment 2: **<u>Exec Summ, last para., bullet 1.</u> Additional background GW samples are needed.**

Response 2: Agreed. Based on the results of the September 11, 2002 meeting, two additional rounds of groundwater sampling will be completed for background purposes. The following text will be added to the Executive Summary and Recommendations to address the background groundwater sampling (please see response to Jim Beaujon's Comment No. 19 for all of the other revised recommendations):

- Background data determinations:

  - Groundwater sampling of background wells will be conducted for two additional events to verify the reality of the nitroaromatic detections, to justify background

well localities, and to obtain additional background analytical data. The sampling events should be conducted in October 2002 (dry season) and April 2003 (wet season).

- Existing analytical results from monitoring well PB-BED-MW26 will not be used in the background calculations because data was determined to be "outlier" data.

- Only unfiltered groundwater data (both on-site and background) will be used for screening and risk assessment purposes.

- Background groundwater data values will be limited to include only data from 2001 through 2003 obtained by low-flow sample collection. Data collected by means of a bailer can be used in qualitative discussions of risk uncertainty or to provide further evidence in a risk assessment as needed.

- If sufficient low-flow data is present for each AOC, then only that data will be used for statistical analysis. Bailer obtained data can be used in the absence of low-flow data but should be discussed in a risk uncertainty section.

- The lesser value of the "Upper Tolerance Level" and the "Maximum Detected Concentration" should be used for background screening of inorganics.

- Statistical population testing will be used to determine whether detected concentrations of inorganics are associated with background conditions.

Comment 3: **<u>Exec Sum, last para., bullet 4.</u> Provide objectives and rationale for off-site GW survey.**

Response 3: Bullet 4 will be replaced with the following:

➢ Determine extent of nitroaromatics in groundwater downgradient of the north fence line by:

- conducting a local off-site private wells survey to determine the number of private wells, construction information, and availability for sampling.

- evaluating off-site nitroaromatic migration through private well sampling (if possible).

- installing downgradient bedrock monitoring wells for contaminant assessment, if necessary.

Comment 4: **<u>Exec Sum, last para., bullet 5.</u> What would the objectives and rationale be for the proposed sampling? There have been a few surface water areas assessed on-site. None of these surface water areas have been identified as media of concern through risk assessment. As per future**

risk assessments, surface water and sediment will be sampled as part of individual AOC investigations. If the exposure points assessed indicate no further action, why would we want to sample springs as stated in this bullet?

Response 4: Given the uncertainty related to off-site contaminant transport, sampling springs at this point would not be appropriate; therefore, this recommendation will be deleted from the report. However, sampling of off-site springs where potential groundwater discharge is occurring may provide exposure information to contaminated groundwater. The previous off-site surface water and sediment sampling was not intended to sample groundwater discharge locations, rather locations that received surface discharge from PBOW wastewater treatment facilities. Further evaluation of the need for spring sampling will be made upon completion of any off-site well sampling.

Comment 5: **Section 1.1, General Comment. It should be noted that one major objective is to establish a GW background data set to be used in screening site/AOC data in risk assessment. Background GW data should be analyzed and presented with risk assessment in mind.**

Response 5: Agreed. A bullet will be inserted stating "Establish naturally occurring levels of inorganics in PBOW groundwater to use in screening site data in risk assessments."

Comment 6: **Section 3.1.1.1 TNT A, para. 6. Reference to PRGs, should be changed to preliminary screening levels as published by EPA Region 9, 2000 residential tap water values. It should be noted here and in every other AOC summary that at this time, screening levels are to give site data some perspective and are not regulatory limits and are not binding in anyway. You should also note that EPA Region 9 has updated their screening table on 1 October 2002, after the publication of this draft GW report.**

Response 6: PRGs will not be used in this report and will be replaced by risk-based screening concentrations (RBSC). Although groundwater analytical data are not subjected to risk assessment screening, a comparison to the RBSCs will be made. The groundwater RBSCs are derived from EPA (2002) tap water criteria and are based on generalized residential drinking water scenario that is assumed to be the most restrictive use of groundwater. The RBSCs do not infer a regulatory limit or mandated cleanup level and are only used as a comparison tool.

Comment 7: **Section 3.1.1.1, TNT A, 2nd to last para. regarding BERA. This paragraph is inaccurate. This paragraph needs to be changed to reflect the real agreement. In the quantitative ERA (which is really a SLERA), soil HQs were 800+ based on NOAELs, and 100+ based on LOAELs with the major contributors being Aroclor 1260 and TNT. Because we are**

developing proposed remedial goal options based upon a residential scenario, and PCB and Lead ARARs, the resulting remedial ecological HQs will most likely be less than 10. There should be a section in the FS that re-assesses HQs on an ecological basis as part of long-term protection of the environment.

Response 7: Section 3.1.1.1 of the text will be revised accordingly. The following text is suggested as replacement for the second sentence of the referenced paragraph:

"The BERA estimated that ecological hazards associated with TNTA surface and total soils were elevated. These estimates are regarded as conservative and are associated with a considerable degree of uncertainty; additional investigation and evaluation would be necessary to provide more accurate estimates of ecological hazards. However, it was agreed that TNTA soils be remediated to human health-based remedial goal options (RGO), and that ecological risk be re-evaluated in the FFS based on cleanup of areas previously exceeding these RGOs."

It is noted that revision to the TNTA&C FFS is ongoing. A discussion of ecological risk, the agreement made regarding cleanup to human health RGOs, and the revised ecological HQ values will be included in the FFS.

Comment 8: **<u>Section 3.1.1.1, TNT A last para.</u> Reword the whole paragraph to incorporate established risk assessment language such as exceeding the risk management range instead of "unacceptable risk" and "threshold". Note that the existing TNT A risk assessment includes only surface media, not GW. Delete reference to building and single data points in the area. Proposed risk-based remedial goal options are being developed on an AOC basis, and the origin of these RGOs is the TNT A risk assessment, not the sample by sample risk assessment.**

Response 8: This paragraph will be rewritten accordingly, as follows:

"A baseline human health risk assessment (BHHRA) was also performed for exposure to TNTA soil, surface water, and sediment (IT, 2001b). Results of the BHHRA indicate that cumulative human health risks associated with TNTA total soil for the potential future resident and construction worker exceed the respective risk management ranges for cancer risk (i.e., incremental lifetime cancer risk>1E-5) and noncancer hazard (i.e., hazard quotient>1). Exposure to surface water and sediment were found to contribute insignificantly to human health risks. Exposure to surface soil (as evaluated for the groundskeeper, indoor worker, and hunter/venison eater) resulted in noncancer and cancer risk estimates within or less than the risk management ranges. The chemicals of concern (COC) for TNTA total soil are lead, Aroclor 1260, and several nitroaromatics. Human health risk-based RGOs for TNTA soil are being developed as cleanup criteria in the TNTA&C FFS."

Comment 9: **<u>Section 3.1.1.2, TNT B, para. starting with During 1997, no VOCs to the end of the section.</u> See Lannae Long's Comments for TNT A.**

Response 9: Regarding the ecological and human health risk issues similar to those raised by Lannae Long's Comment Nos. 7 and 8, as applicable, the following text is suggested as replacement for the second-to-last paragraph:

"A BHHRA and screening level ecological risk assessment (SLERA) were performed for TNTB (IT, 2000d). Total soil was found to exceed the cancer (1E-5) and noncancer cumulative risk management ranges for both receptors evaluated (potential future resident and construction worker). Likewise, surface soil was found to exceed the respective risk management ranges for both receptors evaluated (groundskeeper and indoor worker). Thirteen human health risk COCs were identified in TNTB surface and total soils. Site-related human health risks associated with surface water and sediment were found to be within or less than the risk management ranges (i.e., ILCR$\leq$1E-5 and HI$\leq$1).

The SLERA estimated that ecological hazards associated with TNTB surface and total soils were elevated. These estimates are regarded as conservative and are associated with a considerable degree of uncertainty; additional investigation and evaluation would be necessary to provide more accurate estimates of ecological hazards. However, it was agreed that TNTB soils be remediated to human health-based cleanup levels. The resulting residual ecological risks to terrestrial receptors were re-evaluated in the FFS based on cleanup of areas previously exceeding the cleanup levels. The resulting ecological risks were estimated to be reduced an average of approximately 750-fold. The SLERA concluded that remediating the site to human health cleanup levels would result in residual concentrations that are protective of terrestrial receptors. Additionally, the SLERA found that due to the limited aquatic habitat and the lack of rare, threatened, or endangered species, that the development of RAOs based on aquatic receptors was unwarranted."

Comment 10: **<u>Section 3.1.1.3, TNT C.</u> See Lannae Long's Comments for TNT A.**

Response 10: Section 3.1.1.3 of the text will be revised consistent with the response to comment to Lannae Long's Comment No. 7. The following text will be replaced for the second-to-last paragraph in Section 3.1.1.3:

"A BERA was performed for TNTC (IT, 2001a), which estimated that ecological hazards associated with exposure to TNTC surface and total soils were elevated for terrestrial receptors. These estimates are regarded as conservative and are associated with a considerable degree of uncertainty; additional investigation and evaluation would be necessary to provide more accurate estimates of ecological hazards. However, it was agreed that TNTC soils be remediated to human health-based remedial goal options (RGO), and that ecological risk be re-evaluated in the FFS based on cleanup of areas

previously exceeding the human health RGOs for TNTC. Also, neither remedial action nor further study are recommended for aquatic receptors exposed to TNTC surface water based on the following: uncertainties associated with estimating chemical concentrations in aquatic insects, limited area and low quality of aquatic habitat, and relatively low hazard estimates especially when using the lowest-observable-adverse-effects-level approach."

It is noted that revision to the TNTA&C FFS is ongoing. A discussion of ecological risk, the agreement regarding cleanup to human health RGOs, and the revised ecological HQ values will be included in the FFS.

