N00102.AR.000055
NSY PORTSMOUTH
5090.3a

RCRA CORRECTIVE ACTION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE PHASE II FIELDWORK-- REPORT AND APPENDICES I & II

PREPARED FOR:

U.S. DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
PHILADELPHIA, PENNSYLVANIA 19112-5094
CONTRACT Nº N62472-86-C-1283

PREPARED BY:

McLAREN/HART ENVIRONMENTAL ENGINEERING CORPORATION
28 MADISON AVENUE EXTENSION
ALBANY, NEW YORK 12203

APRIL 26, 1991

RCRA CORRECTIVE ACTION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
PHASE II FIELDWORK REPORT

Prepared for:

U.S. DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
PHILADELPHIA, PENNSYLVANIA 19112-5094
CONTRACT Nº N62472-86-C-1283

Prepared by:

McLAREN/HART ENVIRONMENTAL ENGINEERING CORPORATION
28 MADISON AVENUE EXTENSION
ALBANY, NEW YORK 12203

APRIL 26, 1991

RCRA CORRECTIVE ACTION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
PHASE II FIELDWORK REPORT
CONTRACT Nº N62472-86-C-1283
AMENDMENT #6 (REVISED)

Page

EXECUTIVE SUMMARY i

1.0 INTRODUCTION 1-1

2.0 JILF (SMWU #8) 2-1

2.1 Monitoring Well Redevelopment 2-1

2.1.1 Redevelopment Procedures 2-1
2.1.2 Redevelopment Findings 2-4

2.2 Groundwater Sampling 2-6

2.2.1 Sampling Procedures 2-7
2.2.2 Findings (Groundwater Conditions) 2-12
2.2.3 Laboratory Analytical Results 2-14
2.2.4 Interpretations/Discussion 2-15

2.3 Water Level Monitoring 2-27

2.3.1 Monitoring Procedures 2-29
2.3.2 Monitoring Results 2-29

2.4 Soil Gas Survey 2-29

2.4.1 Survey Procedures 2-34
2.4.2 Survey Results 2-37
2.4.3 Interpretations/Discussion 2-42

2.5 Off-Shore Sediment Sampling 2-50

2.5.1 Off-Shore Sediment Sampling Procedures 2-50
2.5.2 Findings 2-53
2.5.3 Laboratory Analytical Results 2-53
2.5.4 Interpretations/Discussion 2-56

2.6 Conclusions/Recommendations 2-59

PHASE II FIELDWORK REPORT
CONTRACT Nº N62472-86-C-1283
AMENDMENT #6 (REVISED)
(continued)

3.0 MERCURY BURIAL SITES (SWMU #9) 3-1

3.1 Monitoring Well Redevelopment 3-1

3.1.1 Redevelopment Procedures 3-1
3.1.2 Redevelopment Findings 3-1

3.2 Groundwater Sampling 3-4

3.2.1 Sampling Procedures 3-5
3.2.2 Findings (Groundwater Conditions) 3-8
3.2.3 Laboratory Analytical Results 3-8
3.2.4 Interpretations/Discussion 3-10
3.2.5 Conclusions/Recommendations 3-11

4.0 DRMO (SWMU #6) 4-1

4.1 Surface Soil Sampling 4-1

4.1.1 Sampling Procedures 4-4
4.1.2 Findings 4-5
4.1.3 Laboratory Analytical Results 4-5
4.1.4 Interpretations/Discussion 4-12

4.2 Monitoring Well Redevelopment 4-13

4.2.1 Redevelopment Procedures 4-13
4.2.2 Redevelopment Findings 4-13

4.3 Groundwater Sampling 4-15

4.3.1 Sampling Procedures 4-16
4.3.2 Findings (Groundwater Conditions) 4-18
4.3.3 Laboratory Analytical Results 4-19
4.3.4 Interpretations/Discussion 4-20

4.4 Conclusions/Recommendations 4-30

PHASE II FIELDWORK REPORT
CONTRACT Nº N62472-86-C-1283
AMENDMENT #6 (REVISED)
(continued)

5.0 INDUSTRIAL WASTE OUTFALLS (SWMU #5) 5-1

5.1 Sediment Sampling 5-1

5.1.1 Sampling Procedures 5-1
5.1.2 Findings 5-3
5.1.3 Laboratory Analytical Results 5-3
5.1.4 Interpretations/Discussion 5-5
5.1.5 Conclusions/Recommendations 5-7

6.0 BATTERY ACID TANK #24 (SWMU #10) 6-1

6.1 Sediment Sampling 6-1

6.1.1 Sampling Procedures 6-1
6.1.2 Findings 6-3
6.1.3 Laboratory Analytical Results 6-3
6.1.4 Interpretations/Discussion 6-4
6.1.5 Conclusions/Recommendations 6-4

7.0 TANK INVESTIGATION (SWMU #12) 7-1

7.1 Boiler Blowdown Water Sampling 7-1

7.1.1 Sampling Procedures 7-1
7.1.2 Findings 7-2
7.1.3 Laboratory Analytical Results 7-2
7.1.4 Interpretations/Discussion 7-2
7.1.5 Conclusions/Recommendations 7-2

8.0 FUEL OIL SPILLAGE AREA (SWMU #27) 8-1

8.1 Sediment Sampling 8-1

8.1.1 Sampling Procedures 8-1
8.1.2 Findings 8-3
8.1.3 Laboratory Analytical Results 8-3
8.1.4 Interpretations/Discussion 8-4
8.1.5 Conclusions/Recommendations 8-4

PHASE II FIELDWORK REPORT
CONTRACT Nº N62472-86-C-1283
AMENDMENT #6 (REVISED)
(continued)

8.2 Exploratory Test Pits 8-5

8.2.1 Excavation Procedures 8-5
8.2.2 Subsurface Soil Sampling 8-7

8.2.2.1 Sampling Procedures 8-7
8.2.2.2 Findings 8-8
8.2.2.3 Laboratory Analytical Results 8-9
8.2.2.4 Interpretations/Discussion 8-9
8.2.2.5 Conclusions/Recommendations 8-11

9.0 RIVER AND BACK CHANNEL SEDIMENT SAMPLING 9-1

9.1 Sediment Sampling 9-1

9.1.1 Sampling Procedures 9-1
9.1.2 Findings 9-3
9.1.3 Laboratory Analytical Results 9-4
9.1.4 Interpretations/Discussion 9-8
9.1.5 Conclusions/Recommendations 9-10

10.0 SOIL AND DEVELOPMENT/PURGE WATER SAMPLING 10-1

10.1 Soil Sampling 10-1

10.1.1 Sampling Procedures 10-1
10.1.2 Laboratory Analytical Results 10-2
10.1.3 Interpretations/Discussion 10-2

10.2 Development/Purge Water Sampling 10-2

10.2.1 Sampling Procedures 10-2
10.2.2 Laboratory Analytical Results 10-4
10.2.3 Interpretations/Discussion 10-4

10.3 Conclusions/Recommendations 10-5

11.0 REFERENCES

APPENDICES I--FIELD NOTE BOOKS
II--SUMMARY OF VALID ANALYTICAL RESULTS
III--LABORATORY-SUPPLIED ANALTYICAL RESULTS
IV--DATA LOGGER DATA

LIST OF FIGURES

Figure #	Title	Page #
2-1	JILF (SWMU #8) Monitoring Well and Test Boring Location Map	2-2
2-2	JILF (SWMU #8) Soil and Groundwater Concentrations Exceeding New Jersey ECRA and/or Federal Regulations	2-23
2-3	JILF (SWMU #8) Geologic Cross Section A-A'	2-24
2-4	JILF (SWMU #8) Geologic Cross Section B-B'	2-25
2-5	JILF (SWMU #8) Geologic Cross Section C-C'	2-26
2-6	JILF (SWMU #8) Generalized Subsurface Composition	2-28
2-7	JILF (SWMU #8) Water Level Fluctuations In JW-6	2-30
2-8	JILF (SWMU #8) Water Level Fluctuations In JW-8	2-31
2-9	JILF (SWMU #8) Water Level Fluctuations in JW-9	2-32
2-10	JILF (SWMU #8) Soil Gas Survey Sampling Grid	2-35
2-11	JILF (SWMU #8) Sketch of Soil Gas Collector	2-36
2-12	JILF (SWMU #8) Soil Gas Survey--Relative Flux Total Hydrocarbon Compounds Map	2-38
2-13	JILF (SWMU #8) Soil Gas Survey--Relative Flux Aromatic Hydrocarbons Map	2-39
2-14	JILF (SWMU #8) Soil Gas Survey--Relative Flux Trichloroethene (TCE) Map	2-40
2-15	JILF (SWMU #8) Soil Gas Survey--Relative Flux Tetrachloroethene (PCE) Map	2-41
2-16	JILF (SWMU #8) Gradient Magnetic Filed Survey (GMF) Soil Gas Survey Overlay--Total Hydrocarbon Compounds	2-46
2-17	JILF (SWMU #8) Gradient Magnetic Field Survey (GMF) Soil Gas Survey Overlay--Aromatic Hydrocarbon	2-47

LIST OF FIGURES (Continued)

Figure #	Title	Page #
2-18	JILF (SWMU #8) Gradient Magnetic Field Survey (GMF) Soil Gas Survey Overlay--Trichloroethene (TCE)	2-48
2-19	JILF (SWMU #8) Gradient Magnetic Field Survey (GMF) Soil Gas Survey Overlay--Tetrachloroethene (PCE)	2-49
2-20	JILF (SWMU #8) Clark's Island Embayment Sediment Samples (Approximate Locations)	2-51
3-1	Mercury Burial Sites (SWMU #9) Monitoring Well Location Map	3-2
4-1	DRMO (SWMU #6) Quarters "S" and "N" Sampling Locations	4-2
4-2	DRMO (SWMU #6) Off-Site Sampling Locations	4-3
4-3	DRMO (SWMU #6) Priority Pollutant Metals In Surface Soils	4-7
4-4	DRMO (SWMU #6) Total Petroleum Hydrocarbons and Pesticides In Surface Soils	4-11
4-5	DRMO (SWMU #6) Soil and Groundwater Concentrations Exceeding New Jersey ECRA and Federal Regulations	4-22
4-6	DRMO (SWMU #6) Geologic Cross Section A-A'	4-23
4-7	DRMO (SWMU #6) Geologic Cross Section B-B'	4-24
4-8	DRMO (SWMU #6) Geologic Cross Section C-C'	4-25
4-9	DRMO (SWMU #6) Geologic Cross Section D-D'	4-26
5-1	SWMUs #5, #10, and #27 Off-Shore Sediment Samples	5-2
6-1	SWMUs #5, #10, and #27 Off-Shore Sediment Samples	6-2
8-1	SWMUs #5, #10, and #27 Off-Shore Sediment Samples	8-2
8-2	Fuel Oil Spillage Area (SWMU #27) Test Pit Location Map	8-6
9-1	Off-Shore Sampling River and Back Channel Sediment Sampling Locations	9-2

LIST OF TABLES

Table #	Title	Page #
2-1	Stabilized Field Parameters Jamaica Island Landfill (SWMU #8) August 9-21, 1990	2-5
2-2	Decontamination Procedures	2-9
2-3	Groundwater Sampling And Field Parameter Information Jamaica Island Landfill (SWMU #8) August 23, 1990	2-11
2-4	Groundwater Resampling And Field Parameter Information Jamaica Island Landfill (SWMU #8) September 18, 1990	2-13
2-5	Summary of Total TCL Volatile Concentrations--Soil Exceeding New Jersey ECRA Guidance Values Jamaica Island Landfill (SWMU #8) November 8-December 1, 1989	2-17
2-6	Summary of Total TCL Semi-Volatile Concentrations--Soil Exceeding New Jersey ECRA Guidance Values Jamaica Island Landfill (SWMU #8) November 8-December 1, 1989	2-18
2-7	Summary of PCB Concentrations--Soil Exceeding New Jersey ECRA Guidance Values and/or Proposed Federal Action Levels Jamaica Island Landfill (SWMU #8) November 8-December 1, 1989	2-20
2-8	Summary of Metal Concentrations--Soil Exceeding New Jersey ECRA Guidance Values and/or Proposed Federal Action Levels Jamaica Island Landfill (SWMU #8) November 8-December 1, 1989	2-21
2-9	Summary of TPH Concentrations--Sediment Exceeding New Jersey ECRA Guidance Values Clark's Island Embayment (SWMU #8) August 21, 1990	2-55

LIST OF TABLES (Continued)

Table #	Title	Page #
2-10	Summary of Metal Concentrations--Sediment Exceeding New Jersey ECRA Guidance Values and/or Proposed Federal Action Levels Clark's Island Embayment (SWMU #8) August 21, 1990	2-57
3-1	Stabilized Field Parameters Mercury Burial Sites (SWMU #9) August 15, 1990	3-3
3-2	Groundwater Sampling and Field Parameter Information Mercury Burial Sites (SWMU #9) August 22, 1990	3-6
3-3	Groundwater Resampling And Field Parameter Information Mercury Burial Sites (SWMU #9) September 19, 1990	3-9
4-1	Summary of Metal Concentrations--Surface Soil Exceeding New Jersey ECRA Guidance Values and/or Proposed Federal Action Levels DRMO (SWMU #6) October 18, 1989 and August 7-8, 1990	4-8
4-2	Summary of TPH Concentrations--Surface Soil Exceeding New Jersey ECRA Guidance Values DRMO (SWMU #6) October 18, 1989 and August 7-8, 1990	4-10
4-3	Well Development Stabilized Field Parameters DRMO (SWMU #6) August 16-22, 1990	4-14
4-4	Groundwater Sampling and Field Parameter Information DRMO (SWMU #6) August 23, 24 & 27, 1990	4-17
4-5	Summary of Metal Concentrations--Groundwater Exceeding National Interim Primary Drinking Water Regulations DRMO (SWMU #6) August 23, 24, 27 and October 1, 1990	4-21

LIST OF TABLES (Continued)

Table #	Title	Page #
4-6	Summary of Metal Concentrations--Soil Exceeding New Jersey ECRA Guidance Values and/or Proposed Federal Action Levels DRMO (SWMU #6) October 31-November 10, 1989	4-27
4-7	Summary of PCB Concentrations--Soil Exceeding New Jersey ECRA Guidance Values and/or Proposed Federal Action Levels DRMO (SWMU #6) October 31-November 10, 1989	4-31
4-8	Summary of TPH Concentrations--Soil Exceeding New Jersey ECRA Guidance Values DRMO (SWMU #6) October 31-November 10, 1989	4-32
5-1	Summary of TPH Concentrations--Sediment Exceeding New Jersey ECRA Guidance Values Industrial Waste Outfalls (SWMU #5) August 23, 1990	5-6
8-1	Summary of TPH Concentrations--Soil Exceeding New Jersey ECRA Guidance Values Fuel Oil Spillage Area (SWMU #27) August 8, 1990	8-10
9-1	Summary of TPH Concentrations--Sediment Exceeding New Jersey ECRA Guidance Values River and Back Channel August 20-22, 1990	9-7
9-2	Summary of Metal Concentrations--Sediment Exceeding New Jersey ECRA Guidance Values and/or Proposed Federal Action Levels River and Back Channel August 20-22, 1990	9-9

EXECUTIVE SUMMARY

McLaren/Hart Environmental Engineering Corporation (McLaren/Hart), performed the RCRA Facility Investigation Fieldwork--Phase II, at the Portsmouth Naval Shipyard, Kittery, Maine, as described in amendment 6 (revised) of Contract N62472-86-C-1283. All methodologies and procedures as described in the draft Portsmouth Naval Shipyard RCRA Facility Investigation Proposal (RFIP), August 1989, were followed during the performance of this work. The following is a synopsis of the Phase II Investigation.

JILF (SWMU #8)

Eight monitoring wells at the JILF were redeveloped and sampled for analysis of Target Compound List (TCL) Organics and Target Analyte List (TAL) Inorganics.

Based on salinity and conductivity measurements, monitoring wells JW-3, JW-4, JW-6, JW-7 and JW-8 contain fresh water, JW-5 contains brackish water and JW-9 and JW-10 contain a dilution of seawater.

There were no detectable concentrations of volatiles or pesticide/PCBs in any groundwater samples collected from the JILF. One detectable semi-volatile concentration, 23 ppb of bis(2-ethylhexyl)phthalate was found in sample JW-05. Bis(2-ethylhexyl)phthalate is commonly used as a plasticizer for polyvinyl chloride (PVC) and other polymers in large quantities and is likely to be released to air and water during production and waste disposal of these plastic products. Detectable concentrations of TAL metals were found in all groundwater samples from the JILF monitoring wells, however, there were no metal concentrations above current National Interim Primary Drinking Water Regulations or proposed Federal Action Levels as documented in the Federal Register (55 FR 30865, July 27, 1990).

Water levels in three monitoring wells (JW-6, JW-8 and JW-9) were monitored continuously over a 48 hour period. Little to no tidal fluctuations were observed in JW-6 or JW-8. Well JW-9 displayed a consistent rise and fall with the tidal cycles with no detectable lag time.

A passive soil gas survey was conducted on the JILF as an initial screening process for the general location and composition of volatile organic compound sources and plumes. The total ion count at each sampling point for total petroleum hydrocarbons (TPH), aromatic hydrocarbons, trichloroethene, and tetrachloroethene were plotted on individual maps. Each of the soil gas maps exhibit large areas with relatively high ion counts ($\geq$ 1,000 or 10,000) which appear as anomalies compared to the relatively low ion counts ($\leq$ 1,000) surrounding these areas. Volatile organic compound anomalies occupy such a significant fraction of the survey area (especially the total petroleum hydrocarbons) that the JILF could be treated as one collective source.

Off-shore sediment was collected from a total of twenty sample points in Clark's Island Embayment for submission to the laboratory. Nineteen surface sediment samples were analyzed for TCL volatiles, acid extractables, TCL pesticide/PCBs, total organic carbon (TOC), TPH, and priority pollutant metals. One surface sediment sample was analyzed for all the compounds listed in Appendix IX and TOC. Seven sediment core samples were analyzed for TCL pesticide/PCBs, TOC and priority pollutant metals.

Total volatile concentrations of 1.13 ppm found in sediment sample D3B (duplicate of D3A) exceed the New Jersey ECRA Guidance Value for total volatiles of 1 ppm. There were no detectable volatile concentrations exceeding proposed Federal Action Levels. Detectable concentrations and semi-quantitative estimates of TPH ranging from 140 ppm to 780 ppm exceed the New Jersey ECRA Guidance Value of

100 ppm in all surface sediment samples analyzed for TPH. Detectable metal concentrations were found in all surface and cored sediment samples. Twenty surface and cored sediment samples had chromium concentrations exceeding the New Jersey ECRA Guidance Value of 100 ppm in soil. Surface sediment samples E1 and E2 exceed the New Jersey ECRA Guidance Value of 20 ppm for arsenic in soil.

The source of the contamination in sediments in Clark's Island Embayment is unknown at this time. Currently, there is no direct correlation between the contaminants in sediments and those found in soils or groundwater in the JILF, although, the landfill may be the primary suspect.

Based on the investigations conducted during Phase I and Phase II, the JILF is known to contain areas with anomalously high volatile compounds as gases within the subsurface soil. Analyses of subsurface soils and groundwater on the margins of this SWMU indicate only localized and moderate soil contamination and no indication of serious groundwater contamination in the existing wells. Water level data suggests areas of fresh water as well as areas of salt water within the landfill. The saline waters correspond to wells which show measurable water level fluctuations during the tidal cycle indicating they are in hydraulic communication with the river. Based on this information, it can be expected that there may be a number of preferred pathways for groundwater and river water to move into and out of the JILF during tidal variations.

Sediment within Clark's Island Embayment was found to be contaminated with TPH and chromium and to a much lesser extent arsenic. There is currently no direct correlation between these contaminants and those found within the landfill, although, the JILF is considered the most likely source.

Mercury Burial Sites (SWMU #9)

Four monitoring wells at the Mercury Burial Sites were redeveloped and sampled for analysis of TCL Organics and TAL Inorganics.

Based on salinity and conductivity measurements, monitoring wells MW-2 and MW-3 contain fresh water and MW-4 and MW-5 contain brackish water.

Low concentrations of benzene, toluene, ethylbenzene, and xylene (BTEX) were detected in monitoring wells MW-2 and MW-3 along the perimeter of the western Mercury Burial Site. Qualitative estimates of benzene and ethylbenzene were also detected in monitoring well MW-4 at the perimeter of the eastern Mercury Burial Site. The presence of BTEX is an indication of petroleum, particularly gasoline, in the subsurface. The qualitative and semi-quantitative semi-volatile estimates detected are also indicative of a petroleum product. The source of the BTEX may be from previous disposal practices or an abandoned gasoline tank and station formerly located approximately 200 feet southwest of monitoring well MW-3.

Based on the laboratory analytical results, there does not appear to be any mercury in the groundwater attributable to potential releases from either Mercury Burial Site.

The investigations to date indicate that the area around the western (landward) Mercury Burial Site has been contaminated by a petroleum product (most likely gasoline). Both soil and groundwater have been adversely affected. Although detectable concentrations of mercury were found in soil, there has been no measurable mercury found in the monitoring wells. The concentrations of mercury found in soils were quite low and showed no trend with depth. It is unlikely that this mercury resulted from releases from the burial vaults.

DRMO (SWMU #6)

A total of eighteen surface soil samples were collected in the vicinity of Quarters "S" and "N", plus two duplicate samples and one equipment rinseate field blank. In addition, four surface soil samples were collected east and west of the 300-foot sampling arc around the DRMO established during Phase I field activities. These samples were analyzed for priority pollutant metals, TPH, and TCL pesticide/PCBs.

Detectable concentrations of metals were found in all surface soil samples. A total of twenty samples and one duplicate collected from Phase I (October 18, 1989) and Phase II (August 7-8, 1990) sampling events had metal concentrations exceeding New Jersey ECRA Guidance Values and/or Federal Action Levels. Detectable concentrations of TPH were found in twenty-two of the thirty-four surface soil samples and three duplicates collected from Phase I and Phase II sampling events. The concentrations of TPH range from 63 to 4,600 ppm. A total of fourteen surface soil samples and two duplicates from Phase I and Phase II sampling events exceed the New Jersey ECRA Guidance Value of 100 ppm TPH in soil. Only two surface soil samples SS-01 and SS-26 had detectable concentrations of PCBs. The PCB level in these two samples are below New Jersey ECRA Guidance Value range of one to five ppm for total PCBs in soil. Detectable pesticide concentrations of 4,4-DDE and 4,4-DDT were found in sixteen of the twenty-two surface soil samples and two duplicates collected from the Phase II sampling event. Surface soil samples collected from Phase I sampling events were not analyzed for pesticides.

Seven monitoring wells at the DRMO were redeveloped and sampled for TCL volatiles, priority pollutant metals, and TCL pesticide/PCBs.

Based on salinity and conductivity measurements, monitoring wells DW-1, DW-2, DW-3, DW-6 and DW-7, all contain a dilution of seawater and monitoring wells DW-4 and DW-5 contain brackish water.

There were no detectable concentrations of volatiles or pesticide/PCBs in any of the groundwater samples collected from the DRMO monitoring wells. Lead was the only metal detected in groundwater at concentrations exceeding the National Interim Primary Drinking Water Regulations. Elevated lead concentrations were found in monitoring wells DW-2, DW-6, and DW-7.

Field investigations at the DRMO have shown measurable soil contamination in the area consisting primarily of heavy metals, TPH and pesticides. The aerial extent of the soil contamination extends beyond the SWMU boundaries and encompasses residential quarters "S" and "N". An interim risk assessment will be performed using sample results from quarters "S" and "N" to assess the potential impact of contaminants on the residents.

Monitoring wells installed at the DRMO contain saline water which fluctuates with the tides indicating the wells are in hydraulic communication with the estuary. Three of the seven monitoring wells had concentrations of lead in the groundwater samples which exceeded regulatory standards. Lead was the only contaminant found in detectable concentrations in the wells at the DRMO. Because the wells are in communication with the estuary, it is reasonable to assume that the lead contaminated groundwater may be reaching the river, although, this has not been confirmed.

Industrial Waste Outfalls (SWMU #5)

Six sediment samples, including one duplicate, were collected off-shore from the Industrial Waste Outfalls at Berths 6, 11, and 13. Five of the sediment samples plus the

duplicate sample were analyzed for TCL volatiles, acid extractables, TCL pesticide/PCBs, TOC, TPH, and priority pollutant metals. One sediment sample was analyzed for all the compounds listed in Appendix IX and TOC.

There were no detectable volatile concentrations exceeding New Jersey ECRA Guidance Values or proposed Federal Action Levels. Appendix IX analysis of sample SWMU 5-B revealed a total concentration of semi-volatiles exceeding the New Jersey ECRA Guidance Value of 10 ppm for total base neutrals. A detectable TPH concentration of 610 ppm found in sample SWMU 5-E and semi-quantitative TPH estimates of 280 ppm and 540 ppm found in samples SWMU 5-A and SWMU 5-A1 (duplicate of SWMU 5-A), respectively, exceed the New Jersey ECRA Guidance Value of 100 ppm. A semi-quantitative beryllium estimate of 1.2 ppm found in sample SWMU 5-C exceeds the New Jersey ECRA Guidance Value of 1.0 ppm and the proposed Federal Action Level of 0.2 ppm. This was the only metal concentration found in these samples which exceeded regulatory guidance or action levels.

Sediment sampling off-shore from Berths 6, 11 and 13 has revealed the presence of semi-volatile and TPH contamination. These contaminants suggest that the source is a petroleum product. The source of these contaminated sediments is unknown, but it is likely that some or all may be attributable to operations at the shipyard.

Battery Acid Tank #24 (SWMU #10)

Two sediment samples were collected off-shore of Berth 4 in the vicinity of Battery Acid Tank #24. These samples were analyzed for TOC, TPH, and priority pollutant metals.

Detectable TPH concentrations were found in samples SWMU 10-A and SWMU 10-B. Only sediment sample SWMU 10-B had a TPH concentration (260 ppm) that exceeded the New Jersey ECRA Guidance Value for TPH of 100 ppm.

Sediment samples collected off-shore from Berth 4 revealed moderate TPH contamination. This contamination is not related to SWMU #10 (Battery Acid Tank), but may be related to activities at the shipyard. Some or all of this contaminated sediment may have migrated to this location from other sources in the river. The exact source has not been identified at this time.

Tank Investigation (SWMU #12)

Three rounds of liquid samples were collected from the Boiler Blowdown Tank. The liquid samples were collected during the initial, middle, and final stages of Phase II work. The samples were analyzed for priority pollutant metals and pH to determine if the liquid content of the tank is a hazardous waste as defined under 40 CFR Part 261. Detectable concentrations of priority pollutant metals were found in all three liquid samples, however, these concentrations were below the maximum allowable concentrations as specified in 40 CFR Part 261. Both pH and metal concentrations were found to be below the maximum allowable concentrations as specified in 40 CFR Part 261.

Samples collected from the contents of the Boiler Blowdown Tank indicate the tank contents are not a hazardous waste. Soil borings to be drilled in a future phase of work will determine if the tank contents have adversely affected underlying soils. No such adverse affect is expected.

Fuel Oil Spillage Area (SWMU #27)

Three sediment samples were collected downgradient of the Fuel Oil Spillage Area (SWMU #27) off-shore of Berth 7. The sediment samples were analyzed for TCL pesticide/PCBs, TOC, and TPH.

There were no detectable concentrations of pesticide/PCBs in any of the sediment samples collected at SWMU #27. Semi-quantitative TPH estimates were found in samples SWMU 27-B and SWMU 27-C. The semi-quantitative TPH estimate of 100 ppm found in sample SWMU 27-B is equivalent to the New Jersey ECRA Guidance Value of 100 ppm.

Three test pits were excavated east of Berth 6 along the former pipeline. A total of seven composite soil samples were collected from the three test pits to assess potential soil contamination associated with the former fuel oil pipeline. All of the samples were analyzed for TPH and polynuclear aromatic hydrocarbons (PAH).

All samples exceed the New Jersey ECRA Guidance Value of 100 ppm TPH in soils, with the exception of TP-03S. Detectable concentrations of PAH were found in all samples except TP-03B, however, total PAH concentrations are below the New Jersey ECRA Guidance Value.

Investigations conducted both on-shore and off-shore of Berth 7 have revealed the presence of TPH in soils and sediment. Although a direct route for contaminant migration has not been established, it is likely that petroleum releases on-shore have found their way to the sediments off-shore. The contaminated sediments off-shore may also have come from other sources in the river. The exact source has not been identified.

River and Back Channel

A total of fourteen sampling locations were defined by using fixed points and Loran coordinates to sample the sediment from the main channel of the Piscataqua River and the back channel. Six of these locations within the main channel of the Piscataqua River were also cored to obtain ten subsurface sediment samples.

Three surface sediment samples in the Piscataqua River were analyzed for Appendix IX compounds and TOC. Three additional surface sediment samples and one duplicate sample in the Piscataqua River were analyzed for TCL volatiles, acid extractables, pesticide/PCBs, TOC, TPH, priority pollutant metals, and grain size analysis. Ten core samples and one duplicate sample were collected from six sediment locations in the main channel of the Piscataqua River and analyzed for TCL pesticide/PCBs, TOC, and priority pollutant metals. Eight surface sediment samples were collected along the back channel and analyzed for pesticide/PCBs, TOC, TPH, and priority pollutant metals.

There were no detectable volatile concentrations exceeding New Jersey ECRA Guidance Values or proposed Federal Action Levels. River sediment sample R-B and back channel sediment samples BC-1, BC-3, BC-4, BC-7, and BC-8 have detectable TPH concentrations and/or semi-quantitative estimates ranging from 100 ppm to 280 ppm that are equivalent to and/or exceed the New Jersey ECRA Guidance Value of 100 ppm for TPH. Detectable metal concentrations were found in all surface and cored sediment samples. Concentrations for beryllium in samples R-C, R-B(10-12), RB(16-18), and RD(8-11) exceed the proposed Federal Action Level (.2 ppm) and/or the New Jersey ECRA Guidance Value (1 ppm) for beryllium. Chromium concentrations of 113 ppm and 115 ppm found in samples RC(10-12) and RC(13-15), respectively, exceed the

New Jersey ECRA Guidance Value of 100 ppm. A mercury concentration of 2.30 ppm, found in sample RA(10-12), exceeds the New Jersey ECRA Guidance Value of 1 ppm. Other metals were detected below regulatory guidance or action levels.

Sediment samples from the main channel and back channel of the Piscataqua River show moderate concentrations of TPH (primarily back channel sediments) and localized heavy metals contamination including beryllium, chromium and mercury. No direct correlation exists between the contamination found in sediments in the river and activities at the PNS. Much of the contamination was found at sampling locations upstream from the shipyard.

Soil and Development/Purge Water Sampling

Soil samples were collected from 55 gallon drums containing auger cuttings from Phase I drilling activities. Also, water samples were collected from 55 gallon drums and 300 gallon polyethylene tanks containing development/purge water from Phase I and Phase II field activities. All samples were analyzed to determine the hazardous characteristics of the containerized materials using the Toxicity Characteristic Leaching Procedure (TCLP) and flash point, corrosivity and reactivity tests. There were no samples which exhibited hazardous waste characteristics as defined under 40 CFR Part 261.

1.0 INTRODUCTION

The Phase II Field Work Investigation involved studies at the following locations: JILF (SWMU #8), Mercury Burial Sites (SWMU #9), DRMO (SWMU #6), Industrial Waste Outfalls (SWMU #5), Battery Acid Tank #24 (SWMU #10), Tank Investigation (SWMU #12), Fuel Oil Spillage Area (SWMU #27), and the Back Channel and the Main Channel of the Piscataqua River. Monitoring wells were redeveloped and groundwater samples collected and analyzed from monitoring wells at the JILF, Mercury Burial Sites, and DRMO. Water level monitoring and a soil gas survey were also conducted at the JILF. Surface soil samples were collected and analyzed at the DRMO. Off-shore sediment samples were collected and analyzed near the JILF, Industrial Waste Outfalls, Battery Acid Tank #24, Fuel Oil Spillage Area, and in the Back Channel and Main Channel of the River. Water samples were collected and analyzed as part of the Tank Investigation. Exploratory test pits were excavated and subsurface soil samples collected and analyzed at the Fuel Oil Spillage Area. Soil and water samples were collected and analyzed from soil and development/purge water drums.

This report summarizes all field activities which includes hydrogeological, off-shore sediment and soil gas survey interpretation and presents laboratory results.

The procedure for laboratory analysis of Target Compound List (TCL) organic compounds, which includes volatiles, pesticide/PCBs analyses for soil and groundwater samples, followed the most current USEPA document "Statement of Work (SOW), Organic Analysis, Multi-Media Multi-Concentration". Total petroleum hydrocarbons were analyzed by infrared technique using EPA Method 418.1. The procedure for analysis of Target Analyte List (TAL) inorganic compounds, which encompasses the priority pollutant metal analysis for soil and groundwater samples, also followed the most

current USEPA document "Statement of Work (SOW), Inorganic Analysis, Multi-Media Multi-Concentration".

The analytical laboratory (RAI) used the required methods and submitted the required deliverables as stated in the July 1987 Revision of the "Statement of Work of the EPA Contract Laboratory Program" (CLP) and follow-up revisions to the "Statement of Work of the EPA Contract Laboratory Program".

It should be noted that data flags Q, J, and R in the analytical tables are indications of data quality as defined in the February 1988 publication "Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses" and the July 1988 "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses" prepared for the Hazardous Site Evaluation Division of the USEPA.

As presented in the tables, values that stand alone (without a qualifier) are the most accurate results, and possess both qualitative and quantitative connotations. Numbers that are flagged with a "J" represent qualitative but only semi-quantitative results. Values flagged with a "Q" indicate results that are qualitative only. Finally the qualifier "R" signifies a result that is unusable based on the QA/QC data validation.

2.0 JAMAICA ISLAND LANDFILL (SWMU #8)

The purpose of this phase of work at the JILF was to develop an initial database regarding shallow groundwater quality at the landfill and to screen the entire landfill area for potential contaminants using a passive soil gas survey. The following tasks were performed as part of the Phase II field investigation at the Jamaica Island Landfill:

- Monitoring well redevelopment
- Groundwater sampling
- Water level monitoring utilizing data loggers
- Soil gas survey
- Sediment sampling in Clark's Island Embayment

The information gathered from these investigations will be incorporated into the design of the next phase of the investigation to be conducted during the winter months of 1990-1991. Figure 2-1 is a map of the JILF showing the location of the monitoring wells installed during Phase I field investigation and discussed below.

2.1 Monitoring Well Redevelopment

Redevelopment of the groundwater monitoring wells at the JILF was conducted from August 9th through August 21, 1990. Redevelopment of the monitoring wells was performed to remove any accumulated fine grained sediment from the well screen and sand pack and improve the hydraulic connection between the well and the water bearing formation.

2.1.1 Redevelopment Procedures

All of the monitoring wells at the JILF were redeveloped using the WaTerra inertial pump system. This pump system consists of two downhole components; a self-tapping delrin foot valve and a length of high density polyethylene tubing. Vertical movement of the tubing alternately seats and unseats the foot valve allowing water to accumulate within the tubing. The upward stroke seats the valve trapping the water in the tubing while the downward stroke unseats the valve and forces water into the tubing. The vertical motion

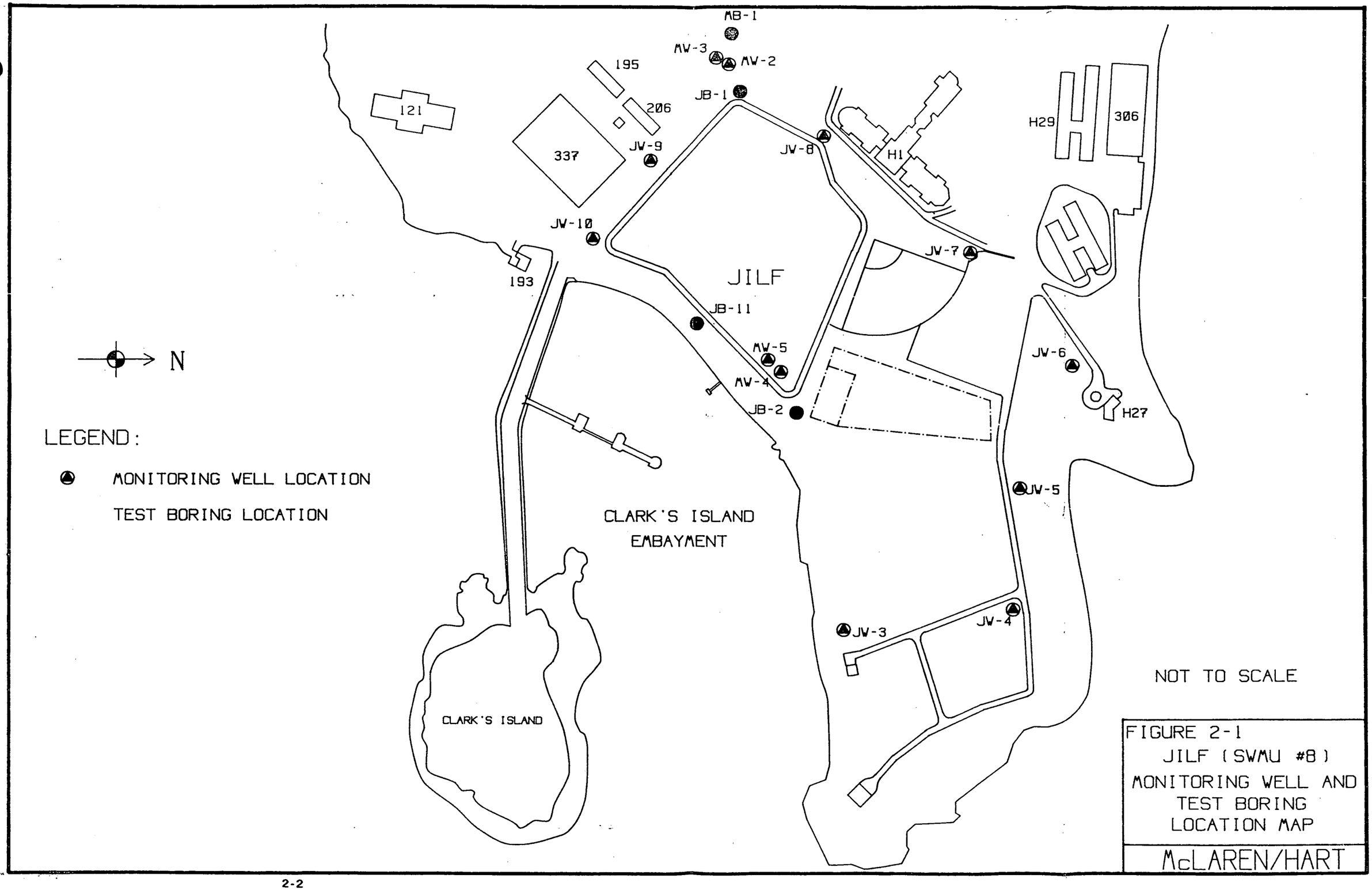


FIGURE 2-1
JILF (SWMU #8)
MONITORING WELL AND
TEST BORING
LOCATION MAP

McLAREN/HART

of the valve and tubing creates turbulence in the well which surges water in and out of the screen and sand pack. This surging action draws fine grained sediment through the screen into the well then up through the tubing and out of the well. Continued pumping removes fine grained sediment from the well and the water clears up over time.