The last paragraph of Section 3.1.1.3 will be revised consistent with Lannae Long's Comment No. 8. The following text is suggested:

"A baseline human health risk assessment (BHHRA) was also performed for exposure to TNTC soil, surface water and sediment (IT, 2001d). Results of the BHHRA indicate that cumulative human health risks associated with total soil for the potential future resident and construction worker exceed the respective risk management ranges for cancer risk (i.e., incremental lifetime cancer risk>1E-5) and noncancer hazard (i.e., hazard quotient>1). Similarly associated with exposure to surface soil for the groundskeeper, indoor worker, and adult hunter exceeded the respective risk management ranges. Noncancer risks associated with exposure to sediment for the potential future resident and construction worker also exceeded the risk management range (i.e., ILCR>1E-5), and cancer risks associated with exposure to sediment contributed significantly (ILCR>1E-6) to the overall ILCR of the construction worker and potential future resident. Human health risk-based RGOs for TNTC soil and sediment are being developed as cleanup criteria in the TNTA&C FFS. "

Comment 11: **<u>Section 3.1.2.1, WARWP, last para.</u> See Lanne Long's Comment No. 8.**

Response 11: The last paragraph of Section 3.1.2.1 will be revised consistent with Lannae Long's Comment No. 8. The following text is suggested:

"A baseline human health risk assessment (BHHRA) was also performed for exposure to WARWP soil, surface water and sediment (IT, 2000b). Results of the BHHRA indicate that site-related cumulative human health risks do not exceed the respective risk management levels for cancer risk (i.e., incremental lifetime cancer risk>1E-5) and noncancer hazard (i.e., hazard quotient>1) when summed across all media for any of the receptors evaluated. An FFS was performed for the two Red Water Pond Areas (IT, 2002a). Because no WARWP COCs were identified in the BHHRA, the FFS did not identify or evaluate any remedial alternatives for the WARWP."

Comment 12: **<u>Section 3.1.2.2, PRRWP, last 3 para.</u> See Lannae Long's Comment No. 8.**

Response 12: The third paragraph on page 3-20 (Section 3.1.2.2) will be revised consistent with Lannae Long's Comment No. 8; the first paragraph below is the replacement text. Also, the second paragraph below is replacement text for the last paragraph on Page 3-15 to introduce the PRRWP "hot-spot" removal concept from a risk management perspective.

"A baseline human health risk assessment (BHHRA) was also performed for exposure PRRWP surface soil and total soil (IT, 2000b). Results of the BHHRA indicate that cumulative human health risks associated with total soil exceed the respective risk management ranges for cancer risk (i.e., incremental lifetime cancer risk>1E-5) and noncancer hazard (i.e., hazard quotient>1) in the potential future resident. Also, the noncancer hazards for the construction worker also exceed the risk management range for exposure to total soil. Six nitroaromatics and benzo(a)pyrene COCs were identified in the BHHRA.

An FFS was conducted for the two Red Water Pond areas (IT, 2002a). The FFS evaluation of the PRRWP was initially based on the BHHRA and the COCs identified therein. During the FFS, a single location with elevated nitroaromatics concentrations, particularly TNT, was identified. It was determined that if this small "hot spot" was remediated, then the remaining soil would not pose a cancer risk nor noncancer hazard for any PRRWP receptor at levels exceeding the respective risk management ranges."

Comment 13: **<u>Section 5.4, General.</u> It is not clear why background GW samples were compared to EPA Region 9 PRGs. I suggest not comparing the background data to PRGs. I suggest analyzing background data on its own in a qualitative, and statistical or quantitative manner to describe outliers or bad datum.**

Response 13: Agreed. The intent of comparing background data to PRGs was to show that some inorganics may represent a residual risk at background concentrations. The comparison was not intended to make any implication as to outliers or bad data. The set of background wells will be finalized after two additional background wells are installed and additional samples and water level measurements are collected from existing potential background wells. Because a set of background wells has not yet been finalized, reference to background concentrations will be deleted from this report.

Comment 14: **<u>Section 5.4, para. 2.</u> Reword 1st sentence.**

Response 14: The following text is a replacement for the first two paragraphs of Section 5.4:

The use of PRGs as a screening criteria has been replaced by risk-based screening concentrations (RBSC). See Response No. 6 by USACE-L. Long.

Comment 15: **<u>Section 5.4, para. 4.</u> It is unclear why you would compare SPLP data to EPA Region 9 PRGs. The purpose of SPLP data at this time is not to compare the SPLP data to background and EPA Region 9 PRGs. I suggest having SPLP data stand alone for now, and in the coming year have discussion and agreement among USACE, OEPA and NASA about the objectives on using SPLP data, if it is used at all. I do not believe SPLP data will be used directly in any risk assessment, so SPLP data should not be handled in such manner.**

Response 15: As recommended in the comments from USACE-CX, all SPLP data will be removed from the report and provided under separate cover. The data will not be compared to any regulatory criteria.

Comment 16: **<u>Section 6.4.9, down gradient wells.</u> I believe other wells were considered down gradient bedrock wells besides Bed-22 and Bed-27. Bed-17 north of TNT A, Bed-18 east of TNT A, Bed-15 east of the Reactor Site, and possibly Bed-19 north of TNT C. For risk assessment, these wells will be used to simulate worst case off-site residential GW use. I suggest summarizing all down gradient data here, not just data from the two new wells.**

Response 16: Agreed. The following text will be inserted into Section 6.4.9 after the last sentence: "It is important to note that these perimeter wells represent groundwater impacts from a number of PBOW source areas. While previous discussions for each site summarized worst case exposure scenarios for groundwater migrating from these source areas, perimeter wells represent the affects of natural attenuation on these concentrations and provide an indication of current exposures at the perimeter boundary." For completeness, analytical data previously discussed for downgradient source area wells is also summarized in this section.

Comment 17: **<u>Section 6.4.10, page 6.23.</u> My copy is missing this page.**

Response 17: Review of internal copies of the report indicates that this an isolated error that must have occurred in the reproduction process.

Comment 18: **<u>Section 6.4.10.2, 3rd quarter April 2002.</u> A summary of all nitroaromatic detections should be included here, regardless of EPA Region 9 values or not. The nitroaromatics in background wells indicate either a wide-spread nitroaromatic problem at PBOW, or a problem with sampling and analysis. Detected nitroaromatics in background wells should not be compared to EPA Region 9 PRGs as a way to delete the datum or data from comment in the text. All nitroaromatic detections in background should be addressed.**

Response 18: Agreed. The text will be revised to discuss all detections in the background wells.

Comment 19: **<u>Section 6.6 and all subsections in 6.6, SPLP data.</u> SPLP data should not be compared to EPA Region 9 PRGs at this time. It is important to analyze for any correlation between soil concentrations and GW concentrations to help determine potential GW sources.**

Response 19: As recommended in the comments from USACE-CX, all SPLP data will be removed from the report and provided under separate cover. The data will not be compared to any regulatory criteria.

Comment 20: **<u>Section 7.1.2, background screening values.</u> During the 11 Sept 2002 PBOW group meeting, it has been decided on appropriate data points for the development of background screening values for metals, and 2 other rounds of data will be taken through 2003 for this effort. I suggest waiting until then to recalculate UTL on appropriate data points, and provide rationale for the data points not appropriate.**

Response 20: Agreed. Background values will be recalculated following additional sampling.

Comment 21: **<u>Section 7.1.2, background PAH and BTEX.</u> It is the assumption that there are PAHs and BTEX naturally occurring in the PBOW area. For risk assessment purposes, PAHs and BTEX will not summarily be screened out of the AOC GW data sets just because PAHs and BTEX were detected in background wells. There needs to be strong background data analysis to show that the PAHs and BTEX levels are regional variations to use the data for screening. Otherwise, the data will be used on the backside of a risk assessment in a qualitative manner to help determine if any part of on-site PAH and BTEX concentrations can be attributed to regional background. I suggest providing data analysis with the objective of being able to state that there are naturally occurring PAHs and BTEX as levels detected, or there is not enough information and the data will be used on the backside of a risk assessment.**

Response 21: It is agreed that BTEX and PAHs will not be summarily screened out based on a background screening level (i.e., MDCs or UTLs). Clearly, there is much variation in BTEX/PAH concentrations across the site and among the background wells. For example, PAHs and BTEX are detected in background well PB-BED-MW24 at concentrations 1 to 2 orders of magnitude higher than in the other background wells. However, several site wells exhibit BTEX/PAH concentrations appreciably greater than those found in PB-BED-MW-24. Thus, even though it is generally believed that virtually all BTEX/PAHs present is naturally occurring, BTEX/PAHs cannot be removed from consideration as "site-related" contaminants based solely on a quantitative comparison of site to background concentrations.

It is recommended that a spatial evaluation of BTEX and PAHs be performed that would include site and background groundwater locations. Vertical correlation—especially with regard to lithologic unit—would be considered as well as horizontal. Additionally, existing information should be gathered, as available, concerning regional variations, again, with respect to lithologic units. This evaluation should be completed after the planned April 2003 round of groundwater sampling is completed. As part of this evaluation, the monitoring wells should be evaluated for hydrogen sulfide content. The presence of hydrogen sulfide is commonly associated with PAHs/BTEX that may be found in the Delaware Limestone. Also, hydrogen sulfide concentrations in background well PB-BED-MW24 screened in the Delaware Limestone, exceeded the range of the instrument (i.e., >500 ppm) during the July 2002 sampling period.

It is anticipated that the results of the study would have to be interpreted qualitatively as well as quantitatively, and that it would yield no obvious "bright-line" concentration to be used in background screening for risk assessment or other purposes. Instead, it would likely be used to facilitate informed site management agreements.

Section 5.4.2 will be revised to indicate that BTEX/PAHs will not be summarily screened out based on a screening concentration. Brief mention will be made of the need for additional study of the PAHs/BTEX. This section will also be revised to state that the lower of the UTL or MDC will be used for screening inorganics.

Comment 22: **Section 7.5. SPLP data should not be compared to EPA Region 9 PRGs.**

Response 22: Agreed. As recommended in the comments from USACE-CX, all SPLP data will be removed from the report and provided under separate cover. The data will not be compared to any regulatory criteria.

Comment 23: **Section 8, recommendations. Clear rationale and specific objectives should be defined before recommendations become final. For example off-site survey and sampling may or may not fill an objective. A better objective recommendation could be: Determine the extent of nitroaromatics in groundwater downgradient from the north fence line.**

Response 23: The recommendations will be revised to present a clearer rationale and objective. Recommendations decided at the September 11, 2002 meeting will also be incorporated. Please see response to Jim Beaujon's Comment No. 19 for revised recommendations.

Comment 24: **Data Tables for AOCs in Document Tables. It would be helpful to have in a data summary column, the maximum detected concentration for each AOC, even if the maximum concentration is less than EPA Region 9**

PRGs. This easy info would help FUDS semi-annual chemical reporting requirements to HQ.

Response 24: Agreed. This information will be provided in the tables, as requested.

Comment 25: **<u>Section 7.1.2, background PAH and BTEX.</u> It is the assumption that there are PAHs and BTEX naturally occurring in the PBOW area. For risk assessment purposes, PAHs and BTEX will not summarily be screened out of the AOC GW data sets just because PAHs and BTEX were detected in background wells. There needs to be strong background data analysis to show that the PAHs and BTEX levels are regional variations to use the data for screening. Otherwise, the data will be used on the backside of a risk assessment in a qualitative manner to help determine if any part of on-site PAH and BTEX concentrations can be attributed to regional background. I suggest providing data analysis with the objective of being able to state that there are naturally occurring PAHs and BTEX as levels detected, or there is not enough information and the data will be used on the backside of a risk assessment.**

Response 25: Comment is a repetition of Lannae Long's Comment No. 21; please see response to Comment No. 21.

Comment 26: **<u>Figures.</u> It would be helpful to have on one map, all the well locations to give a site-wide overview of the well system. For example, there is a map seemingly unattached to any project report and has no figure number that I recommend to be in the report. In the control boxes, it is Job NO. 825635, drawing number 825635ES.017. Some of the maps included in the report do not have the new wells indicated on them, or there are no wells (not even in light gray shade) indicated except for a pointed few.**

Response 26: Figure 2-2 is a site map with all of the wells on it. Some of the figures do not include all of the wells (e.g., Figure 6-3) because water levels were not recorded site-wide until February 2002. Figures will be revised to show all site wells. Gray scale will be used where appropriate to distinguish overburden/weathered shale wells from bedrock wells.

Comment 27: **<u>Appendix O, Section O.1.3.</u> A more rigorous check on each datum following your protocol should help eliminate inappropriate data from data sets.**

Response 27: Agreed. This appendix (now Appendix L) is being rewritten. Because a set of background wells has not yet been finalized, reference to specific background concentrations will be deleted in the revised report.

Comment 28: **<u>General.</u> How we look at groundwater data from this time forward should incorporate the 11 Sept 2002 meeting minutes. In the future, those minutes need to be reflected in subsequent reports.**

Response 28: Concur. September 11, 2002 meeting minutes will be reflected in this and future reports.

Reference: Comments received from Doug Mullendore (dated 1 November 2002)

Comment 1: **<u>Page 3-4, 1st Complete Paragraph, 2nd Sentence.</u> Suggesting changing *unexceptable* to *unacceptable.***

Response 1: Agreed. The wording change will be performed.

Comment 2: **<u>Page 4-11 and 4-12.</u> Suggest changing "U.S. Liquids Office" to *"U.S. Liquids facility".***

Response 2: Section 4.9, 2rd paragraph, 2nd sentence, Page 4-11, "U.S. Liquids office" will be changed to "U.S. Liquids facility". Same paragraph, 3rd sentence, Page 4-12, change "U.S. Liquids office" will be changed to "U.S. Liquids facility".

Comment 3: **<u>Page 5-4, 2nd Paragraph, Last Sentence.</u> As the main data user of the SPLP data it was not my intention to have extract analytical results compared to any residential tap water risk screening criteria. If this is to be done I recommend that Shaw consult with both USACE and Ohio EPA risk assessment personnel to ensure that such comparisons are appropriate. Any consultations and agreements should be referenced in the report.**

Response 3: Agreed. While the SPLP method is widely utilized, there has been no standard method developed for the interpretation of the results. In general, most studies and guidance documents from other states available for review do compare the SPLP results to state or federal drinking water standards. However, it is agreed that the SPLP data should be presented without interpretation at this time and that discussions need to be held with USACE and OEPA to determine the objectives for this data. All comparison to any regulatory criteria will be removed from the report

Comment 4: **<u>Page 6-4, 3rd Paragraph.</u> The significance of this horizontal hydraulic gradient needs to be discussed in layman's terms in the report. Is the gradient higher within the trough thus representing a preferential pathway for contaminant transport?**

Response 4: The gradient represents the slope of the water table. The larger or higher the gradient, the steeper the slope. In the case of the troughs at PBOW, the gradient is steeper into the trough than it is within the trough. Therefore, the trough can be a preferential pathway for contaminants. "Groundwater slopes" will be inserted into the text following "Horizontal hydraulic gradient" in the first sentence to clarify the definition of gradient. Also in the first sentence, "troughs" will be preceded by the term "preferential pathways."

Comment 5: **<u>Page 6-5, Section 6.2.3, 2nd Sentence.</u> This sentence was misleading and needs clarification within the text of the report. After reading the paragraph several times I understood the sentence to mean that groundwater connectivity between the overburden and limestone bedrock is limited. This is based on the vertical gradient between overburden and bedrock groundwater. If this is a correct interpretation than such a sentence stating the conclusion of the analysis of vertical gradients should be added to the paragraph.**

Response 5: Agreed. The following sentences will replace the second sentence in this section: "Well pairs on the western and northern portions of the site showed higher groundwater elevations in the overburden zone than in the bedrock aquifer. This difference suggests that there may be relatively limited connectivity between the overburden and bedrock water bearing zones in these areas. In addition, any vertical groundwater migration that occurs will be downward into the bedrock."

Comment 6: **<u>Page 6-6, Section 6.2.4.</u> The first sentence of this section states *"no clear correlation exists between...in site wells"*. Succeeding sentences and paragraphs discuss correlations that existed at the site. This reviewer misses the subtleties of the first sentence and it appears that seasonal correlations do exist at the site, which influence water levels, although not on a monthly basis. I suggest revising this section to focus on the seasonal correlations (effectively deleting the phrase mentioned earlier). Additionally, this reviewer suggests that text be added to the report indicating optimal sampling times for overburden groundwater sampling.**

Response 6: Agree. The following text will replace the first two sentences of this section: "Although previous investigations have indicated that there is a strong connection between precipitation and groundwater elevations, no clear correlation exists between monthly precipitation rates and water level elevations in site wells. The lack of observed correlation is probably influenced by the amount of precipitation and the runoff rate. For example, summer thunderstorms that produce short periods of heavy precipitation my result in more surface runoff and less infiltration. Conversely, constant periods of precipitation at a lower rate over a period of days may result in more infiltration. Freezing rain or snow will also not result in an immediate recharge to groundwater. These factors are not discernable from total monthly precipitation data shown on Figure 6-12."

The following text will be added after the fourth sentence of this paragraph: "Therefore, the optimal time for sampling of overburden monitoring wells would be from January through July."

Comment 7: **<u>Page 6-7, Section 6.3, Last Paragraph, Last Sentence.</u> Suggest adding a reference where the reader can find this analysis in the report. I believe Appendix O, Section O.2.0 is the correct reference.**

Response 7: Reference to Section L.2.0 (former Appendix O) will be added to the end of this paragraph.

Comment 8: **<u>Page 6-8, Section 6.4.1.2.</u> I find it interesting that sulfate and sodium are the dominant anion and cation (on a equivalance/liter basis) found in well PB-BED-MW14 and overburden wells sampled during this and previous sampling. When compared to the results of PB-BED-MW24, a downgradient well also completed in the Delaware Limestone, where Ca^{2+} and HCO_3^- are the dominant ions present, it appears that the red water ponds have changed the geochemistry of the deep water bearing zone. How such a change could impact the solubility of such inorganic ions as arsenic needs to be discussed somewhere in the report.**

Response 8: The report will explain that an increase in the concentrations of cations and anions in groundwater can change the mobilities of trace elements via several different mechanisms. An increase in the concentration of one or more major elements can affect the adsorption of trace elements by competing for sorption sites. For instance, divalent cations generally compete for the same sorption sites. A large increase in the concentration of calcium or magnesium from a site activity can displace an adsorbed trace element such as lead, thus increasing its mobility. Likewise, a large increase in sulfate from site activities can displace arsenate, which competes for the same anionic sorption sites.

Increases in anion concentrations can increase the solubilities of metals by formation of aqueous complexes. For instance, lead has an affinity to form a series of chloride complexes ($PbCl^+$, $PbCl_2^0$, $PbCl_3^-$, $PbCl_4^{-2}$, etc.), which can enhance lead solubility in a high-chloride environment. Each metal has a unique set of affinities for forming such complexes. Some metals form complexes with chloride, fluoride, sulfate, carbonate, bicarbonate, nitrate, phosphate, and hydroxy anions to varying degrees, depending on the metal. This is why seawater contains dissolved metal concentrations that exceed the solubility limits in fresh water.

Comment 9: **<u>Page 6-8, Section 6.4.1.2, *Wet Season Sampling Event (April)*, Next to Last Sentence.</u> Should "*was*" be "*were*"?**

Response 9: Section 6.4.1.2, 2002 Wet Season Sampling Event (April), 4th sentence will be reworded.

Comment 10: **<u>General comment.</u> Since it appears groundwater has been impacted by nitroaromatics in the Pentolite Road Red Water Pond area and no**

bedrock wells are located within this AOC, I suggest a bedrock well be installed in the vicinity of the ponds.

Response 10: Two wells exist in the interpreted downgradient direction of the Pentolite Road Red Water Pond based on the May 2002 groundwater contours presented on Figure 6-4 of this report. These wells provide information on the impact of site related contamination to the bedrock aquifer. As noted, however, there are no bedrock monitoring wells within the Pentolite Road Red Water Pond Area. Water level data in this area could be valuable in determining the potential migration pathways from the overburden to the bedrock aquifer. Based on review of existing groundwater data, one additional well paired with an existing overburden well will be recommended to monitor bedrock contamination at the Pentolite Road Red Water Ponds. Numerous overburden wells in this area show contamination and the exact location of the new bedrock well will be determined in future discussions with the USACE and OEPA.

Comment 11: **Page 6-9, Section 6.4.2.2, *2001 Dry Season Sampling Event*, 4th Sentence. Was naphthalene detected at levels above the risk based screening criteria?**

Response 11: Yes. Naphthalene was detected above the preliminary screening level in both bedrock wells associated with the Pentolite Area (PB-BED-MW15 and PB-BED-MW23). The text will be adjusted to indicate that it was above the preliminary screening level.

Comment 12: **Page 6-11, Section 6.4.3, 7th and 8th Sentences. According to Figure 6-4 BED-MW17 seems to be located more side gradient to than downgradient of TNT Manufacturing Area A; while BED-MW18 seems to be upgradient of TNT Manufacturing Area A.**

Response 12: Yes. The text will be adjusted as per the comment.

Comment 13: **Page 6-11, Section 6.4.3.2. Are the 3 nitroaromatic compounds detected during the dry season sampling the same 3 that were detected during the wet season sampling? If so suggest this be added to the text of the dry season sampling.**

Response 13: Yes. The nitroaromatics compounds detected during the wet season were the same as detected during the dry season. Those compounds (4-A2,6-DNT, 2-A4,6-DNT, and 2,4,6-TNT) will be added to the "2001 Dry Season" text.