Each well was redeveloped with a dedicated foot valve and length of tubing. Dedicating the redevelopment materials eliminated decontamination procedures and the potential for cross contamination between wells. Redevelopment was initiated at each well by attaching the tubing to a power pump or by hand pumping. The foot valve was postioned approximately one foot from the bottom of the well. The WaTerra power pump and/or hand pumping systems were used to actuate the tubing, resulting in the redevelopment of the wells.

Field parameter measurements including pH, temperature, specific conductance, and turbidity were taken of the discharge water from each well. These measurements were taken at regular intervals for the high yielding wells after every five gallons of discharge until redevelopment was complete. Measurements for low yielding wells occurred at more irregular intervals and redevelopment was conducted over several days until the redevelopment was complete. The redevelopment water from all of the monitoring wells was contained on-site in DOT approved 55 gallon drums and/or 300 gallon polyethylene tanks for later analysis.

Monitoring well redevelopment was conducted until all the measured field parameters stabilized. The last parameter to stabilize during redevelopment was turbidity. Redevelopment was considered complete when three consecutive turbidity measurements fell below five nephelometric turbidity units (NTUs) or when three consecutive turbidity measurements were within ten percent or less variation.

2.1.2 Redevelopment Findings

Redevelopment of the monitoring wells at the JILF was conducted until the field parameter measurements stabilized. Table 2-1 contains a summary of the stabilized field parameters for each of the wells and the dates over which each well was redeveloped. Monitoring wells JW-4, JW-5, JW-7, JW-8 and JW-9 recharged quickly and were successfully redeveloped during the first attempt at redevelopment. The slower recharging wells, JW-3 and JW-6, were redeveloped over several days due to slower recharge. Monitoring well JW-10 recharged quickly but water production was tide dependent. Monitoring well JW-10 dried out when redevelopment occurred during low tide.

Salinity measurements for all wells at the JILF, except JW-10, were not recorded during redevelopment because a salinity meter was not available. The conductivity measurement at JW-9 was given as >20,000 umhos/cm because the actual measurement exceeded the upper limit of the available conductivity meter. Since the salinity measurements could not be obtained, the calculated salinity is included on Table 2-1 as an estimate.

Salinity values can be calculated by determining the chlorine content of the water from temperature and conductivity measurements and then converting chlorinity to salinity (Williams, 1973). This calculation can be accomplished by determining the chlorinity from two conversion tables, one based on the measured conductivity and the other based on the measured temperature. The values extracted from these two conversion tables are multiplied and the result is the chlorinity of the water which is substituted into the following formula to find salinity:

$$S^{\circ}/\infty = 1.80665\ Cl^{\circ}/\infty \quad \text{where;}$$

S = Salinity

Cl = Chlorinity

TABLE 2-1

STABILIZED FIELD PARAMETERS

JAMAICA ISLAND LANDFILL (SWMU #8)
PORTSMOUTH NAVAL SHIPYARD

AUGUST 9-21, 1990

Well Nº	Redevelopment Date(s)	Total Volume Removed (Gals)	pH	Temp. (°C)	Specific Conductivity (µmhos/cm)	Turbidity (NTUs)	Measured Salinity (°/∞)	Calculated Salinity (°/∞)	Measured Salinity During Sampling 08/23/90
JW-3	8/15-8/21	45.5	6.52	13.7	298	9.80	NA	0.2	0
JW-4	8/10/90	75	6.54	16.0	527	4.46	NA	0.3	0
JW-5	8/14/90	50	6.84	16.2	9,680	3.06	NA	6.7	4.5
JW-6	8/14-8/17	109.5	7.07	13.3	650	10.40	NA	0.4	0
JW-7	8/9/90	45	6.65	15.5	1,565	33.20	NA	1.0	0.2
JW-8	8/9/90	20	6.97	20.7	788	0.48	NA	0.4	0.2
JW-9	8/14/90	50	6.84	15.6	>20,000	22.00	NA	>14.9	18.5
JW-10	8/14-8/20	75	7.14	16.6	33,100	2.80	24.5	25.2	25.0

NOTE:

For comparison purposes, the salinity measurements obtained during groundwater sample collection are also included in Table 2-1. The salinity calculation yields a fairly accurate estimate of the salinity of the water as compared to the measured salinities during sample collection.

The salinity and conductivity measurements give an indication of the salt content of the water. The following terms and definitions (Ingmanson and Wallace, 1973) will be used throughout this document to describe the groundwater based on the salinity measurement:

Fresh Water:	Water in which salinity values are below 0.50°/∞.
Brackish Water:	Water in which salinity values range from 0.50 to 17.00°/∞.
Seawater:	Water in which salinity values exceed 17.00°/∞. (Note that average salinity in seawater is about 35°/∞ indicating the groundwater on-site that meets this criteria is actually some dilution of seawater).

Based on the salinity and conductivity measurements given in Table 2-1, monitoring wells JW-3, JW-4, JW-6, JW-7 and JW-8 contain fresh water, JW-5 contains brackish water and JW-9 and JW-10 contain seawater.

An HF Scientific, Inc. DRT-15C portable turbidimeter was used to measure amounts of suspended solids in the groundwater during redevelopment. The turbidimeter projects a light source through the sample and measures the intensity of light rays scattered from particles in suspension. Standard units of measurement are Nephelometric Turbidity Units (NTUs).

The turbidity measurements at monitoring wells JW-4, JW-5, JW-8 and JW-10 all stabilized below five NTUs. Turbidity measurements for wells JW-3, JW-6, JW-7 and JW-9 did not fall below five NTUs. Redevelopment of these four wells was considered complete after obtaining three consecutive turbidity measurements with ten percent or less variation.

2.2 Groundwater Sampling

On August 23, 1990, groundwater samples were collected from all eight monitoring wells installed around the perimeter of the JILF (Figure 2-1). A replicate sample labeled

JW-11, taken at well JW-9, and one equipment rinseate field blank (RB-02) were included in this groundwater sampling. Historical information regarding the types of waste disposed of at the JILF suggests the potential for organic and inorganic contaminants to be present in the landfill. The objectives of groundwater sampling at the JILF are summarized as follows:

1) To evaluate the quality of groundwater beneath the JILF;

2) To assess whether organic compounds and/or inorganic constituents related to past or current conditions at the JILF have migrated to groundwater;

3) To assess whether any organic compounds and/or inorganic constituents in groundwater samples obtained from the monitoring wells are present in concentrations that exceed applicable groundwater standards; and

4) To provide valid, properly obtained groundwater sampling data for all monitoring wells.

2.2.1 Sampling Procedures

Prior to sampling a monitoring well, a calculated volume of water must be removed to purge the standing column of water in the well or the well must be evacuated and allowed to recover to ensure that formational water is being sampled. EPA guidelines for monitoring well purging stipulate that at least three times the computed well volume is acceptable for assuring that the sample contains groundwater representative of the formation. Also, evacuation of a well to dryness is an acceptable procedure to ensure that the sample contains representative groundwater (EPA 1986). Groundwater samples collected from monitoring wells purged by evacuation to dryness may not be completely representative of formational groundwater if the turbidity is high.

A monitoring well was purged by first obtaining the static water level in the monitoring well and subtracting this level from the total depth of the well. The result is the height of the standing column of water in the monitor well which is then multiplied by a

volume per foot factor which is dependent on the diameter of the well to obtain the volume of water in the well. All of the monitoring wells at the JILF, with the exception of JW-3, were purged by removing five times the calculated volume. Monitoring well JW-3 was purged by evacuating the well to dryness three times and allowing the well time to recover.

All monitoring well purging at the JILF, as well as at the other SWMUs, was accomplished using dedicated, precleaned, bottom-filling stainless-steel bailers with teflon check valves for each well. One exception was made at monitoring well JW-7 due to an obstruction, located approximately five feet below the top of casing, would not permit the passage of a bailer. Monitoring well purging and subsequent sampling at JW-7 was accomplished using a new length of high density polyethylene tubing and a Delrin foot valve.

All purge water was contained in DOT approved 55 gallon drums, supplied by the Portsmouth Naval Shipyard (PNS), or in 300 gallon polyethylene tanks. The containers were labeled and later taken to the PNS Hazardous Waste Storage Area where each container was sampled and temporarily stored while awaiting laboratory analytical results.

Groundwater samples were collected using the same precleaned, stainless-steel bailers used for purging (except at JW-7 as previously discussed) and attached to a clean nylon cord. Bailers were decontaminated prior to use according to the protocol listed in Table 2-2.

All wells were sampled immediately following purging. All samples were collected in a manner to minimize agitation and other disturbing conditions which might cause physiochemical changes in the sample which may bring about losses due to volatilization, adsorption, reduction/oxidation changes or degradation. The groundwater samples were analyzed for Target Compound List (TCL) Organics and Target Analyte List (TAL) Inorganics. Groundwater from each well was field analyzed for pH, temperature, specific

TABLE 2-2

DECONTAMINATION PROCEDURES[1]

PORTSMOUTH NAVAL SHIPYARD

A. Sampling devices made of carbon steel (split-spoon samplers), stainless-steel, teflon, glass, and plastic[2].

1. Wash equipment using phosphate-free, laboratory-grade detergent (Alconox or equivalent) and potable water.

2. Rinse thoroughly with potable water.

3. Rinse with 10% nitric acid for everything except carbon steel (1% nitric acid for carbon steel) followed by another potable water rinse.

4. Rinse with distilled or deionized water.

5. Applicable only when sampling organic compounds:

   a. Rinse with a pesticide-grade solvent. (Isopropyl is recommended; methanol is acceptable).

   b. Allow to air dry (when possible oven dry at 105 °C for at least 1 hour).

6. Wrap in aluminum foil if not ready for immediate use.

B. Off-shore sampling equipment dredges and core cutter and catcher.

1. Wash equipment using phosphate-free, laboratory-grade detergent (Alconox or equivalent) and potable water.

2. Rinse thoroughly with potable water.

3. Rinse with distilled or deionized water.

C. Drill rigs and large equipment will be steam-cleaned between sampling points and before leaving the site.

---

1 All decontamination liquids generated during the investigation were contained and later stored of at the Portsmouth Naval Shipyard (PNS) Hazardous Waste Storage Area, awaiting eventual disposal based on analytical results.

2 This procedure modifies the decontamination outline found in Quality Control in Remedial Site Investigation (Perket, 1986).

conductivity, salinity, and turbidity prior to sample collection. All of the field parameter measurements were recorded in the field notebook (Appendix I). A summary of groundwater sampling and field parameter information is contained in Table 2-3. Samples collected for metal analyses were field filtered through 0.45 micron cellulose prior to collection in laboratory-supplied bottles and were preserved in the field with nitric acid. Samples collected for total cyanide analysis were preserved in the field with sodium hydroxide and placed in laboratory-supplied bottles.

Upon collection, samples were placed in coolers which were kept chilled using ice. Groundwater sample coolers were hand delivered to Resource Analysts, Inc. (RAI), of Hampton, New Hampshire.

On September 13, 1990, McLaren/Hart was informed by RAI that the JILF groundwater samples collected on August 23, 1990 for total cyanide analysis exceeded the fourteen day CLP holding time. In addition, groundwater samples collected for TCL Base-Neutral-Acid Extractables (BNAs) and TCL pesticide/PCBs analyses at JW-4 exceeded the seven day extraction holding times as per 40 CFR 136.

On September 18, 1990, McLaren/Hart and RAI personnel resampled the groundwater from the eight monitoring wells for total cyanide. Additionally, JW-4 was resampled for BNAs and pesticide/PCB analyses. A replicate sample (JW-11) taken from monitoring well JW-9 and one equipment rinseate field blank (RB-091890) were also included in the groundwater sampling. Prior to collecting groundwater samples, static water levels in each of the monitoring wells were measured, and the volume of water in the well was calculated. The wells were then purged using the same precleaned, stainless-steel bailers used for sampling on August 23, 1990 (except at JW-7 as previously discussed). All of the wells, with the exception of JW-3, were purged until three well volumes were

TABLE 2-3

GROUNDWATER SAMPLING AND FIELD PARAMETER INFORMATION

JAMAICA ISLAND LANDFILL (SWMU #8)
PORTSMOUTH NAVAL SHIPYARD

AUGUST 23, 1990

Well №	Well Volume (gallons)	Number of Well Volumes Evacuated	pH	Temp. (°C)	Specific Conductivity (μmhos/cm)	Salinity (°/∞)	Turbidity (NTUs)
JW-3	1.85	3	6.67	13.9	327	0	100.2
JW-4	1.15	5	6.45	15.3	368	0	>200
JW-5	1.36	5	6.62	13.5	6,300	4.5	>200
JW-6	2.07	5	7.32	11.7	600	0	>200
JW-7	1.09	5	6.67	14.8	1,010	0.2	70.7
JW-8	0.48	5	7.03	19.6	540	0.2	>200
JW-9	1.43	5	6.89	15.2	25,200	18.5	>200
JW-10	1.04	5	7.79	17.0	33,200	25.0	88.6

removed. Purging at JW-3 was completed by evacuating the well one time and allowing the well time to recover. A total of three gallons or 1.70 well volumes was removed from JW-3. All purge water was contained in DOT approved 55 gallon drums, supplied by the PNS. The containers were labeled and later taken to the PNS Hazardous Waste Storage Area.

Groundwater samples were collected using the same precleaned, stainless-steel bailers used for purging (except at JW-7 as previously discussed) which was attached to a clean nylon cord. Bailers were decontaminated prior to use according to the same protocol previously described in Table 2-2.

All wells were resampled immediately following purging. All groundwater samples were field analyzed for pH, temperature, specific conductivity, salinity, and turbidity prior to sample collection and all results were recorded in the field notebook (Appendix I). A summary of groundwater resampling and field parameter information is contained in Table 2-4. Upon collection, total cyanide samples were preserved in the field with sodium hydroxide in laboratory-supplied bottles. All samples were placed in coolers, and kept chilled using ice. Groundwater sample coolers were hand delivered to RAI.

2.2.2 Findings (Groundwater Conditions)

Prior to sampling, turbidity readings in wells JW-4, JW-5, JW-6, JW-8, and JW-9 exceeded the maximum reading of the turbidity meter (i.e. greater than 200 NTU's) and wells JW-3, JW-7, and JW-10 had turbidity readings ranging from 70.7 to 100.2 NTUs. These high turbidity readings suggest that the suspended solids in the groundwater are forming a mud-cake on the sand pack during development and are subsequently being resuspended in the water after development ceases. This process may be assisted by the tidal action measured in some wells.

TABLE 2-4

GROUNDWATER RESAMPLING AND FIELD PARAMETER INFORMATION

JAMAICA ISLAND LANDFILL (SWMU #8)
PORTSMOUTH NAVAL SHIPYARD

SEPTEMBER 18, 1990

Well Nº	Well Volume (gallons)	Number of Well Volumes Evacuated	pH	Temp. (°C)	Specific Conductivity (μmhos/cm)	Salinity (°/∞)	Turbidity (NTUs)
JW-3	1.77	1.70	6.74	15.0	285	0	5.40
JW-4	1.12	3.00	6.60	16.0	372	0	>200
JW-5	1.37	3.00	6.57	15.5	8,100	6.3	>200
JW-6	2.05	3.00	7.22	13.8	610	0	>200
JW-7	1.06	3.00	6.63	14.4	990	0.2	>200
JW-8	0.58	3.00	6.83	17.8	520	0	>200
JW-9	1.49	3.00	6.86	14.8	26,200	20.03	>200
JW-10	0.37	3.00	7.02	14.0	24,900	20.05	>200

The salinity readings in JW-9 and JW-10 were 18.5°/∞ and 25°/∞, respectively, indicating the presence of seawater in the wells. This is also supported by high specific conductivity readings (Table 2-3), and the significant water level fluctuation in JW-10. The salinity reading in JW-5 at 4.5°/∞ and a specific conductivity reading of 6,300 umhos/cm indicates brackish water conditions in the vicinity of this well. The lower salinities and conductivities in monitoring wells JW-3, JW-4, JW-6, JW-7 and JW-8 suggest these wells contain fresh water. The field parameters measured during the September 18, 1990 resampling event reinforce these findings.

2.2.3 Laboratory Analytical Results

Eight groundwater samples were collected from monitoring wells around the perimeter of the JILF. In addition, replicate sample (JW-11) collected from monitoring well JW-9, and equipment rinseate field blank (RB-02) were included in the groundwater sampling program. The samples were analyzed for TCL organics and TAL inorganics. A summary of valid groundwater results are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

The State of Maine does not have published clean-up guidelines for contamination in groundwater, therefore, National Interim Primary Drinking Water Regulations and proposed Federal Action Levels documented in the Federal Regiester (55 FR 30865, July 27, 1990) are used to evaluate the analytical data.

<u>TCL Volatiles</u>

There were no detectable concentrations of volatile organic compounds in any of the groundwater samples collected from the JILF monitoring wells.

TCL Semi-Volatiles

One detectable semi-volatile concentration of 23 ppb bis(2-ethylhexyl)phthalate was found in sample JW-05. Bis(2-ethylhexyl)phthalate is not listed as a contaminant under the National Interim Primary Drinking Water Regulations. According to proposed Federal Action Levels, the action level for bis(2-ethylhexyl)phthalate is 3 ppb. There were no other detectable concentrations of semi-volatiles in the groundwater samples collected from the JILF.

TCL Pesticide/PCBs

There were no detectable concentrations of pesticide/PCBs in any groundwater samples collected from the JILF.

TAL Inorganics

Detectable concentrations of filtered TAL metals were found in all groundwater samples from the JILF monitoring wells, including the equipment rinseate field blank (RB-02), however, there were no metal concentrations above current National Interim Primary Drinking Water Regulations or proposed Federal Action Levels. Further, there were no detectable concentrations of cyanide in any groundwater samples collected from the JILF.

2.2.4 Interpretations/Discussion

A total of eleven test borings, labeled JSB-1 through JSB-11, were drilled from November 8, 1989 through December 1, 1989 with eight borings completed as monitoring wells (JW-3 through JW-10). McLaren/Hart has drawn the following conclusions from the Phase I and Phase II field investigations of the JILF (SWMU #8).

TCL Volatiles

Soil samples from borings JSB-1 and JSB-11 show detectable concentrations of volatile organic compounds at depths ranging from 5 to 30 feet below grade. Table 2-5 summarizes soil samples which have total volatile concentrations exceeding the New Jersey ECRA Guidance Value of 1 ppm. There were no detectable concentrations of volatiles in the remaining soil samples nor were volatiles detected in any groundwater samples from the JILF monitoring wells.

TCL Semi-Volatiles

Soil samples from borings JSB-1, JSB-2, JSB-7, JSB-9, JSB-10, and JSB-11 had detectable concentrations of semi-volatile organic compounds at depths ranging from near surface to 17 feet below grade. Table 2-6 summarizes soil samples which have total semi-volatile concentrations exceeding the New Jersey ECRA Guidance Value of 10 ppm. There were no detectable concentrations of semi-volatiles in soil samples from borings JSB-3, JSB-4, JSB-5, JSB-6, and JSB-8. The only semi-volatile compound detected in groundwater was bis(2-ethylhexyl)phthalate found at 23 ppb in JW-05. Wells installed in borings where semi-volatile compounds were found in soil had no detectable semi-volatile compounds in groundwater. This indicates that the contaminants are bound to the soil as should be expected with these compounds in the absence of volatile components. If volatiles were present in soils and/or groundwater, the mobility of the semi-volatiles would increase and their concentrations would increase in groundwater.

TCL Pesticide/PCBs

Soil samples from borings JSB-1, JSB-2, JSB-4, JSB-5, JSB-6, JSB-7, JSB-10, and JSB-11 had detectable concentrations of pesticides at depths ranging from near surface to 12 feet below grade. There were no pesticide concentrations which exceeded proposed Federal Action Levels. Pesticides are not listed under New Jersey ECRA Guidance Values. There were no detectable concentrations of pesticides in soil samples from borings JSB-3, JSB-8, and JSB-9.

TABLE 2-5

SUMMARY OF TOTAL TCL VOLATILE CONCENTRATIONS--SOIL
EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES

JAMAICA ISLAND LANDFILL (SWMU #8)
PORTSMOUTH NAVAL SHIPYARD

NOVEMBER 8--DECEMBER 1, 1989

McLAREN/HART SAMPLE I.D.	TOTAL VOLATILE CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)
JSB-1(10-12')	143.70	1.0
JSB-1(15-17')	10.17	1.0
JSB-11(5-7')	28.60	1.0

TABLE 2-6

SUMMARY OF TOTAL TCL SEMI-VOLATILE CONCENTRATIONS--SOIL
EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES

JAMAICA ISLAND LANDFILL (SWMU #8)
PORTSMOUTH NAVAL SHIPYARD

NOVEMBER 8--DECEMBER 1, 1989

McLAREN/HART SAMPLE I.D.	TOTAL SEMI-VOLATILE CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)
JSB-1(0-2')	10.85	10.0
JSB-1(10-12')	135.80	10.0
JSB-1(15-17')	17.68	10.0
JSB-1(15-17')RE	16.60	10.0
JSB-7(0-2')	112.98	10.0

Soil samples from borings JSB-1 and JSB-11 had detectable concentrations of PCBs at depths ranging from 5 to 17 feet below grade. There were no detectable concentrations of PCBs in the remaining soil samples. Table 2-7 summarizes soil samples which exceed New Jersey ECRA Guidance Values and/or proposed Federal Action Levels for PCBs in soil. There were no pesticides or PCB compounds detected in any of the groundwater monitoring wells at the JILF. Pesticides and PCBs have relatively low solubilities in water and are commonly bound to soils at low to moderate concentrations. High concentrations, or the presence of volatile compounds, would increase their solubility and increase the likelihood of finding detectable concentrations in groundwater.

TAL Inorganics

There were no cyanide concentrations in any soil samples which exceed New Jersey ECRA Guidance Values and/or proposed Federal Action Levels. Soil sample results from borings JSB-1, JSB-2, JSB-7, JSB-8D, JSB-9, and JSB-11 contain one or more metals with concentrations that exceed New Jersey ECRA Guidance Values and/or proposed Federal Action Levels. These results are summarized in Table 2-8.

Figure 2-2 is presented to relate soil concentrations exceeding New Jersey ECRA Guidance Values to the results obtained from groundwater sampling. Although a number of borings showed metal concentrations which exceeded New Jersey's ECRA Guidance Values, filtered metals analyses of groundwater samples from all wells had metal concentrations well below regulatory action or guidance levels. This indicates that metals are not leaching from the soil to the groundwater. The mobility of most metals increases with decreasing pH. A nearly neutral pH was measured in all monitoring wells at the landfill as shown in Tables 2-3 and 2-4. Phase I geologic cross-sections A-A^1, B-B^1, and C-C^1, as shown in Figures 2-3 through 2-5, are also presented to show the vertical profile of soil contamination. A more detailed discussion of soil results from Phase I test borings was prepared for the Phase I report submitted November, 1990.

TABLE 2-7

SUMMARY OF PCB CONCENTRATIONS--SOIL
EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES
AND/OR PROPOSED FEDERAL ACTION LEVELS

JAMAICA ISLAND LANDFILL (SWMU #8)
PORTSMOUTH NAVAL SHIPYARD

NOVEMBER 8--DECEMBER 1, 1989

McLAREN/HART SAMPLE I.D.	PCB CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)	PROPOSED FEDERAL ACTION LEVEL (PPM)
JSB-1(10-12')	1.5	1.0 to 5.0	0.09
JSB-11(5-7')	13.0	1.0 to 5.0	0.09
JSB-11(15-17')	2.2	1.0 to 5.0	0.09

TABLE 2-8

SUMMARY OF METAL CONCENTRATIONS--SOIL EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND/OR PROPOSED FEDERAL ACTION LEVELS

JAMAICA ISLAND LANDFILL (SWMU #8) PORTSMOUTH NAVAL SHIPYARD

NOVEMBER 8--DECEMBER 1, 1989

PARAMETER	McLAREN/HART SAMPLE I.D.	CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)	PROPOSED FEDERAL ACTION LEVEL (PPM)
ANTIMONY	JSB-11(5-7')	27.80J	10.0	30.0
BERYLLIUM	JSB-1(0-2')	0.76	1.0	0.2
	JSB-1(10-12')	1.40	1.0	0.2
	JSB-1(15-17')	0.97	1.0	0.2
	JSB-1(20-22')	0.49	1.0	0.2
	JSB-1(28-30')	0.47	1.0	0.2
	JSB-2(0-2')	2.90	1.0	0.2
	JSB-2(5-7')	3.50	1.0	0.2
	JSB-7(0-2')	1.30	1.0	0.2
	JSB-8D(0-2')*	0.41	1.0	0.2
	JSB-9(0-2')	0.44	1.0	0.2
	JSB-9(5-7')	0.43	1.0	0.2
	JSB-11(5-7')	1.30	1.0	0.2
COPPER	JSB-1(0-2')	568.00J	170.0	NA
	JSB-1(10-12')	759.00J	170.0	NA
	JSB-1(15-17')	304.00J	170.0	NA
	JSB-2(0-2')	1670.00	170.0	NA
	JSB-2(5-7')	231.00	170.0	NA
	JSB-2(15-17')	220.00	170.0	NA
	JSB-6(0-2')	244.00	170.0	NA
	JSB-7(0-2')	238.00	170.0	NA
	JSB-11(0-2')	187.00	170.0	NA
	JSB-11(5-7')	878.00	170.0	NA

J = Qualitative and Semi-Quantitative
NA = Not Available
* = RAI Duplicate Per NEESA Program 20.2-047B

TABLE 2-8 (CONTINUED)

SUMMARY OF METAL CONCENTRATIONS--SOIL EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND/OR PROPOSED FEDERAL ACTION LEVELS

JAMAICA ISLAND LANDFILL (SWMU #8) PORTSMOUTH NAVAL SHIPYARD

NOVEMBER 8--DECEMBER 1, 1989

PARAMETER	McLAREN/HART SAMPLE I.D.	CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)	PROPOSED FEDERAL ACTION LEVEL (PPM)
LEAD	JSB-1(10-12')	929.00J	250-1,000	NA
	JSB-1(15-17')	375.00J	250-1,000	NA
	JSB-2(0-2')	353.00	250-1,000	NA
	JSB-11(5-7')	592.00J	250-1,000	NA
MERCURY	JSB-1(10-12')	9.50	1.0	20.0
NICKEL	JSB-2(0-2')	194.00	100.0	2,000.0
	JSB-11(5-7')	139.00	100.0	2,000.0
ZINC	JSB-1(10-12')	778.00	350	NA
	JSB-1(15-17')	419.00	350	NA
	JSB-2(0-2')	2030.00	350	NA
	JSB-2(5-7')	1390.00	350	NA
	JSB-7(0-2')	903.00	350	NA
	JSB-11(5-7')	1160.00	350	NA

J = Qualitative and Semi-Quantitative
NA = Not Available
* = RAI Duplicate Per NEESA Program 20.2-047B

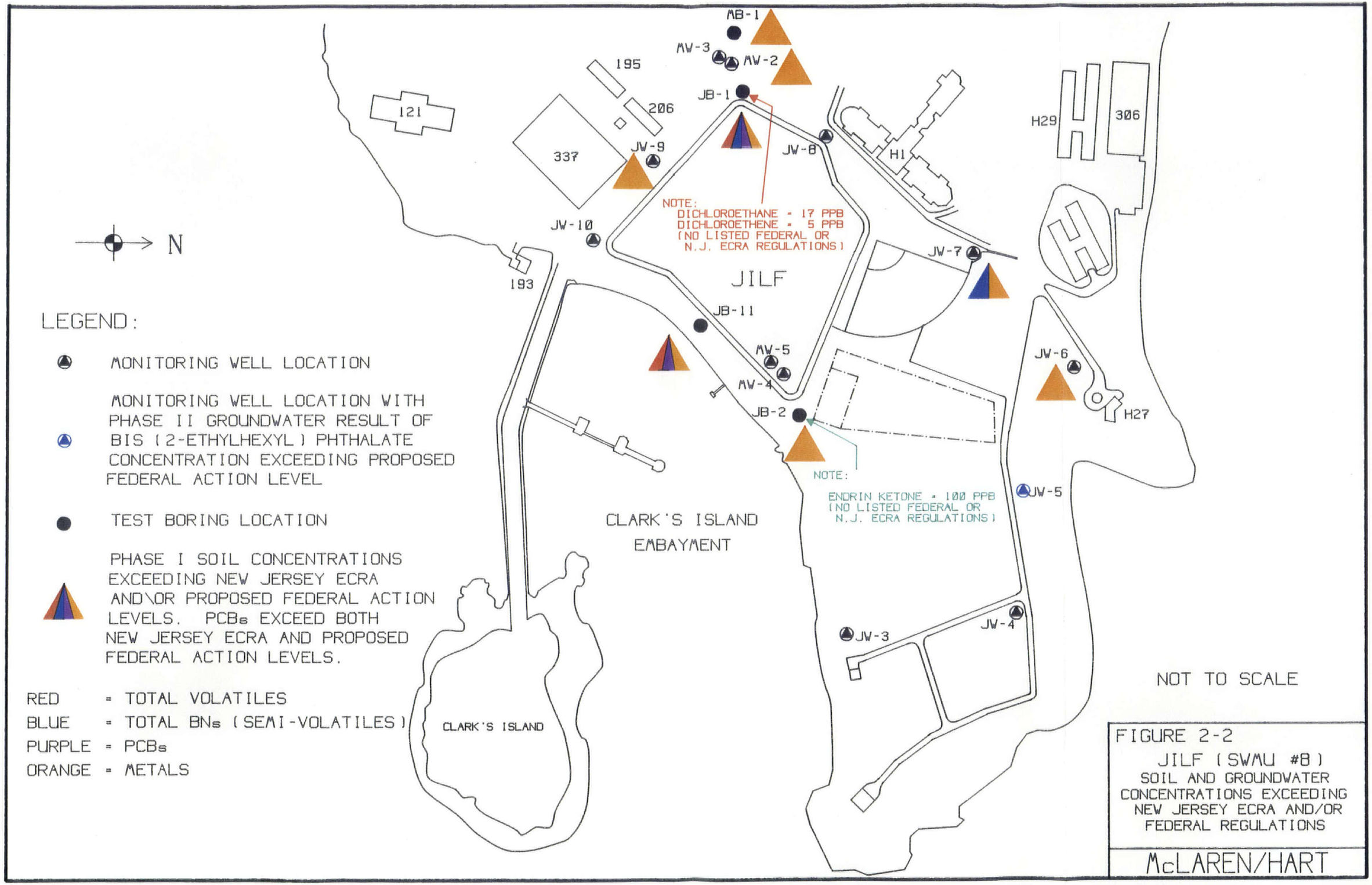
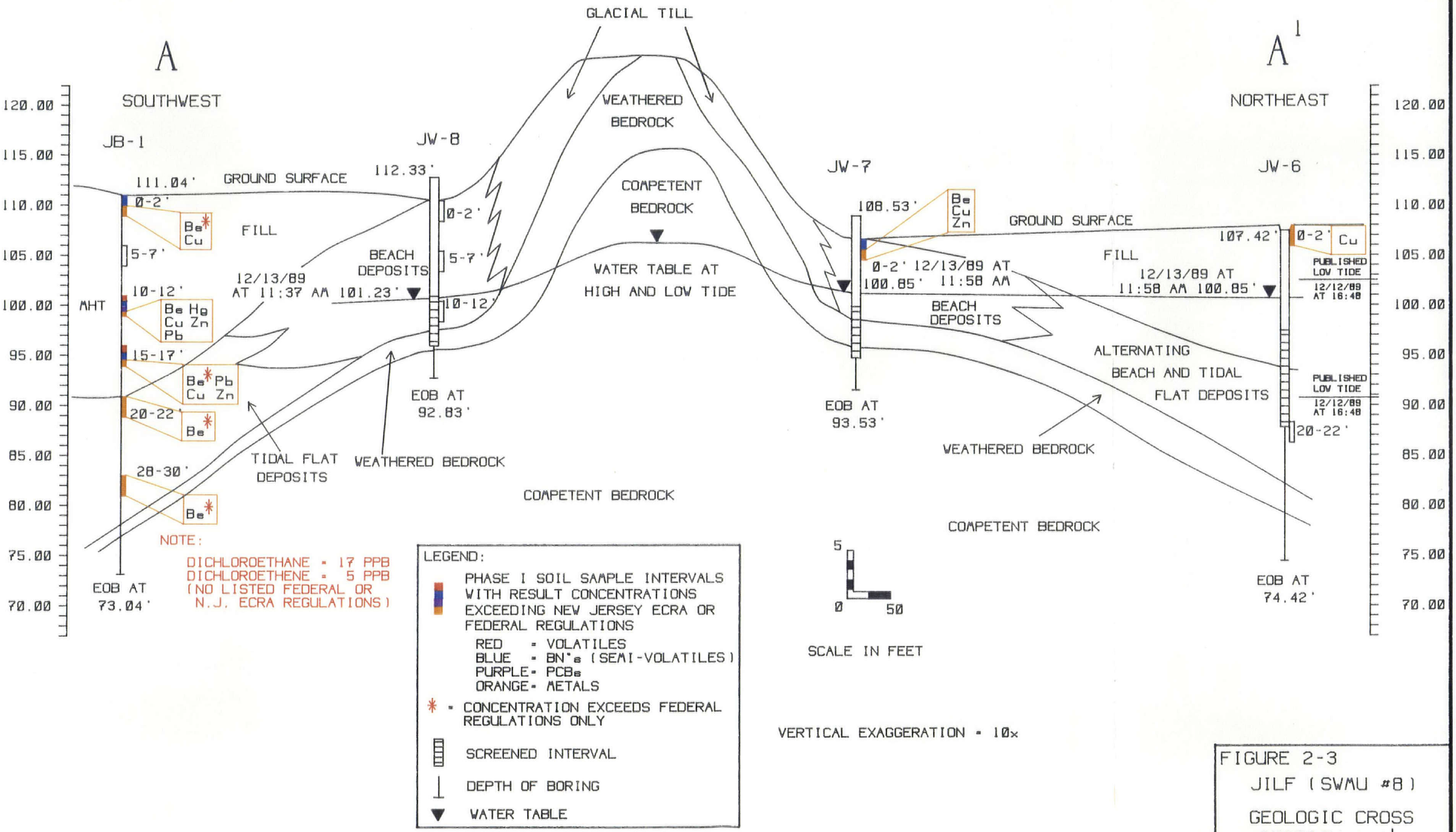


FIGURE 2-2
JILF (SWMU #8)
SOIL AND GROUNDWATER CONCENTRATIONS EXCEEDING NEW JERSEY ECRA AND/OR FEDERAL REGULATIONS

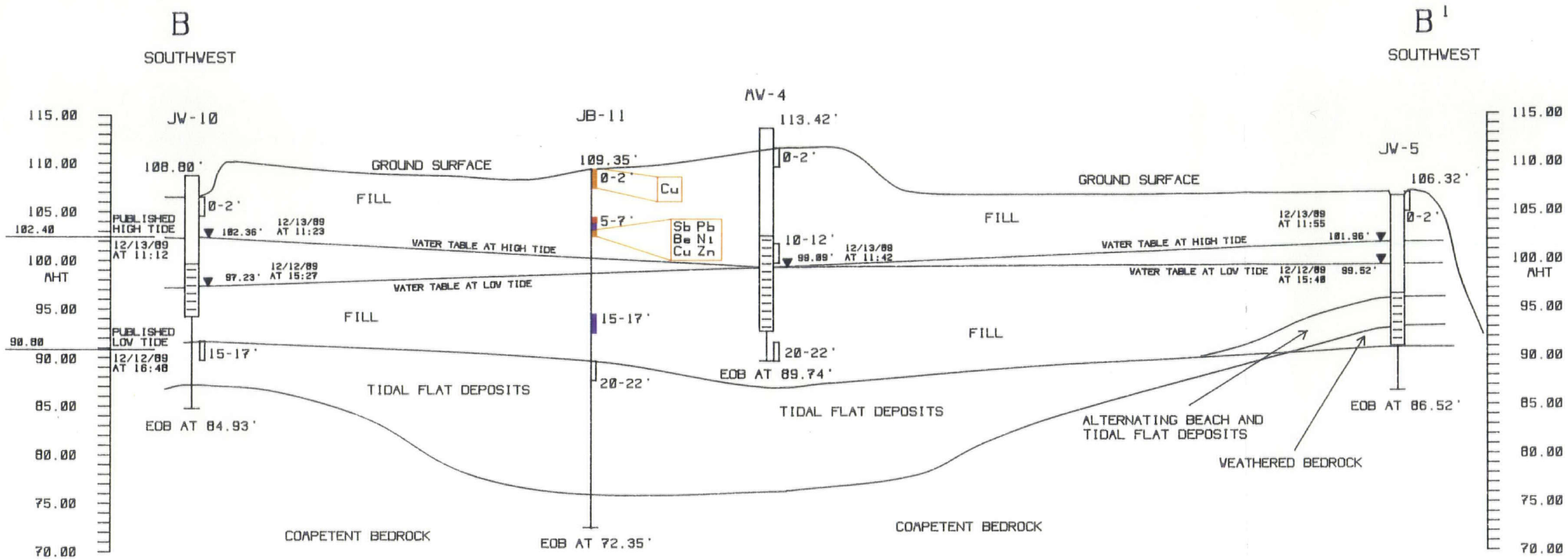
McLAREN/HART



NOTE: ELEVATION 100.00' MEAN HIGH TIDE, PORTSMOUTH NAVAL SHIPYARD SYSTEM IS EQUAL TO 3.804' USGS SYSTEM

FIGURE 2-3
JILF (SWMU #8)
GEOLOGIC CROSS SECTION A-A'

McLAREN/HART



LEGEND:

- PHASE I SOIL SAMPLE INTERVALS WITH RESULT CONCENTRATIONS EXCEEDING NEW JERSEY ECRA OR FEDERAL REGULATIONS
  - RED = VOLATILES
  - PURPLE = PCBs
  - ORANGE = METALS
- SCREENED INTERVAL
- DEPTH OF BORING
- VATER TABLE