Comment 14: **General Comment. I'm perplexed regarding the discovery of nitroaromatic compounds in wells that based on figure 6-4 appear to be side gradient or upgradient from contaminated source areas (TNT Manufacturing Area A). Looking at information contained in Table 6-1 it appears that the water level in PB-BEDMW17 was measured as 598'**

above MSL in May of 2002. Suggest, Shaw review the contour value of 608.14' and determine if it is accurate.

Response 14: Figure 6-4 elevation of 608.14 is incorrect. The correct value is 598.03. The figure will be updated with correct value. Even with the correction to the groundwater contours, the observation is accurate that the contamination in the nearby wells appears to be upgradient and cross gradient. When interpreting the distribution of contaminants in PBOW groundwater, it is important to recognize any uncertainty in the groundwater flow regime. A generalized cross-section has been inserted (Figure 6-4A) which illustrates the PBOW groundwater site conceptual model. The cross-section shows the geologic units, the overburden/shale and bedrock water-bearing zones, the interrelationship between these components, and the possible contaminant migration transport routes.

Given the lack of off-site wells to further define groundwater flow in the area, groundwater contours shown on all overburden and bedrock figures will be dashed to imply that they are inferred. Future work may aid in better defining groundwater flow in this area.

Comment 15: **Page 6-12, Section 6.4.3.3, *2002 Wet Season Sampling Event*, 1st Sentence. Should *2-, 3- nitrotoluene* be 2-nitrotoluene and 3-nitrotoluene? If so clarify as necessary.**

Response 15: 2-, 3-nitrotoluene will be changed to 2-nitrotoluene and 3-nitrotoluene.

Comment 16: **Page 6-14, Section 6.4.4.3. It should be noted that the dominant ions in the TNTB-BEDGW004 are calcium and sulfate, which is different from what is normally found in the shale at PBOW. This is of particular interest because the overburden groundwater is also sulfate controlling (reference the results for MK-MW16 and MK-MW-17) and TNTB-BEDGW004 is located near a washhouse where sellite (Sodium sulfite) was used. I believe this could be an indication that while this well has not had nitroaromatic contamination detected, it does appear to have been impacted by TNT Area B operations in the vicinity of TNTB-BEDGW004.**

Response 16: Agreed. The following text will be added to Section 6.4.4.3: "Well TNTB-BEDGW-004 is located near a washhouse where sellite (sodium sulfite) was used, and groundwater in the vicinity may have been impacted by site operations. Sulfite will oxidize to sulfate in an oxidizing environment and raise sulfate concentrations above background levels. Wells impacted by sulfate can be identified by an anomalously high sulfate/chloride ratio. For instance, the October 2001 and April 2002 TNTB-BEDGW-004 samples exhibit sulfate/chloride ratios of 17 and 57, respectively. In comparison, the sulfate/chloride ratios for the background samples are all below 1.9, with a mean of 0.4."

Comment 17: **<u>General Comment.</u> Suggest that some discussion on whether the bedrock/overburden water zones are considered a reducing or oxidizing environment be included in this report. Further, a discussion of how nitroaromatics react/degrade in such an environment should also be included**

Response 17: The following text will inserted into the conclusions of the report. "Evidence available to evaluate the redox state of the groundwater includes oxidation-reduction potential (ORP), dissolved oxygen (DO), and sulfide. The 95 ORP field measurements available from background and non-background wells sampled from November 1997 through July 2002 range from –411 to +390 mV, with a median of –144 and a mean of –145 mV. The 106 DO measurements from the same data set range from 0.00 (nondetect) to 15.8 mg/L; however, most of the samples that had negative ORP also had low or nondetectable DO, providing independent evidence of reducing conditions. In addition, some wells had detectable sulfide in excess of 50 ppm, and some other wells were not sampled for safety reasons because of high hydrogen sulfide vapors.

The strong evidence for reducing conditions suggests that anaerobic microbial degradation pathways will be dominant over aerobic pathways. Four separate anaerobic TNT degradation pathways are known to exist (Ellis *et al.*, 2001). Intermediate degradation products from these pathways include:

4-Hydroxylamino-2,6-dinitrotoluene
2-Hydroxylamino-4,6-dinitrotoluene
2,4-Dihydroxyl-amino-6-nitro-toluene
4-Amino-2,6-dinitro-toluene
2-Amino-4,6-dinitro-toluene
2-Amino-5-hydroxyl-4-hydroxylamino-6-nitrotoluene
2,4-Diamino-6-nitrotoluene
2,4,6-Triamino-toluene
2,4,6-Trihydroxytoluene
4-Hydroxytoluene

The last intermediate, 4-hydroxytoluene, will degrade to toluene, which in turn, will degrade to benzoate under anaerobic conditions."

Reference:

Ellis, L.B.M., Hershberger, C.D., Bryan, E.M., and Wackett, L.P. (2001) "The University of Minnesota Biocatalysis/Biodegradation Database: Emphasizing Enzymes," ***Nucleic Acids Research***, 29: 340-343."

Comment 18: **<u>Figure 6-26.</u> Please add the amino substituted nitroaromatics to this figure.**

Response 18: All soil SPLP data (including Figure 6-26) will be removed from this groundwater report and will be issued under separate cover at a later date. The addition of amino substituted nitroaromatics will be added to this figure.

Comment 19: **General Comment Regarding SPLP Information. Please add a discussion regarding the leaching of nitroaromatics from soils into the groundwater. We need to start making the case that the leaching model provided in the Soil Screening Level guidance is overly conservative. Additionally, we need to postulate on how the soil removal actions completed at PBOW might impact groundwater. It appears from the figures that leaching of nitroaromatics at soil concentrations prescribed by the decision document might be modeled by a simple linear relationship (y=mx+b). I would suggest developing a table that shows the action levels concentrations and the predicted leachate concentration.**

Response 19: All soil SPLP data will be removed from this groundwater report and will be issued under separate cover at a later date. A comparison to the SSLs, as well as action levels, will be included in the submittal of the SPLP results.

Reference: Comments on Typing Errors and Minor Corrections (dated 1 November 2002)

Comment 1: **(a) Page 1-2: 2nd bullet. Change "second semi-annual round" to "wet season round". Sentence above Section 1.1- (b) The appropriate capitalization of document titles was lost when the page was printed.**

Response 1: (a) "second semi-annual " will be changed to "wet season." (b) Documents will be properly capitalized.

Comment 2: **Page 1-5, item no. 2. Change "plumes" to "flumes".**

Response 2: "plumes" will be changed to "flumes".

Comment 3: **Page 2-1, 5th line from bottom. Change "Pentalite Area Red Water Ponds" to "Pentolite Road Red Water Ponds".**

Response 3: "Pentalite" will be changed to "Pentolite" and "Area" will be changed to "Road".

Comment 4: **Page 2-2, Section 2.2.2, 1st sentence. Change "are shown on a revised regional geologic map" to "outcrop across PBOW".**

Response 4: "are shown on a revised regional geological map" will be changed to "outcrop across PBOW".

Comment 5: **Page 2-3, Section 2.2.3, 1st paragraph, 4th line. Change "As shown on the updated Figure 2-9" to "As shown on Figure 2-9".**

Response 5: "the updated" will be removed from 5th sentence, Section 2.2.3, Page 2-3.

Comment 6: **<u>Page 3-4, 4th line of words.</u> Change "unexceptable" to "unacceptable".**

Response 6: This paragraph will be revised (see previous responses to comments).

Comment 7: **<u>Page 4-4.</u> (a) TNTC- Shouldn't soil sample number "AB066A" be "SO066A"? (b) West Area Red Water Ponds- The reference to "DP10" should be "DP13".**

Response 7: (a) "SO" will replace "AB" on the soil sample identification numbers. (b) The reference to "DP10" will be changed to "DP13"

Comment 8: **<u>Page 4-5, 3 line paragraph.</u> Change "site-wide SAP" to "Site-wide SAP".**

Response 8: "site-wide" will be changed to "Site-wide".

Comment 9: **<u>Page 4-7, last paragraph on page.</u> "PB-BED-16" should be "PB-BED-MW16".**

Response 9: "PB-BED-16" will be changed to "PB-BED-MW16".

Comment 10: **<u>Page 4-9, 2nd line.</u> Change "site-wide QAPP" to "Site-wide QAPP".**

Response 10: According to the References, site-wide is not part of the title to the QAPP, therefore, it should not be capitalized.

Comment 11: **<u>Page 6-20: (a) 2002 Wet Season paragraph.</u> Change "No nitroaromatics, VOCs, SVOCs were" to "No nitroaromatics, VOCs, or SVOCs were". (b) Section 6.4.7.3, 1st sentence- Change "upon reviewing" to "during".**

Response 11: (a) The word "or" will be inserted between VOCs and SVOCs. (b) "Upon reviewing" will be changed to "during".

Comment 12: **<u>Page 6-21, Section 6.4.8.3, 5th line.</u> Change "levels only during" to "levels during".**

Response 12: The word "only" will be removed from the 5th line.

Comment 13: **<u>Page 6-23: (a) Section 6.4.9.3, 4th line.</u> Change relevant to "Benzene and methylene chloride were". (b) Section 6.4.10- Edit for clarity the sentence that begins with "Overburden monitoring".**

Response 13: (a) The word "was" will be changed to "were". (b) 4th sentence, Section 6.4.10, Page 6-27 will be changed to "Overburden monitoring well IT-MW01 was selected to be sampled as part of the dry/wet season sampling events due

to its location and possible use in determining background overburden groundwater values."

detected. The surface sample from Wash House, Building 146 was analyzed only for nitroaromatics. TNT concentrations were 11,000 µg/L." Similar text will also be used for other sections or samples where data will be compared against screening levels, if available.

Comment 5: **<u>Figure 3-1.</u> Identify the location and title (per mission) for Building 131. This building is highlighted in reference to the risk assessment performed.**

Response 5: "Mono House, Building 131" text will be included on Figure 3-1.

Comment 6: **<u>p. 3-4, 3.1.1.2, 1st paragraph.</u> Clarify the predominant mission related to the TNT-B area as is discussed in 3.1.1.1 for TNT-A and 3.1.1.2 for TNT-C. For instance, define whether the facilities main function to manufacture TNT, DNT, PETN, or other support features. Clarify title noted on text vs. fig 3-2 as Hypersonic "Tunnel" or "Testing " Facility also.**

Response 6: The following information will be included in the first paragraph to clarify the purpose of TNTB: "TNTB was used during World War II as a manufacturing facility for TNT and DNT. During PBOW operations, TNTB had three TNT lines consisting of 5 buildings each, and one DNT line consisting of one building".

Text of the 2nd paragraph will be changed to "Hypersonic Testing Facility" to match the title of the area as in Figure 3-2.

Comment 7: **<u>p.3-7, 2nd paragraph.</u> The benzene concentration highlighted as being found in this (and other?) background well(s) should be used as noted above in comment 1.**

Response 7: VOC contaminants benzene and methylene chloride, detected at concentrations above their preliminary screening levels, as noted in the 2nd paragraph on page 3-7, were from groundwater in monitoring well TNTB-BEDGW-002. The use of the term "background" in the context of this report refers only to wells on the most upgradient side of PBOW (i.e., the south and west sides). This monitoring well, while located upgradient of the TNTB area, is not considered a background well for the entire PBOW site.

Comment 8: **<u>Figure 3-3.</u> Identify the location of Building 682 on the figure. This building is highlighted in reference to the highest concentration of TNT found in TNT-C that is suspected to be waste from a clay line found.**

Response 8: The statement in the text (page 3-14, 1st paragraph) that identifies the highest TNT concentration from Building 682 was incorrect and will be changed to Building 692. Two building locations (Mono House, Building 681 and Fortifier House, Building 613) not identified on Figure 3-3, will be labeled.

Comment 9: **<u>p.3-15., 3.1.2.2., 3rd paragraph.</u> TCLP is the leaching procedure only. Several determinative analytical tests are done to address the compounds**

identified within 40 CFR 261. Define the compound(s) that are the basis for the HW determination statement made.

Response 9: The compound that caused the soil to be determined a Hazardous Waste was 2,4-DNT with a regulatory disposal limit of 0.13 mg/kg. 2,4-DNT will be noted as the HW chemical.

Comment 10: **<u>p. 6-10, 6.4.2.3.</u> The last statement on Thallium should be qualified to apply to the filtered sample only.**

Response 10: Reviewing Table 6-5 that presents metal detections, thallium was not detected in either Pentolite Road bedrock monitoring well (PB-BED-MW15 or PB-BED-MW23) during the months of October and April 2002. Therefore, this last sentence in the paragraph will be removed.

Comment 11: **<u>Figures 6-14-6-**.</u> Note that some detections included within the figures do not exceed the PRG as is noted within the legend. Why are some compounds noted within text missing from the figures, and vise-versa? Suggest a consistency so that the figures fully support a graphical depiction of the site (CSM) and the text associated with these areas.**

Response 11: The text and figures will be rechecked to ensure consistency.

Comment 12: **<u>p.6-18 – 6-31.</u> General text. Several of the figure references included within the document are in error. Verify the references noted within these sections i.e., figures 6-13, 6-14, 6-15, etc. are applicable to the text being presented and edit accordingly.**

Response 12: The text presenting the figures will be reviewed for all table and figure callouts and any corrections made prior to the document being reissued.

Comment 13: **<u>p. 6-1 – 6-31 throughout all 6.* sections; and 7-1 to 7-4, sections 7..1.1 and 7.1.2.</u> There are several instances (in sections 6.*) where a comparison of MW results to the background UTL was done and expressed as exceeding the calculated 95%UTL. This cut/dry dialogue is contradictory to the message previously expressed – hypothesized that the occurrence of these compounds (BTEX, SVOCs, etc.) was naturally occurring. Based on my review of the data, however, it was noted that the values were just slightly above the 95% UTL values (within 1 to 2 times) in most cases. In addition, the presentation of the background data (6-25, 6.4.10.3) is an oversimplification of the complexities of determining these characteristics of the environmental conditions found onsite. Other issues are encountered when attempting to apply statistics (i.e., invalid assumptions about the background population must be assumed) to determine a range for these values. Section 7.1 last paragraph of 7.1 does touch on this point, but it is too little, too late. Suggest these complexities of the subsurface environment, and some qualification of the weakness of these UTL values be addressed early**

within section 6.* text, prior to any individual areas discussion where these values are used. This is especially important in light of the close proximity of these values. For instance, with the sporadic nature of this naturally occurring petroleum product within the bedrock formation, as well as the limited number (5) of background wells and sampling events – suggest the level of discrepancy should be addressed on an individual data point basis and qualified throughout.

Response 13: It is agreed that: 1) background screening values should be used for screening only and should not be used to make a decisive determination that site concentrations exceed background, and 2) the issue of elevated BTEX/PAHs in site media needs to be evaluated more closely and on a spatial, geochemical, and/or statistical basis as appropriate.

For this revised report, analytical concentrations will not be compared with calculated background data. When background groundwater data values are presented, exceedance of a screening value should not be interpreted to mean that the site concentration is necessarily associated with site activities. Instead, exceedance of background, especially when marginal, indicates that further evaluation may be required. This evaluation may include a statistical population test of site to background analytical results; it may also include a geochemical and/or spatial evaluation. A more complete discussion of the revised approach to be taken for background screening/comparisons is included in the response to Becky Terry/Jim Beaujon Comment No. 19.

PAHs and BTEX will not be summarily screened out based on a background screening level as discussed in the response to Lannae Long Comment No. 21. A portion of that response is included below:

It is recommended that a spatial evaluation of BTEX and PAHs be performed that would include site and background groundwater locations. Vertical correlation—especially with regard to lithologic unit—would be considered as well as horizontal. Additionally, existing information should be gathered, as available, concerning regional variations, again, with respect to lithologic units. This evaluation should be completed after the planned April 2003 round of groundwater sampling is completed. As part of this evaluation, the monitoring wells should be evaluated for hydrogen sulfide content. The presence of hydrogen sulfide is commonly associated with PAHs/BTEX that may be found in the organic-rich shales. Also, hydrogen sulfide concentrations in background well PB-BED-MW24 screened in the Delaware Limestone, exceeded the range of the instrument (i.e., >500 ppm) during the July 2002 sampling period.

It is anticipated that the results of the study would have to be interpreted qualitatively as well as quantitatively, and that it would yield no obvious "bright-line" concentration to be used in background screening for risk assessment or other purposes. Instead, it would likely be used to facilitate informed site management agreements.

Sections 6 and 7 will be revised to reflect the above discussion.

Comment 14: **<u>p. 6-26, 6.5.</u> The results from the analyses of bedrock LNAPL found in various areas as expressed here for BTEX, GRO, and DRO provide some value (quantitated as containing more light-end petroleum compounds vs. heavy-end compounds), but do not provide any insight to the nature of this material, whether they are likely from a similar or different sources, etc. Contact the lab that analyzed these samples and ask for an assessment of the type of fuel - whether they believe it represents one or a mixture of refined petroleum product(s) – or if it is thought to represent a naturally occurring source. A determination of sulfur content for this material may also be considered for future efforts to help determine the nature of the sources of these LNAPLs. Include the lab analyst's professional judgment and a copy of the chromatograms within the document. Is this LNAPL material speculated as the natural petroleum associated with the bedrock, or are other anthropogenic sources known or suspected? Use professional judgment to express the potential sources for this material and incorporate those here as well.**

Response 14: The lab was contacted and is unable to provide any additional information regarding the samples. Typically, laboratories deliver analytical results without interpretation. To verify the origin of naturally-occurring hydrocarbons requires specialized testing beyond the capabilities of most analytical labs and standard EPA methods. The accepted methods allow identification of compounds for which standards are available and chromatographic patterns are recognizable. Identification is hindered by the alteration of established patterns due to evaporation, exposure, and biodegradation. Specialized labs with modified methods and petroleum-specific calibration standards, including weathered standards, should be used. A copy of the chromatograms will be inserted into the report (Appendix O).

The following text will be added: "Monitoring well MK-MW20, which is located downgradient from the Upper Toluene Tanks, had detections of toluene, gasoline range organics (GRO) and diesel range organics (DRO). Although the sample had detections of hydrocarbons in the gasoline and diesel ranges, the chromatograms did not resemble the gasoline and diesel standards. In the GRO chromatogram, the predominant peak was from toluene. The sample did not contain concentrations of several components of the gasoline standard such as the methylpentanes, heptane, ethylbenzene, xylenes, or trimethylbenzene. Although weathering of the hydrocarbons would lower the concentrations of the alkanes, the aromatic compounds should still be present. The lack of benzene, ethylbenzene, and xylenes in the 8260B analysis confirms that it is probably not gasoline. Only two single components of the diesel standard were present in the sample. Therefore, the potential source of the contaminants in the groundwater appears to be from the storage of toluene in the Upper Toluene Tanks."

"Monitoring well PB-BED-MW16 is also located downgradient from the Upper Toluene Tanks. The sample contains a mixture of hydrocarbons in the gasoline and diesel ranges. Early eluting compounds are not evident in the 8260B chromatogram. This may be due to weathering. Although many of the single components of gasoline are present, they do not appear in the same ratios as the gasoline standard. Usually, total xylenes and toluene are present in similar concentrations. Since the relative concentration of toluene is low, the Upper Toluene Tanks are an unlikely source. More specialized analytical methods are necessary to determine the exact nature of the product."

"Groundwater samples were collected from TNTA-BEDGW-001 and PB-BED-MW16. Their chromatograms are similar, and the concentrations of components are very similar. Since early eluting compounds are present, little weathering appears to have taken place. Although many of the single components of gasoline are present, they do not appear in the same ratios as the gasoline standard. The concentration of total xylenes compared to the other aromatics is high. More specialized analytical methods are necessary to determine the exact nature of the product. The presence of sulfur-like odors indicates that the source may also be naturally-occurring."

Comment 15: **p. 6-27 – 6-31, 6.6.*and p.7-14, 7.5. The application the SPLP explosives data and speculation expressed here is irrelevant and unadvised. Suggest future sampling efforts remove this protocol as lacking value and focus monies to GW sampling as an indication of site conditions and the leachability of these compounds into GW.**

Response 15: It is agreed that the SPLP data, in the strict context of the groundwater report, is irrelevant. Soil SPLP data were collected to support future evaluations of the soil to groundwater contained migration at various sites (i.e., the Redwater Ponds and TNT Manufacturing Areas). The samples were collected during the execution of the groundwater investigation as a cost-effective means to support ongoing soil feasibility studies and future evaluation of the effectiveness of any soil removal actions. All soil SPLP data will be removed from this groundwater report and will be issued under separate cover at a later date.