5 0 50

SCALE IN FEET

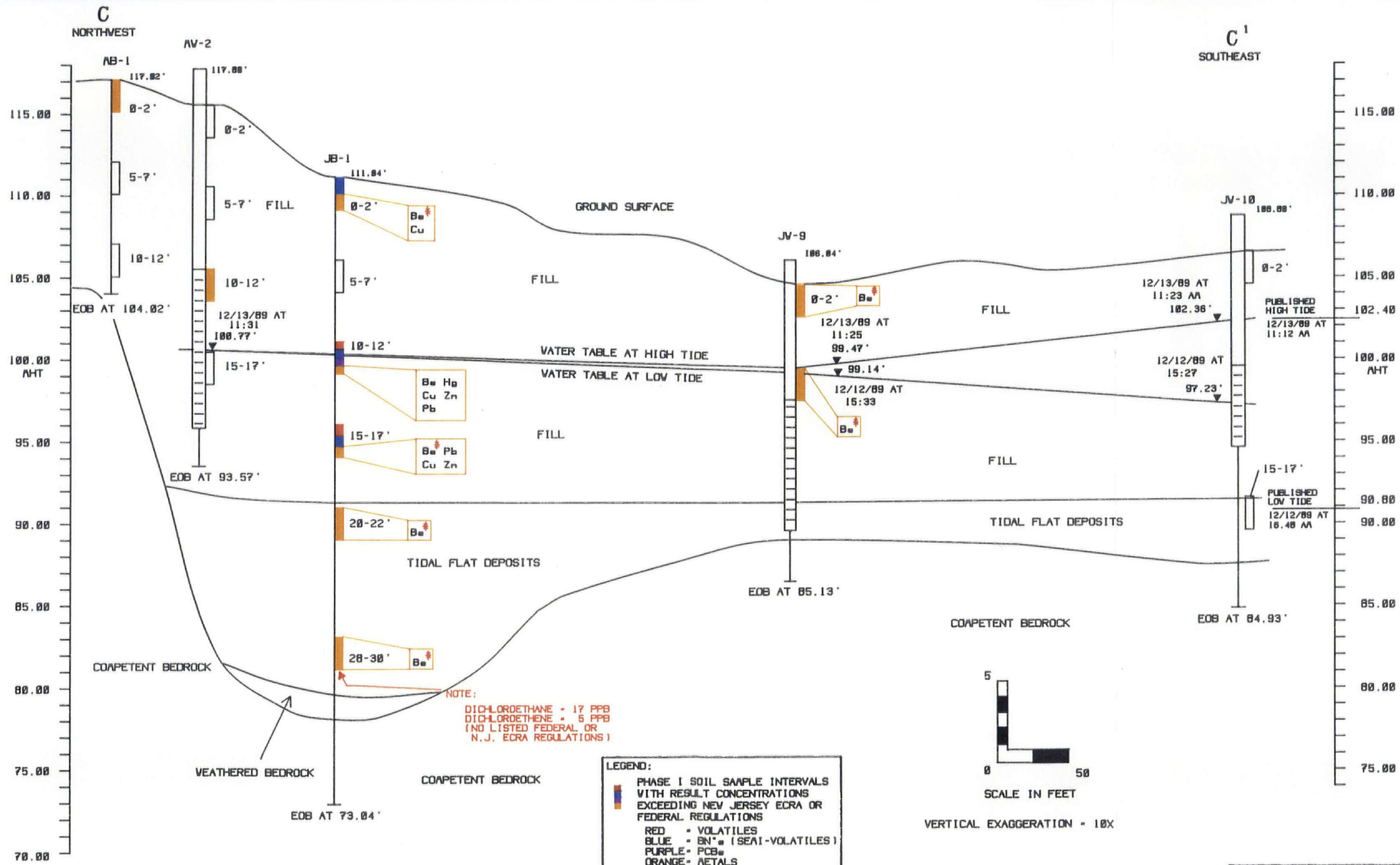
VERTICAL EXAGGERATION = 10x

NOTE: ELEVATION 100.00' MEAN HIGH TIDE, PORTSMOUTH NAVAL SHIPYARD SYSTEM IS EQUAL TO 3.804' USGS SYSTEM

FIGURE 2-4

JILF (SWMU #8)
GEOLOGIC CROSS SECTION B-B'

McLAREN/HART



NOTE: ELEVATION 100.00' MEAN HIGH TIDE, PORTSMOUTH NAVAL SHIPYARD SYSTEM IS EQUAL TO 3.804' U.S.G.S. SYSTEM

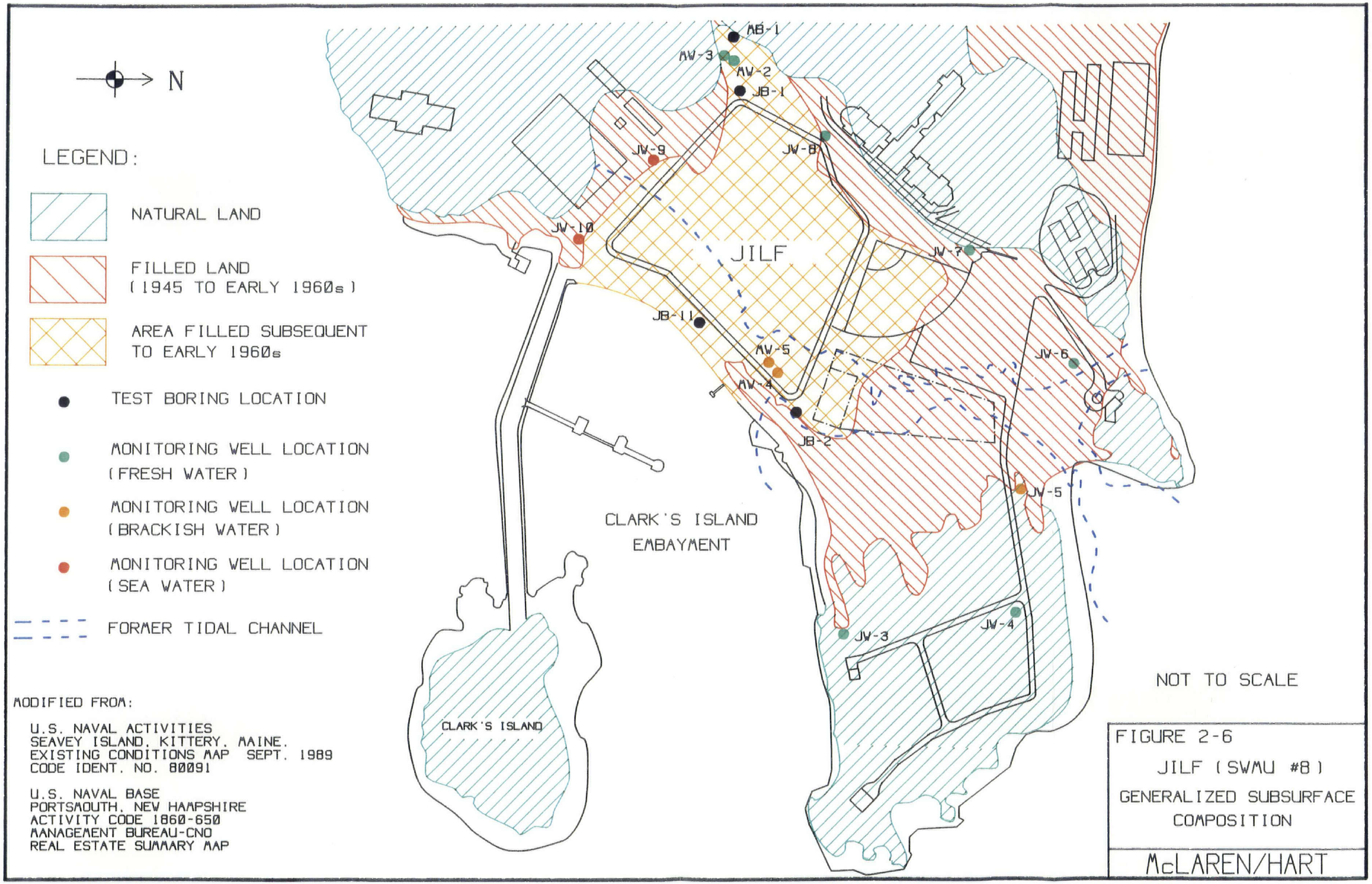
FIGURE 2-5
JILF (SWMU #8)
GEOLOGIC CROSS SECTION C-C'

McLAREN/HART

Figure 2-6 shows the relationship between natural land and filled land within and surrounding the JILF. A former tidal channel is also denoted on Figure 2-6. The delineation of natural and filled land, as well as the former tidal channel, was determined from historical aerial photographs dating from July 1952 to April 1973 and historical maps dating from June 1942 to the present. All photographs and maps were provided by PNS personnel. Groundwater quality based on conductivity and salinity readings obtained during Phase II sampling is also shown on Figure 2-6. Fresh water was found to be present in monitoring wells MW-2, MW-3, JW-3, JW-4, JW-6, JW-7 and JW-8. Seawater was present in JW-9 and JW-10. Brackish water was present in JW-5, MW-4 and MW-5, which are located above or immediately adjacent to the former tidal channel. Brackish water conditions found in these monitoring wells suggests that the groundwater within the landfill may be influenced by the former tidal channel beneath the existing JILF. The former tidal channel may be a preferential pathway for contaminant migration as rising and falling tides move contamination through coarse sediment deposited within the channel. Placement of Phase III test boring/monitoring wells should include the former tidal channel to gather additional data on the subsurface stratigraphy and test the hypothesis that groundwater contaminant migration may occur through tidal channel deposits.

2.3 Water Level Monitoring

In addition to the water level measurements collected prior to monitoring well redevelopment and purging, three wells were selected for continuous water level monitoring. Continuous water level recorders were installed in three of the wells at the JILF to document hourly changes in the water levels over a forty-eight hour period. Continuous water level measurements allowed for an assessment of the effects of tidal fluctuations on groundwater elevations.


N
LEGEND:
NATURAL LAND
FILLED LAND
(1945 TO EARLY 1960s)
AREA FILLED SUBSEQUENT
TO EARLY 1960s
TEST BORING LOCATION
MONITORING WELL LOCATION
(FRESH WATER)
MONITORING WELL LOCATION
(BRACKISH WATER)
MONITORING WELL LOCATION
(SEA WATER)
FORMER TIDAL CHANNEL
MODIFIED FROM:
U.S. NAVAL ACTIVITIES
SEAVEY ISLAND, KITTERY, MAINE.
EXISTING CONDITIONS MAP SEPT. 1989
CODE IDENT. NO. 80091
U.S. NAVAL BASE
PORTSMOUTH, NEW HAMPSHIRE
ACTIVITY CODE 1860-650
MANAGEMENT BUREAU-CNO
REAL ESTATE SUMMARY MAP
MB-1
MW-3
MW-2
JB-1
JW-9
JW-8
JW-10
JILF
JW-7
JB-11
MW-5
MW-4
JB-2
JW-6
JW-5
CLARK'S ISLAND
EMBAYMENT
JW-3
JW-4
CLARK'S ISLAND
NOT TO SCALE
FIGURE 2-6
JILF (SWMU #8)
GENERALIZED SUBSURFACE
COMPOSITION
McLAREN/HART

2.3.1 Monitoring Procedures

The water levels were monitored in JW-6, JW-8 and JW-9 using three In-Situ Hermit Data Logger/Processors (SE 1000B) which employed downhole pressure transducers suspended on vented polyurethane cables. The wells were prepared for continuous monitoring by lowering a pressure transducer into each well and programming the data loggers for a simultaneous first water level reading. The data loggers were programmed to take hourly water level measurements in each of the wells. The recorded measurements were printed on an In-Situ field printer and are included in Appendix IV.

2.3.2 Monitoring Results

The water levels in JW-6, JW-8, and JW-9 were continuously monitored for forty-eight hours using a Hermit Data-Logger. Well JW-6 displayed very little to no fluctuation in water level corresponding to the tidal cycle as shown in Figure 2-7. As described previously, JW-6 had a low conductivity of 600 umhos/cm and a salinity of 0°/∞, which is suggestive of a fresh water source.

The water level in JW-8 steadily decreased while displaying a very small fluctuation corresponding to the tidal cycle as shown in Figure 2-8. As described previously, JW-8 had a low conductivity of 540 umhos/cm and a salinity of 0.2°/∞, which is also suggestive of a fresh water source.

Well JW-9 displayed a rise and fall corresponding to the tidal cycles with no detectable lag time as shown in Figure 2-9. Well JW-9 displayed high conductivity and salinity readings which is indicative of estuary influence.

2.4 Soil Gas Survey

The JILF consists of a twenty-five acre tract of man-made land overlying intertidal mud flats and tidal channels that separate two original islands (Figure 2-6). The JILF has

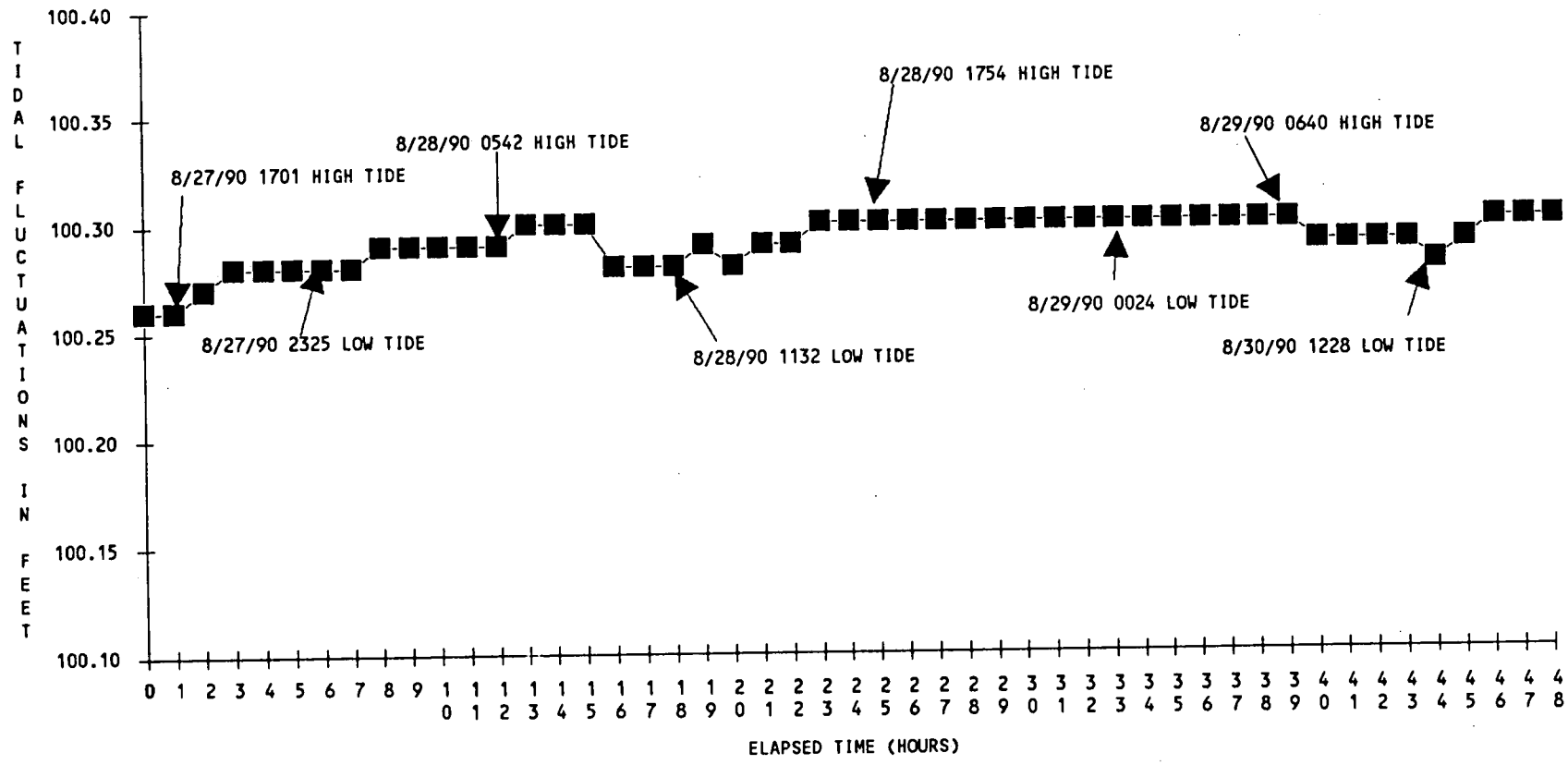


FIGURE 2-7

JILF (SWMU #8)
WATER LEVEL FLUCTUATIONS
IN JW-6

McLAREN/HART

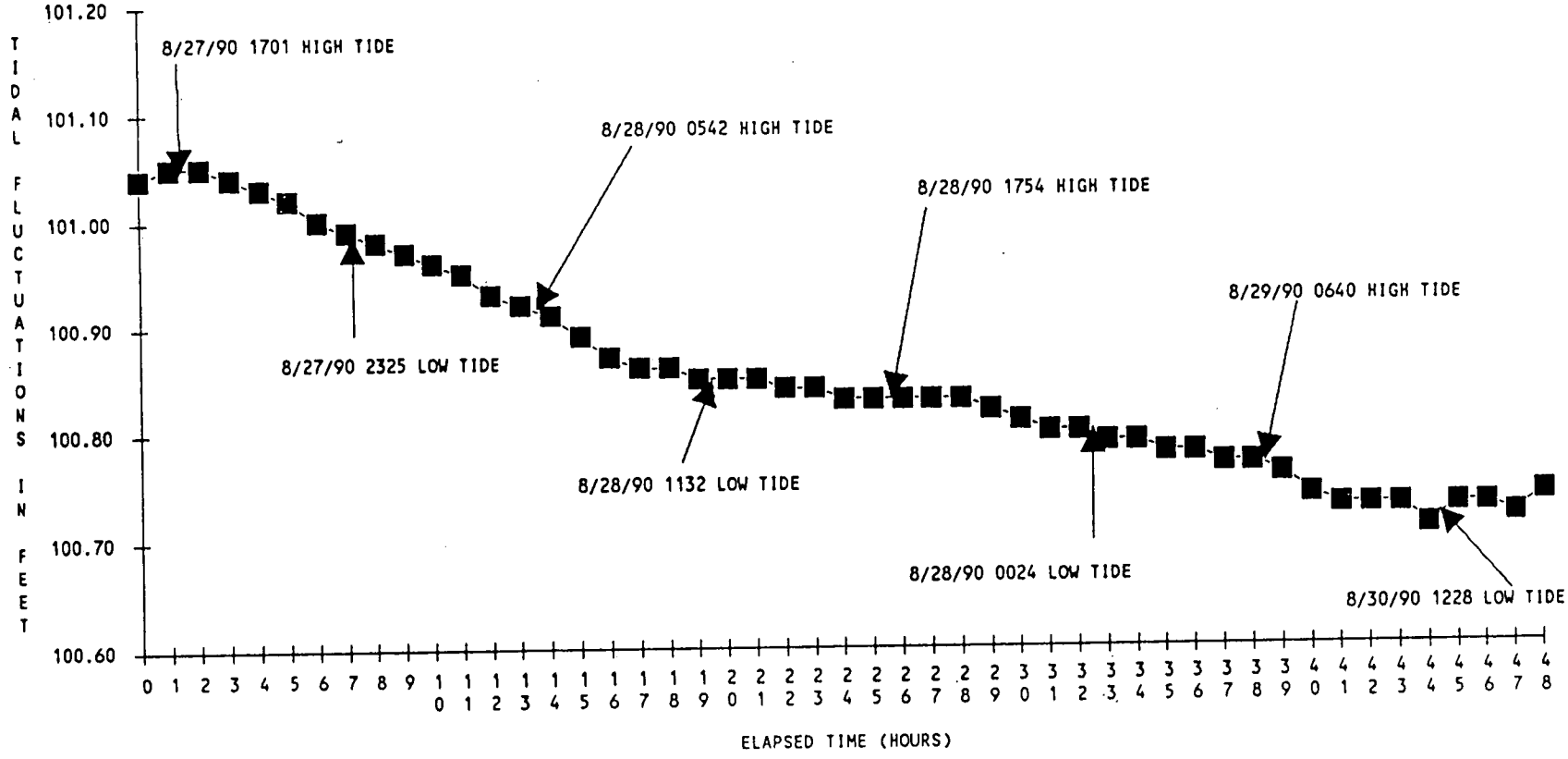


FIGURE 2-8

JILF (SWMU #8)
WATER LEVEL FLUCTUATIONS IN JW-8

McLAREN/HART

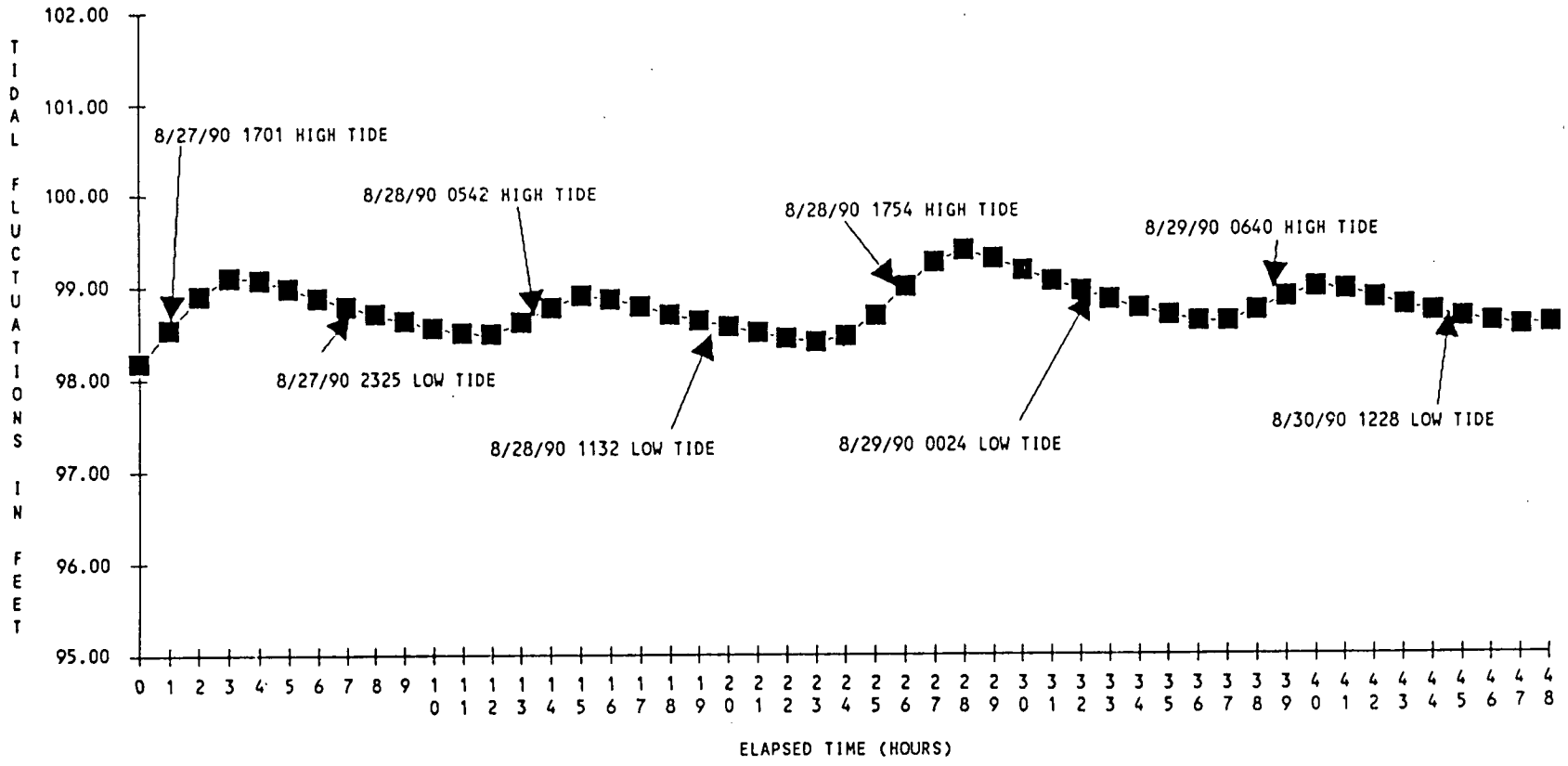


FIGURE 2-9

JILF (SWMU #8)

WATER LEVEL FLUCTUATIONS IN JW-9

McLAREN/HART

a sparsely documented history concerning the deposition of wastes and innocuous fill materials. However, the Initial Facility Characterization Report (IFCR) contains a list of the known hazardous materials disposed of within the JILF including 520,000 gallons which are potential sources of volatile organic compounds (VOCs) including trichloroethylene, methyl ethyl ketone, toluene, waste paints and solvents, etc.. These potential VOC sources could be located anywhere within the landfill and would be difficult and time consuming to locate through intrusive activities given the size and composition of the JILF.

The potential for saturated or vadose zone plume migration from these source areas via complicated and unnatural migration pathways is extremely high. This is because the water table is situated within the fill and because the fill itself is likely to be extremely heterogeneous in terms of particle size, compaction and composition.

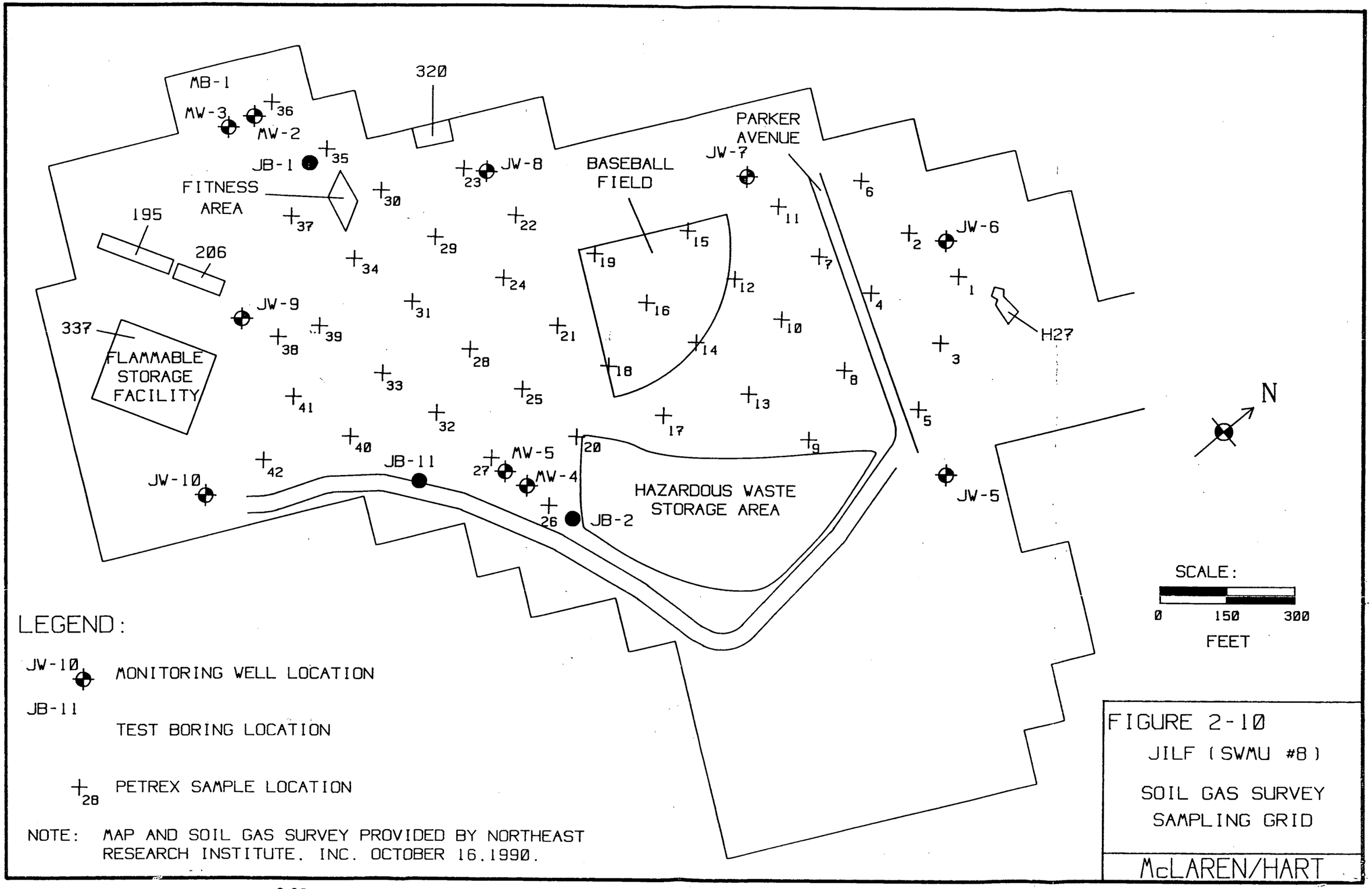
Due to these investigative constraints, a passive soil gas survey was conducted on the JILF as an initial screening process for the general location and composition of potential VOC sources and plumes. Due to their volatile nature, a map of the aerial extent of individual VOCs could be generated without intrusive activities and within a relatively short period of time by sampling soil gas emanating from the surface of the JILF.

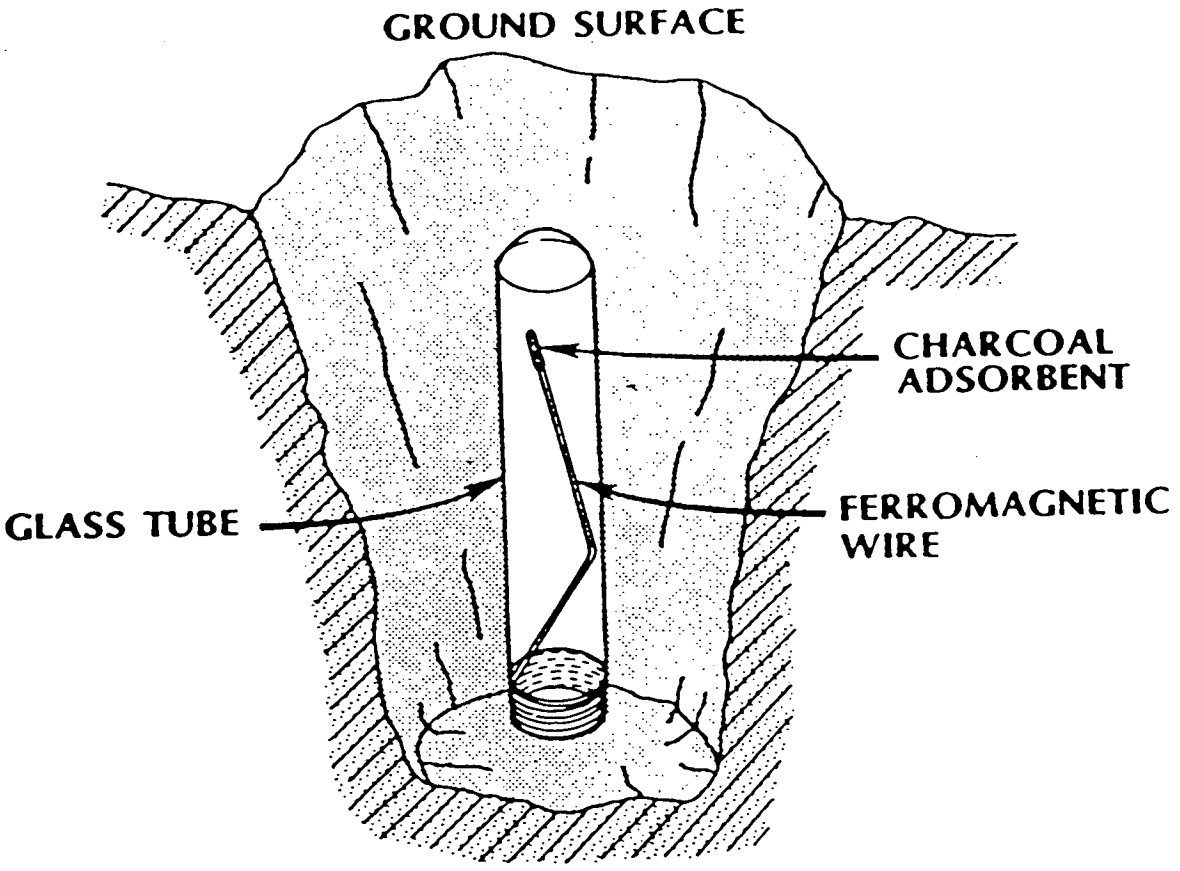
Soil gas data are always semi-quantitative in that multiple sources in soil and/or groundwater cannot be differentiated vertically. These sources can be leaking subsurface containers, residual product in the soil from surface spills or subsurface leaks and/or free-floating product on the water table, again as the result of spills or leaks. In general, horizontal differentiation between these source areas and dissolved plumes in the groundwater is often possible due to the pattern of relative VOC concentrations. Geologic heterogeneities will also affect the relative soil gas readings and should be considered when interpreting the resulting map pattern. The results of this survey were evaluated with the results of other investigative activities to focus the hydrogeologic investigation.

2.4.1 Survey Procedures

In order to accomplish the soil gas survey, a sampling grid was established over the dredge spoils area, the baseball field and the parking lot as shown on Figure 2-10. Due to the large size of the study area, a grid node spacing of approximately two hundred feet was selected. This spacing allowed for a gross determination of the extent of VOCs while keeping the number of sampling locations to a minimum. Slight variations of the position of the sampling point from the ideal grid node locations were necessary because of unpredictable subsurface impediments. A total of forty-two sampling points were incorporated in the survey.

The soil gas samples were collected using Petrex sampling tubes placed at each grid node. The Petrex method involved the use of a specially constructed static collector combined with analyses by mass spectrometry. The static collectors were placed in cored holes to a depth of forty-five centimeters and backfilled. In the JILF, this placed the probes just at or above the top of the clay cap layer at the dredge spoils area so as to not penetrate through the clay into the underlying fill material and disturb the integrity of the cap. The collectors were placed below the asphalt in the parking area north of the baseball field. The collectors then equilibrated with the soil gases for a period of nineteen days. After this period the collectors were retrieved from the field and returned to the laboratory for analysis by Curie point desorption mass spectrometry. The resulting data is a time-integrated average of the soil gas fluctuations (due to tidal influences for example) at locations just below the ground surface. This collection technique is superior to instantaneous collection techniques when a clay layer is situated between the surface and the source area as was the case at the dredge spoil area. The relative amount of each VOC is expressed as a total count of the ionized VOC fragments desorbing from the collector wire. A schematic diagram of the static collector used with this sampling method is shown in Figure 2-11.


MB-1
320
MW-3
36
MW-2
JB-1
35
FITNESS
AREA
30
23
JW-8
BASEBALL
FIELD
PARKER
AVENUE
JW-7
6
11
195
37
22
15
2
JW-6
206
29
19
7
34
24
12
1
JW-9
31
16
4
337
39
21
10
H27
38
14
FLAMMABLE
STORAGE
FACILITY
28
18
3
33
8
25
13
41
5
32
17
N
40
20
9
42
JB-11
27
MW-5
MW-4
JW-10
HAZARDOUS WASTE
STORAGE AREA
JW-5
26
JB-2
SCALE:
0
150
300
FEET
LEGEND:
JW-10
MONITORING WELL LOCATION
JB-11
TEST BORING LOCATION
28
PETREX SAMPLE LOCATION
NOTE: MAP AND SOIL GAS SURVEY PROVIDED BY NORTHEAST
RESEARCH INSTITUTE. INC. OCTOBER 16.1990.
FIGURE 2-10
JILF (SWMU #8)
SOIL GAS SURVEY
SAMPLING GRID
McLAREN/HART



ISOMETRIC VIEW

Schematic diagram of static collector used for trapping volatile organic compounds

FIGURE 2-11

JILF (SWMU #8)

SKETCH OF SOIL GAS COLLECTOR

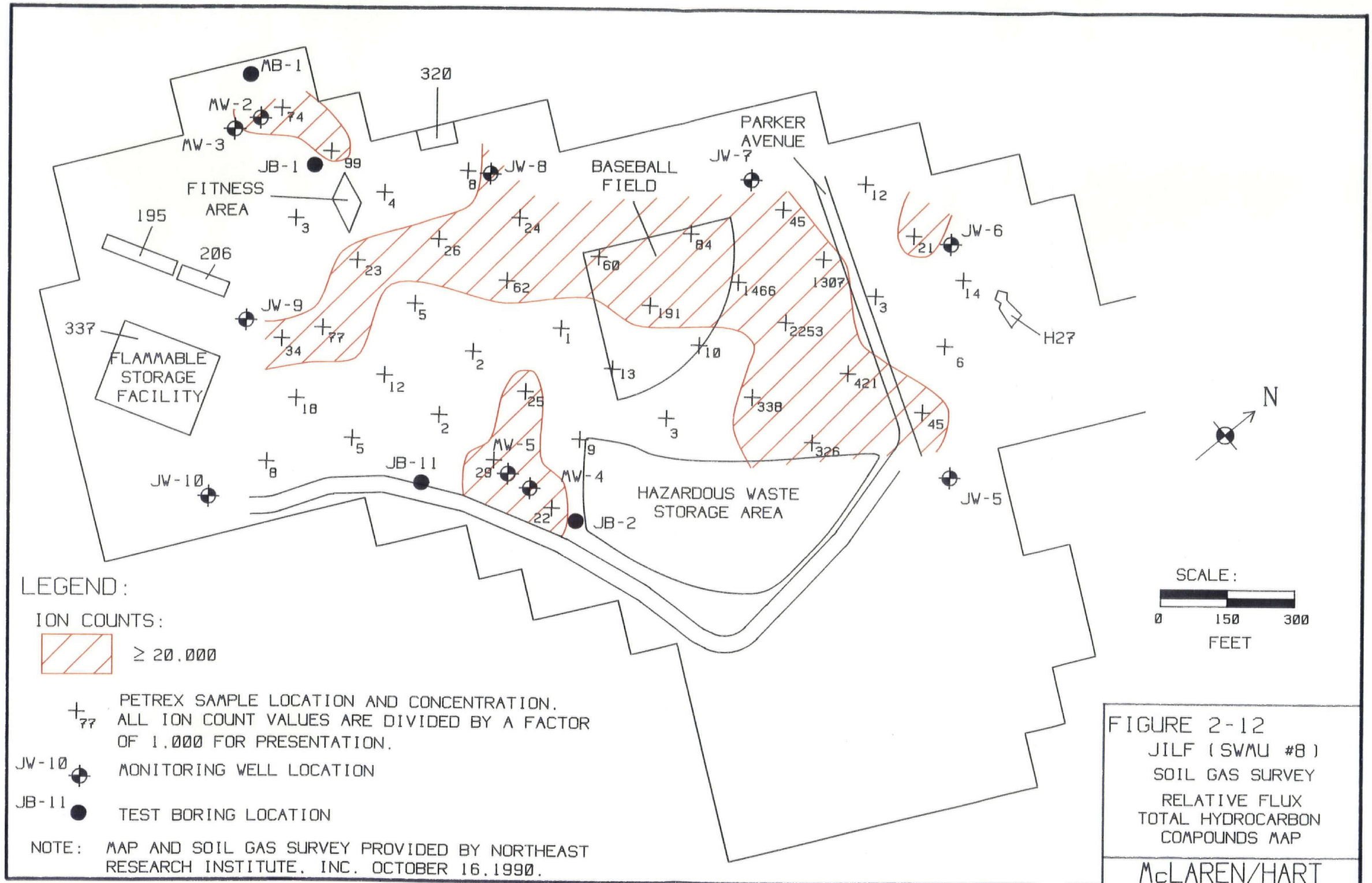
McLAREN/HART

SOURCE: PETREX MAPS, A CASE HISTORY:SURFACE STATIC COLLECTION AND ANALYSIS OF CHLORINATED HYDROCARBONS FROM CONTAMINATED GROUND WATER. MALLEY, BATH.& BONGERS 1985.

2.4.2 Survey Results

The total ion count at each sampling point for total petroleum hydrocarbons, aromatic hydrocarbons (i.e., benzene, toluene, ethylbenzene and xylenes), trichloroethene (TCE) and tetrachloroethene (PCE) are plotted on Figures 2-12 through 2-15, respectively. In each map, the regions of sampling locations exhibiting greater ion counts have been contoured in order to visually separate them from areas which generally have orders of magnitude lower ion counts. The resulting pattern on Figures 2-12, 2-13, and 2-14 indicate several large areas of high ion counts distributed throughout the survey area. Within the contoured zones there are generally greater ion counts from the samples collected below the parking lot than at other contoured areas. This is most likely due to the relative inability for VOCs to vent from the subsurface due to the overlying asphalt. The VOC vapors are confined by this cap and therefore tend to build up to artificially higher concentrations in the shallow subsurface than at uncapped areas. This effect was not observed at the dredge spoils area because the sample collectors were situated above the clay cap covering this area and are therefore artificially low. This discrepancy must be taken into account when contouring and evaluating the zones of higher ion counts. In addition, it should be noted that very few locations had zero ion counts for any particular VOC. Low ion counts were found at nearly all sampling locations outside of the contoured areas.