Comment 16: **p.-General. It appears that the acetone detections are associated only with the most recent sampling events conducted by IT Group. The source of this acetone may be related to residues found with the decon solvent (isopropyl alcohol) used. Suggest use of disposable materials (bailer, tubing, etc.) and dropping the organic rinse from a future sampling effort to evaluate whether this has any impact on the next round of data.**

Response 16: Disposable materials such as bailers, rope, tubing, filters, etc., are already used. Based upon a meeting held September 11, 2002, groundwater samples collected only by means of the low-flow sampling methodology will be used to determine background quantitative values. Samples collected with a bailer will be used for qualitative purposes. Based upon this information, each well that a groundwater

sample is able to be collected by low-flow sampling, will continue to be sampled in that manner. Analytical results will be reviewed following the October 2002 sampling. If acetone is still present in groundwater samples collected by low-flow sampling means, the organic rinse may be eliminated during the April 2003 sampling event. The decision to eliminate the organic rinse will be made by the USACE in conjunction with OEPA.

Comment 17: **<u>p.7-3, 7.1.1, last two paragraphs.</u> The text given here is too brief to support the assertion that the PAHs and BTEX are naturally occurring. The fact that these readings coincide together does not support the interpretation, for they can coexist from an anthropogenic source also. This section should be augmented to identify how the PAH and BTEX detections coincide with the field observations, sulfide readings, and other antidotal information that was gathered when formulating the original interpretation. See other comments concerning the gathering of additional data that will support this assertion also.**

Response 17: Additional information obtained from analytical data, field readings and conversations with OEPA will be added to these paragraphs to supplement the natural occurrence of BTEX and PAH.

Comment 18: **<u>p.7-5, 7.2.1, first paragraph.</u> Many of the nitroaromatic compounds detected at PBOW are related transformation products of TNT, and 2,4DNT. Suggest noting within the document that based on the detections of the 2- and 4-aminoDNTs as well as other transformation products (nitrotoluenes, nitrobenzenes, nitroanalines, etc.) site conditions are supporting a biodegradation of the TNT and DNT under aerobic conditions. There are a couple of CRREL papers are available on this subject, i.e., Tech Report 90-2, 92-16. These reports also contain a multitude of references that may be accessed, if desired.**

Response 18: Agreed. The following text will replace the second paragraph in Section 7.1.1 (formerly 7.2.1): "Two of the 10 monitoring wells installed as part of the Groundwater Remedial Investigation are located along the downgradient (north/northeast) perimeter of the PBOW facility. Perimeter wells PB-BED-MW22 and PB-BED-MW27 represent groundwater impacts from a number of PBOW source areas. Sampling during October 2001 and April 2002 detected 2,4-DNT and 2,6-DNT above screening limits in the bedrock groundwater. Based upon the well locations and analytical data, low levels of nitroaromatics are migrating to offsite areas.

Evidence available to evaluate the redox state of the groundwater includes oxidation-reduction potential (ORP), dissolved oxygen (DO), and sulfide. The 95 ORP field measurements available from background and non-background wells sampled from November 1997 through July 2002 range from –411 to +390 mV, with a median of –144 and a mean of –145 mV. The 106 DO measurements from the same data set range from 0.00 (nondetect) to 15.8 mg/L; however, most of the

samples that had negative ORP also had low or nondetectable DO, providing independent evidence of reducing conditions. In addition, some wells had detectable sulfide in excess of 50 ppm, and some other wells were not sampled for safety reasons because of high hydrogen sulfide vapors.

The strong evidence for reducing conditions suggests that anaerobic microbial degradation pathways will be dominant over aerobic pathways. Four separate anaerobic TNT degradation pathways are known to exist (Ellis *et al.*, 2001). Intermediate degradation products from these pathways include:

4-Hydroxylamino-2,6-dinitrotoluene
2-Hydroxylamino-4,6-dinitrotoluene
2,4-Dihydroxyl-amino-6-nitro-toluene
4-Amino-2,6-dinitro-toluene
2-Amino-4,6-dinitro-toluene
2-Amino-5-hydroxyl-4-hydroxylamino-6-nitrotoluene
2,4-Diamino-6-nitrotoluene
2,4,6-Triamino-toluene
2,4,6-Trihydroxytoluene
4-Hydroxytoluene

The last intermediate, 4-hydroxytoluene, will degrade to toluene, which in turn, will degrade to benzoate under anaerobic conditions.

Based on the nitroaromatic detections of 2-A4,6-DNT, 4-A2,6-DNT, 2, 3, and 4-nitrotoluene, nitrobenzene, and nitroanalines, site conditions are supporting a natural biodegradation of 2,4,6-TNT, 2,4-DNT, and 2,6-DNT."

Comment 19: **p.7-5, 7.2.1, second paragraph. This discussion is misplaced under the nitroaromatic compounds heading. Suggest moving to 7.2.2 (organic compounds), correct the toluene analytical result given, and clarify that GW has been impacted in this area. Continue with the current text showing no VOCs in the 3 TNT manufacturing areas....(and so on as stated).**

Response 19: Agreed. The paragraph referring to toluene contamination in overburden monitoring well MK-MW20 will be moved below the VOCs paragraph in section 7.2.2. The analytical result of 37,000 µg/L for well MK-MW20 will be changed to 37,000 µg/L. Clarification will be added to the text indicating that the "overburden" groundwater had been impacted "at the Toluene Storage Tank Area".

Comment 20: **p.8-1, 8.0. Due to the limitations noted earlier in the background data set (not robust data set), suggest further background well sampling at a lesser interval (and more focused analytical protocol) to improve the overall data set. The ranges should be updated accordingly. Evaluation of the changes imposed to these ranges based on the new data should be done after a few rounds, and can then determine whether the impact is worth the costs.**

Suggest the Upper and Middle toluene tanks areas consider a similar approach to that used in previous efforts: DPT strategy with onsite field analytics to monitor toluene only as an indicator compound to streamline the process of determining nature and extent of the contamination in these areas.

Response 20: Conclusions of a meeting between the OEPA, USACE, Shaw, and Mactec (September 11, 2002), were that additional groundwater sampling would be conducted from the background monitoring wells. Sampling events would be conducted in October 2002 (dry season) and in April 2003 (wet season). The additional sampling may determine if the nitroaromatics detected in the background groundwater during April 2002 (BED-MW20, BED-MW24, and BED-MW25) were from field or laboratory error or were real detections. The additional sampling will also allow determination if the background wells are "truly" background wells.

Comment noted regarding use of DPT in assessment of the Upper and Middle Toluene Storage Tank areas. This approach will be recommended in a future work plan for the area.

Comment 21: **<u>p.: App.I, general.</u>**

a. **Suggest each Data Validation Summary Reports clearly begin with a presentation of sample ID numbers of those evaluated within the report.**

b. **Suggest including a reference to the preparatory methods employed on the Parameter table. Due to the differences in extraction efficiencies between the various preparatory procedures, identifying what procedures are/were employed is important to document. This is especially critical when evaluating the reproducibility in data generated throughout a project life cycle, as well as the short-term reproducibility between primary and referee laboratory analyses.**

c. **A review of laboratory case narratives showed several instances where the information was not addressed within the Validation Reports. Most of these focused on the condition of the sample upon receipt (insufficient preservation) or timeliness of receipt at the laboratory. For instance, 3015, 3016, 3018, 3019 were all received at the lab post holding times (HT) for nitrate and turbidity had expired. Other issues were inadequate preservation of 3001 for CN, samples 3044, 5001 for metals, etc. Yet the data validation reports were mute on the issue or state that the criterion was met. Sample 3014 was extracted outside of HTs, but was not identified within the report also. Some of these issues may have contractual implications. My focus, however, is to emphasize an understanding of the impact and bias this may have on the data. Also important is focusing on the root cause of these problems, and applying corrective actions in a timely fashion to address them and avoid their reoccurrence in subsequent LTM field efforts. This should include any**

feedback to field personnel that the preservative included within the pre-preserved bottles was insufficient, and will need to be field checked and preserved further when necessary.

Response 21:

a. A list of sample numbers for each validation summary report will be presented at the beginning of the report.

b. The same reference as identified on Table 5-1 for the samples will be included on the parameters table in Appendix I.

c. A review of the Validation Reports will be conducted and corrections to the text made. As mentioned, laboratory personnel will be notified to make sure Shaw office and field personnel are aware of missed holding times and insufficient sample preservation.

Reference: Comments received from Sam Bass (dated November 13, 2002).

Comment 1: **Appendix C, Boring Logs. Logs should clearly state how borings were backfilled (e.g., bentonite chips or pellets poured into boring; bentonite slurry), especially those borings that encountered ground water. Logs should also include the weight of the hammer used and blow counts for each 6" increment when a split spoon is driven. This information can go in the Remarks column of the log. Blow count information was presented in some cases but not all.**

Response 1: The type of bentonite used for backfill will be more clearly entered onto the boring logs. A 3"outside-diameter (OD) split-spoon was used to collect the soil samples. Because the split-spoons were 3-inches OD, the hammer weight was 300 pounds. As requested, the weight of the hammer and blow count information will be recorded on all of the borelogs.

Comment 2: **Appendix D. For future reference, when logging rock core the drill log should note areas of lost core by X-ing out the representative area of the core run; when core is lost, the log should note the taped depth to the bottom of the hole before starting the next run to determine if the "missing" core was left in the hole; fractures should be noted on the log as natural or drill-induced (mechanical fractures); healed/filled fractures should also be noted. Fracture notations were presented in some cases but not all. Well construction diagrams should be drafted or redrawn to be legible. Use of a pre-drawn form is not recommended because it misrepresents the relationship between the bottom of the surface casing and the top of screen elevation and the thickness of seals placed in the hole, among other things. Given the fact that the core on which the drill logs are based is now in a landfill in Detroit, the information contained on the drill logs relative to core fracture description is practically useless (as well as the related photos).**

Response 2: Comment noted.

Comment 3: **<u>Appendix E.</u> For future reference, photos of boxed core should include a scale of some sort so approximate distances can be determined. The core (box) should be marked or blocks should be used to indicate the top and bottom of the core. Pictures should be taken with the top of the core in the upper left corner of the photo and the bottom of the core in the lower right corner of the photo. Core losses should be marked in the box using labeled blocks of wood. This will help explain the ability to get 3 feet of core in some boxes and 5 feet of core in others. Photos should also include more core and less grass and surrounding environs, i.e., the core should fill the frame of the photo to allow more detail to be captured. Also, if digital cameras are used they should be set to a resolution high enough to prevent pixelation of the prints, as happened to the photos in this report. Since these requirements are for future work and cannot correct the existing report, photographs in the current report should be labeled or include captions to state where the top of the core run is and where the bottom of the core run is. Any core losses in a particular run should also be noted in the caption.**

Response 3: Comment noted for future photographs. All pictures are situated so that the top of the core is located at the top left portion of the photo and the bottom of the core is situated at the bottom of the photo. Core run losses will be added to the pictures.

Comment 4: **<u>Page ES-2, fourth paragraph.</u> Inclusion of PAH and BTEX analyses in the background evaluation is only valid if the sampling locations are in areas with naturally-occurring hydrocarbons, i.e., not all of the PAH and BTEX found in ground water may be solely attributable to naturally-occurring hydrocarbons. The report should address the relative distances between background wells and areas known to contain naturally-occurring hydrocarbons, and should also address the "fingerprint" of hydrocarbons found in background wells.**

Response 4: True, not all BTEX and PAH in the groundwater of PBOW may be naturally occurring but the background monitoring wells are upgradient of the areas of concern and are screened in bedrock known to contain natural hydrocarbon (PB-BED-MW24 – Delaware Limestone; BG8-BEDGW-001 – organic rich Plum Brook shale; PB-BED-MW25 – organic rich Olentangy shale; PB-BED-MW26 - organic rich Olentangy shale; PB-BED-MW20 – black organic rich Ohio shale). No fingerprint of hydrocarbons from the background wells was collected.

Comment 5: **<u>Page 1-2, Section 1.1, first bullet.</u> Suggest this bullet be rephrased to read "...at concentrations that may exceed risk-based screening values." The current language implies a risk assessment will be included as part of this study, and it is unclear if that is actually the case.**

Response 5: The first bullet of Section 1.1 will be rephrased as suggested.

Comment 6: **<u>Page 2-4, Section 2.2.4.1, third sentence.</u> The report should include a reference for the statement that five percent of the county residents obtain ground water from private wells. Also, the report should include a range of distances between the site and private wells if this information is known. If unknown, it should be identified as a data gap recommended for additional investigation.**

Response 6: Based upon the date when this information was generated (Dames and Moore, 1997a), 5 percent may be incorrect six years later. Therefore this statement will be removed. The distance between private wells and site wells is not known and will be included as a data gap.

Comment 7: **<u>Page 2-5, Section 2.2.4.3, second sentence on page.</u> Note in the report that contaminant migration would not occur during dry time periods because of the discontinuous nature of ground water.**

Response 7: Agreed. However, even during "dry" periods, there is periodic rain which likely would mobilize some contamination, albeit to a much lesser degree. The following text will be inserted: "During these periods of low precipitation, only limited migration of contaminants would occur due to less infiltration."

Comment 8: **<u>Figures 2-3 to 2-7.</u> Elevation data would be referenced to either National Geodetic Vertical Datum of 1929 or the North American Vertical Datum, 1988 Adjustment. The 1983 reference is for horizontal coordinates (North American Datum). Correct the figures accordingly. Also, either Figure 2-3 or Figure 2-7 should be reversed so they trend in the same direction (preferably south to north)**

Response 8: Note #1 on Figures 2-3 through 2-7 will be changed to National Geodetic Vertical Datum (1929). Figure 2-3 will be reversed so that it trends south to north.

Comment 9: **<u>Section 3, General comment.</u> The report lacks any discussion comparing site ground water concentrations to background concentrations, instead choosing to compare site detections to preliminary remediation goals (PRG). For inorganics, an exceedance of a PRG is not significant unless the sample also exceeds background. Sample results from background locations should be compared to PRGs, and site samples should be compared to background. In particular, results for manganese and arsenic should be compared to background. Experience at other sites shows that samples from wells completed in northern Ohio overburden tend to be high in these constituents. If there are insufficient current locations suitable for use as background locations, it should be identified as a data gap to be filled in future investigations.**

Response 9: For this report, all groundwater analytical results are compared to risk-based screening concentrations (RBSC). Following completion of additional background sampling, site wells will be compared with calculated background

values. Also, additional background monitoring wells are scheduled to be installed to complement and justify the present background wells.

Comment 10: **<u>Section 3, General comment.</u> When discussing sampling result exceedances for soils, please note the corresponding concentration that was exceeded, or reference a table listing the respective PRG for the analytes and media evaluated. Not all of the tables for Section 3 have PRGs listed.**

Response 10: The text has been revised. Soil (other than site-specific RGOs for TNTB), surface water and sediment analytical data have not been compared to any screening values. Groundwater analytical results have been compared to EPA 2002 risk-based screening concentrations as noted in Section 5.4.

Comment 11: **<u>Page 3-5, Section 3.1.1.2, second paragraph on page.</u> What is the origin of the site-specific cleanup level of 3.36 mg/kg? Include a reference in the report.**

Response 11: The site-specific clean-up level of 3.36 mg/kg for soil was developed for the TNTB feasibility study. The fifth sentence relating to sediment will be rephrased to "...25 mg/kg, below the 10X rule of the soil site-specific clean-up level of 3.36 mg/kg (IT, 2001d)". The TNTB Feasibility Study reference will be included.

Comment 12: **<u>Page 3-12, Section 3.1.2.1.</u> Reference to historical data tables should be Tables 3-13 through 3-16.**

Response 12: The reference to historical tables will be changed from 1-12, 1-13, 1-14, and 1-15 to 3-13, 3-14, 3-15, and 3-16.

Comment 13: **<u>Page 3-13, Section 3.1.2.1, first paragraph, penultimate sentence.</u> Clarify if this statement means that additional characterization was recommended because ground water concentrations exceeded background concentrations. Also include how that determination was made (statistical comparison, sample-by-sample comparison, etc.).**

Response 13: The sentence is stating that additional investigation of the bedrock water-bearing zone north of the WARWP is warranted because nitroaromatic, organic, and inorganic contamination present, exceeded RBSCs. Further investigation should be conducted after the background groundwater distribution set is calculated for inorganics because some RBSC values may be greater than calculated background values. This determination was made by a sample-to-sample comparison. The sentence will be revised to say " in these areas."

Comment 14: **<u>Page 4-1, Section 4.1, and page 4-4, Section 4.4.</u> Text states monitoring wells/ piezometers were not installed in the overburden because of a lack of ground water, and that "OEPA agreed that further installation of temporary piezometers to monitor the overburden groundwater would not be required." Does that mean OEPA has agreed to <u>not</u> consider shallow (overburden) ground water as an exposure pathway, or that no more overburden wells are required at all during the remainder of the characterization effort? If they**

have not agreed to this there is a significant data gap relative to characterization of overburden ground water that must be filled during the wet season in future field efforts.

Response 14: Ohio EPA agreed that no further effort be made to characterize the overburden groundwater in the TNT areas. It was agreed that only intermittent water is present in the overburden and it does not represent an exposure pathway. No further characterization is planned.

Comment 15: **Page 4-5, Section 4.4, second complete paragraph on page. Explain why overburden material was not analyzed for constituents of concern when installing monitoring wells. This is particularly important if any of the wells were installed in potential source areas, i.e., did the wells serve a dual purpose of locating potential source areas as well as monitoring ground water?**

Response 15: Information will be included in the penultimate sentence stating "No soil overburden samples were collected for laboratory analysis because bedrock monitoring wells were installed in either an upgradient background location; in source areas identified by previous soil sampling; or in downgradient suspected 'clean' soil areas".

Comment 16: **Page 4-6, Section 4.4 and 4.5. The report states bedrock wells were installed as screened or open-hole, yet the report only describes completion (and development) of screened wells. Provide detail in the report on completion and development methods used for open-hole wells.**

Response 16: The surface completion and development procedures of the open borehole were the same as for the screened wells. Note that it is specified in the last paragraph on page 4-6 that PVC riser and factory slotted screen was not installed in well PB-BED-MW27. The following text will replace the last sentence in the fourth paragraph on page 4-3, Section 4.4: "With the exception of monitoring well PB-BED-MW27, which was completed as an open borehole, monitoring wells were completed as described below."

Comment 17: **Page 4-7, Section 4.6, second complete paragraph on page. Clarify if the 15 overburden monitoring wells not installed due to dry conditions will be installed later.**

Response 17: As previously stated in response to comment 14 above, Ohio EPA does not consider intermittent water present in the TNT areas to be an exposure pathway. Therefore, the original 15 wells planned for installation will not be installed at any future date. This information will be added to the text.

Comment 18: **Page 4-8, Section 4.6, third paragraph on page, last sentence. Clarify when purging was considered complete; when the water level reached the top of screen or after 3-5 volumes of water was removed from the well.**

Response 18: Purging was considered complete when the water level reached the top of the screen. This sentence will be revised to "If the recharge rate was slow, purging

was considered complete after the stagnant water column above the well screen was purged and the well was sampled."

Comment 19: **<u>Page 4-9, Section 4.6, first complete paragraph on page.</u> Clarify why only unfiltered metals samples were collected from the background monitoring wells.**

Response 19: Insufficient recharge did not allow the collection of both filtered and unfiltered samples only from well PB-BED-MW26. This information will be added to the text.

Comment 20: **<u>Page 4-10, Section 4.7.</u> Text states rising or falling head tests were performed, but only describes procedure for rising head test. Include falling head test procedure also.**

Response 20: The first paragraph on page 4-10 will be replaced to include the following information for both a falling and rising head test:

"Rising and/or falling head tests were completed by performing the following steps:

- Measure the static water level from the top of casing.
- Place a pressure transducer at least ½ foot above the bottom of the well and initiate the reference information on the data logger.
- Allow the water level to re-equilibrate, then initiate the data logging sequence on the recording device and insert the slug to start the falling head test.
- After the falling head test is complete and the water level returns to the pre-testing condition, the data logger will be reset. The rising test will begin by removing the slug from the well."

Comment 21: **<u>Page 4-10, Section 4.7, last paragraph in section.</u> Given your knowledge of the site and the assumptions used in the Bouwer and Rice solution, include an estimate of whether slug test results would typically be biased high or low.**

Response 21: Bouwer and Rice slug test analysis assumes that the aquifer is homogeneous and isotropic. This assumption brings about uncertainty in areas where heterogeneity exists, especially in fractured rocks. It is a common understanding among the groundwater experts that Bouwer & Rice method tends to underestimate the hydraulic conductivity by one to two orders of magnitude as compared to pumping test results. The following statements from experts in this field are noteworthy:

"A considerable body of data has been amassed that indicates that K estimates from a pumping test are, on average, considerably larger than the estimate obtained from a series of slug tests in the same formation." "Slug tests are

extremely sensitive to altered, near-well conditions, low-K skins can produce slug-test estimates that may be orders of magnitude lower than the average hydraulic conductivity of the formation in the vicinity of the well screen." "Failure to account for vertical anisotropy in the analysis of slug-test data can lead to an underestimation of hydraulic conductivity up to a factor of three. Estimates from pumping tests, however, will be unaffected by vertical anisotropy if the Cooper-Jacob semi-log method and/or observation at a distance from pumping well are used." (Butler and Healy, 1998, "Relationship Between Pumping-Test and Slug Test parameters: Scale effect or artifact?," Ground Water, Vol. 36, No.2, pp 305-313). Jim Butler and John Healy are currently working for Kansas Geological Survey. Jim Butler is the developer of the KGS slug test program and is a well-known expert in this field.