The petroleum hydrocarbon soil gas map (Figure 2-12) is a sum total of the individual VOC ion count for petroleum products such as alkanes, simple aromatics and cycloalkane/alkene compounds. This map shows one large major soil gas anomaly ($\geq$20,000 ion counts) trending roughly north-south from the parking lot, through the western part of the baseball field and across the center of the dredge spoils area. Three smaller anomalies are also present west of the fitness area, south of the hazardous waste storage area and at


MB-1
320
MW-2
74
MW-3
JB-1
99
FITNESS AREA
195
206
JW-8
BASEBALL FIELD
PARKER AVENUE
JW-7
JW-6
H27
JW-9
337
FLAMMABLE STORAGE FACILITY
MW-5
MW-4
JB-11
JW-10
HAZARDOUS WASTE STORAGE AREA
JB-2
JW-5
N
SCALE:
0
150
300
FEET
LEGEND:
ION COUNTS:
≥ 20.000
PETREX SAMPLE LOCATION AND CONCENTRATION. ALL ION COUNT VALUES ARE DIVIDED BY A FACTOR OF 1.000 FOR PRESENTATION.
JW-10 MONITORING WELL LOCATION
JB-11 TEST BORING LOCATION
NOTE: MAP AND SOIL GAS SURVEY PROVIDED BY NORTHEAST RESEARCH INSTITUTE, INC. OCTOBER 16,1990.
FIGURE 2-12
JILF (SWMU #8)
SOIL GAS SURVEY
RELATIVE FLUX
TOTAL HYDROCARBON
COMPOUNDS MAP
McLAREN/HART

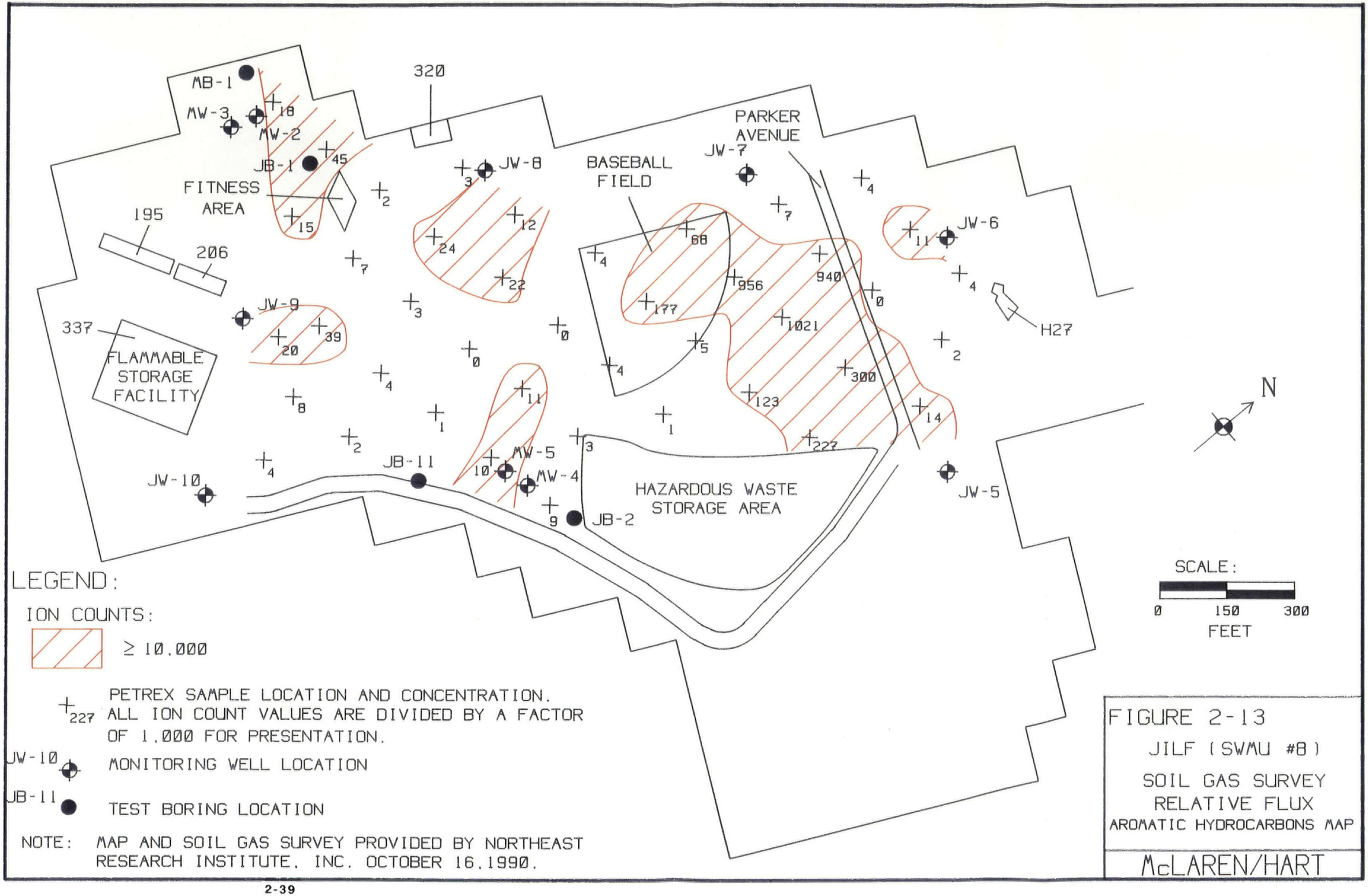
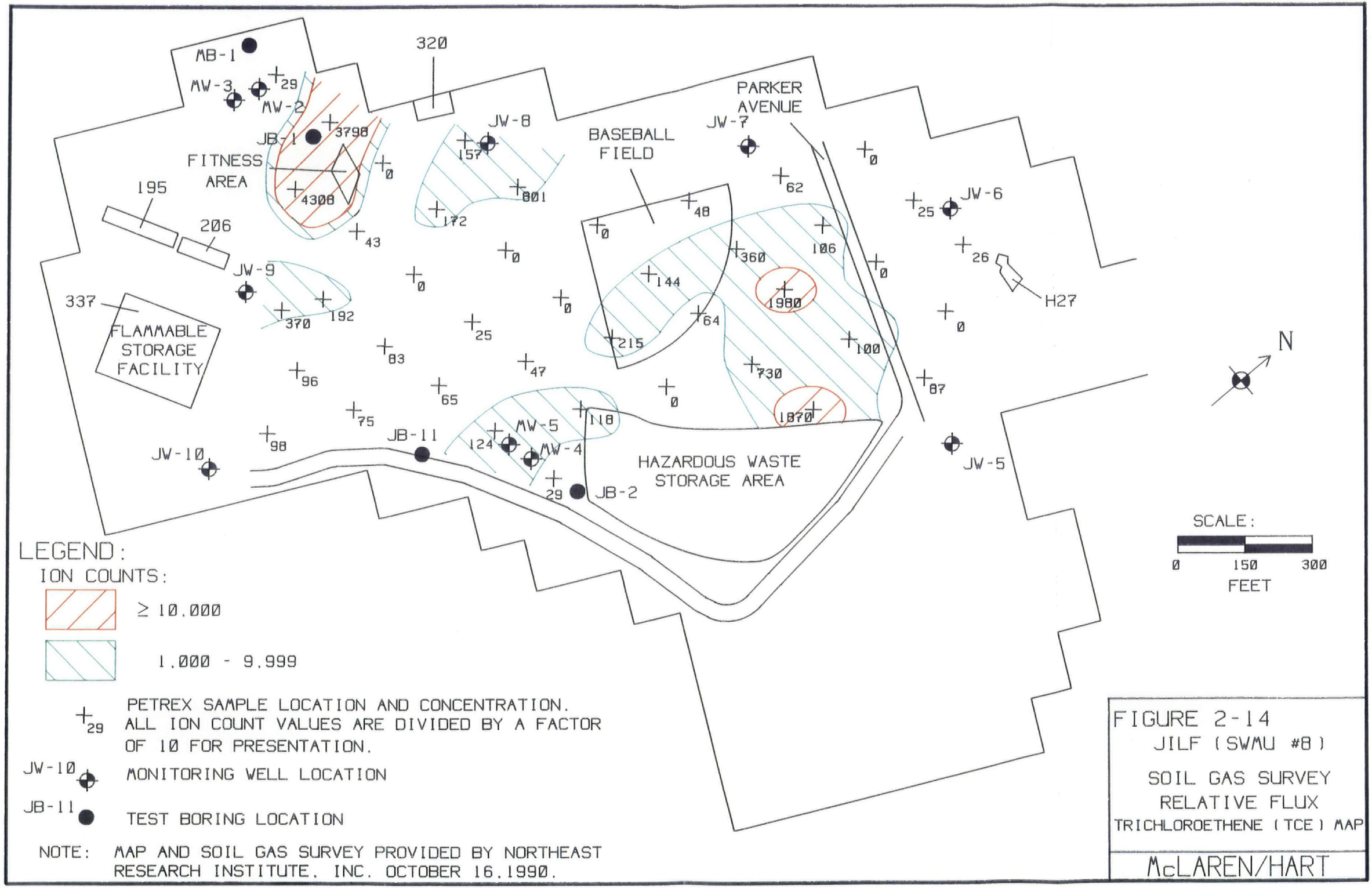
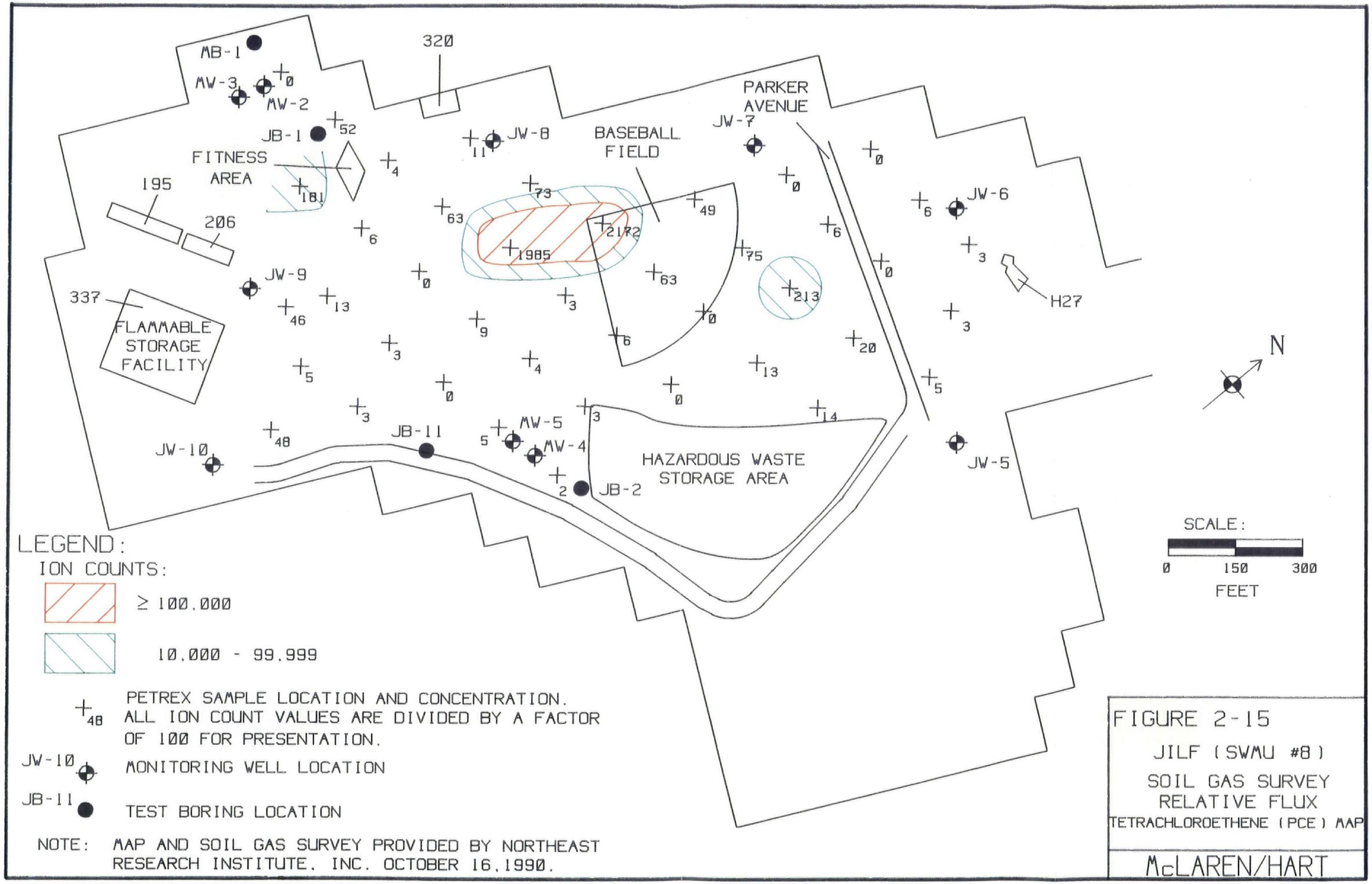


FIGURE 2-13

JILF (SWMU #8)

SOIL GAS SURVEY
RELATIVE FLUX
AROMATIC HYDROCARBONS MAP


MB-1
MW-3
29
MW-2
320
JB-1
3798
FITNESS
AREA
4308
0
195
206
43
JW-8
157
801
172
BASEBALL
FIELD
PARKER
AVENUE
JW-7
0
62
48
0
360
106
144
1980
64
215
100
730
1870
87
JW-6
25
26
H27
0
JW-9
370
192
337
FLAMMABLE
STORAGE
FACILITY
0
25
83
47
96
65
0
75
118
98
JB-11
MW-5
124
MW-4
JW-10
HAZARDOUS WASTE
STORAGE AREA
29
JB-2
JW-5
N
SCALE:
0
150
300
FEET
LEGEND:
ION COUNTS:
≥ 10,000
1,000 - 9,999
29
PETREX SAMPLE LOCATION AND CONCENTRATION.
ALL ION COUNT VALUES ARE DIVIDED BY A FACTOR
OF 10 FOR PRESENTATION.
JW-10
MONITORING WELL LOCATION
JB-11
TEST BORING LOCATION
NOTE: MAP AND SOIL GAS SURVEY PROVIDED BY NORTHEAST
RESEARCH INSTITUTE, INC. OCTOBER 16,1990.
FIGURE 2-14
JILF (SWMU #8)
SOIL GAS SURVEY
RELATIVE FLUX
TRICHLOROETHENE (TCE) MAP
McLAREN/HART


MB-1
320
MW-3
MW-2
PARKER AVENUE
JB-1
JW-8
BASEBALL FIELD
JW-7
FITNESS AREA
195
206
JW-6
JW-9
337
FLAMMABLE STORAGE FACILITY
H27
N
JW-10
JB-11
MW-5
MW-4
HAZARDOUS WASTE STORAGE AREA
JB-2
JW-5
SCALE:
0
150
300
FEET
LEGEND:
ION COUNTS:
≥ 100,000
10,000 - 99,999
PETREX SAMPLE LOCATION AND CONCENTRATION. ALL ION COUNT VALUES ARE DIVIDED BY A FACTOR OF 100 FOR PRESENTATION.
MONITORING WELL LOCATION
TEST BORING LOCATION
NOTE: MAP AND SOIL GAS SURVEY PROVIDED BY NORTHEAST RESEARCH INSTITUTE, INC. OCTOBER 16,1990.
FIGURE 2-15
JILF (SWMU #8)
SOIL GAS SURVEY
RELATIVE FLUX
TETRACHLOROETHENE (PCE) MAP
McLAREN/HART

one sampling location at the northern edge of the survey area. The aromatics soil gas map (Figure 2-13) shows the same general pattern except that the main anomaly seen on the total hydrocarbon soil gas map is separated into three smaller anomalies (≥ 10,000 ion counts). The aromatics data is a subset of the data used to complete Figure 2-12 and generally defines the portion of the total hydrocarbon anomalies represented by the most volatile constituents of fuels such as BTEX.

The distribution of major soil gas anomalies for the two chlorinated compounds TCE and PCE are only partly similar to each other. The zones of TCE soil gas with ion counts ≥ 1,000 (Figure 2-14) is similar to the distribution of aromatic VOCs seen in Figure 2-13. The greatest ion counts for TCE, however, were found at the fitness area (>38,000 ion counts) with two sampling locations exhibiting ion counts > 19,000 in the parking lot. There were only four sampling locations where PCE soil gas was detected at ion counts ≥ 10,000 (Figure 2-15). While two of these locations were around the fitness area and parking lot (where there are also TCE anomalies) the other two locations were situated around and south of home plate at the baseball field. This latter anomaly had ion counts > 100,000 and is not coincident with any of the TCE anomalies.

2.4.3. Interpretations/Discussion

Each of the soil gas maps exhibit large areas with relatively high ion counts (≥ 1,000 or 10,000) which appear as anomalies compared to the relatively low ion counts (≤ 1,000) surrounding these areas. High ion count anomalies such as these are commonly an indication of VOC source areas (product) proximal to the sampling location. As mentioned earlier, these sources can be indicative of containers of product, free-floating product (in the case of non-chlorinated hydrocarbons) and/or residual product (both chlorinated and non-chlorinated hydrocarbons) bound to soil particles in the vadose zone. Thus the anomalies

delineated by the survey indicate the presence of either large continuous VOC sources or multiple closely spaced smaller ones. In either case, VOC source areas (anomalies) occupy such a significant fraction of the survey area (especially the total petroleum hydrocarbons shown on Figure 2-12) that the JILF should be treated as one collective source.

The impact of these VOC sources on groundwater quality is most likely reflected in the almost total lack of zero ion counts at sampling locations outside of the major anomalies. The widespread occurrence of lower ion counts may be indicative of soil gas VOCs emanating from plumes of dissolved product in the groundwater within the JILF. In an ideal situation where the potential source area is much smaller than the survey area, the groundwater plume is situated in natural materials and the hydraulic gradient maintains a generally consistent direction. It is usually possible to identify the groundwater flow direction from a curvilinear pattern of lower ion counts terminating at the high ion count source area. However, at the JILF, the groundwater may flow in different directions during the course of the day due to the presence of tidal fluctuations, restricted pathways (old channels) and different degrees of permeability within the fill material. In essence, any direction may be downgradient from the source areas at some point during the day with the result that dissolved VOCs are spread from the source areas in many directions.

In addition to this effect, there is also the possibility that many small VOC sources may be scattered throughout the areas surrounding the major VOC source anomalies. A grid spacing of 200 feet will not resolve these individual small sources unless they were close to a grid node or were so closely spaced as to represent a large source. Their effect would be detected by low ion counts similar to those seen outside the major anomalies due to lateral migration of VOC soil gas in the vadose zone.

In summary, the soil gas anomalies shown in Figures 2-12 through 2-15 would appear to represent the current location for each of the VOCs delineated. The relatively large area encompassed by the non-chlorinated total petroleum hydrocarbons (Figure 2-12) compared to the TCE and PCE anomalies may be partially due to lateral spreading of product on the water table within the JILF. Chemical compounds such as TCE and PCE may sink below the water table if the concentration exceeds approximately 10 ppm, and may spread out laterally on the original tidal flat muds below the water table. The major anomalies for the compounds might also be representative of residual product bound to the soil above the water table. Almost all of the anomalies delineated for each VOC are generally spatially coincident suggesting common disposal locations for both petroleum and chlorinated solvents. The exceptions are the major PCE soil gas anomaly around and south of home plate which does not correspond to any TCE anomaly, and the limited extent of other PCE anomalies.

While there are clearly several large VOC source areas within the JILF, the areas around the major anomalies also show persistent low ion counts. These results are probably due to a combination of dissolved VOCs within the groundwater and many very small VOC sources. The determination of a prevalent groundwater flow direction within the JILF cannot be determined because of the multitude and extent of possible sources and the lack of visible trends within the areas of lower ion counts. This goal is probably also mitigated by the influence of complex hydrogeologic conditions (tides, restricted pathways and permeability variations) within the JILF.

The soil gas survey has determined that the JILF can be treated as one large VOC source that should be examined primarily as a single entity with regard to these compounds. The large extent of VOC anomalies and complex hydrogeologic conditions appear to have

influenced the groundwater quality throughout the study area with no prevalent downgradient direction discernable within the JILF. A higher resolution soil gas survey would be redundant in this scenario. The 200 foot grid could be expanded to cover all filled areas and bordering land in order to characterize these zones. Because groundwater should "mound" underneath the islands, these areas are likely to be free of VOCs (unless disposal has taken place there as well) because they are upgradient of groundwater within the JILF. The only areas that would appear to be potentially downgradient of the JILF are underwater and obviously are not conducive to soil gas analyses.

Overlays generated from soil gas survey results were compared to the gradient magnetic field survey (GMF), conducted during Phase I activities, to determine if potential source areas for volatile organic compounds can be identified. A large GMF value of 3,004 gammas was recorded in the vicinity of home plate at the baseball field. This data strongly suggests the presence of ferrous metal objects in the shallow subsurface in this area. A GMF measurement of 1,923 gammas was recorded in the southeastern section of the baseball field, suggesting the presence of shallow targets in this area also. A detailed discussion of the magnetic survey can be found in the Phase I report.

The total hydrocarbon compounds overlay shows a plume of total petroleum hydrocarbons (TPH) passing through the home plate anomaly as shown in Figure 2-16. Based on the information present, a direct correlation between the TPH plume and the anomaly as the source area can not be made. There does not appear to be any correlation between high ion counts of aromatic hydrocarbons or trichloroethene (TCE) and the magnetic anomalies shown in Figures 2-17 and 2-18, respectively. A correlation can be made between high ion counts of tetrachloroethene (PCE) and the home plate anomaly shown in Figure 2-19. This area may be a potential source area for PCE.

TABLE 4-6 (CONTINUED)

SUMMARY OF METAL CONCENTRATIONS--SOIL EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND/OR PROPOSED FEDERAL ACTION LEVELS

DRMO (SWMU #6) PORTSMOUTH NAVAL SHIPYARD

OCTOBER 31--NOVEMBER 10, 1989

PARAMETER	McLAREN/HART SAMPLE I.D.	CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)	PROPOSED FEDERAL ACTION LEVEL (PPM)
CHROMIUM	DSB-1D(0-2')+	105.00J	100.0	400.0
	DSB-2(0-2')	134.00J	100.0	400.0
	DSB-2(2-4')*	133.00J	100.0	400.0
COPPER	DSB-1(0-2')	410.00J	170.0	NA
	DSB-1D(0-2')+	341.00J	170.0	NA
	DSB-2(0-2')	1460.00	170.0	NA
	DSB-2(2-4')*	1410.00	170.0	NA
	DSB-2(5-7')	979.00	170.0	NA
	DSB-3(0-2')	412.00J	170.0	NA
	DSB-4(1-3')	542.00	170.0	NA
	DSB-6A(0-2')	193.00	170.0	NA
	DSB-6C(0-2')	541.00J	170.0	NA
	DSB-6C(2-4')**	223.00J	170.0	NA
	DSB-7(0-2')	477.00	170.0	NA
	DSB-7(2-4')***	1180.00	170.0	NA
LEAD	DSB-1(0-2')	3140.00J	250-1,000	NA
	DSB-1D(0-2')+	4330.00J	250-1,000	NA
	DSB-2(0-2')	26300.00	250-1,000	NA
	DSB-2(2-4')*	26600.00	250-1,000	NA
	DSB-2(5-7')	9310.00	250-1,000	NA
	DSB-3(0-2')	130000.00	250-1,000	NA
	DSB-4(1-3')	911.00	250-1,000	NA
	DSB-5(0-2')	1960.00J	250-1,000	NA
	DSB-5(5-7')	2360.00J	250-1,000	NA
	DSB-6A(0-2')	59500.00	250-1,000	NA
	DSB-6C(0-2')	2680.00	250-1,000	NA
	DSB-6C(2-4')**	5330.00	250-1,000	NA
	DSB-7(0-2')	5980.00	250-1,000	NA
	DSB-7(2-4')***	7570.00	250-1,000	NA

J = Qualitative and Semi-Quantitative
NA = Not Available
+ = RAI Duplicate per NEESA Program 20.2-047B
* = McLAREN/HART Duplicate Sample of DSB-2(0-2')
** = McLAREN/HART Duplicate Sample of DSB-6C(0-2')
*** = McLAREN/HART Duplicate Sample of DSB-7(0-2')

LEGEND:

GROUNDWATER MONITORING WELL LOCATION

TEST BORING LOCATION

CONTOUR LINE (400 GAMMA CONTOUR INTERVAL)

TOTAL HYDROCARBON COMPOUND ION COUNTS:

≥ 20,000

SCALE:

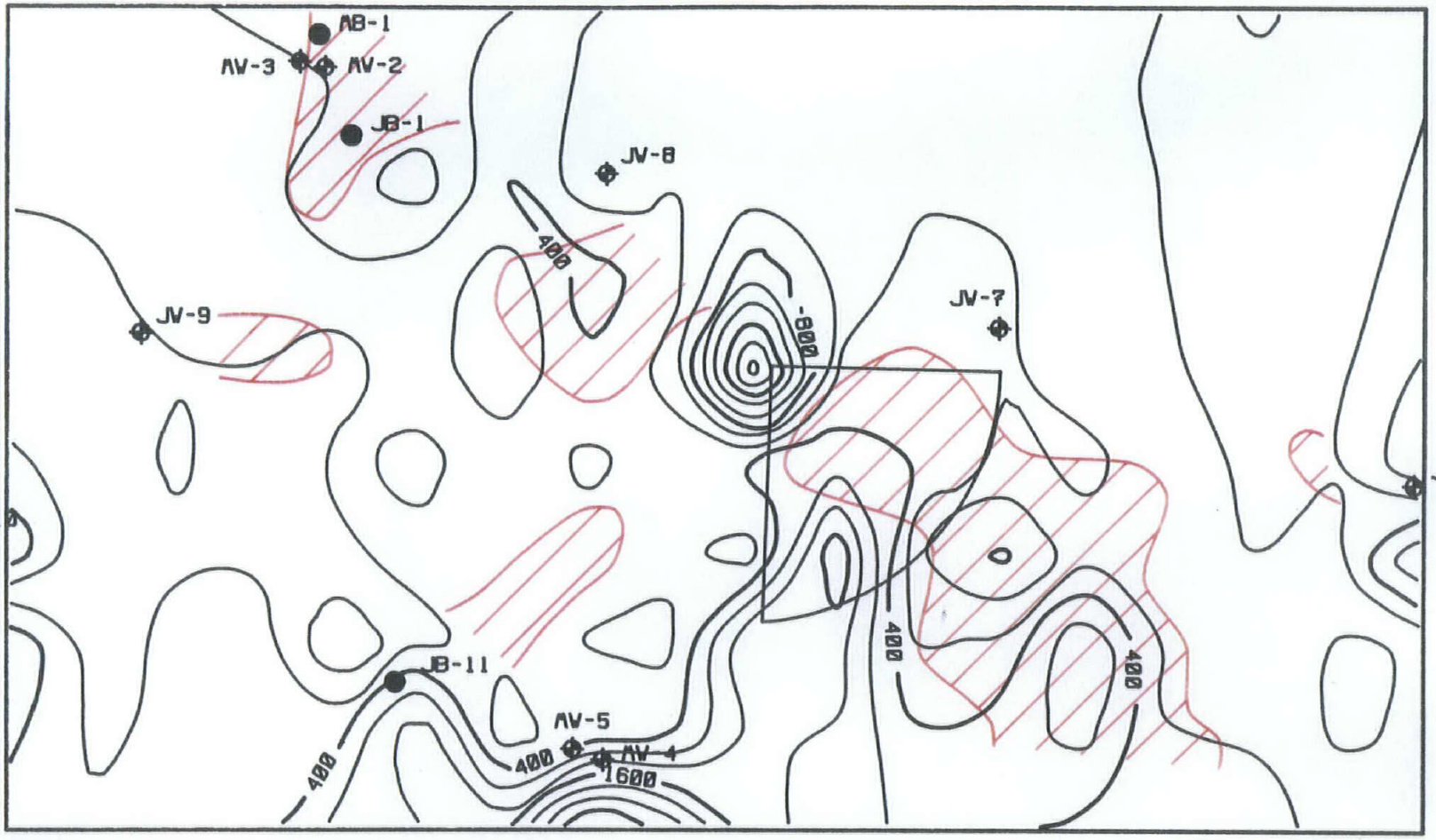
100 FEET

N

NOTE: SOIL GAS SURVEY PROVIDED BY NORTHEAST RESEARCH INSTITUTE, INC. OCTOBER 16, 1990.

FIGURE 2-16
JILF (SWMU #8)
GRADIENT MAGNETIC FIELD SURVEY (GMF)
SOIL GAS SURVEY OVERLAY
TOTAL HYDROCARBON COMPOUNDS

McLAREN/HART



LEGEND:

- GROUNDWATER MONITORING WELL LOCATION
- TEST BORING LOCATION
- CONTOUR LINE (400 GAMMA CONTOUR INTERVAL)
- AROMATIC HYDROCARBON ION COUNTS: ≥ 10,000

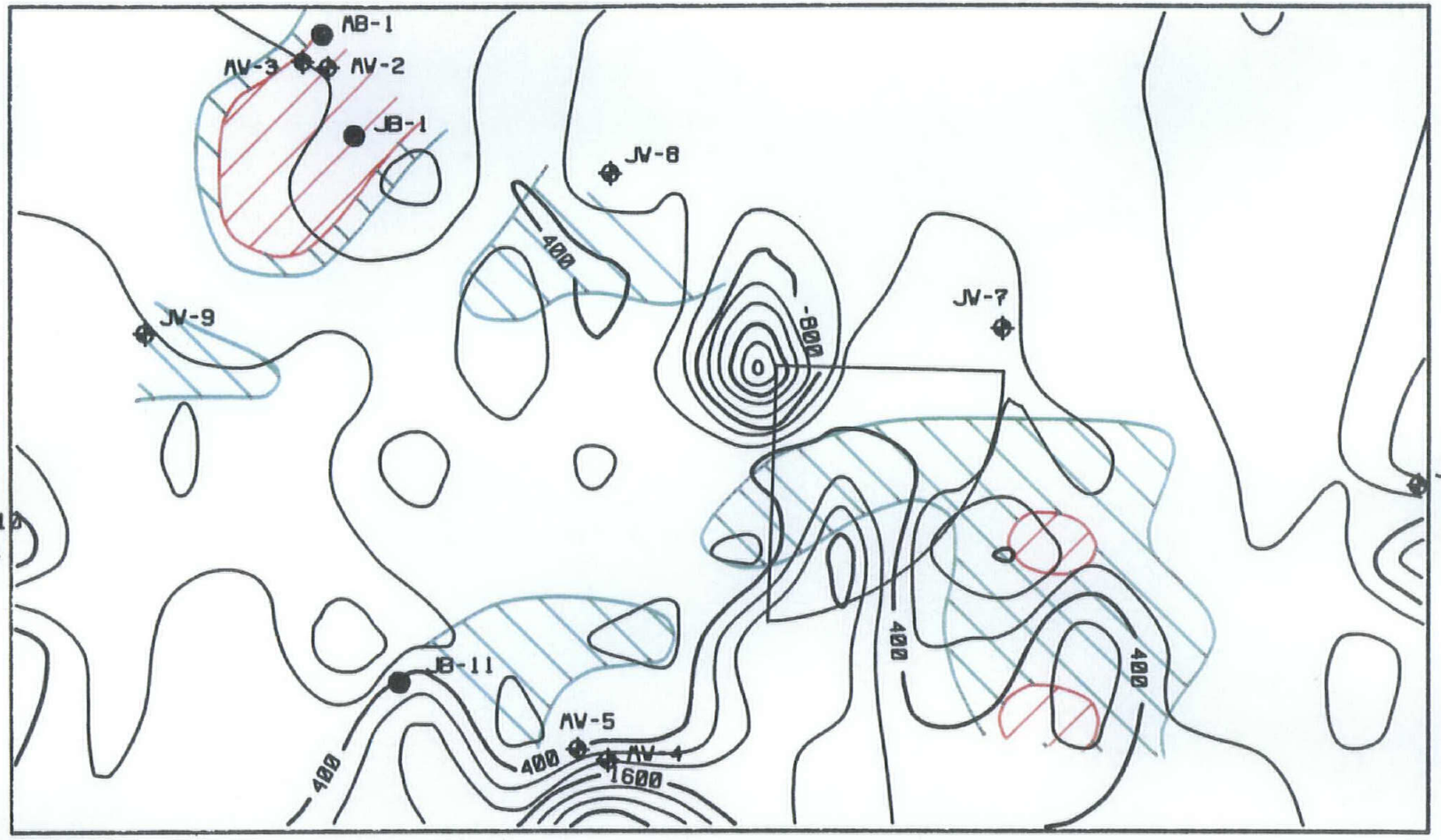
SCALE: 100 FEET

N

NOTE: SOIL GAS SURVEY PROVIDED BY NORTHEAST RESEARCH INSTITUTE, INC. OCTOBER 16, 1990.

FIGURE 2-17
JILF (SWMU #8)
GRADIENT MAGNETIC FIELD SURVEY (GMF)
SOIL GAS SURVEY OVERLAY
AROMATIC HYDROCARBON

McLAREN/HART



LEGEND:

GROUNDWATER MONITORING WELL LOCATION

TEST BORING LOCATION

CONTOUR LINE (400 GAMMA CONTOUR INTERVAL)

TRICHLOROETHENE (TCE) ION COUNTS:

≥ 100,000

10,000 - 99,999

SCALE:

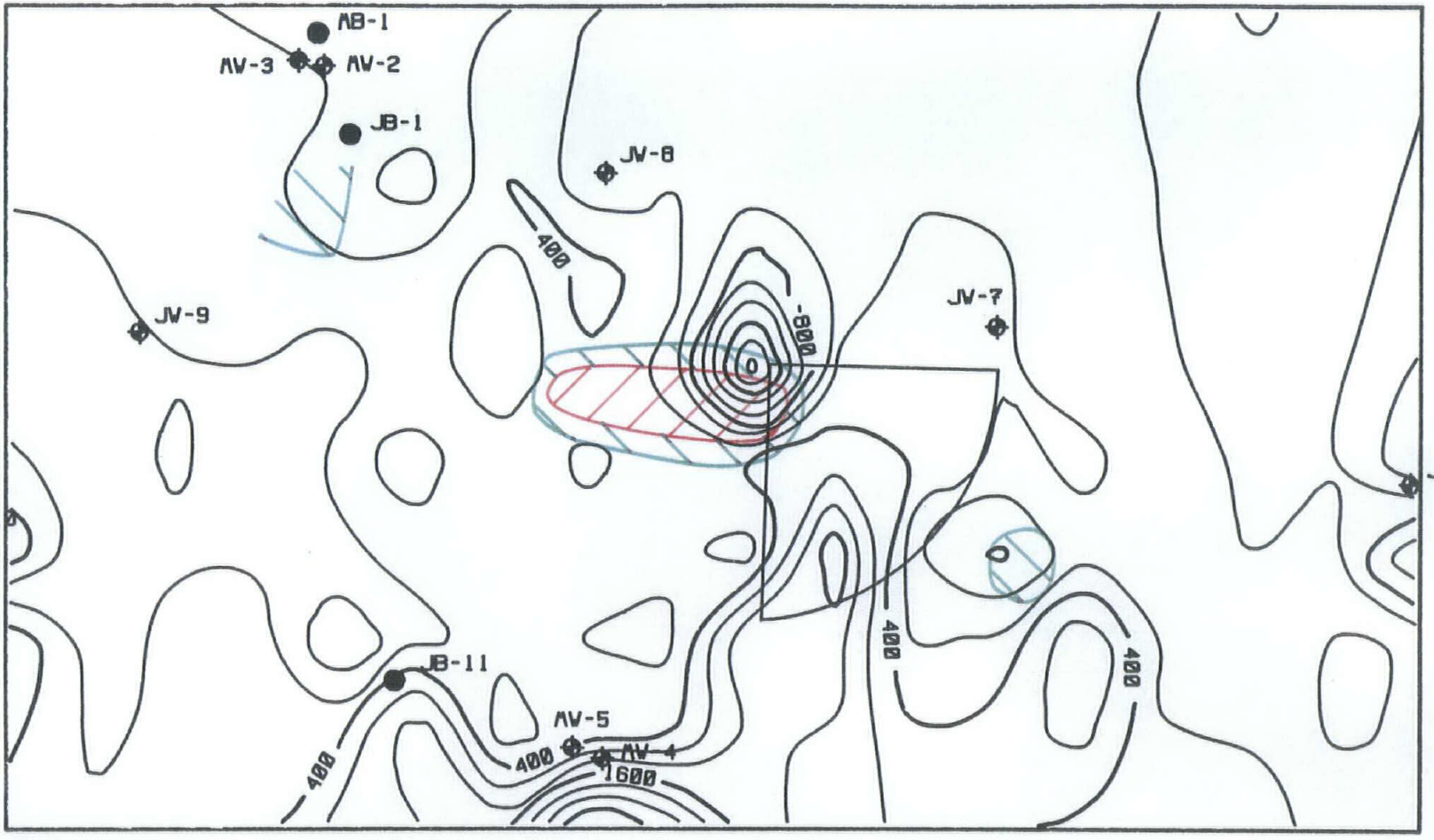
100 FEET

N

NOTE: SOIL GAS SURVEY PROVIDED BY NORTHEAST RESEARCH INSTITUTE, INC. OCTOBER 16, 1990.

FIGURE 2-18
JILF (SWMU #8)
GRADIENT MAGNETIC FIELD SURVEY (GMF)
SOIL GAS SURVEY OVERLAY
TRICHLOROETHENE (TCE)

McLAREN/HART



LEGEND:

- GROUNDWATER MONITORING WELL LOCATION
- TEST BORING LOCATION
- CONTOUR LINE (400 GAMMA CONTOUR INTERVAL)

TETRACHLOROETHENE (PCE) ION COUNTS:

- ≥100,000
- 10,000 - 99,999

NOTE: SOIL GAS SURVEY PROVIDED BY NORTHEAST RESEARCH INSTITUTE, INC. OCTOBER 16, 1990.

SCALE: 100 FEET

N

FIGURE 2-19
JILF (SWMU #8)
GRADIENT MAGNETIC FIELD SURVEY (GMF)
SOIL GAS SURVEY OVERLAY
TETRACHLOROETHENE (PCE)

McLAREN/HART

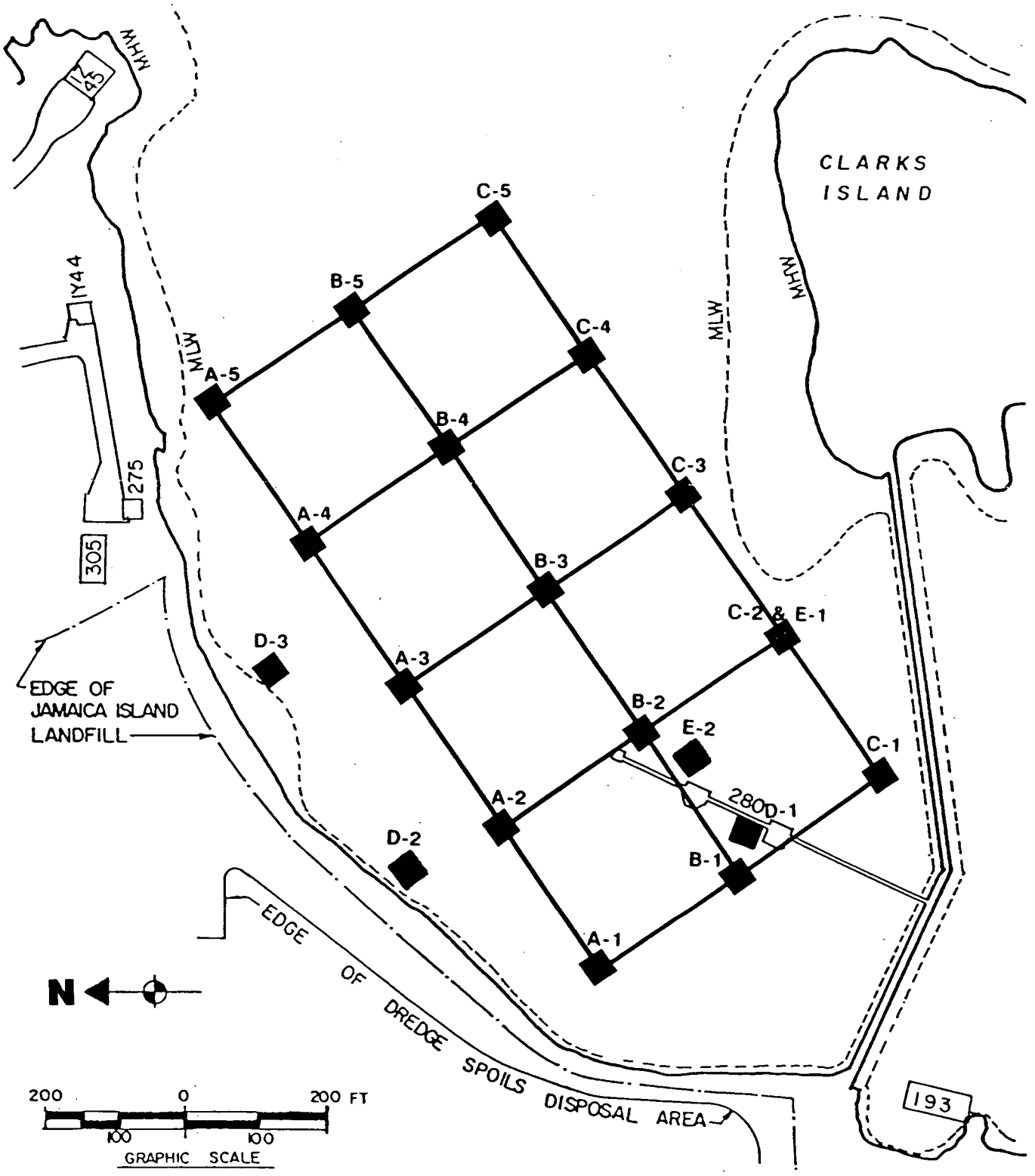
2.5 Off-Shore Sediment Sampling

Off-shore sediment sampling was conducted in Clark's Island Embayment on August 20 and 21, 1990. Sediment was collected from a total of twenty sample points in the embayment for submission to the laboratory. The purpose of the sediment sampling was to evaluate any potential contamination in the sediment of the embayment and assess the origin of any contamination.

2.5.1 Off-Shore Sediment Sampling Procedures

A fifteen point sampling grid and five judgmental sediment locations were used to sample the Clark's Island Embayment as shown in Figure 2-20. RAI performed all sampling under the supervision of McLaren/Hart personnel. RAI obtained fifteen surface sediment samples, plus one duplicate sample from the grid. In addition, three surface sediment locations, plus one duplicate, were sampled in the area of the "hot spots" as defined in the Loureiro Engineering Associates (LEA), June 1986, Final Confirmation Study Report. Two more surface sediment samples were collected in the vicinity of Clark's Island. All sampling locations were defined using LORAN and fixed point headings.

Surface sediments were sampled using a ponar dredge. Sediment from the dredge was placed into a clean stainless-steel bowl. Volatile samples were placed in laboratory-supplied bottles before any mixing of the sample took place. The remaining sediment was mixed and the bottles were filled using a clean stainless-steel trowel. Nineteen of the surface sediment samples were analyzed for TCL volatiles, acid extractables, TCL pesticide/PCBs, total organic carbon (TOC), total petroleum hydrocarbons (TPH), and priority pollutant metals. One surface sediment sample was analyzed for all the compounds listed in Appendix IX and TOC.



KEY

■ SEDIMENT SAMPLE LOCATION

MODIFIED AFTER LOUREIRO

FIGURE 2-20

JILF (SWMU #8)

CLARK'S ISLAND EMBAYMENT SEDIMENT SAMPLES (APPROXIMATE LOCATIONS)

McLAREN/HART

In addition to the surface sediment samples, six core samples plus one duplicate sample and one equipment rinseate field blank were collected in the area of the "hot spots". A hand core was used to sample the subsurface sediment. The hand core used was composed of:

1) A 3-foot long core barrel, with a core cutter on one end and a swiveled connection on the other end.
2) Plastic core liners and core catchers that are inserted inside the core barrel and held in place by the core catcher.
3) A "T" handle with 5 to 6 foot extension pieces enabling the corer to be used in 25 feet of water.

The hand core was lowered to the bottom and then pushed into the sediment. The core was retrieved and the core liner containing the sediment removed. The cored intervals sampled were 10"-12" and 16"-18" below the sediment/water interface. Each core interval was analyzed for TCL pesticide/PCBs, TOC and priority pollutant metals. A summary of the core sediment sample identifications is given below.

Cored Sediment Samples
Clark's Island Embayment

D1 (10-12")	D1 (16-18")
D2 (10-12")	D2 (16-18")
D3 (10-12")	D3 (16-18")

D1B (10-12") Duplicate of D1 (10-12")

All equipment involved with sampling was decontaminated before use at each location. This equipment included the ponar dredge, core cutter, stainless-steel trowels and stainless-steel bowls. Equipment was decontaminated prior to use as described in Table 2-2.

A new core liner and core catcher was used at each core location. All samples were transported by RAI to their laboratory for analysis under proper chain-of-custody procedures.

2.5.2 Findings

The majority of the Clark's Island Embayment sediment samples consisted of dark brown to black mud with varying amounts of sand. Differences from this description occur at sample points B-1 where a sulfur smell was noted, B-3 where there was grey mud and C-4 and C-5 where brown sandy clay was found. With the exception of the sulfur smell at B-1, no other odors or visual signs of potential contamination were observed.

In addition to the surface sediment samples, six core samples were collected from three locations as discussed in Section 2.5.1. All three locations contained black mud with no odors or visual evidence of potential contamination.

2.5.3 Laboratory Analytical Results

A summary of valid surface sediment sample results are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

The State of Maine does not have any published clean-up guidelines for contamination in soils, therefore, New Jersey ECRA Guidance Values and proposed Federal Action Levels documented in the Federal Register (55 FR 30865, July 27, 1990) are used for comparison purposes.

TCL Volatiles

There were no volatile concentrations above the proposed Federal Action Levels, however, a total volatile concentration of 1.13 ppm found in sample D3B (duplicate of D3A) exceeds the New Jersey ECRA Guidance Value of 1 ppm for total volatiles.

Semi-Volatiles (Appendix IX)

No detectable semi-volatile concentrations were found in sediment sample C5. No other samples were analyzed for semi-volatile compounds.

Acid Extractables

No detectable acid extractable concentrations were found in any of the sediment samples.

TCL Pesticide/PCBs

No detectable pesticide/PCB concentrations were found in any of the sediment samples.

Herbicides (Appendix IX)

No detectable herbicide concentrations were found in sediment sample C5. No other samples were analyzed for herbicide compounds.

Total Organic Compounds (TOC)

TOC concentrations were found ranging from 0.13% to 3.2% in all sediment samples. These concentrations are indicative of the grain size variation in the sediment. The higher TOC concentrations are found in the lower energy environment where finer material tends to accumulate.

TPH

All surface sediment samples show detectable concentrations and semi-quantitative estimates of TPH ranging from 140 ppm to 780 ppm. All of these surface sediment samples exceed the New Jersey ECRA Guidance Value of 100 ppm. TPH is not a listed contaminant under proposed Federal Action Levels. Table 2-9 summarizes all sediment samples with TPH concentrations exceeding the New Jersey ECRA Guidance Value. Neither surface sediment sample C5 nor any of the cored sediment samples were analyzed for TPH.

TABLE 2-9

SUMMARY OF TPH CONCENTRATIONS--SEDIMENT EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES

CLARK'S ISLAND EMBAYMENT (SWMU #8)
PORTSMOUTH NAVAL SHIPYARD

AUGUST 21, 1990

McLAREN/HART SAMPLE I.D.	TPH CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)
A1	680	100
A2	700J	100
A3	540J	100
A4	600J	100
A5	640J	100
B1	640	100
B2	600J	100
B3(1)	460J	100
B3(2)*	520J	100
B4	540J	100
B5	140J	100
C1	580J	100
C2	620J	100
C3	340J	100
C4	220J	100
D1	720	100
D2	780	100
D3(A)	600	100
D3(B)**	560	100
E1	620J	100
E2	640J	100

J = Qualitative and Semi-Quantitative
* = McLAREN/HART Duplicate Sample of B3(1)
** = McLAREN/HART Duplicate Sample of D3(A)

Priority Pollutant Metals

Only two sediment samples E1 and E2 had arsenic concentrations that exceed the New Jersey ECRA Guidance Value of 20 ppm. A total of twenty of the twenty-nine sediment samples had chromium concentrations that exceeded the New Jersey ECRA Guidance Value of 100 ppm. Table 2-10 summarizes sediment samples with metal concentrations exceeding New Jersey ECRA Guidance Values or proposed Federal Action Levels. No other metal concentrations detected exceeded New Jersey ECRA Guidance Values or proposed Federal Action Levels.

2.5.4 Interpretation/Discussion

McLaren/Hart has drawn the following conclusions from the off-shore sediment sampling performed in the Clark's Island Embayment.

TCL Volatiles

Total volatile concentrations of 1.13 ppm found in sediment sample D3B (duplicate of D3A) exceed the New Jersey ECRA Guidance Value for total volatiles of 1 ppm. These sediment samples were obtained by lowering a ponar dredge twice in close proximity. Therefore, differing analytical results of acetone (.083 ppm and 1.1 ppm) found in sediment samples D3A and duplicate D3B, respectively, are probably indicative of the sediment matrix variation in these two samples. Since total volatile concentrations slightly exceeded the 1 ppm ECRA Guidance Value in only one of the samples collected, volatile organic contamination is not of significant concern.

The adsorption of these volatiles to the river sediment should not be significant due to volatilization enhanced by the turbulence of flowing water.

TABLE 2-10

SUMMARY OF METAL CONCENTRATIONS--SEDIMENT EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND/OR PROPOSED FEDERAL ACTION LEVELS

CLARK'S ISLAND EMBAYMENT (SWMU #8) PORTSMOUTH NAVAL SHIPYARD

AUGUST 21, 1990

PARAMETER	McLAREN/HART SAMPLE I.D.	CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)	PROPOSED FEDERAL ACTION LEVEL (PPM)
ARSENIC	E1	32.20	20.0	80.0
	E2	47.40	20.0	80.0
CHROMIUM	A1	141.00	100.0	400.0
	A2	117.00	100.0	400.0
	A3	116.00	100.0	400.0
	A4	108.00	100.0	400.0
	B1	124.00	100.0	400.0
	B2	105.00	100.0	400.0
	C1	113.00	100.0	400.0
	C2	124.00	100.0	400.0
	D1	120.00	100.0	400.0
	D2	131.00	100.0	400.0
	D3(A)	123.00	100.0	400.0
	D3(B)*	122.00	100.0	400.0
	E1	126.00	100.0	400.0
	E2	104.00	100.0	400.0
	D1(10-12)	258.00	100.0	400.0
	D1B(10-12)**	271.00	100.0	400.0
	D2(10-12)	172.00	100.0	400.0
	D2(16-18)	115.00	100.0	400.0
	D3(10-12)	156.00	100.0	400.0
	D3(16-18)	226.00	100.0	400.0

* = McLAREN/HART Duplciate Sample of D3(A)
** = McLAREN/HART Duplicate Sample of D1(10-12)

TPH

Concentrations of TPH ranging from 140 ppm to 780 ppm exceed the New Jersey ECRA Guidance Value of 100 ppm in all surface sediment samples. Neither surface sediment sample C5 nor any of the cored sediment samples were analyzed for TPH. Additional surface sediment samples should be collected to delineate the areal extent of contamination and sediment core samples analyzed to determine the vertical extent.

Priority Pollutant Metals

Detectable metal concentrations were found in all surface and cored sediment samples. Only arsenic and chromium concentrations summarized in Table 2-10 exceed New Jersey ECRA Guidance Values. No other detectable metal concentrations were found above New Jersey ECRA Guidance Values or proposed Federal Action Levels.

Arsenic concentrations found in sediment samples E1 and E2 exceed the New Jersey ECRA Guidance Value of 20 ppm, however, natural concentrations of arsenic in the surficial soil of southern Maine range from 0.41 to 65.0 ppm (Shacklette and Boerngen, 1984). Arsenic levels observed are within expected background levels.

Chromium concentrations (ranging from 104 to 271 ppm) found in twenty of the twenty-nine sediments exceeded the New Jersey ECRA Guidance Value of 100 ppm. Natural chromium concentrations in the surficial soil of southern Maine range from 1.0 to 70 ppm (Shacklette and Boerngen, 1984). Chromium concentrations suggest contamination above expected background levels may exist. Additional samples near the elevated chromium sample points [D1(10-12), D2(10-12) and D3(16-18)], and at other locations are needed to assess potential contamination at depth.

2.6 Conclusions/Recommendations

The soil sampling performed during well installation in Phase I revealed the presence of low to moderate soil contamination in a number of boring locations across the landfill. Contaminated soils were found at depths ranging from near surface to seventeen (17) feet below grade.

Groundwater samples collected from the monitoring wells during Phase II were generally "clean" indicating that the contaminants found in soils are not mobile under present environmental conditions.

A soil gas survey revealed soil gas emission from a number of areas across the JILF. There was no strong correlation between high soil gas flux and magnetic anomalies recorded during Phase I with the possible exception of the PCE flux and magnetic anomaly near home plate at the baseball field. The soil gas results suggest the possibility that soil and/or groundwater within the landfill may be contaminated to a significant degree with hydrocarbon and volatile organic compounds, however, the gas flux measured cannot be equated to any specific concentration at this time.

Sediment samples from the Clark's Island Embayment showed minor total volatile contamination (acetone in D3B), extensive, although, moderate TPH contamination, and notable heavy metals contamination. The vertical extent of the TPH contamination is unknown at this time and should be determined in future phases of work. Total chromium contamination and to a lesser extent arsenic contamination was present in a majority of samples collected.

Future phases of work should address the potential for volatile contaminants to migrate via groundwater along preferential pathways, such as the tidal channel, and exit the JILF in areas not intercepted by the existing monitoring wells.

Additional monitoring wells and additional continuous water level measurements are needed to better estimate groundwater flow directions within the landfill.

Future work off-shore should include the collection of additional sediment samples in the Clark's Island Embayment to better define the vertical and lateral extent of the contamination measured during this phase of work. The source of the contamination in sediments in Clark's Island Embayment is unknown at this time. It may be necessary to conduct a review of the potential sources of contaminants in the river and to ascertain whether sediment from upstream or downstream may be deposited in the waters off the JILF. At this time, there is no direct correlation between the contaminants in sediments and those found in soils or groundwater in the JILF, although, the landfill may be the primary suspect.

3.0 MERCURY BURIAL SITES (SWMU #9)

The purpose of this phase of work was to establish an initial database regarding shallow groundwater quality in the vicinity of the Mercury Burial Sites. The Phase II field work at the Mercury Burial Sites involved the following:

- Monitoring Well Redevelopment
- Monitoring Well Sampling

Figure 3-1 shows the locations of the monitoring wells and the Mercury Burial sites. Information collected will be incorporated into the design of the investigations next phase.

3.1 Monitoring Well Redevelopment

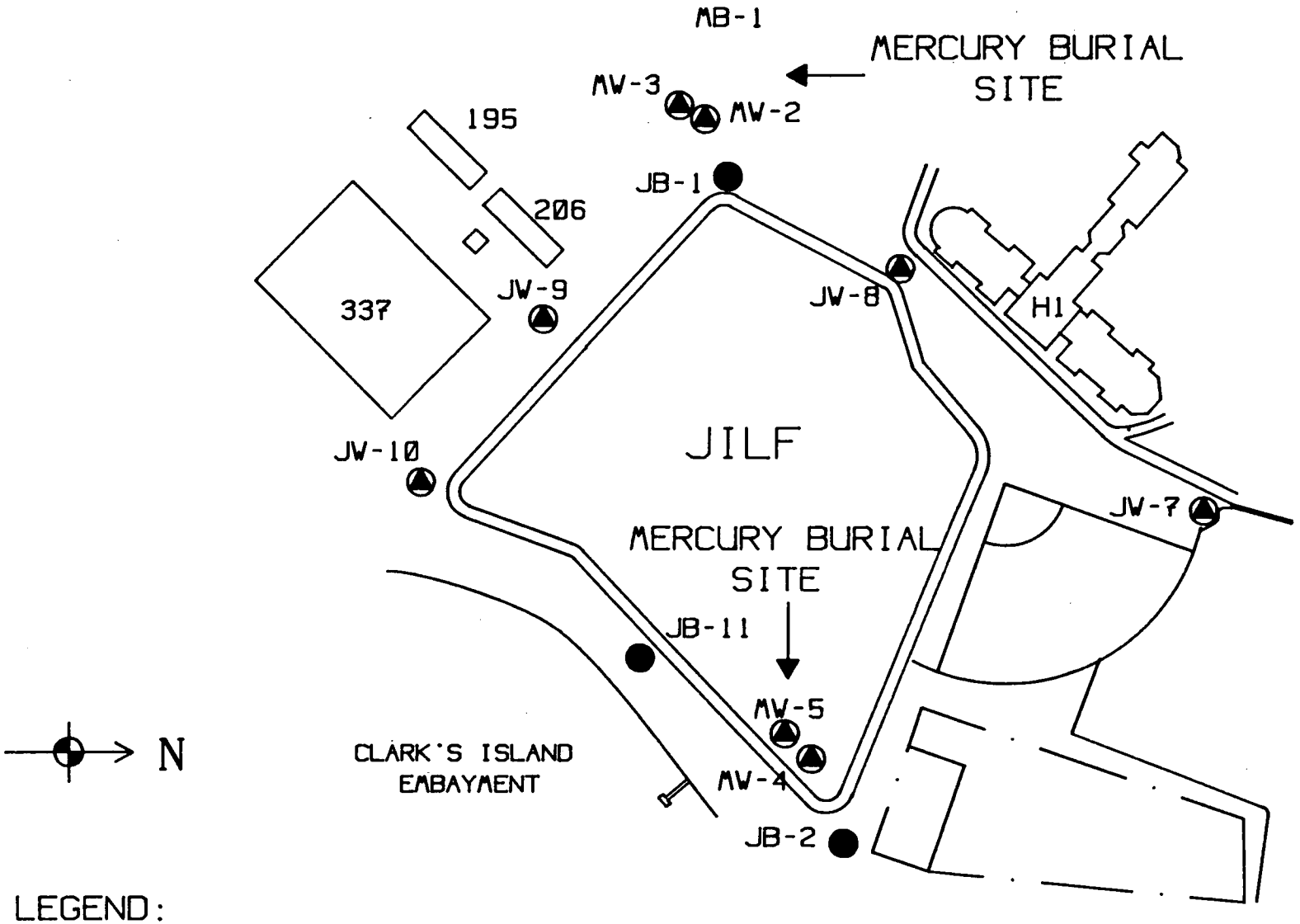
Redevelopment of the groundwater monitoring wells at the Mercury Burial Sites was conducted on August 15, 1990. This was performed to remove fine grained sediment from the well screen and sand pack and to improve the hydraulic connection between the well and the water bearing formation.

3.1.1 Redevelopment Procedures

All of the Mercury Burial Site monitoring wells were redeveloped according to the redevelopment procedures discussed in Section 2.1.1.

3.1.2 Redevelopment Findings

Redevelopment of the wells at the Mercury Burial Sites was conducted until the field parameter measurements stabilized. Table 3-1 contains a summary of the stabilized field parameters for each of the wells and the total volume of water removed from each well during redevelopment. All four monitoring wells recharged quickly and were redeveloped successfully during the first attempt at redevelopment. The salinity and conductivity measurements give an indication of the saline content of the water. Salinity



LEGEND:

- MONITORING WELL LOCATION
  - MW DENOTES A MERCURY BURIAL WELL
  - JW DENOTES A JILF WELL
- TEST BORING LOCATION
  - MB DENOTES A MERCURY BURIAL BORING
  - JB DENOTES A JILF BORING

NOT TO SCALE

FIGURE 3-1

MERCURY BURIAL SITES (SWMU #9)

MONITORING WELL LOCATION MAP

McLAREN/HART

TABLE 3-1

STABILIZED FIELD PARAMETERS

MERCURY BURIAL SITES (SWMU #9)
PORTSMOUTH NAVAL SHIPYARD

AUGUST 15, 1990

Well Nº	Redevelopment Date(s)	Total Volume Removed (Gals)	pH	Temp. (°C)	Specific Conductivity (µmhos/cm)	Turbidity (NTUs)	Measured Salinity (°/∞)	Calculated Salinity (°/∞)	Measured Salinity During Sampling 08/22/90
MW-2	8/15/90	25	7.33	13.4	984	3.2	NA	.63	0
MW-3	8/15/90	45	7.13	14.1	1,050	11.8	NA	.68	0
MW-4	8/15/90	80	7.29	11.3	1,915	12.6	NA	1.32	0.6
MW-5	8/15/90	140	7.62	10.7	7,790	5.8	NA	6.10	5.0

NA = Not Analyzed

measurements for all four Mercury Burial Site wells were not recorded during redevelopment because a salinity meter was not available. The salinities were calculated as described in Section 2.1.2 and are included on Table 3-1. The measured salinities taken during sample collection are also included for comparison. The salinity and specific conductivity measurements in the wells show the presence of fresh water at MW-2 and MW-3, and brackish water at MW-4 and MW-5.

The turbidity measurements stabilized below the desired five NTU guideline at MW-2. Turbidity measurements in wells MW-3, MW-4, and MW-5 slowly improved to 11.8, 12.6 and 5.8 NTUs, respectively, at which point the readings stabilized over three consecutive measurements.

3.2 Groundwater Sampling

On August 22, 1990, groundwater samples were collected from the four monitoring wells installed around the two Mercury Burial Sites (Figure 3-1). A replicate sample labeled MW-01 was collected at monitoring well location MW-2 in order to assess the accuracy of laboratory analysis.

The objectives of groundwater sampling at the two Mercury Burial Sites are summarized as follows:

1) To provide valid, properly obtained groundwater sampling data for all monitoring wells;
2) To evaluate the quality of groundwater beneath the Mercury Burial Sites;
3) To assess whether any potential contaminants related to the buried vaults have migrated to the groundwater. This assessment will also give an indication of the integrity of the vaults; and
4) To assess whether potential contaminants, if present, exceed applicable groundwater standards.

3.2.1 Sampling Procedures

Prior to collecting groundwater samples, the static water level in each monitoring well was measured, and the volume of water in the well was calculated. The wells were then purged, as described in Section 2.2.1, using separate, dedicated, precleaned, bottom-loading stainless-steel bailers with teflon check valves for each well. Wells were bailed until five well volumes were removed. All purge water was contained in one of two 300 gallon polyethylene tanks. The tanks were labeled and later taken to the PNS Hazardous Waste Storage Area.

Groundwater samples were collected as previously described in Section 2.2.1. All wells were sampled immediately after purging. All samples were collected in a manner to minimize agitation and other disturbing conditions which might cause physiochemical changes that would bring about losses due to volatilization, adsorption, redox changes or degradation. The samples were analyzed for TCL Organics and TAL Inorganics. At the time of sample collection, all purged wells were field analyzed for pH, temperature, specific conductivity, salinity, and turbidity; results were recorded in the field notebook (Appendix I). A summary of groundwater sampling and field parameter information is contained in Table 3-2. Samples collected for metal analyses were field filtered through 0.45 micron cellulose filters prior to nitric acid preservation in laboratory-supplied bottles. Samples collected for total cyanide analysis were immediately preserved in the field with sodium hydroxide in laboratory-supplied bottles.

Upon collection, samples were placed in field coolers and kept chilled using ice. Groundwater sample coolers were hand delivered to RAI.

TABLE 3-2

GROUNDWATER SAMPLING AND FIELD PARAMETER INFORMATION

MERCURY BURIAL SITES (SWMU #9)
PORTSMOUTH NAVAL SHIPYARD

AUGUST 22, 1990

Well Nº	Well Volume (gallons)	Number of Well Volumes Evacuated	pH	Temp. (°C)	Specific Conductivity (µmhos/cm)	Salinity (°/∞)	Turbidity (NTUs)
MW-2	0.69	5	7.20	13.7	750	0	56.7
MW-3	0.59	5	6.92	13.6	850	0	84.6
MW-4	0.97	5	7.06	11.4	1,370	0.6	>200
MW-5	1.21	5	7.27	10.9	6,900	5.0	>200

On September 13, 1990, McLaren/Hart was informed by RAI that the Mercury Burial Sites' groundwater samples, collected on August 22, 1990 for total cyanide analysis exceeded the fourteen day CLP holding time. The samples collected for TCL BNAs exceeded the seven day extraction holding time as per 40 CFR 136. In addition, the groundwater sample collected for TCL pesticide/PCB analysis at MW-5 exceeded the seven day extraction holding time as per 40 CFR 136.

On September 19, 1990, McLaren/Hart and RAI personnel resampled the groundwater from the four monitoring wells for total cyanide and TCL BNAs. Additionally, MW-5 was resampled for TCL pesticide/PCB analysis. A replicate sample (MW-01) taken at MW-2 was included in the groundwater resampling. Prior to collecting groundwater samples, the static water level in each monitoring well was measured, and the volume of water in the well was calculated. The wells were then purged using the same precleaned, stainless-steel bailers used for sampling on August 22, 1990. Wells were bailed until at least three well volumes were removed. All purge water was contained in DOT approved 55 gallon drums, supplied by PNS. The containers were labeled and later taken to the PNS Hazardous Waste Storage Area.

Groundwater samples were collected, as previously described in Section 2.2.1. Bailers were decontaminated prior to use, according to the protocol described in Table 2-2.

All wells were resampled immediately after purging and field parameters were taken. A summary of groundwater sampling and field parameter information from September 19, 1990, is contained in Table 3-3. Upon collection, total cyanide samples were preserved in the field with sodium hydroxide in laboratory-supplied bottles. All samples were placed in coolers and kept chilled with ice. Groundwater sample coolers were hand delivered to RAI.

3.2.2 Findings (Groundwater Conditions)

Turbidity readings prior to sampling wells MW-4 and MW-5 exceeded the maximum reading of the turbidity meter (i.e. greater than 200 NTUs), wells MW-2 and MW-3 had turbidity readings of 56.7 and 84.6 NTUs, respectively.

The salinity readings collected from monitoring wells MW-4 and MW-5 indicate brackish water conditions. This interpretation is also supported by specific conductivity readings shown in Tables 3-2 and 3-3. Salinity readings of zero and low specific conductivity readings in MW-2 and MW-3 indicate fresh water conditions at these locations.

3.2.3 Laboratory Analytical Results

Four groundwater samples labeled MW-02-02 through MW-05-02 were collected from monitoring wells around the two Mercury Burial Sites. A replicate sample labeled MW-01-02 was collected at MW-2, and one equipment rinseate field blank (RB-02) was also included in this groundwater sampling. The samples were analyzed for TCL Organics and TAL Inorganics. Samples collected for metal analyses were field filtered. A summary of valid groundwater results are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

The State of Maine does not have published clean-up guidelines for contamination in water, therefore, National Interim Primary Drinking Water Regulations and proposed Federal Action Levels documented in the Federal Register (55 FR 30865, July 27, 1990) are used for comparison purposes.

<u>TCL Volatiles</u>

Qualitative and semi-quantitative estimates of benzene, toluene, ethylbenzene, xylene and chlorobenzene were detected in varying concentrations at the Mercury Burial

TABLE 3-3

GROUNDWATER RESAMPLING AND FIELD PARAMETER INFORMATION

MERCURY BURIAL SITES (SWMU #9)
PORTSMOUTH NAVAL SHIPYARD

SEPTEMBER 19, 1990

Well Nº	Well Volume (gallons)	Number of Well Volumes Evacuated	pH	Temp. (°C)	Specific Conductivity (µmhos/cm)	Salinity (°/∞)	Turbidity (NTUs)
MW-2	0.66	5	7.38	14.8	690	0	79.2
MW-3	0.56	5	7.10	15.2	790	0	65.5
MW-4	0.98	5	7.11	13.8	1,450	0.7	>200
MW-5	1.11	3.5	7.35	12.9	5,900	4.2	>200

Site's monitoring wells. There were, however, no detectable volatile concentrations exceeding proposed Federal Action Levels. Volatile organics are not listed as contaminants under the National Interim Primary Drinking Water Regulations.

TCL Semi-Volatiles

There were no detectable semi-volatile concentrations which exceeded proposed Federal Action Levels. Semi-volatile organics are not listed as contaminants under the National Interim Primary Drinking Water Regulations.

TCL Pesticide/PCBs

There were no detectable concentrations of pesticide/PCBs in any groundwater samples collected from the Mercury Burial Sites.

TAL Inorganics

There were no detectable concentrations of cyanide in any groundwater samples collected from the Mercury Burial Sites. There were no metal concentrations above either National Interim Primary Drinking Water Regulations or proposed Federal Action Levels.

Comparing filtered RCRA metal results from Phase I groundwater sampling to filtered TAL metal results from Phase II sampling showed comparable concentrations.

3.2.4 Interpretations/Discussion

Low concentrations of benzene, toluene, ethylbenzene, and xylene (BTEX) were detected in monitoring wells MW-2 and MW-3, which are located along the perimeter of the western Mercury Burial Site. Qualitative estimates of benzene and ethylbenzene were also detected in monitoring well MW-4, which is at the perimeter of the eastern Mercury Burial Site. The presence of BTEX is an indication of petroleum products, particularly gasoline, in the subsurface. The qualitative and semi-quantitative semi-

volatile estimates detected are also indicative of a petroleum product. The source of the BTEX may be from previous disposal practices or from an abandoned gasoline tank and station formerly located approximately 200 feet southwest of monitoring well MW-3. The location of the gasoline tank and station was obtained from a PNS drawing which depicted site conditions on June 30, 1942.

Based on the laboratory analytical results, there does not appear to be any mercury in the groundwater attributable to potential releases from either Mercury Burial Site.

3.2.5 Conclusions/Recommendations

Monitoring wells MW-4 and MW-5, based on salinity and conductivity readings, are positioned in a brackish water source. These wells are, therefore, partially influenced by tidal changes. Remedial technologies, if required, must be evaluated with this in mind. Monitoring wells MW-2 and MW-3 are located in a fresh water source and are less likely to be affected by tidal effects.

The concentrations of BTEX detected in MW-2 and MW-3, and the qualitative estimates of benzene and ethylbenzene in MW-4 suggest the presence of gasoline or some other highly purified petroleum product. The actual source of the contamination is unknown, but may be attributed to an old service station that used gasoline storage tanks (Circa 1942). The entire area surrounding the former service station should be further investigated to verify the existence/absence of buried tanks that may be leaking. Additional samples of the soil and groundwater approximately 200 feet southwest of MW-3 should be taken in order to assess current site conditions and to determine if there are existing tanks which need to be removed.

There were no detectable concentrations of semi-volatiles, pesticides/PCBs, or cyanides in any of the monitoring wells at the Mercury Burial Sites. No further analysis for these parameters are needed to characterize the SWMU.

Metals (RCRA metals in Phase I, and TAL metals in Phase II) were detected in samples collected from the monitoring wells. None of the metals present exceeded National Interim Primary Drinking Water Regulations or proposed Federal Action Levels. The levels of metals present, especially mercury, do not suggest that significant releases have occurred to the environment from this SWMU. Metals analysis, especially for lead, is advised for additional investigations concerning the potential existence of tanks.

4.0 DRMO (SWMU #6)

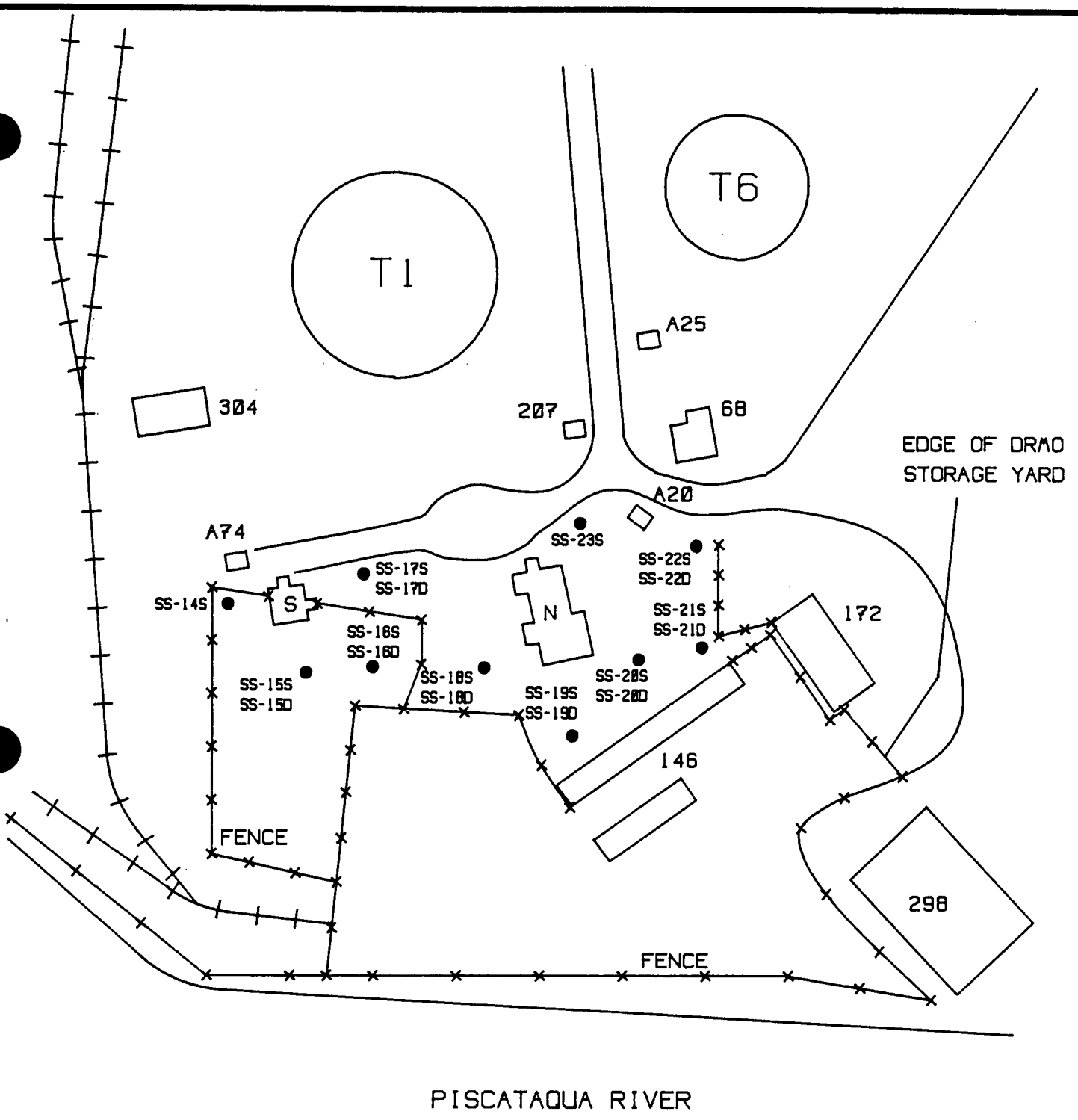
The purpose of this phase of work at the DRMO was to establish an initial database regarding shallow groundwater quality beneath the DRMO and further evaluate surface soil contamination around the DRMO. Specific tasks of the Phase II field program relating to the DRMO were as follows:

- surface soil sampling
- monitoring well redevelopment
- groundwater sampling

The information collected from this field work will be incorporated into the design of the next phase of the investigation.

4.1 Surface Soil Sampling

On August 7 and 8, 1990, eighteen soil samples, plus two duplicate samples and one equipment rinseate field blank, were collected in the vicinity of Quarters "S" and "N" as shown in Figure 4-1. In addition, four surface soil samples were collected on August 8, 1990 from points east and west of the 300-foot arc around the DRMO that was established during the initial phase of surface soil sample collection. The sampling points along this arc are shown in Figure 4-2. The analytical results for soil samples collected along the arc on October 18, 1989 showed detectable concentrations of priority pollutant metals, total petroleum hydrocarbons (TPH) and polychlorinated biphenyls (PCBs). The objective of this soil sampling program was to further assess the potential for contamination along the 300 foot arc and in the vicinity of quarters "S" and "N" possibly caused by wind dispersal of contaminants from the DRMO. The field notebook (Appendix I) identifies the exact sample locations measured from fixed points.