" There is a consistency in the results: the Bouwer and Rice method provides a value of field conductivity that is lower than the value indicated by the cross-well slug test (note: this cross-well slug test is like a pumping test but without pumping where nearby observation well data are gathered), and it similarly underestimates the conductivity of a hypothetical aquifer with properties that are based on the results of the cross-well slug test." (Belitz and Dripps, 1999, "Cross-well Slug test in Unconfined Aquifers: A case study from the Sleepers River Watershed, Vermont," Ground Water, Vol 37, No. 3, pp 438 - 446.)

The following text will be inserted following the last paragraph on page 4-10 in Section 4.7, "Based upon the current hydrology understanding, where fractured bedrock is encountered, slug test results would most likely be biased low. Results would probably be low since vertical anisotropy is not considered but results are associated with a higher degree of uncertainty with using the Bouwer and Rice method. However, the extent of the uncertainty or the bias is highly dependent on the well development, skin effect, and fracture distribution. Opposite results or tendency (biased high) may occur if the fractures are very well developed just in the immediate proximity of the well and no skin effect is present which is a very unlikely situation. This is because any slug test only affects the immediate proximity of the well and not the formation further away. Unlike the pumping test, it covers a much larger area around the well and therefore the hydraulic conductivity result is more representative of the site than slug test."

[PC1]

Comment 22: **<u>General comment.</u> Comparing individual samples to a background 95th percentile UTL should be done with caution. Depending on the distribution of both the background and site sample sets, comparisons between the entire sample populations may be more appropriate, particularly if site samples "exceed" background by a small margin.**

Response 22: Agreed. Background data evaluation will be completed after additional background sampling has been collected. The above comment will be noted.

Comment 23: **Due to time constraints, Section 6 was not reviewed at this time.**

Response 23: Comment noted.

Comment 24: **<u>General comment.</u> It is difficult to resolve issues with the dry direct-push points when statements are made elsewhere that water levels only fluctuated 4 feet in 6 sampling rounds. This would indicate water was probably present but could not get into the piezometer. Experience with direct-push wells at other sites in northern Ohio indicated smearing of clay on the piezometer screens during placement. Suggest direct-push wells not be installed in the future because of the high clay content of site soils and the high probability of screen fouling.**

Response 24: Disagree. If groundwater was present at the TNT areas during drilling of the borehole for the temporary piezometers, it was usually detected on the probe tip or in the soil sampler. The borehole drilled for the temporary piezometers was a 3 ¼-inch OD borehole followed by installation of a 2-inch OD PVC well screen. Minimal clay smearing of the well screen occurred during installation of the piping and was later verified during piping removal for borehole abandonment. At this time, groundwater was not present in the residuum due to lack of rain and the shallow depth of bedrock. It should be noted that previous attempts to sample shallow groundwater using temporary piezometers during the source area RI in September 2000, was successful at 18 out of 20 locations in the TNT A and C areas.

RESPONSE TO COMMENTS
U.S. ARMY CORPS OF ENGINEERS (HUNTINGTON)
2002 GROUNDWATER DATA SUMMARY AND EVALUATION REPORT
FORMER PLUM BROOK ORDNANCE WORKS, SANDUSKY, OHIO
(Report dated August 2002)

Reference: Comments received from Frank Albert (dated 7 November 2002)

Comment 1: **Section 3.1.1.2, page 3-8, first full paragraph. It is stated that in 1998, human health and ecological screening level risk assessments were performed; however, the reference that is noted, IT, 2001c, is for the baseline ecological risk assessment. Please clarify. (Is IT, 2000b, the reference for the human health risk assessment?)**

Response 1: The reference for the first full paragraph will be changed to reflect the ***TNT Area B Remedial Investigation, Volume II-Baseline Human Health/Volume III-Ecological Risk Assessment, Former Plum Brook Ordnance Works, Sandusky, Ohio, August 2000***. This reference will be added to Section 9.0.

Comment 2: **Section 3.1.1.2, page 3-8, last paragraph. It is stated that the FS was generated in July 2002; however, the reference is dated IT, 2001d. Should the date of the FS be noted as July 2001?**

Response 2: The last paragraph will be changed to reflect that the FS was generated in 2001.

Comment 3: **Section 3.1.1.2, page 3-9, top. Please note that CELRH-EC-CE has awarded the removal action at TNTB since this draft report was published. The removal action commenced in September 2002. The award and work commencement dates, and additional project information can be obtained from EC-CE technical coordinator, Ms. Lisa Humphreys, at (304) 529-5953, or lisa.a.humphreys@usace.army.mil <mailto:lisa.a.humphreys@usace.army.mil>.**

Response 3: Section will be rewritten to reflect that the removal action project commenced in September 2002. The first sentence of the paragraph will be replaced with "The removal action of contaminated soil at TNTB began in September 2002."

Comment 4: **Section 3.1.1.3, page 3-11, 2nd para. It is stated that there were no remedial actions recommended for soil, surface water, or sediment; however, additional studies were recommended. No explanation was offered, though, as to what additional studies were recommended. Recommend adding what additional studies were suggested from the baseline ERA.**

Response 4: This paragraph will be rewritten in response to Comment No. 10 from Lannae Long. The following paragraph will state "A BERA was performed for TNTC (IT, 2001a), which estimated that ecological hazards associated with exposure to TNTC surface and total soils were elevated for terrestrial receptors. These

estimates are regarded as conservative and are associated with a considerable degree of uncertainty; additional investigation and evaluation would be necessary to provide more accurate estimates of ecological hazards. However, it was agreed that TNTC soils be remediated to human health-based remedial goal options (RGO), and that ecological risk be re-evaluated in the FFS based on cleanup of areas previously exceeding the human health RGOs for TNTC. Also, neither remedial action nor further study are recommended for aquatic receptors exposed to TNTC surface water based on the following: uncertainties associated with estimating chemical concentrations in aquatic insects, limited area and low quality of aquatic habitat, and relatively low hazard estimates, especially when using the lowest-observable-adverse-effects-level approach."

Comment 5: **3.1.2.2, page 3-16. Please note that CELRH-EC-CE has awarded a contract for removal of the hotspot since this draft report was published. Information on this project and the Interim Action Memorandum can be obtained from EC-CE's technical coordinator, Ms. Lisa Humphreys, at (304) 529-5953, or lisa.a.humphreys@usace.army.mil <mailto:lisa.a.humphreys@usace.army.mil>.**

Response 5: Section will be rewritten to reflect that a contract has been awarded. The first sentence will be replaced with "Remedial action of the hotspot that includes approximately 148 cubic yards of soil to be removed is expected to be completed in 2003."

Comment 6: **Section 4.1, 1st para. Recommend adding the reference, IT, 2002d, for the RI.**

Response 6: The reference (IT, 2002d) will be added to the last sentence of the paragraph.

Comment 7: **Section 4.6, page 4-8, 4th para. Please consider if a statement is necessary regarding the comparability of data from the non-purged wells to data from the low-flow or 3 to 5 volumes purged wells. (I'm just asking the question mainly for my own knowledge).**

Response 7: Analytical data from monitoring wells that were not sampled by the low-flow technology were reviewed. Data from the April 2002 sampling event from overburden monitoring wells were compared to samples collected by low-flow. Metals concentrations of non-purged wells (calcium) and a select few from purged wells (barium, calcium, magnesium, and manganese) were higher in inorganic concentrations than those collected by the low-flow technology, but for the majority, the metals concentrations were the same. This data will be included in future evaluations but qualified due to the potential impacts from the sampling methodology.

[M1]

Comment 8: **Section 7.4, page 7-14, both paragraphs. High levels of toluene, GRO, and DRO were reported in well MK-MW20 in Section 6.5, page 6-27; however, this is not noted, and the conclusions only pertain to the naturally occurring,**

free-phase hydrocarbons in bedrock. It appears that some statement/conclusion should be offered regarding these contaminants found in an overburden well.

Response 8: Information pertaining to toluene contamination from well MK-MW20 was erroneously included in the conclusion section for nitroaromatic explosives (7.2 Shallow Water-Bearing Zone, 7.2.1 Nitroaromatic Compounds, second paragraph, page 7-5). This information will be will be moved to 7.2.2 Organic Compounds

Comment 9: **<u>Section 8, Page 8-1.</u> The following additional recommendations are offered for your consideration: (a) Removal of the 24 soil "hot spots" that were noted in Section 7.5. (b) (Potential) data gap check to determine if there are any monitoring gaps in the groundwater monitoring well network; particularly focused on monitoring potential off-site migration. (c) Continuation of the groundwater sampling program that has been conducted over the past year.**

Response 9: For additional recommendation a) Twelve soil "hot spots" were revisited and 24 soil samples were collected. Soil "hot spot" locations at TNTA, TNTB, and TNTC are included in the feasibility study reports and will be removed. "Hot spot" locations at the WARWP were determined to be below cleanup levels and "hot spot" locations at the PRRWP will be revisited following complete assessment of groundwater.

For additional recommendation b) The present monitoring well network has established that off-site contaminate migration may be present. As stated in the recommendations, the next step is to assess possible off-site sampling locations.

For additional recommendation c) Because select sitewide monitoring wells have been sampled since 1997 and the data has remained fairly consistent, additional sampling of these wells would not provide any new information. With OEPA guidance, additional sampling of groundwater from the background monitoring wells will be continued with one sampling event in October 2002 and one event in April 2003. This information will be included in the recommendation section.

Comment 10: **<u>Section 9.0. (a) Page 9-2.</u> The reference for the 1998 human health risk assessment may need to be added. (b) Page 9-3. A space is missing between the Hem, J.D reference and the MK reference.**

Response 10: (a) The human health risk assessment for TNTB was conducted in 1998 and the final report submitted in 2000. The footnote will be included.
(b) A blank line will be added between the two references.