N

LEGEND:

● SURFACE SOIL SAMPLING LOCATIONS

NOT TO SCALE

FIGURE 4-1

DRMO (SWMU #6)
QUARTERS "S" AND "N"
SAMPLING LOCATIONS

McLAREN/HART

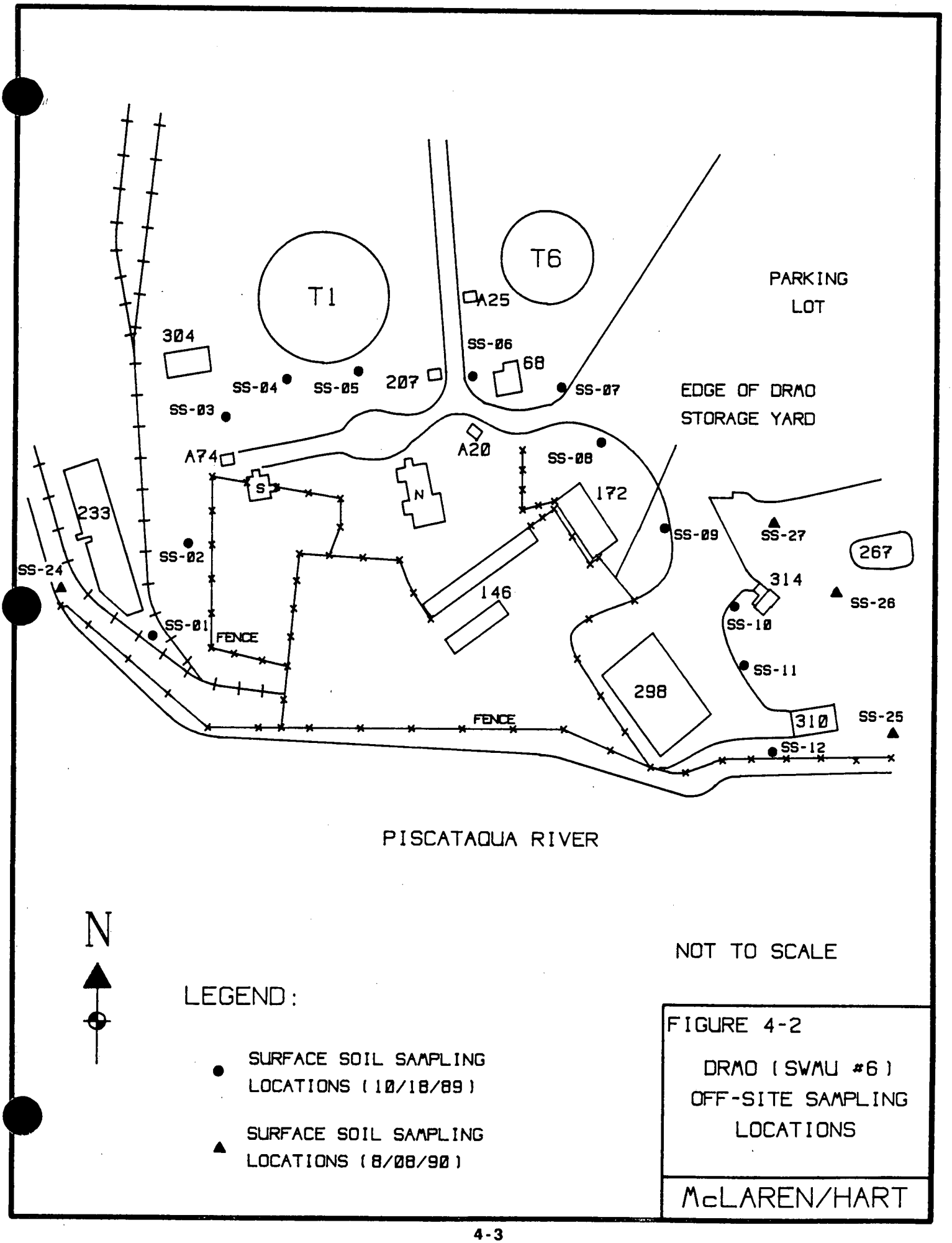


FIGURE 4-2

DRMO (SWMU #6) OFF-SITE SAMPLING LOCATIONS

McLAREN/HART

4.1.1 Sampling Procedures

An attempt was made to collect two soil samples at each of the soil sampling locations around Quarters "S" and "N". The samples collected were labeled SS-14 through SS-23 followed by an "S" or a "D" where the "S" denoted the shallow sample from the location and the "D" denoted the deeper soil sample. Duplicate samples were collected at locations SS-14S and SS-18S to monitor laboratory performance. The two duplicate samples were collected simultaneously with sample collection at the designated locations and were labeled SS-14I and SS-18I, respectively.

The shallow sample was collected from the surface or as near to the surface as possible in areas which were grass covered. The surface soil sample was obtained from the upper six-inches of the soil column at each location using a properly cleaned stainless-steel trowel. Each sample was placed in a stainless-steel mixing bowl, homogenized and transferred to laboratory-supplied sample bottles. The second sample at each location was collected from a depth of approximately eighteen inches below grade using a properly cleaned hand auger. Exceptions occurred at locations SS-14 and SS-23 where the second sample could not be obtained due to hand auger refusals at nine inches and six inches, respectively. Second samples collected at locations SS-16, SS-19, and SS-22 were obtained from a depth of approximately twelve inches below grade because of difficulties augering through coarse grained material. Each of these samples were placed in a stainless-steel mixing bowl, homogenized with a clean stainless-steel trowel and transferred to laboratory-supplied sample bottles.

The four surface soil samples collected east and west of the 300 foot arc around the DRMO (SS-24 through SS-27) were sampled in the same manner as described for surface soil sampling in the vicinity of Quarters "S" and "N". All samples were stored on ice in a field cooler and hand delivered to RAI.

The hand auger, stainless-steel trowels and mixing bowls were decontaminated prior to use according to the protocol described in Table 2-2.

4.1.2 Findings

All soil samples collected from Quarters "S" and "N" were obtained from the upper two feet of the soil column. In general, the soil consisted of brown, fine to medium grained sand and silt with varying amounts of fine to medium grained gravel. Organic matter (roots) and rock fragments were also observed in some of the samples. No soil discoloration, staining or unnatural odors were observed in any of the soil samples.

4.1.3 Laboratory Analytical Results

A total of eighteen surface soil samples were collected in the vicinity of Quarters "S" and "N", plus two duplicate samples and one equipment rinseate field blank (Figure 4-1). In addition, four surface soil samples were collected on August 8, 1990 east and west of the 300-foot arc around the DRMO established on October 18, 1989 (Figure 4-2). These samples were analyzed for priority pollutant metals, TPH, and TCL pesticides/PCBs. A summary of the valid results of the surface soil samples collected from Phase I (October 18, 1989) and Phase II (August 7-8, 1990) sampling events are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

The State of Maine does not have published clean-up guidelines for contamination in soils, therefore, New Jersey's Environmental Cleanup Responsibility Act (ECRA) Guidance Values and proposed Federal Action Levels documented in the Federal Register (55 FR 30865, July 27, 1990) are used for comparison purposes.

Priority Pollutant Metals

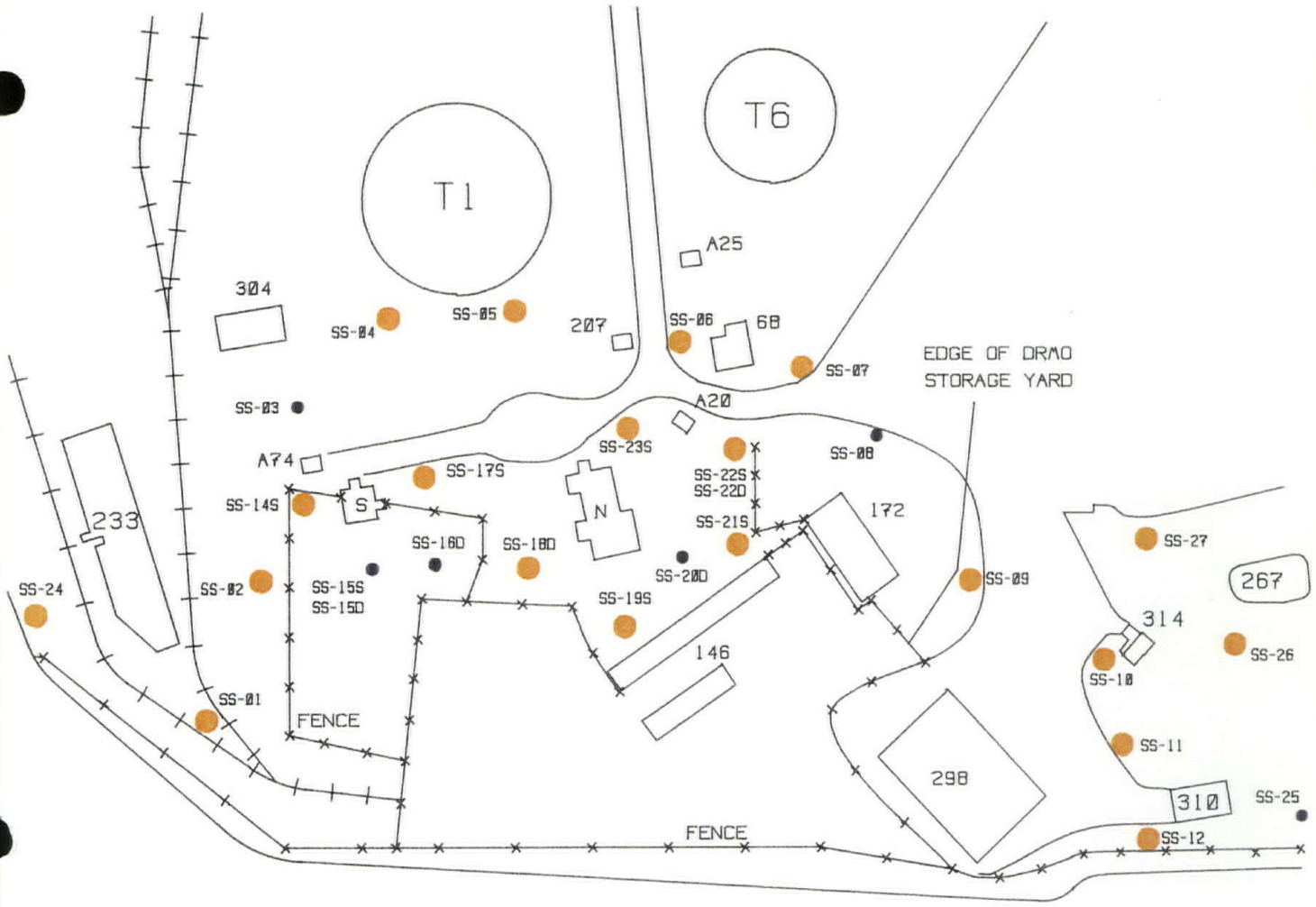
Detectable concentrations of metals were found in all surface soil samples. A total of twenty samples and one duplicate collected from Phase I (October 18, 1989) and Phase II (August 7-8, 1990) sampling events had metal concentrations above New Jersey ECRA Guidance Values and/or proposed Federal Action Levels. Sample locations showing detectable metals concentrations exceeding New Jersey ECRA Guidance Values and/or proposed Federal Action Levels are shown in Figure 4-3 along with other sampling locations. Samples exceeding New Jersey ECRA Guidance Values and/or proposed Federal Action Levels are shown in Table 4-1 with the corresponding guidance value concentrations.

Total Petroleum Hydrocarbons

Detectable concentrations of TPH were found in twenty-two of the thirty-four surface soil samples and three duplicates collected from Phase I and Phase II sampling events. The concentrations range from 63 to 810 ppm. A total of fifteen surface soil samples and three duplicates from Phase I and Phase II sampling events exceed the New Jersey ECRA Guidance Value of 100 ppm TPH in soil. Samples exceeding New Jersey ECRA Guidance Values for TPH are shown in Table 4-2 and on a map of the DRMO in Figure 4-4. There are currently no proposed Federal Action Levels for TPH in soil.

TCL PCBs

Only two surface soil samples SS-01 (sampled October 18, 1989), and SS-26 (sampled August 8, 1990) had detectable concentrations of PCBs. The PCB level in these two samples are below New Jersey's ECRA Guidance Value range of 1 to 5 ppm for total PCBs in soil. There are presently no proposed Federal Action Levels for PCBs in soil.



PISCATAQUA RIVER

N

LEGEND:

- SAMPLES WITH PRIORITY POLLUTANT METAL CONCENTRATIONS EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND/OR PROPOSED FEDERAL ACTION LEVELS
- OTHER SURFACE SOIL SAMPLING LOCATIONS

NOT TO SCALE

FIGURE 4-3

DRMO (SWMU #6) PRIORITY POLLUTANT METALS IN SURFACE SOILS

McLAREN/HART

TABLE 4-1

SUMMARY OF METAL CONCENTRATIONS--SURFACE SOIL EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND/OR PROPOSED FEDERAL ACTION LEVELS

DRMO (SWMU #6)
PORTSMOUTH NAVAL SHIPYARD

OCTOBER 18, 1989 AND AUGUST 7-8, 1990

PARAMETER	McLAREN/HART SAMPLE I.D.	CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)	PROPOSED FEDERAL ACTION LEVEL (PPM)
ANTIMONY	SS-01	35.50J	10.0	30.0
	SS-02	60.90J	10.0	30.0
ARSENIC	SS-04	21.40J	20.0	80.0
	SS-06	83.80J	20.0	80.0
	SS-07	32.50J	20.0	80.0
	SS-14S	20.20	20.0	80.0
	SS-14I*	21.30	20.0	80.0
	SS-18D	20.00	20.0	80.0
	SS-21S	22.00	20.0	80.0
	SS-22S	20.70	20.0	80.0
	SS-22D	22.60	20.0	80.0
	SS-23S	21.20	20.0	80.0
	SS-24	23.70	20.0	80.0
	SS-26	20.10	20.0	80.0
BERYLLIUM	SS-27	2.10	1.0	0.2
COPPER	SS-01	250.00J	170.0	NA
	SS-02	238.00J	170.0	NA
	SS-09	559.00J	170.0	NA
	SS-10	5740.00J	170.0	NA
	SS-11	4550.00J	170.0	NA
	SS-24	751.00	170.0	NA
	SS-26	179.00	170.0	NA
	SS-27	334.00	170.0	NA

J = Qualitative and Semi-Quantitative
NA = Not Available
* = McLAREN/HART Duplicate Sample of SS-14S

TABLE 4-1 (CONTINUED)

SUMMARY OF METAL CONCENTRATIONS--SURFACE SOIL EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND/OR PROPOSED FEDERAL ACTION LEVELS

DRMO (SWMU #6) PORTSMOUTH NAVAL SHIPYARD

OCTOBER 18, 1989 AND AUGUST 7-8, 1990

PARAMETER	McLAREN/HART SAMPLE I.D.	CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)	PROPOSED FEDERAL ACTION LEVEL (PPM)
LEAD	SS-01	2290.00	250-1,000	NA
	SS-02	12100.00	250-1,000	NA
	SS-05	257.00	250-1,000	NA
	SS-06	417.00	250-1,000	NA
	SS-07	257.00	250-1,000	NA
	SS-10	3490.00	250-1,000	NA
	SS-12	301.00	250-1,000	NA
	SS-14S	403.00	250-1,000	NA
	SS-14I*	387.00	250-1,000	NA
	SS-17S	396.00	250-1,000	NA
	SS-19S	467.00	250-1,000	NA
	SS-21S	370.00	250-1,000	NA
	SS-22S	383.00	250-1,000	NA
	SS-22D	296.00	250-1,000	NA
	SS-23S	765.00	250-1,000	NA
	SS-24	2830.00	250-1,000	NA
	SS-27	909.00	250-1,000	NA
NICKEL	SS-10	152.00J	100.0	2,000.0
	SS-11	4970.00J	100.0	2,000.0
SILVER	SS-11	8.10	5.0	200.0
ZINC	SS-02	714.00J	350.0	NA
	SS-10	1030.00J	350.0	NA
	SS-11	805.00J	350.0	NA
	SS-24	1230.00	350.0	NA
	SS-26	360.00	350.0	NA
	SS-27	934.00	350.0	NA

J = Qualitative and Semi-Quantitative
NA = Not Available
* = McLAREN/HART Duplicate Sample of SS-14S

TABLE 4-2

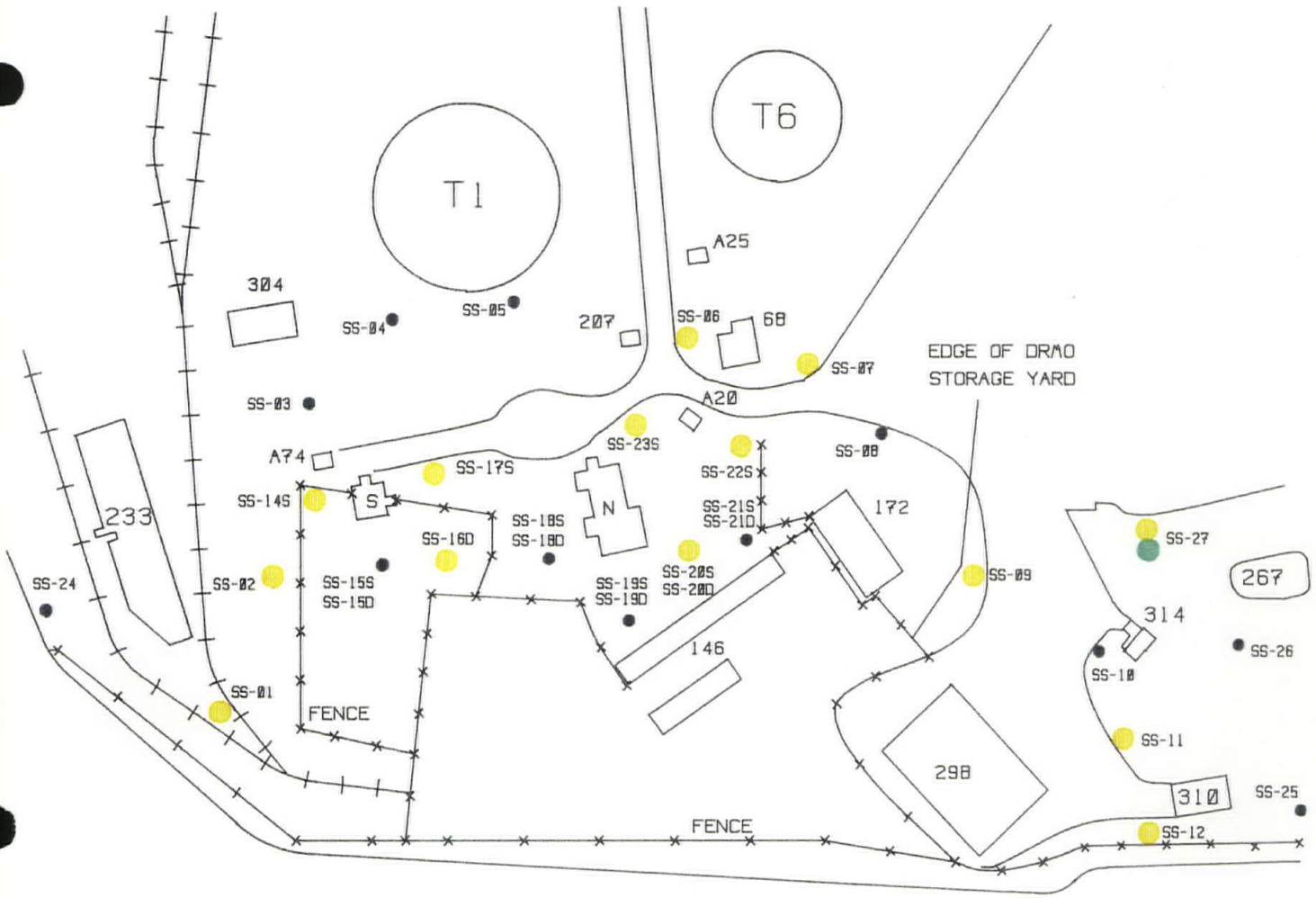
SUMMARY OF TPH CONCENTRATIONS--SURFACE SOIL EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES

DRMO (SWMU #6)
PORTSMOUTH NAVAL SHIPYARD

OCTOBER 18, 1989 AND AUGUST 7-8, 1990

McLAREN/HART SAMPLE I.D.	TPH CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)
SS-01	590J	100
SS-02	260J	100
SS-06	190J	100
SS-07	130J	100
SS-09	260J	100
SS-11	450J	100
SS-12	610J	100
SS-13*	810J	100
SS-13DUP+	680J	100
SS-14S	160	100
SS-14I**	160	100
SS-16D	200	100
SS-17S	250	100
SS-20S	120	100
SS-20D	120	100
SS-22S	120	100
SS-23S	210	100
SS-27	640	100

J = Qualitative and Semi-Quantitative
+ = RAI Duplicate per NEESA Program 20.2-047B



PISCATAQUA RIVER

N

LEGEND:

- SAMPLES WITH TPH CONCENTRATIONS EXCEEDING NEW JERSEY ECRA GUIDANCE VALUE OF 100 PPM.
- SAMPLES WITH PESTICIDE CONCENTRATIONS EXCEEDING PROPOSED FEDERAL ACTION LEVELS
- OTHER SURFACE SOIL SAMPLING LOCATIONS

NOT TO SCALE

FIGURE 4-4

DRMO (SWMU #6)
TOTAL PETROLEUM
HYDROCARBONS
AND PESTICIDES
IN SURFACE SOILS

McLAREN/HART

NOTE: SOIL SAMPLES SS-1 THROUGH SS-12 COLLECTED ON 10/18/89 WERE NOT ANALYZED FOR PESTICIDES

TCL Pesticides

Detectable pesticide concentrations of 4,4-DDE and 4,4-DDT were found in sixteen of the twenty-two surface soil samples and two duplicates collected from the Phase II sampling event. Qualitative results of 4,4-DDE (27.4 ppb) and 4,4-DDT (31.0 ppb) were detected below the contract required quantitation limit in samples SS-18S and SS-21D, respectively. The contract required quantitation limit is the minimum concentration of a substance that can be accurately measured and reported to provide quantitative results. Surface soil samples collected from Phase I sampling events were not analyzed for pesticides. New Jersey ECRA Guidance Values are not available for pesticides in soil, therefore, proposed Federal Action Levels are used for comparison purposes. Only one surface soil sample, SS-27, had semi-quantitative estimates of 4,4-DDE (2,500 ppb) and 4,4-DDT (3,000 ppb) that exceed the proposed Federal Action Level of 2,000 ppb for these compounds in soil (Figure 4-4).

4.1.4 Interpretations/Discussion

As previously stated in Section 4.1.3, twenty out of thirty-four surface soil samples collected from Phase I and Phase II sampling events had metal concentrations above New Jersey ECRA Guidance Values and/or proposed Federal Action Levels. The elevated metal concentrations in the surface soil samples around the DRMO may be the direct result of air dispersion of metal contamination from the DRMO.

A total of fourteen surface soil samples from Phase I and Phase II sampling events exceed the New Jersey ECRA Guidance Value of 100 ppm TPH in soil. It is not likely that these elevated concentrations are due to air dispersion from activities conducted at the DRMO. Possible sources for elevated TPH concentrations include TPH contaminated fill material spread in these areas, and runoff from roadways, driveways and parking lots that have petroleum products presumably from vehicles.

Sixteen of the twenty-two surface soil samples collected from the Phase II sampling event had detectable concentrations of pesticides. Phase I surface soil samples were not analyzed for pesticides. Only one sample had a semi-quantitative pesticide estimate that exceeded the proposed Federal Action Level. A source for pesticides may be a former PNS spraying program.

There were only two isolated detectable concentrations of PCBs. These concentrations are below New Jersey's ECRA Guidance Value range of one to five ppm for total PCBs in soil.

4.2 Monitoring Well Redevelopment

Redevelopment of the groundwater monitoring wells at the DRMO was conducted from August 16th through August 22, 1990. Redevelopment of the monitoring wells was performed to remove any accumulated fine grained sediment from the well screen and sand pack and improve the hydraulic connection between the well and the water bearing formation.

4.2.1 Redevelopment Procedures

All of the monitoring wells at the DRMO were redeveloped according to the redevelopment procedures discussed in Section 2.1.1.

4.2.2 Redevelopment Findings

Redevelopment of the wells at the DRMO was conducted until the field parameter measurements stabilized. Table 4-3 contains a summary of the stabilized field parameters for each of the wells, the total volume of water removed during redevelopment, and the dates over which each well was redeveloped. Specific conductivity and salinity measurements in all of the wells clearly show the presence of saline water in all of the wells. Based on the salinity and conductivity measurements, monitoring wells DW-1, DW-2, DW-3, DW-6 and DW-7 all contain seawater and monitoring wells DW-4 and DW-5 contain brackish water.

TABLE 4-3

WELL REDEVELOPMENT STABILIZED FIELD PARAMETERS

DRMO (SWMU #6)
PORTSMOUTH NAVAL SHIPYARD

AUGUST 16-22, 1990

Well Nº	Development Date(s)	Total Volume Removed (Gals)	pH	Temp. (°C)	Specific Conductance (µmhos/cm)	Salinity (°/∞)	Turbidity (NTUs)
DW-1	8/21/90	25.5	6.84	16.8	30,100	21.0	4.6
DW-2	8/16-8/21	75.0	7.53	18.5	34,400	24.5	3.9
DW-3	8/16/90	25.0	7.52	20.0	37,000	26.2	1.5
DW-4	8/22/90	25.0	6.57	15.1	16,800	11.0	1.6
DW-5	8/21-8/22	41.5	6.06	15.5	16,200	11.8	1.4
DW-6	8/16-8/21	50.0	7.65	17.7	32,900	23.1	6.5
DW-7	8/16-8/21	35.0	7.50	17.1	33,800	23.5	1.4

The turbidity measurements all stabilized below the desired five NTU guideline with the exception of well DW-6. Turbidity measurements in well DW-6 slowly improved to 6.5 NTU where the readings stabilized over three consecutive measurements.

All seven monitoring wells recharged quickly and all are somewhat tide dependent. All of the monitoring wells, with the exception of DW-4 and DW-5, dried out during low tide.

4.3 Groundwater Sampling

On August 23, 24, and 27, 1990, groundwater samples were collected from the seven monitoring wells installed around the perimeter of the DRMO. A replicate sample labeled DW-08 collected from well DW-5 and one equipment rinseate field blank were included in the groundwater sampling in order to assess laboratory analytical accuracy.

The objectives of groundwater sampling at the DRMO are summarized as follows:

1) To provide valid, properly obtained groundwater sampling data for all monitoring wells;
2) To evaluate the quality of groundwater beneath the DRMO;
3) To assess whether organic compounds and/or inorganic constituents related to past or current conditions at the DRMO have migrated to groundwater; and
4) To assess whether any organic compounds and/or inorganic constituents in groundwater samples obtained from the monitoring wells are present in concentrations that exceed applicable groundwater standards.

4.3.1 Sampling Procedures

Prior to collecting groundwater samples, static water levels in each of the monitoring wells were measured, and the volume of water in the well was calculated. The wells were then purged, as described in Section 2.2.1, using separate, dedicated, precleaned, bottom-loading stainless-steel bailers with teflon check valves for each well. Wells were bailed until five well volumes were removed. All purge water was contained in DOT approved 55 gallon drums, supplied by PNS, or in a 300 gallon polyethylene tank. The containers were labeled and later taken to the PNS Hazardous Waste Storage Area.

Groundwater samples were collected as previously described in Section 2.2.1. Bailers were decontaminated prior to use according to the protocol described in Table 2-2.

All wells were sampled immediately after purging. The groundwater samples were collected in a manner to minimize agitation and other disturbing conditions which might cause physiochemical changes and bring about losses due to volatilization, adsorption, redox changes or degradation. The samples were analyzed for TCL volatiles, priority pollutant metals, and TCL pesticides/PCBs. All groundwater samples were field analyzed for pH, temperature, specific conductivity, salinity, and turbidity at the time of sample collection; results were recorded in the field notebook (Appendix I). A summary of groundwater sampling and field parameter information is contained in Table 4-4. Samples collected for metal analyses were field filtered through 0.45 micron cellulose filters prior to nitric acid preservation in laboratory-supplied bottles.

Upon collection, samples were placed in field coolers and kept chilled using ice. Groundwater sample coolers were hand delivered to RAI.

TABLE 4-4

GROUNDWATER SAMPLING AND FIELD PARAMETER INFORMATION

DRMO (SWMU #6)
PORTSMOUTH NAVAL SHIPYARD

AUGUST 23, 24, & 27, 1990

Well Nº	Well Volume (gallons)	Number of Well Volumes Evacuated	pH	Temp. (°C)	Specific Conductivity (µmhos/cm)	Salinity (°/∞)	Turbidity (NTUs)
DW-1	0.26	5	6.96	15.4	27,800	18.2	>200
DW-2	0.60	5	7.73	17.9	34,100	24.7	118.5
DW-3	0.66	5	7.64	17.5	32,200	23.2	25.3
DW-4	0.37	5	6.77	16.9	16,700	11.5	52.7
DW-5	0.36	5	6.35	16.2	9,000	6.1	>200
DW-6	0.47/0.73*	5/5*	7.55/7.46*	18.9/13.7*	30,900/>10,000*	19.7	103.4
DW-7	0.34	5	7.65	17.3	33,100	23.2	52.1

NOTE: *Field parameter information from resampling October 1, 1990.

On September 20, 1990 McLaren/Hart was informed by RAI that the DW-06 groundwater sample collected on August 27, 1990 for TCL pesticide/PCB analysis exceeded the seven day extraction holding time as per 40 CFR 136.

On October 1, 1990, RAI personnel resampled the groundwater from DW-6 for TCL volatiles, pesticide/PCBs and priority pollutant metals. Prior to collecting the groundwater sample, the static water level in the monitoring well was measured, and the volume of water in the well was calculated. The well was then purged using a precleaned, teflon bailer. The well was bailed until five well volumes were removed. All purge water was contained in a DOT approved 55 gallon drum supplied by PNS. The container was labeled and later taken to the PNS Hazardous Waste Storage Area.

The groundwater sample was collected as previously described in Section 2.2.1. The bailer was decontaminated prior to use according to the protocol described in Table 2-2.

Monitoring well DW-6 was resampled immediately after purging, and the groundwater sample field analyzed as previously discussed. Upon collection, the sample was placed directly into a laboratory-supplied bottle, placed in a cooler, and kept chilled using ice. The groundwater sample cooler was hand delivered to RAI.

4.3.2 Findings (Groundwater Conditions)

Turbidity readings prior to sampling wells DW-1 and DW-5 exceeded the maximum reading of the turbidity meter (i.e. greater than 200 NTUs) and well DW-2, DW-3, DW-4, DW-6, and DW-7 had turbidity readings ranging from 25.3 to 118.5 NTUs, respectively.

The salinity readings collected from monitoring wells DW-1, DW-2, DW-3, DW-6, and DW-7 indicated the presence of saline water in the wells. The interpretation is also supported by high specific conductivity readings shown in Table 4-4. Monitoring wells DW-4 and DW-5 had salinity readings and specific conductivity readings that indicated brackish water conditions in these wells.

4.3.3 Laboratory Analytical Results

Seven groundwater samples labeled DW-01 through DW-07 were collected from monitoring wells around the perimeter of the DRMO. A replicate sample labeled DW-08 was collected at DW-5, and one equipment rinseate field blank (RB-03) was also included in this groundwater sampling. The samples were analyzed for TCL volatiles, TCL pesticide/PCBs, and priority pollutant metals. Samples collected for metal analyses were field filtered. A summary of valid groundwater results are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

The State of Maine does not have published clean-up guidelines for contamination in water, therefore, National Interim Primary Drinking Water Regulations are used for comparison purposes.

TCL Volatiles

There were no detectable concentrations of volatile organic compounds in any of the groundwater samples collected from the DRMO monitoring wells.

TCL Pesticide/PCBs

There were no detectable concentrations of pesticide/PCBs in any of the groundwater samples collected from the DRMO monitoring wells.

Priority Pollutant Metals

Detectable concentrations of metals were found in groundwater samples DW-01, DW-02, DW-03, DW-06, DW-07, and replicate sample DW-08. Detectable lead concentrations found in DW-02, DW-06 and DW-07 exceed the National Interim Primary Drinking Water Regulation of 50 ppb as shown in Table 4-5. All other detectable metals are below the National Interim Primary Drinking Water Regulations. There are no detectable metal concentrations in samples DW-04 and DW-05.

4.3.4 Interpretations/Discussion

As discussed in Section 4.3.3, there were no detectable concentrations of TCL volatiles or pesticide/PCBs in any of the groundwater samples collected from the DRMO monitoring wells. Lead was the only metal detected in concentrations exceeding the National Interim Primary Drinking Water Regulations. Elevated lead concentrations were found in monitoring wells DW-2, DW-6 and DW-7.

Figure 4-5 is presented as a comparison of analytical results from Phase I soil borings exceeding New Jersey ECRA Guidance Values and/or proposed Federal 55 FR 30865 Action Levels with Phase II groundwater results exceeding National Interim Primary Drinking Water Regulations. Phase I geologic cross-sections A-A', B-B', C-C', and D-D', shown as Figures 4-6 through 4-9, are also presented to show the relationship of soil concentrations exceeding New Jersey ECRA Guidance Values and/or proposed Federal Action Levels with depth. The cross-sections and map show contaminant concentrations exceeding New Jersey ECRA Guidance Values and/or proposed Federal Action Levels for priority pollutant metals in soil at all test boring locations except DB-6B as shown in Table 4-6. The PCB concentrations observed exceeded New Jersey ECRA Guidance Values and/or proposed Federal Action Levels at six of the nine

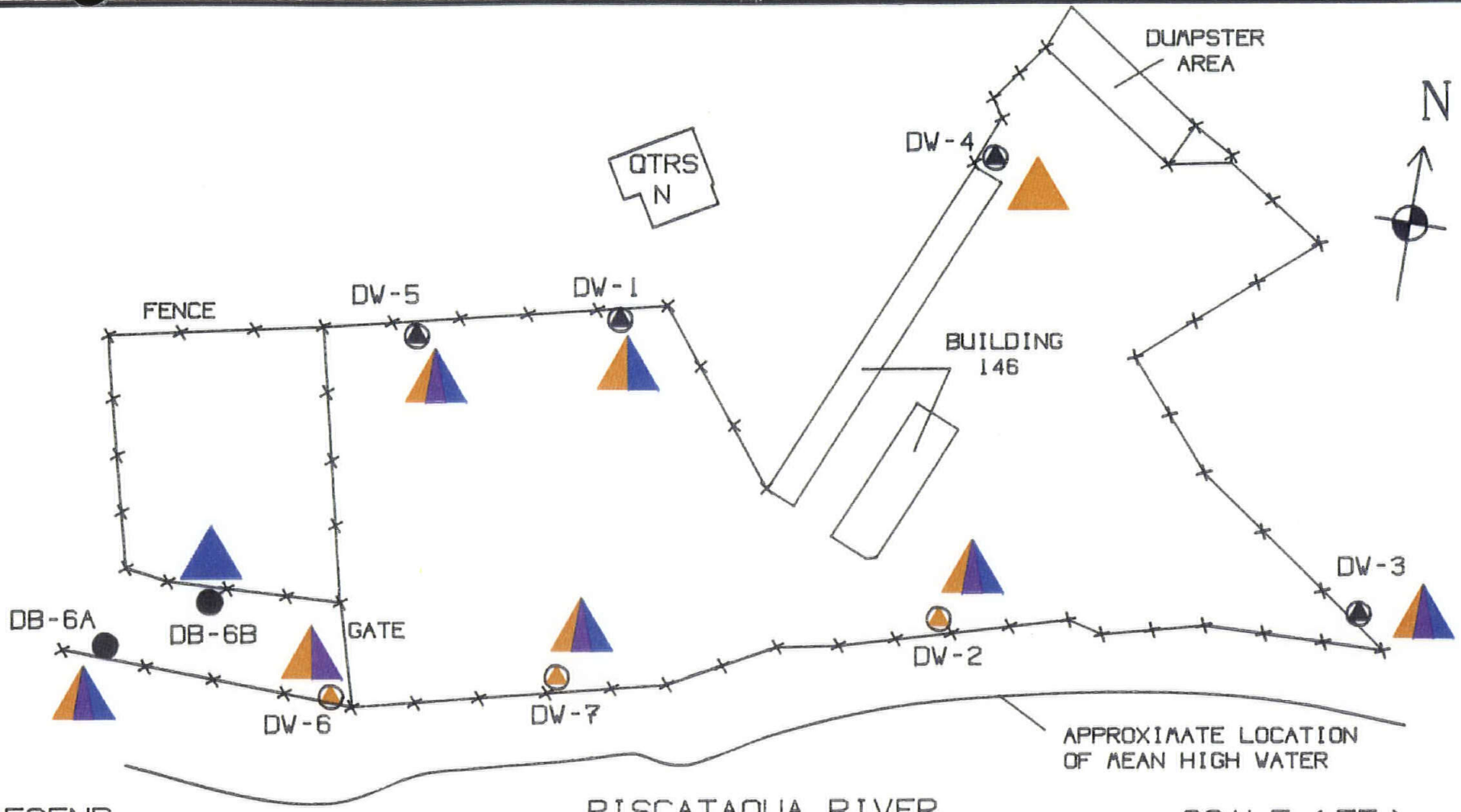
TABLE 4-5

SUMMARY OF METAL CONCENTRATIONS--GROUNDWATER EXCEEDING NATIONAL INTERIM PRIMARY DRINKING WATER REGULATIONS

DRMO (SWMU #6)
PORTSMOUTH NAVAL SHIPYARD

AUGUST 23, 24, 27 AND OCTOBER 1, 1990

PARAMETER	McLAREN/HART SAMPLE I.D.	CONCENTRATION (PPB)	NATIONAL INTERIM PRIMARY DRINKING WATER REGULATION (PPB)
LEAD	DW-02	51.4	50.0
	DW-06	913.0	50.0
	DW-07	74.8	50.0



LEGEND:

- TEST BORING/MONITORING WELL LOCATION
- TEST BORING LOCATION
- BORING/WELL LOCATION WHERE PHASE II GROUNDWATER SAMPLE RESULTS HAD LEAD CONCENTRATIONS EXCEEDING THE NATIONAL INTERIM PRIMARY DRINKING WATER REGULATIONS
- PHASE I SOIL CONCENTRATIONS EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND PROPOSED FEDERAL ACTION LEVELS. COLORS IN THE TRIANGLE INDICATE ANALYTICAL PARAMETERS AS FOLLOWS:

  ORANGE - METALS
  PURPLE - PCBs
  BLUE - TPH

SCALE (FT)

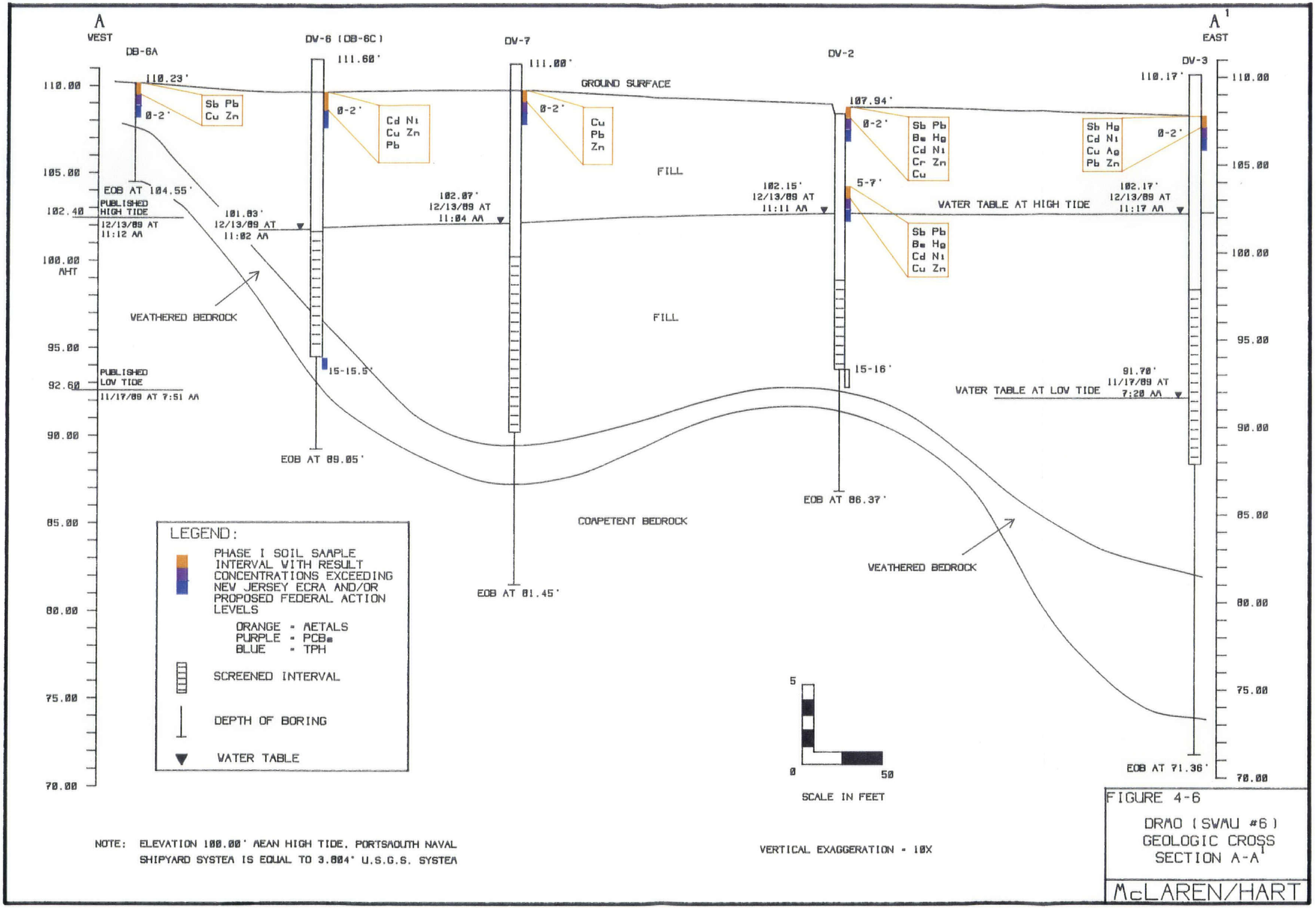
0 10 20 50 90 140

FIGURE 4-5

DRMO (SWMU #6)

SOIL AND GROUNDWATER CONCENTRATIONS EXCEEDING N.J. ECRA AND FEDERAL REGULATIONS

McLAREN/HART



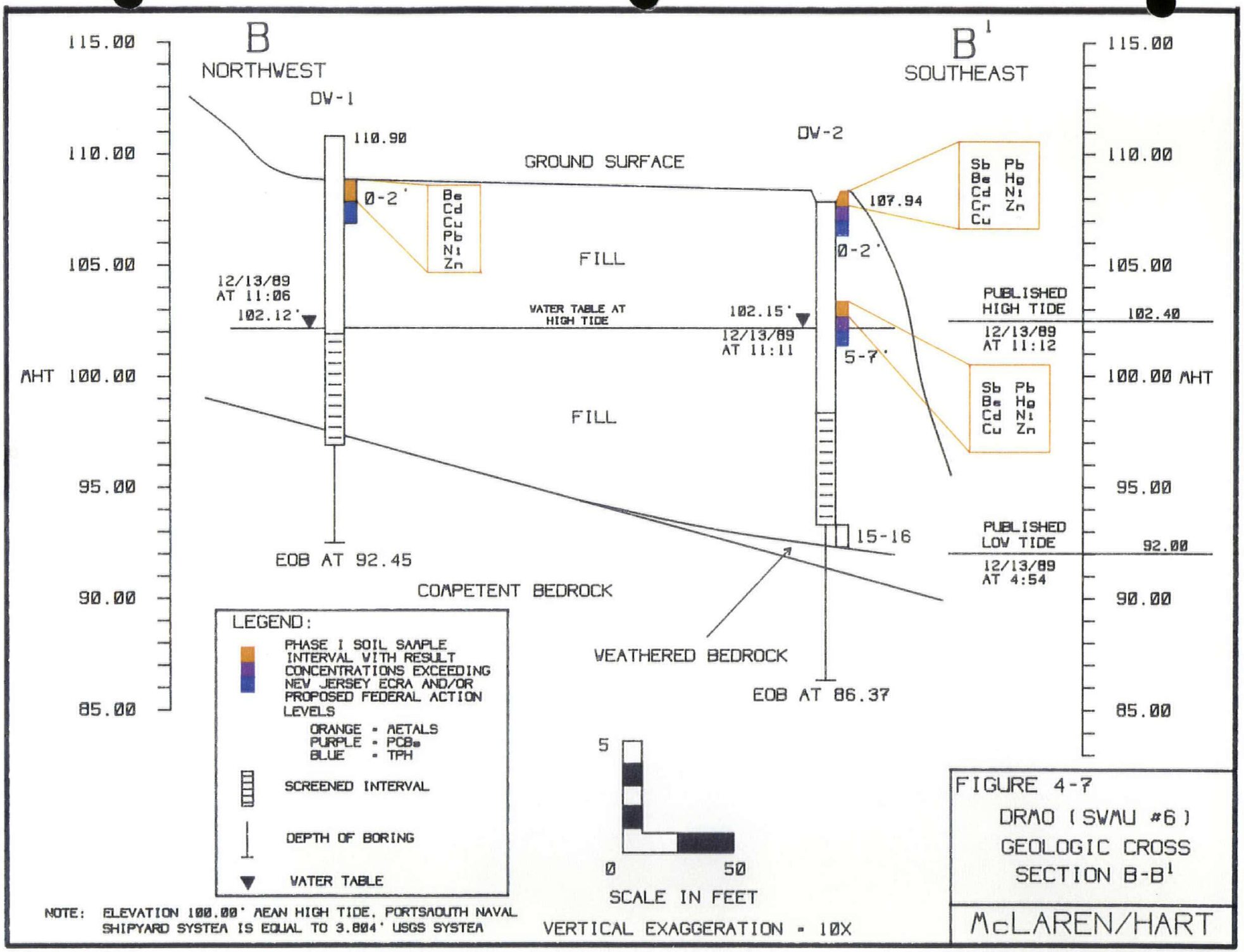
NOTE: ELEVATION 100.00' MEAN HIGH TIDE, PORTSMOUTH NAVAL SHIPYARD SYSTEM IS EQUAL TO 3.804' U.S.G.S. SYSTEM

VERTICAL EXAGGERATION = 10X

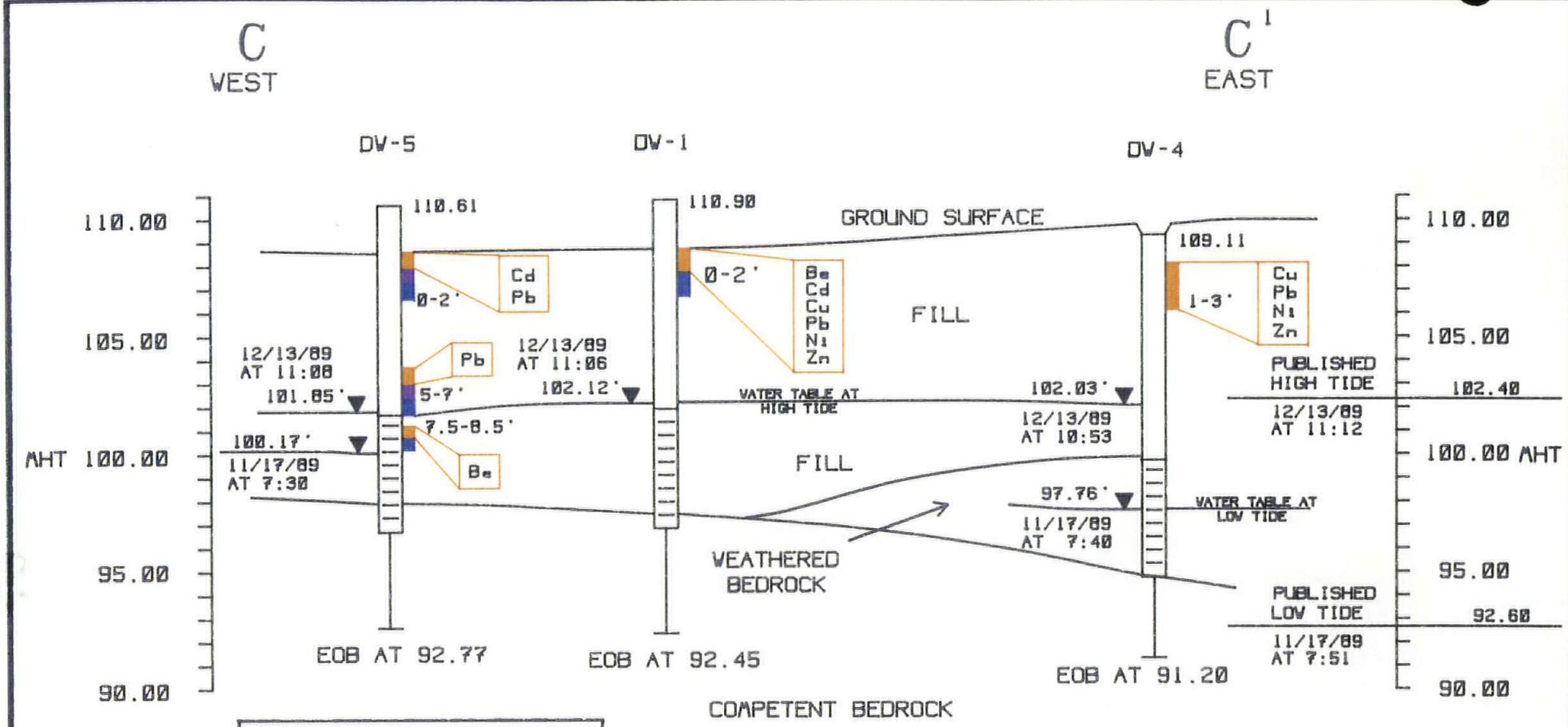
FIGURE 4-6

DRMO (SWMU #6) GEOLOGIC CROSS SECTION A-A1

McLAREN/HART



NOTE: ELEVATION 100.00' MEAN HIGH TIDE, PORTSMOUTH NAVAL SHIPYARD SYSTEM IS EQUAL TO 3.804' USGS SYSTEM



NOTE: ELEVATION 100.00' MEAN HIGH TIDE, PORTSMOUTH NAVAL SHIPYARD SYSTEM IS EQUAL TO 3.804' USGS SYSTEM

FIGURE 4-8

DRMO (SWMU #6) GEOLOGIC CROSS SECTION C-C'

McLAREN/HART

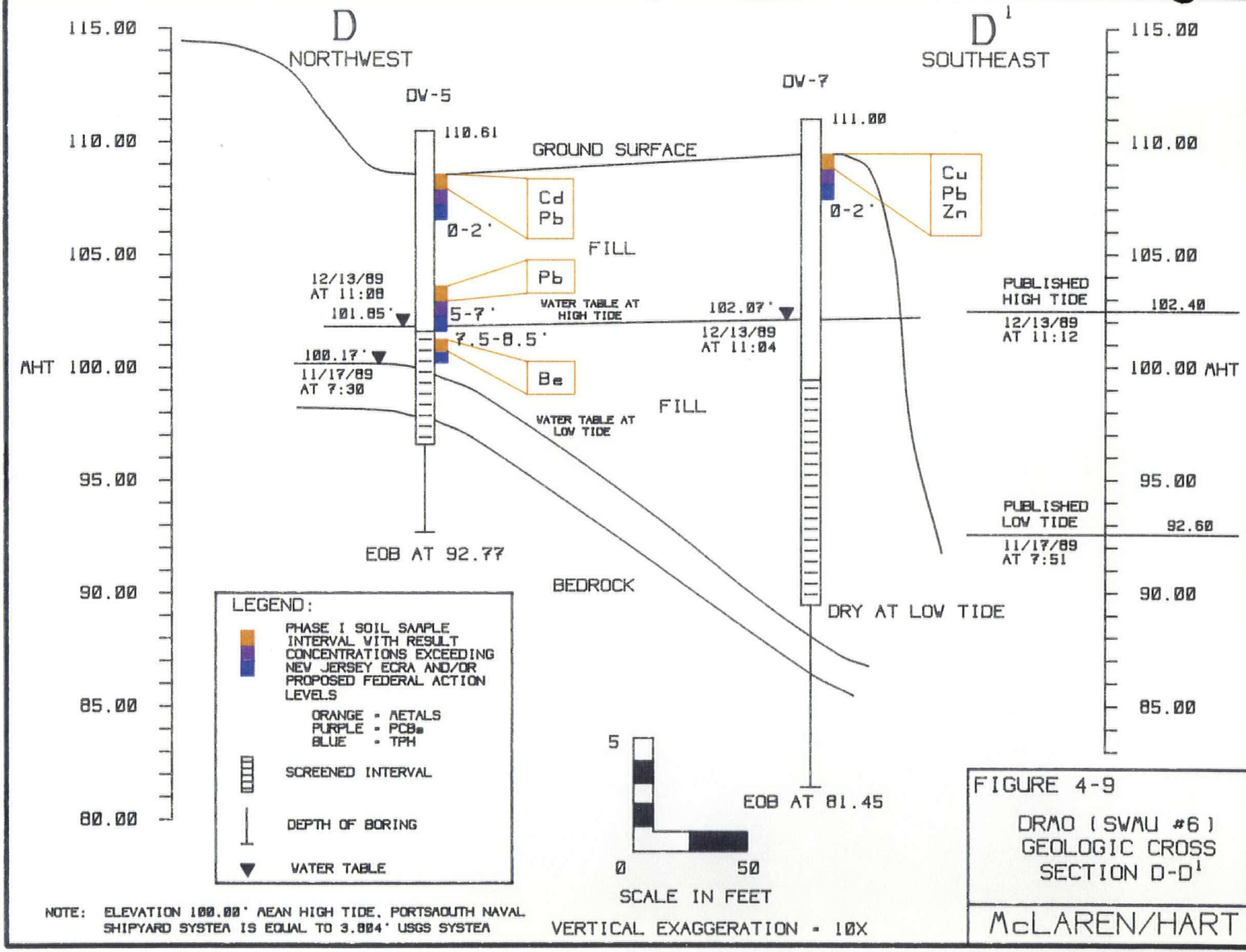

D
NORTHWEST
D'
SOUTHEAST
DW-5
DW-7
110.61
111.00
GROUND SURFACE
Cd
Pb
0-2'
FILL
Pb
5-7'
7.5-8.5'
Be
12/13/89
AT 11:08
101.85'
WATER TABLE AT
HIGH TIDE
102.07'
12/13/89
AT 11:04
100.17'
11/17/89
AT 7:30
WATER TABLE AT
LOW TIDE
FILL
Cu
Pb
Zn
0-2'
PUBLISHED
HIGH TIDE
102.40
12/13/89
AT 11:12
PUBLISHED
LOW TIDE
92.60
11/17/89
AT 7:51
115.00
110.00
105.00
MHT 100.00
95.00
90.00
85.00
80.00
EOB AT 92.77
BEDROCK
DRY AT LOW TIDE
EOB AT 81.45
LEGEND:
PHASE I SOIL SAMPLE INTERVAL WITH RESULT CONCENTRATIONS EXCEEDING NEW JERSEY ECRA AND/OR PROPOSED FEDERAL ACTION LEVELS
ORANGE - METALS
PURPLE - PCBs
BLUE - TPH
SCREENED INTERVAL
DEPTH OF BORING
WATER TABLE
5
0
50
SCALE IN FEET
VERTICAL EXAGGERATION - 10X
NOTE: ELEVATION 100.00' MEAN HIGH TIDE, PORTSMOUTH NAVAL SHIPYARD SYSTEM IS EQUAL TO 3.804' USGS SYSTEM
FIGURE 4-9
DRMO (SWMU #6)
GEOLOGIC CROSS
SECTION D-D'
McLAREN/HART

TABLE 4-6

SUMMARY OF METAL CONCENTRATIONS--SOIL EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND/OR PROPOSED FEDERAL ACTION LEVELS

DRMO (SWMU #6) PORTSMOUTH NAVAL SHIPYARD

OCTOBER 31--NOVEMBER 10, 1989

PARAMETER	McLAREN/HART SAMPLE I.D.	CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)	PROPOSED FEDERAL ACTION LEVEL (PPM)
ANTIMONY	DSB-1D(0-2')+	157.00J	10.0	30.0
	DSB-2(0-2')	23.00J	10.0	30.0
	DSB-2(2-4')*	28.80J	10.0	30.0
	DSB-2(5-7')	13.60J	10.0	30.0
	DSB-3(0-2')	2470.00	10.0	30.0
	DSB-6A(0-2')	6510.00J	10.0	30.0
BERYLLIUM	DSB-1(0-2')	0.51	1.0	0.2
	DSB-1D(0-2')+	0.45	1.0	0.2
	DSB-2(0-2')	1.00	1.0	0.2
	DSB-2(2-4')*	2.40	1.0	0.2
	DSB-2(5-7')	1.60	1.0	0.2
	DSB-5(7.5-8.5')	0.42	1.0	0.2
	DSB-5D(7.5-8.5')+	0.60	1.0	0.2
CADMIUM	DSB-1(0-2')	4.80	3.0	40.0
	DSB-1D(0-2')+	4.30	3.0	40.0
	DSB-2(0-2')	7.80	3.0	40.0
	DSB-2(2-4')*	10.30	3.0	40.0
	DSB-2(5-7')	5.40	3.0	40.0
	DSB-3(0-2')	3.30	3.0	40.0
	DSB-5(0-2')	4.60	3.0	40.0
	DSB-6C(0-2')	4.20	3.0	40.0
	DSB-6C(2-4')**	8.20	3.0	40.0
	DSB-7(2-4')***	8.80	3.0	40.0

J = Qualitative and Semi-Quantitative
NA = Not Available
+ = RAI Duplicate per NEESA Program 20.2-047B
* = McLAREN/HART Duplicate Sample of DSB-2(0-2')
** = McLAREN/HART Duplicate Sample of DSB-6C(0-2')
*** = McLAREN/HART Duplicate Sample of DSB-7(0-2')

TABLE 4-6 (CONTINUED)

SUMMARY OF METAL CONCENTRATIONS--SOIL EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND/OR PROPOSED FEDERAL ACTION LEVELS

DRMO (SWMU #6) PORTSMOUTH NAVAL SHIPYARD

OCTOBER 31--NOVEMBER 10, 1989

PARAMETER	McLAREN/HART SAMPLE I.D.	CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)	PROPOSED FEDERAL ACTION LEVEL (PPM)
MERCURY	DSB-2(0-2')	1.80J	1.0	20.0
	DSB-2(2-4')*	1.90J	1.0	20.0
	DSB-2(5-7')	2.10J	1.0	20.0
	DSB-3(0-2')	20.00J	1.0	20.0
NICKEL	DSB-1(0-2')	153.00	100.0	2,000.0
	DSB-2(0-2')	957.00J	100.0	2,000.0
	DSB-2(2-4')*	872.00J	100.0	2,000.0
	DSB-2(5-7')	660.00J	100.0	2,000.0
	DSB-3(0-2')	134.00J	100.0	2,000.0
	DSB-4(1-3')	192.00J	100.0	2,000.0
	DSB-6C(0-2')	162.00J	100.0	2,000.0
	DSB-7(2-4')***	402.00J	100.0	2,000.0
SILVER	DSB-3(0-2')	7.80	5.0	200.0
ZINC	DSB-1(0-2')	415.00	350.0	NA
	DSB-1D(0-2')+	471.00	350.0	NA
	DSB-2(0-2')	1400.00	350.0	NA
	DSB-2(2-4')*	2960.00	350.0	NA
	DSB-2(5-7')	1390.00	350.0	NA
	DSB-3(0-2')	630.00	350.0	NA
	DSB-4(1-3')	474.00	350.0	NA
	DSB-6A(0-2')	824.00	350.0	NA
	DSB-6C(0-2')	1160.00	350.0	NA
	DSB-6C(2-4')**	2310.00	350.0	NA
	DSB-7(0-2')	1440.00	350.0	NA
	DSB-7(2-4')***	2000.00	350.0	NA

J = Qualitative and Semi-Quantitative
NA = Not Available
+ = RAI Duplicate per NEESA Program 20.2-047B
* = McLAREN/HART Duplicate Sample of DSB-2(0-2')
** = McLAREN/HART Duplicate Sample of DSB-6C(0-2')
*** = McLAREN/HART Duplicate Sample of DSB-7(0-2')

locations as shown in Table 4-7. The TPH concentrations observed exceeded New Jersey ECRA Guidance Values at seven of the nine locations (Table 4-8). Contaminant concentrations exceeding New Jersey ECRA Guidance Values and/or proposed Federal Action Levels are also present at depth within the soil borings. The only soil sample at depth that does not exceed a New Jersey ECRA Guidance Value is the 15 to 16 foot sample at DW-2. Based on results from Phase II groundwater sampling, lead appears to be the only contaminant emanating from the soils that has adversely affected groundwater quality. This is based solely on one groundwater sampling event and on samples field filtered for metal analyses. Phase III groundwater sampling should include both filtered and non-filtered metal analyses to compare suspended versus non-suspended particulates.

4.4 Conclusions/Recommendations

Surface soil samples collected around the DRMO showed evidence of a variety of contaminants. Twenty of thirty-four samples meet or exceed New Jersey's ECRA Guidance Values and/or proposed Federal Action Levels for one or more metals in soil. Fourteen of twenty-six samples were found to contain TPH in concentrations which meet or exceed New Jersey's ECRA Guidance Values of 100 ppm in soil. One soil sample was found to contain pesticides (4,4-DDE and 4,4-DDT) at concentations above the proposed Federal Action Levels for these compounds. PCBs were detected in many samples but were below the regulatory standards used for comparison.

Metals concentrations decreased with increasing sampling depth and very few samples from below the surface were found to exceed regulatory standards. No additional sampling was performed to define the vertical extent of contamination in those locations where the concentration of contaminants below the surface was found to

TABLE 4-7

SUMMARY OF PCB CONCENTRATIONS--SOIL EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND/OR PROPOSED FEDERAL ACTION LEVELS

DRMO (SWMU #6)
PORTSMOUTH NAVAL SHIPYARD

OCTOBER 31--NOVEMBER 10, 1989

McLAREN/HART SAMPLE I.D.	PCB CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)	PROPOSED FEDERAL ACTION LEVEL (PPM)
DSB-2(0-2')	4.83	1.0-5.0	0.09
DSB-2(2-4')*	6.80	1.0-5.0	0.09
DSB-2(5-7')	3.23	1.0-5.0	0.09
DSB-3(0-2')	7.70	1.0-5.0	0.09
DSB-5(0-2')	11.10	1.0-5.0	0.09
DSB-5(5-7')	17.60	1.0-5.0	0.09
DSB-6A(0-2')	1.82	1.0-5.0	0.09
DSB-7(0-2')	47.70	1.0-5.0	0.09
DSB-7(0-2')DL	63.70	1.0-5.0	0.09
DSB-7(2-4')**	58.90	1.0-5.0	0.09
DSB-7(2-4')DL	69.80	1.0-5.0	0.09

DSB-7(0-2')DL and DSB-7(2-4')DL are x-fold dilutions of DSB-7(0-2') and DSB-7(2-4'), respectively.
* = McLAREN/HART Duplicate Sample of DSB-2(0-2')
** = McLAREN/HART Duplicate Sample of DSB-7(0-2')

TABLE 4-8

SUMMARY OF TPH CONCENTRATIONS--SOIL
EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES

DRMO (SWMU #6)
PORTSMOUTH NAVAL SHIPYARD

OCTOBER 31--NOVEMBER 10, 1989

McLAREN/HART SAMPLE I.D.	TPH CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)
DSB-1(0-2')	190	100
DSB-1D(0-2')+	3500	100
DSB-2(0-2')	820	100
DSB-2(2-4')*	1400	100
DSB-2(5-7')	1100	100
DSB-3(0-2')	140J	100
DSB-5(0-2')	5200	100
DSB-5(5-7')	7500	100
DSB-5(7.5-8.5')	110	100
DSB-6A(0-2')	570	100
DSB-6B(5-7')	420	100
DSB-6C(0-2')	810J	100
DSB-6C(2-4')**	700J	100
DSB-6C(15-15.5')	930J	100
DSB-7(0-2')	1300	100
DSB-7(2-4')***	1800	100

J = Qualitative and Semi-Quantitative
+ = RAI Duplicate per NEESA Program 20.2-047B
* = McLAREN/HART Duplicate Sample of DSB-2(0-2')
** = McLAREN/HART Duplicate Sample of DSB-6C(0-2')
*** = McLAREN/HART Duplicate Sample of DSB-7(0-2')

exceed the standards. The future phases of field work should include subsurface soil sampling in those select areas where contamination was encountered below grade in order to establish the total depth of the contaminated soil in order to estimate the volume of soil affected.

Saline groundwater was encountered in all of the monitoring wells at the DRMO. The water in five of the wells had salinity values high enough to be considered diluted seawater while the remaining two wells were brackish. Water levels in the wells fluctuated with the tides indicating that the wells were in direct hydraulic communication with the river.

Laboratory analyses of groundwater samples from the wells showed no evidence (non-detectable) of TCL volatile compounds and (non-detectable) pesticide/PCBs. Priority Pollutant Metals were found in most wells but only lead was found at concentrations which exceeded the National Interim Drinking Water Standard of 50 ppb.

If future sampling rounds confirm that the only groundwater contaminants at the DRMO are metals, then the analytical parameters may be pared down to a subset of the analyses performed for this round.

5.0 INDUSTRIAL WASTE OUTFALLS (SWMU #5)

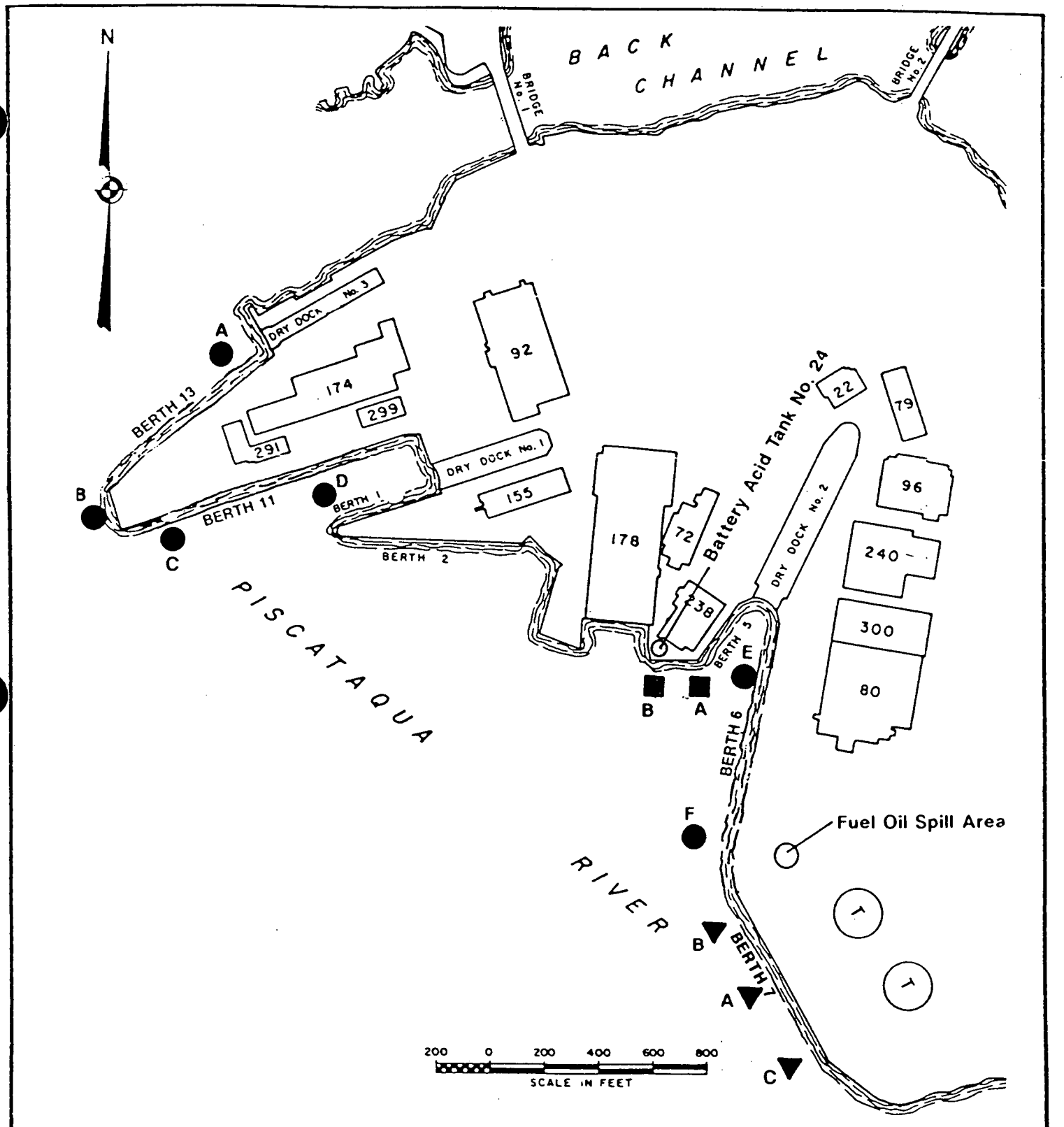
The field program related to this SWMU consisted of the collection of six off-shore sediment samples in the vicinity of six industrial waste outfalls. These samples were collected to provide a baseline data set for an evaluation of potential contamination directly off-shore from the industrial waste outfalls. This analytical data, along with other analytical results, will aid in the evaluation of whether potential contamination is directly related to the outfalls.

5.1 Sediment Sampling

On August 23 and 24, 1990, six sediment samples, including one duplicate, were collected off-shore from the Industrial Waste Outfalls at Berths 6, 11, and 13 as shown in Figure 5-1. Sample locations were contingent upon favorable bottom conditions (i.e. free of debris and sediment present). Each sampling location was defined with LORAN and fixed point headings. The bottom was surveyed prior to sample collection using sonar to establish the best location for obtaining sediment.

5.1.1 Sampling Procedures

The off-shore sediment sampling was conducted by RAI under the supervision of McLaren/Hart personnel. Following the selection of a favorable sample location, bottom sediments were collected using a ponar dredge. Sediment from the dredge was placed into a clean stainless-steel mixing bowl. Samples collected for volatiles analysis were placed directly into laboratory-supplied bottles before mixing the sample to reduce the possibility of losses due to volatilization. The remaining sediment was well mixed and the bottles were filled using a clean stainless-steel trowel. A total of five off-shore sediment samples, and one duplicate sample SWMU 5-A1 (duplicate of SWMU 5-A) were analyzed for TCL volatiles, acid extractables, TCL pesticide/PCBs, TOC, TPH, and priority pollutant metals. One sediment sample (SWMU-5B) was analyzed for all the compounds listed in Appendix IX and TOC.



KEY

SWMU 5 (INDUSTRIAL WASTE OUTFALLS)

▲ SWMU 27 (FUEL OIL SPILL AREA - BERTH 7)

■ SWMU 10 (BATTERY ACID TANK # 24)

FIGURE 5-1

SWMUs 5, 10, & 27

OFF-SHORE SEDIMENT SAMPLES

McLAREN/HART

All equipment involved with sampling was decontaminated prior to use according to the protocol described in Table 2-2. All samples were hand delivered by RAI to their laboratory for analysis under proper chain-of-custody.

5.1.2 Findings

Sample collection at each of the six off-shore sampling locations associated with the Industrial Waste Outfalls were completed using a ponar dredge to collect the sample and sonar to locate a suitable sampling point. The sediment collected at location SWMU 5-C, SWMU 5-D and SWMU 5-F consisted of fine brown sand with shell fragments. No indication of contamination, visual or olfactory, was observed during sample collection with the exception of a slight sheen on the sediment collected at SWMU 5-F. The depth to sediment at each of these locations ranged from forty to sixty feet. The other three sample locations, SWMU 5-A, SWMU 5-A1 (duplicate of SWMU 5-A), SWMU 5-B, and SWMU 5-E, consisted of brown silt and mud with some grey mud and no shell fragments. The depth to sediment at these three locations was shallower ranging from thirty to thirty-five feet. The sediment collected at each of these locations exhibited a sheen during sample collection.

5.1.3 Laboratory Analytical Results

Five of the off-shore sediment samples and one duplicate, SWMU 5A, SWMU 5A1 (duplicate of SWMU 5-A), SWMU 5-C, SWMU 5-D, SWMU 5-E, and SWMU 5-F were analyzed for TCL volatiles, acid extractables, TCL pesticide/PCBs, TOC, TPH, and priority pollutant metals. The sixth sample (SWMU 5-B) was analyzed for Appendix IX and TOC. A summary of valid sediment results are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

The State of Maine does not have published clean-up guidelines for contamination in soils or sediment, therefore, New Jersey's Environmental Clean-up Responsibility Act (ECRA) Guidance Values and proposed Federal Action Levels documented in the Federal Register (55 FR 30865, July 27, 1990) are used for comparison purposes.

TCL and Appendix IX Volatiles

There were no detectable volatile concentrations above the New Jersey ECRA Guidance Value and proposed Federal Action Levels.

Semi-Volatiles (Appendix IX)

Detectable semi-volatile concentrations and qualitative estimates were found in sediment sample SWMU 5-B. Total semi-volatile concentrations found in sample SWMU 5-B exceed the New Jersey ECRA Guidance Value of 10 ppm for total base neutrals.

Acid Extractables

There were no detectable acid extractable concentrations in any of the sediment samples analyzed for these parameters.

TCL and Appendix IX Pesticide/PCBs

There were no detectable TCL pesticide/PCB concentrations in any of the sediment samples.

Herbicides (Appendix IX)

There were no detectable herbicide concentrations in sediment sample SWMU 5-B.

Total Organic Compounds (TOC)

TOC concentrations ranging from 0.04% to 1.8% were found in all sediment samples. These concentrations are indicative of the grain size variation in the sediment. The higher TOC concentrations are found in the lower energy depositional environment where finer material tends to accumulate.

TPH

Detectable TPH concentrations were found in all sediment samples except for samples SWMU 5-B which was not analyzed for TPH. Sediment samples SWMU 5-A, SWMU 5-A1 (duplicate of SWMU 5-A), and SWMU 5-E all exceed the New Jersey ECRA Guidance Value of 100 ppm for TPH. Table 5-1 summarizes all sediment samples with TPH concentrations exceeding the New Jersey ECRA Guidance Value. TPH is not a listed contaminant under proposed Federal Action Levels.

Priority Pollutant Metals

Detectable concentrations of metals were found in all sediment samples. Only one sediment sample SWMU 5-C had a semi-quantitative beryllium estimate of 1.20 ppm that exceeds the New Jersey ECRA Guidance Value of 1.0 ppm and the proposed Federal Action Level of 0.2 ppm.

5.1.4 Interpretations/Discussion

Detectable concentrations and semi-quantitative estimates of TPH were found in all sediment samples collected from the Industrial Waste Outfalls. Sediment samples SWMU 5-A, SWMU 5-A1 (duplicate of SWMU 5-A), and SWMU 5-E all exceed the New Jersey ECRA Guidance Value of 100 ppm for TPH. Sediment sample SWMU 5-B was not analyzed for TPH. The TPH concentrations suggest the presence of a petroleum product. The actual source of the contamination is unknown, but may be attributed to one or more of the six Industrial Waste Outfalls, spills from on-shore or surface vessels, or contaminated sediment transported from an upriver source.

TABLE 5-1

SUMMARY OF TPH CONCENTRATIONS--SEDIMENT EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES

INDUSTRIAL WASTE OUTFALLS (SWMU #5)
PORTSMOUTH NAVAL SHIPYARD

AUGUST 23, 1990

McLAREN/HART SAMPLE I.D.	TPH CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)
SWMU 5-A	280J	100
SWMU 5-A1*	540J	100
SWMU 5-E	610	100

J = Qualitative & Semi-Quantitative
* = McLaren/Hart Duplicate Sample of SWMU 5-A

Total semi-volatile concentrations found in Appendix IX analysis of sediment sample SWMU 5-B exceeded the New Jersey ECRA Guidance Value of 10 ppm for total base neutrals. The semi-volatiles present are also an indication of a petroleum product.

There were no detectable concentrations of acid extractables, pesticide/PCBs, and herbicides (Appendix IX analysis only) in the sediment samples collected along the Industrial Waste Outfalls.

Only one semi-quantitative beryllium estimate in sediment sample SWMU 5-C exceeded the New Jersey ECRA Guidance Value and the proposed Federal Action Level. However, natural beryllium concentrations found in the surficial soil of Southern Maine range from 1-7 ppm, (Shacklette and Boerngen, 1984). No other metal concentrations exceeded the New Jersey ECRA Guidance Values and/or the proposed Federal Action Levels.

5.1.5 Conclusions/Recommendations

The concentrations and semi-quantitative estimates of TPH detected in the Industrial Waste Outfall sediment samples suggest the presence of a petroleum product. Semi-volatile concentrations found in sample SWMU 5-B also indicate a petroleum product. The actual source of the contamination is unknown, but may be attributed to previous discharges from the outfalls, spills from on-shore or surface vessels, or contaminated sediment transported from an upriver source. The area surrounding the outfalls should be further investigated to characterize the extent and concentration of contamination. Sediment samples should be analyzed for TCL organics, TAL inorganics, TOC, and grain size analysis. TCL organic analysis will provide chromatograms and tentatively identified compounds that would confirm the presence of a petroleum product.

6.0 BATTERY ACID TANK #24 (SWMU #10)

The field program related to this SWMU consists of off-shore sediment sampling in the vicinity of Battery Acid Tank #24. These samples were collected to provide analytical data for an assessment of potential contaminants directly off-shore from Battery Acid Tank #24.

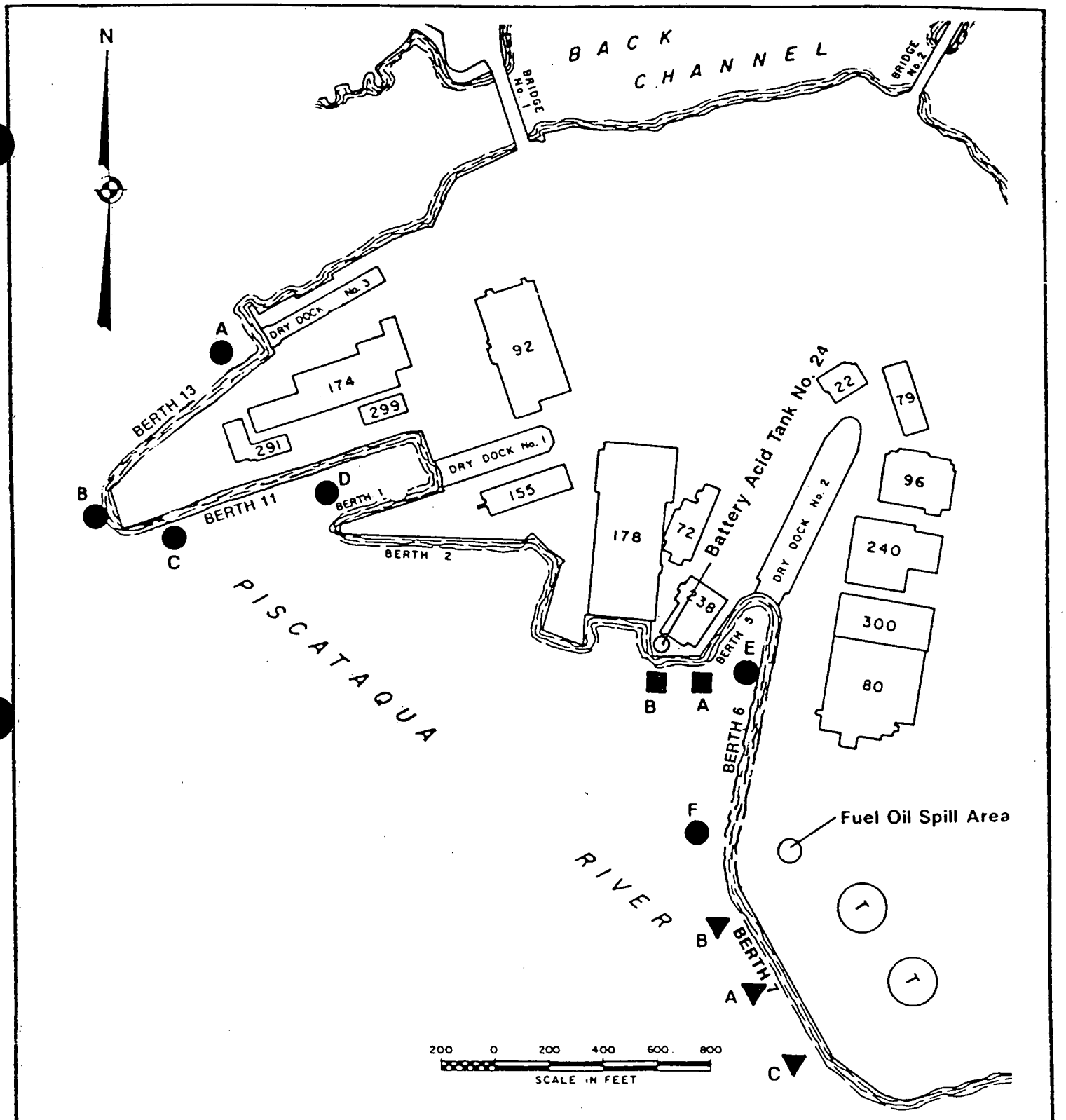
6.1 Sediment Sampling

On August 24, 1990, two sediment samples, SWMU10-A and SWMU10-B, were collected in the vicinity of Battery Acid Tank #24, off-shore of Berth 4 as shown in Figure 6-1. The sample locations were contingent upon favorable bottom conditions (i.e. free of debris and sediment present). Each sampling location was defined with LORAN and fixed point headings. The bottom at each location was surveyed prior to sample collection using sonar to establish the best location for obtaining sediment.

6.1.1 Sampling Procedures

The off-shore sediment sampling was conducted by RAI under the supervision of McLaren/Hart personnel. Following the selection of a favorable sample location, sediment was sampled using a ponar dredge. Sediment collected in the dredge was placed into a clean stainless-steel bowl. The sediment was mixed and laboratory-supplied bottles were filled using a clean stainless-steel trowel. The two samples were analyzed for TOC, TPH, and priority pollutant metals.

All sampling equipment was decontaminated prior to use according to the protocol described in Table 2-2.



KEY

SWMU 5 (INDUSTRIAL WASTE OUTFALLS)

▲ SWMU 27 (FUEL OIL SPILL AREA - BERTH 7)

■ SWMU 10 (BATTERY ACID TANK # 24)

FIGURE 6-1

SWMUs 5, 10, & 27

OFF-SHORE SEDIMENT SAMPLES

McLAREN/HART

6.1.2 Findings

Sample collection at both off-shore sampling locations associated with Battery Acid Tank #24 was completed using sonar to select a suitable sampling point and a ponar dredge to collect the sample. Sediment sample SWMU10-A consisted of brown sand with some gravel and a few crushed shells. This sample was collected in approximately fifty-five feet of water. Sediment sample SWMU10-B consisted of dark brown silt with some gravel and a sheen was observed on the sediment. This sample was collected in approximately forty-six feet of water.

6.1.3 Laboratory Analytical Results

Two sediment samples, labeled SWMU 10-A and SWMU 10-B, were collected off-shore in the vicinity of Battery Acid Tank #24, as shown in Figure 6-1. These samples were analyzed for TOC, TPH, and priority pollutant metals. A summary of valid sediment results are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

The State of Maine does not have published clean-up guidelines for contamination in soils or sediment, therefore, New Jersey's Environmental Clean-up Responsibility Act (ECRA) Guidance Values and proposed Federal Action Levels documented in the Federal Register (55 FR 30865, July 27, 1990) are used for comparison purposes.

<u>TPH</u>

TPH concentrations were found in samples SWMU 10-A and SWMU 10-B at 85 ppm and 260 ppm, respectively. Sample SWMU 10-B exceeds the New Jersey ECRA Guidance Value for TPH of 100 ppm. TPH is not a listed contaminant under proposed Federal Action Levels.

TOC

Detectable TOC concentrations of 0.18% and 0.34% found in both samples appear to be indicative of the grain size variation in the sediment. The low TOC concentrations are typical in high energy environments where the finer material is removed.

Priority Pollutant Metals

Detectable metal concentrations found in both samples are below New Jersey ECRA Guidance Values and proposed Federal Action Levels.

6.1.4 Interpretations/Discussion

The only contaminant of concern is the TPH concentration of 260 ppm found in sediment sample SWMU 10-B which exceeds the New Jersey ECRA Guidance Value of 100 ppm. The actual source of petroleum hydrocarbon contamination is unknown, but may be attributed to previous discharges from the Industrial Waste Outfalls, spills from on-shore or surface vessels, or contaminated sediment transported from an upriver source.

6.1.5 Conclusions/Recommendations

Based on the analytical results of samples collected, there does not appear to have been any negative impact on off-shore sediment by any former releases from Battery Acid Tank #24.

The concentrations of TPH detected in the sediment samples suggest the presence of a petroleum product. The actual source of contamination is unknown, but may be attributed to previous discharges from the Industrial Waste Outfalls, spills from on-shore or surface vessels, or contaminated sediment transported from an upriver source. The area surrounding Battery Acid Tank #24 should be further investigated to characterize

the extent and concentration of contamination. This investigation should be conducted in conjunction with the recommended investigation at the Industrial Waste Outfalls discussed in Section 5.1.5. Sediment samples should be analyzed for TCL organics, TAL inorganics, TOC, and grain size analysis. TCL organic analysis will provide chromatograms and tentatively identified compounds that would confirm the presence of a petroleum product.

7.0 TANK INVESTIGATION (SWMU #12)

The field program related to this SWMU consisted of boiler blowdown tank sampling and analysis. The purpose of the sampling program was to determine if the liquid content of the tank is a hazardous waste as defined under 40 CFR Part 261.

7.1 Boiler Blowdown Water Sampling

The Boiler Blowdown Tank investigation consisted of three rounds of sampling of the tank contents. The liquid samples were collected during the initial (8/7/90), middle (8/17/90), and final stages (8/29/90) of Phase II field work.

7.1.1 Sampling Procedures

The liquid samples were collected using a dedicated, precleaned, bottom-filling, teflon bailer. The teflon bailer was lowered into the tank using a clean nylon cord. The dedicated bailer was decontaminated prior to use according to the protocol described in Table 2-2.

Liquid samples from each round of sampling were placed directly into a laboratory-supplied sample container. The samples were labeled, (BB-01, BB-01-02, and BB-01-03 for the first, second and third rounds, respectively), and stored on ice in a cooler for hand delivery to RAI. Samples collected from each round were analyzed for priority pollutant metals. All liquid samples were field analyzed for pH and temperature at the time of sample collection. Field parameters are summarized below:

	Temp (°C)	pH
First Round (BB-01)	--	11.29
Second Round (BB-01-02)	33.3	10.24
Third Round (BB-01-03)	31.2	9.23

Note: -- Not measured

7.1.2 Findings

The liquid samples collected from each round of sampling appeared clear and free of sediment. Field analyses for pH show the samples decreasing from a high pH of 11.29 in the first round to a low of 9.23 in the third round. Temperature dropped slightly from a high of 33.3°C in the second round of sampling to 31.2°C in the third round. Temperature was not measured in the first round of sampling.

7.1.3 Laboratory Analytical Results

A total of three liquid samples were collected from the Boiler Blowdown Tank. These samples were analyzed for priority pollutant metals. A summary of the valid results of the liquid samples collected August 7, August 17, and August 29, 1990 are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

7.1.4 Interpretations/Discussion

Hazardous waste characteristics defined under 40 CFR Part 261.24 were used to determine the maximum allowable concentrations of contaminants exhibiting the characteristic of TCLP Toxicity. Detectable concentrations of priority pollutant metals were found in all three liquid samples collected from the Boiler Blowdown Tank. All priority pollutant metal concentrations were below the maximum allowable concentrations. The pH of the samples were within the limits of 2 and 12.5 as specified in 40 CFR Part 261. It can be concluded that the liquid samples collected in the Boiler Blowdown Tank are not a hazardous waste as defined under 40 CFR Part 261.

7.1.5 Conclusions/Recommendations

Because the analytical results indicate that the water in the Boiler Blowdown Tank is not a hazardous waste as defined under 40 CFR Part 261, no additional sampling of the tank contents should be necessary.

Future soil borings near the tank will be used to assess the potential impact of tank contents on the surrounding soils. Based on the analytical results from this sampling round and on the historic information provided by the Navy about the tank, it is unlikely that measureable soil contamination will be encountered during installation of the soil borings.

8.0 Fuel Oil Spillage Area (SWMU #27)

The field programs related to this SWMU included the following:

- Off-shore sediment sampling
- Test pit excavations and soil sampling

These samples were collected to provide analytical data for an evaluation of potential contamination off-shore from the fuel oil spillage area and along the former fuel oil pipeline.

8.1 Sediment Sampling

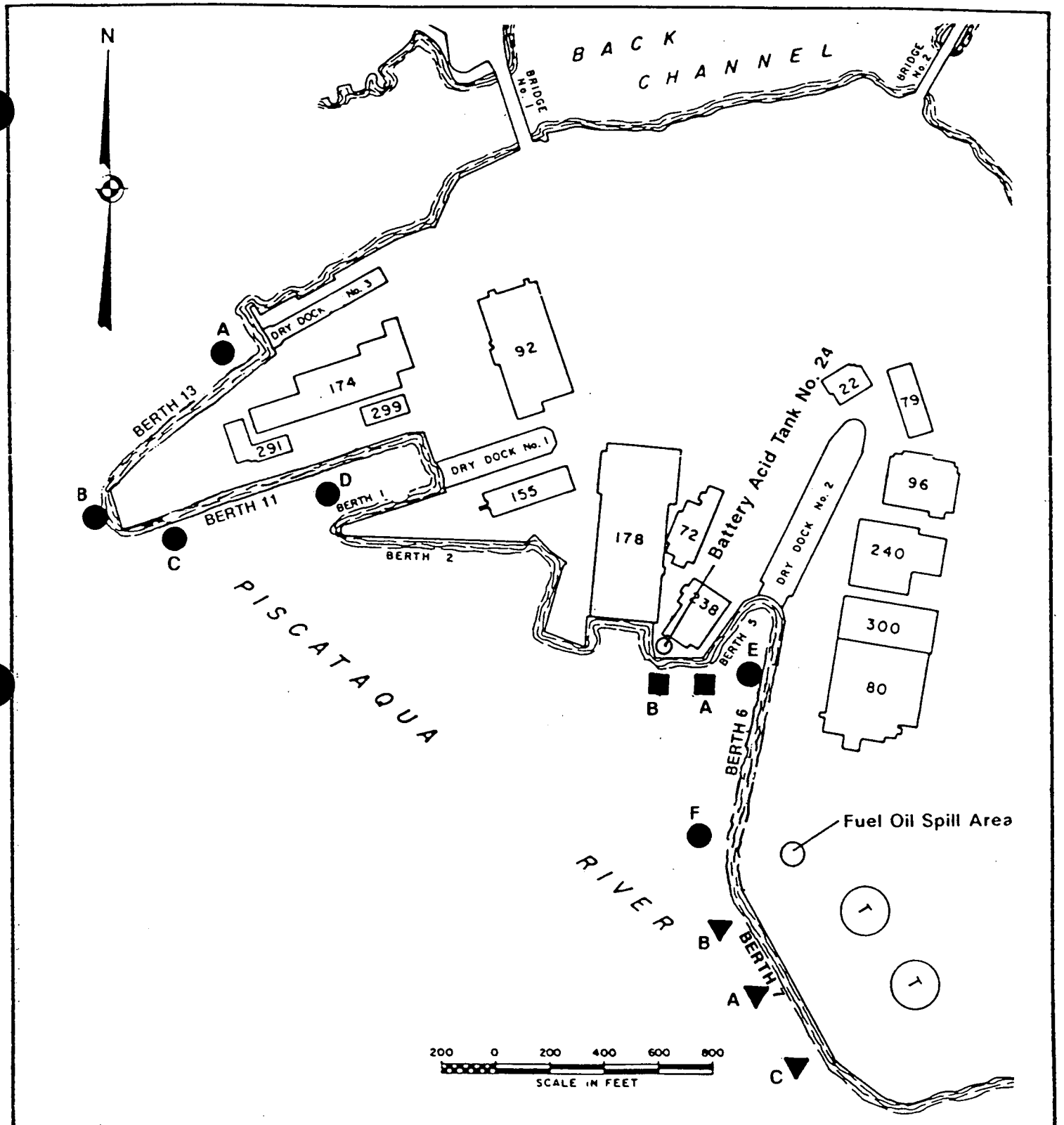
On August 23, 1990, three sediment samples were collected downgradient of the Fuel Oil Spillage Area off-shore of Berth 7 as shown in Figure 8-1. The sample locations were contingent upon favorable bottom conditions (i.e. free of debris and sediment present). Each sampling location was defined with LORAN and fixed point headings. The bottom at each location was surveyed prior to sample collection using sonar to establish the best location for obtaining sediment.

8.1.1 Sampling Procedures

The off-shore sediment sampling was conducted by RAI under the supervision of McLaren/Hart personnel. Following the selection of a favorable sample location, sediment was sampled using a ponar dredge. Sediment from the dredge was placed into a clean stainless-steel bowl, mixed, and the laboratory-supplied bottles filled using a clean stainless-steel trowel. The three samples were analyzed for TCL pesticide/PCBs, TOC, and TPH.

All sampling equipment was decontaminated prior to use according to the protocol described in Table 2-2.

All samples were hand delivered by RAI to their laboratory for analysis under proper chain-of-custody procedures.



KEY

SWMU 5 (INDUSTRIAL WASTE OUTFALLS)

▲ SWMU 27 (FUEL OIL SPILL AREA - BERTH 7)

■ SWMU 10 (BATTERY ACID TANK # 24)

FIGURE 8-1

SWMUs 5, 10, & 27

OFF-SHORE SEDIMENT SAMPLES

McLAREN/HART

8.1.2 Findings

Sample collection at the three off-shore sampling locations associated with the Fuel Oil Spillage Area were completed using sonar to locate a suitable sampling point and a ponar dredge to collect the sample. Three sediment samples were collected in approximately sixty-five to seventy feet of water. Each of the samples consisted of sand and gravel with crushed shells. None of the samples had any odor or visual evidence of contamination.

8.1.3 Laboratory Analytical Results

Three sediment samples, labeled SWMU 27-A, SWMU 27-B, and SWMU 27-C, were collected off-shore of Berth 7 in the vicinity of the Fuel Oil Spillage Area, as shown in Figure 8-1. These samples were analyzed for TCL pesticide/PCBs, TOC and TPH. A summary of valid sediment results are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

The State of Maine does not have published clean-up guidelines for contamination in soils or sediment, therefore, New Jersey's Environmental Clean-up Responsibility Act (ECRA) Guidance Values and proposed Federal Action Levels documented in the Federal Register (55 FR 30865, July 27, 1990) are used for comparison purposes.

TCL Pesticide/PCBs

There were no detectable concentrations of TCL pesticide/PCBs in any of the sediment samples.

TPH

Semi-quantitative TPH estimates were found in samples SWMU 27-B (100 ppm) and SWMU 27-C (60 ppm). There were no detectable TPH concentrations in sample SWMU 27-A. The New Jersey ECRA Guidance Value for TPH is 100 ppm. TPH is not a listed contaminant under proposed Federal Action Levels.

Total Organic Compounds (TOC)

Detectable TOC concentrations found in both samples appear to be indicative of the grain size variation in the sediment.

8.1.4 Interpretations/Discussion

Sediment sample SWMU 27-B shows a semi-quantitative TPH estimate of 100 ppm, which is equivalent to the New Jersey ECRA Guidance Value of 100 ppm TPH.

The detectable TPH concentrations suggest the presence of a petroleum product. The actual source of petroleum hydrocarbon contamination is unknown, but may be attributed to the Fuel Oil Spillage Area, previous discharges from the Industrial Waste Outfalls, spills from on-shore or surface vessels, or contaminated sediment transported from an upriver source. Additional sediment sampling locations in the general vicinity of the Fuel Oil Spillage Area would be necessary to further characterize the extent and concentration of contamination.

8.1.5 Conclusions/Recommendations

The concentrations of TPH detected in the Fuel Oil Spillage Area sediment samples suggest the presence of a petroleum product. The actual source of contamination is unknown, but may be attributed to the Fuel Oil Spillage Area, previous

discharges from the Industrial Waste Outfalls, spills from on-shore or surface vessels, or contaminated sediment transported fron an upriver source. The area surrounding the Fuel Oil Spillage Area should be further investigated to characterize the extent and concentration of contamination. This investigation should be conducted in conjunction with the recommended investigation at the Industrial Waste Outfalls and Battery Acid Tank #24 discussed in Sections 5.1.5 and 6.1.5, respectively. Sediment samples should be analyzed for TCL organics, TAL inorganics, TOC, and grain size analysis. TCL organic analysis will provide chromatograms and tentatively identified compounds that would confirm the presence of a petroleum product.

8.2 Exploratory Test Pits

According to PNS personnel, an abandoned fuel line system carrying #6 fuel oil ran parallel to and along Berth 6 at a depth of approximately six feet. In 1978, a leak was detected in the pipeline. The pipe, which carried the #6 fuel oil, was found to be deteriorated and leaking when the piping was excavated and removed. A subsurface soil investigation was performed at Berth 6 (SWMU #27) to assess the potential for soil contamination in the vicinity of a former fuel oil pipeline. The investigation consisted of excavating three test pits and sampling subsurface soil to assess the presence or absence of contamination.

8.2.1 Excavation Procedures

The test pit program was conducted on August 8, 1990. A total of three test pits were excavated east of Berth 6 along the former pipeline as shown in Figure 8-2. The test pit locations were determined by PNS personnel based on available construction engineering drawings of the former pipeline and underground utilities. Excavation was performed with a Case 580D backhoe operated by H.L. Smith, Inc. of North Hampton, New Hampshire under the supervision of a McLaren/Hart geologist.

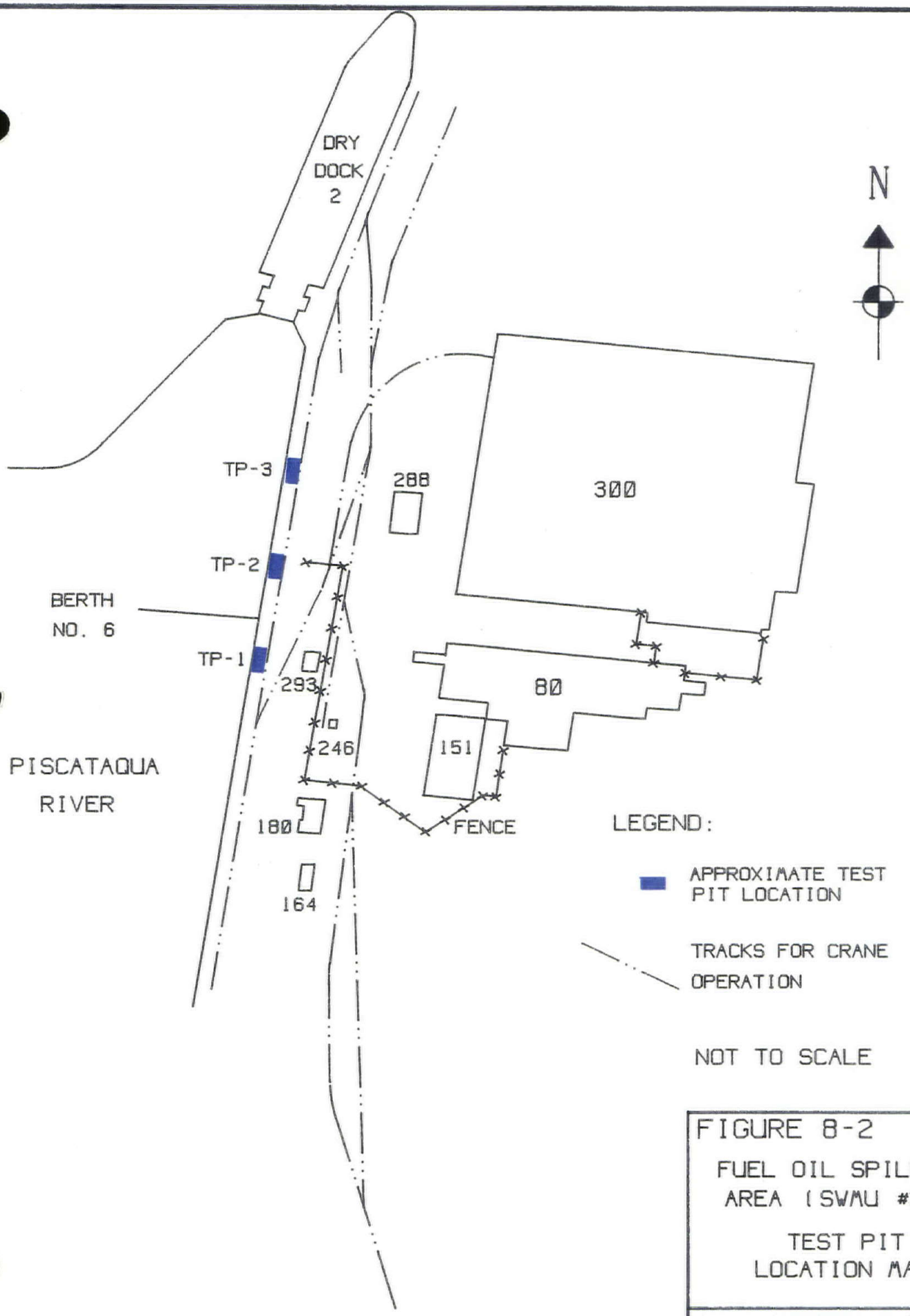


FIGURE 8-2

FUEL OIL SPILLAGE AREA (SWMU #27)

TEST PIT LOCATION MAP

McLAREN/HART

Excavation was initiated by breaking through the asphalt at each test pit location with a jack hammer. The asphalt in the outline of the test pit was removed and excavation commenced. The dimensions of each test pit was limited by an adjacent concrete duct, underground utilities and surface obstructions. Excavation continued at each location until either surface or subsurface obstructions prevented further excavation. Following excavation and soil sampling, the removed soil was replaced in the excavation as backfill.

8.2.2 Subsurface Soil Sampling

A total of seven composite soil samples, including one duplicate, were collected from the three test pits for laboratory analysis. Two samples were obtained from each test pit, one composite of the soil from the sides of the excavation and one composite from the bottom of the excavation. The soil sampling locations in each test pit, that were combined to obtain a composite sample, are described in the test pit summaries in the section 8.2.2.2. These samples were collected to assess potential soil contamination associated with the former fuel oil pipeline.

8.2.2.1 Sampling Procedures

Composite soil samples were obtained from a number of locations within each test pit using separate pre-cleaned stainless-steel trowels. Six inches of soil was removed from each sampling point prior to sample collection to avoid sampling soil that may have come in contact with the backhoe bucket. Soil from each sampling point was then placed in a stainless-steel bowl, homogenized and transferred to a laboratory-supplied sample bottle. The samples were labeled and stored on ice for hand delivery to RAI. All of the samples were analyzed for TPH and polynuclear aromatic hydrocarbons (PAH).

The stainless-steel trowels and mixing bowls were decontaminated prior to use according to the protocol described in Table 2-2.

8.2.2.2 Findings

The unconsolidated fill material encountered in all three test pits consisted of fine to coarse sand, gravel, large rock fragments, and asphalt. The following is a summary of the test pits and soil sampling locations.

Test Pit #1. The excavation dimensions were approximately 7 feet long by 2.5 feet wide. The total depth of the excavation at TP-1 was 3 feet below grade. Composite soil sample TP-01B was collected from the bottom of the excavation, approximately 3.5 feet below grade. Composite soil sample TP-01S was collected from the north, east, and west side walls, approximately 2 feet below grade. The southern side wall was not sampled due to excessive fall-in. A slight petroleum odor was detected while excavating TP-1, but no soil staining was observed.

Test Pit #2. The excavation dimensions were approximately 7 feet long by 2.5 feet wide. The total depth of the excavation at TP-2 was 4.5 feet below grade. Composite soil sample TP-02B was collected from the bottom of the excavation, approximately 5 feet below grade. Composite soil sample TP-02S and duplicate sample TP-02I were collected from the north, south, and east side walls, approximately 2 to 3.5 feet below grade. The western side wall was not sampled due to the presence of a concrete duct and large rock fragments. There was no apparent staining observed or odors detected in TP-2.

Test Pit #3. The excavation dimensions were approximately 10 feet long by 2.5 feet wide. The total depth of the excavation at TP-3 was 4.5 feet below grade. Composite soil sample TP-03B was collected from the bottom of the excavation, approximately 5 feet below grade. Composite soil sample TP-03S was collected from the south and east side walls, approximately 2.5 feet below grade. The north and west side walls were not sampled due to the presence of a concrete duct and the fall-in of large rock fragments. A black viscous tar was observed approximately one foot below the

overlying asphalt roadway, but did not appear to stain the underlying soils. There was no apparent staining observed or odors detected in TP-3.

8.2.2.3 Laboratory Analytical Results

A total of six composite soil samples labeled TP-01S, TP-01B, TP-02S, TP-02B, TP-03S, and TP-03B and one duplicate sample labeled TP-02I were collected from the three test pits along the former pipeline route. These samples were analyzed for TPH and PAH. A summary of valid analytical results are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

The State of Maine does not have published clean-up guidelines for contamination in soils, therefore, New Jersey's Environmental Cleanup Responsibility Act (ECRA) Guidance Values are used for comparison purposes. TPH and PAH are not listed contaminants under proposed Federal Action Levels.

TPH

TPH concentrations exceeded the New Jersey ECRA Guidance Value of 100 ppm in soil samples TP-01S, TP-01B, TP-02S, TP-02I, TP-02B, and TP-03B (Table 8-1).

PAH

There were no detectable PAH concentrations which exceeded New Jersey ECRA Guidance Values.

8.2.2.4 Interpretations/Discussion

Analytical results for the six subsurface soil samples and the one duplicate sample collected during the test pit investigation indicate that all samples exceed the New Jersey ECRA Guidance Value of 100 ppm TPH in soils, with the exception of TP-03S. Detectable concentrations of PAH were found in all samples except for TP-03B, however, total PAH concentrations are below the New Jersey ECRA Guidance Value.

TABLE 8-1

SUMMARY OF TPH CONCENTRATIONS--SOIL EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES

FUEL OIL SPILLAGE AREA (SWMU #27)
PORTSMOUTH NAVAL SHIPYARD

AUGUST 8, 1990

McLAREN/HART SAMPLE I.D.	TPH CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)
TP-01S	4,600	100
TP-01B	340	100
TP-02S	200	100
TP-02I*	240	100
TP-02B	1,100	100
TP-03B	830	100

* McLAREN/HART Duplciate Sample of TP-02S

The total depth of all three excavations was limited due to difficulties associated with backhoe accessibility. Large rock fragments and coarse sands and gravel were encountered within the excavations and indicate that the subsurface material has a high permeability and increases the potential for contaminant migration. Samples were difficult to obtain due to sparse soil between the rock fragments and the collapsing of some excavation walls. The soil within the excavation contained small asphalt fragments that may have influenced the TPH and PAH readings obtained. There was no apparent staining observed on the excavation floors of the three text pits. A slight petroleum odor was detected only while excavating TP-1.

8.2.2.5 Conclusions/Recommendations

The concentrations of TPH detected in the Fuel Oil Spillage Area soil samples suggest the presence of a petroleum product. A soil boring investigation, which is scheduled to be implemented at the Fuel Oil Spillage Area along Berth 6 during Phase III field activities, will further characterize the extent and concentration of contamination. Petroleum fingerprint analysis will be performed on selected soil samples to determine the type of petroleum hydrocarbon present, and to determine if the petroleum hydrocarbons are associated with the former #6 fuel oil leak. In addition, soil samples will be analyzed for TPH and PAH.

9.0 RIVER & BACK CHANNEL SEDIMENT SAMPLING

The field program related to the river and back channel consisted of the collection of off-shore sediment and core samples. These samples were collected to provide a baseline data set for an evaluation of potential contamination in the river and back channel sediment.

9.1 Sediment Sampling

On August 21 and 22, 1990, a total of fourteen sampling locations were defined by using fixed points and Loran coordinates to sample the sediment from the main channel of the Piscataqua River and the back channel as shown in Figure 9-1. Six of these locations within the main channel of the Piscataqua River were also cored to obtain subsurface sediment samples. Sample locations were contingent upon favorable bottom conditions (i.e. free of debris and sediment present). Sample locations were surveyed prior to collecting samples using sonar to establish the best locations to obtain samples.

9.1.1 Sampling Procedures

The off-shore sediment sampling was conducted by RAI under the supervision of McLaren/Hart personnel. RAI obtained fourteen surface sediment samples, ten cored subsurface sediment samples, and two duplicate sediment samples.

Surface sediments were sampled using a ponar dredge. Sediment from the dredge was placed into a clean stainless-steel bowl. Volatile samples were placed directly into laboratory-supplied bottles before any mixing of the sample took place. The remaining sediment was mixed and the bottles filled using a clean stainless-steel trowel. Three surface sediment samples were analyzed for Appendix IX compounds and TOC. Three additional surface sediment samples, and one duplicate sample were analyzed for TCL volatiles, acid extractables, TCL pesticide/PCBs, TOC, TPH, priority pollutant metals, and grain size analysis. Eight surface sediment samples were collected along the back channel and analyzed for TCL pesticide/PCBs, TOC, TPH, and priority pollutant metals.

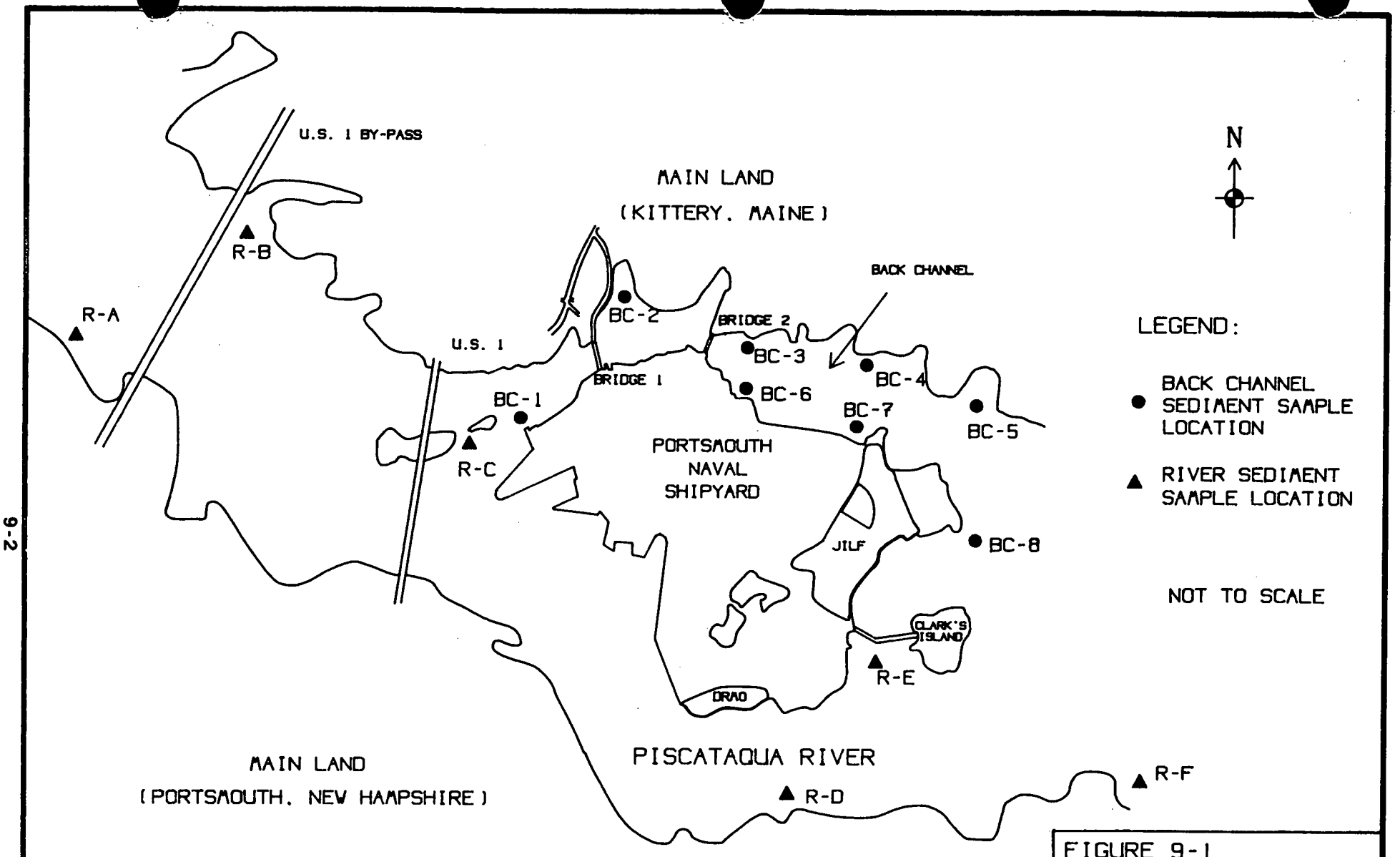


FIGURE 9-1
OFF SHORE SAMPLING
RIVER AND BACK
CHANNEL SEDIMENT
SAMPLING LOCATIONS

McLAREN/HART

Ten core samples and one duplicate sample were collected from six sediment locations in the main channel of the Piscataqua River. A gravity core was used to sample the subsurface sediment. The gravity core used was composed of:

1) A four-foot long core barrel with a 250 lb. weight on top and a core cutter on the bottom.

2) Plastic core liners with stainless-steel core catcher on the bottom and a check valve on top. The core liner with the catcher and check valve are inserted into the barrel and held in place with the weight at the top and the core cutter at the bottom.

3) A cable attached at the top to raise and lower the core barrel.

The gravity core was allowed to fall freely from the surface of the water to the bottom, driving the core barrel into the sediment. The core barrel was retrieved and the core liner, containing the sediment, was removed. An attempt was made to sample the 10-12 inch and 16-18 inch cored intervals. Each sampled core interval was analyzed for TCL pesticide/PCBs, TOC, and priority pollutant metals.

All equipment involved with sampling was decontaminated prior to use according to the protocol described in Table 2-2.

A new core liner was used at each new core location. All samples were hand delivered by RAI to their laboratory for analysis under proper chain-of-custody procedures.

9.1.2 Findings

Sample collection at each of the river and back channel surface sediment sampling locations were completed using a ponar dredge to collect the sample and sonar to locate a suitable sampling point.

The six river surface and core sediment sample locations consist of various materials. Sample R-A consisted of black mud mixed with grey clay, R-B consisted of hard grey clay, R-C consisted of fine sand grading to black clay, R-D consisted of brown sand, R-E consisted of brown sand with crushed shells, and R-F consisted of grey-brown clay. No odor or visual evidence of potential contamination was observed on any of these samples.

The eight back channel surface sediment samples also consisted of various materials. Sample BC-1 and BC-5 consisted of brown sand, BC-2 consisted of brown sand with crushed shells, BC-3 and BC-4 consisted of black sandy mud, BC-6 consisted of grey sand and crushed shells, BC-7 consisted of grey-brown sandy mud, and BC-8 consisted of black mud. No odor or visual evidence of potential contamination was observed on any of the samples.

9.1.3 Laboratory Analytical Results

Surface sediment samples (R-A, R-E, and R-D) were analyzed for Appendix IX compounds and TOC. Surface sediment samples (R-B, R-C, and R-F(A)) and one duplicate (R-F(B)) were analyzed for TCL volatiles, acid extractables, TCL pesticide/PCBs, TOC, TPH, priority pollutant metals, and grain size analysis. Eight surface sediment samples (BC-1 through BC-8) were sampled along the back channel and analyzed for TCL pesticide/PCBs, TOC, TPH, and priority pollutant metals. Ten core samples collected from six sediment locations in the main channel of the Piscataqua River were identified as follows:

RA(10-12)	RC(10-12)	RE(10-12)	RFB(16-18)
RA(16-18)	RC(13-15)		
RB(10-12)	RD(8-11)	RFA(10-12)	
RB(16-18)		RFB(10-12)Duplicate	

Core samples were analyzed for TCL pesticide/PCBs, TOC, and priority pollutant metals. A summary of valid sediment results are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

The State of Maine does not have published clean-up guidelines for contamination in soils or sediment, therefore, New Jersey's Environmental Clean-up Responsibility Act (ECRA) Guidance Values and proposed Federal Action Levels documented in the Federal Register (55 FR 30865, July 27, 1990) are used for comparison purposes.

TCL and Appendix IX Volatiles

There were no volatile concentrations above the New Jersey ECRA Guidance Value and proposed Federal Action Levels. Back channel and cored sediment samples were not analyzed for volatiles.

Semi-Volatiles (Appendix IX)

Concentrations and qualitative estimates of semi-volatiles found in sediment samples R-A and R-E, exceed the New Jersey ECRA Guidance Value of 10 ppm for total base neutrals. Semi-volatile concentrations are not listed under proposed Federal Action Levels.

Acid Extractables

There were no detectable acid extractable concentrations in any of the sediment samples analyzed for these parameters.

TCL & Appendix IX Pesticide/PCBs

There were no detectable pesticide/PCB concentrations in any of the sediment samples.

Herbicides (Appendix IX)

There were no detectable herbicide concentrations found in sediment samples R-A, R-E, and R-D analyzed for these compounds.

Total Organic Compounds (TOC)

Detectable TOC concentrations ranging from 0.03% to 2.9% were found in all sediment samples except for core sample R-D(8-11). The variation in TOC concentration is indicative of the grain size variation in the sediment with high TOC values corresponding to the finer grained sediments.

TPH

TPH concentrations found in river sediment sample R-B and back channel sediment samples BC-1, BC-3, BC-4, BC-7, and BC-8 are equivalent to or exceed the New Jersey ECRA Guidance Value of 100 ppm for TPH. Table 9-1 summarizes all sediment samples with TPH concentrations exceeding the New Jersey ECRA Guidance Value. TPH is not a listed contaminant under proposed Federal Action Levels.

Priority Pollutant Metals

Detectable concentrations of metals were found in all sediment samples. Four sediment samples had beryllium concentrations that exceed the proposed Federal Action Level of 0.2 ppm and/or the New Jersey ECRA Guidance Value of 1.0 ppm for beryllium. Two sediment samples had chromium concentrations that exceed the New Jersey ECRA Guidance Value of 100 ppm. One sediment sample (R-A(10-12)) had a mercury concentration exceeding the New Jersey ECRA Guidance Value of 1 ppm. Table 9-2 summarizes all sediment samples with metal concentrations exceeding the New Jersey ECRA Guidance Values and/or proposed Federal Action Levels.

TABLE 9-1

SUMMARY OF TPH CONCENTRATIONS--SEDIMENT EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES

RIVER AND BACK CHANNEL PORTSMOUTH NAVAL SHIPYARD

AUGUST 20-22, 1990

McLAREN/HART SAMPLE I.D.	TPH CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)
R-B	100	100
BC-1	120J	100
BC-3	280	100
BC-4	240	100
BC-7	180	100
BC-8	240J	100

J = Qualitative & Semi-Quantitative

Grain Size Analysis

Grain size analysis of sediment samples R-B, R-C, RF(A), and RF(B) (duplicate of R-F(A)) showed a moisture content ranging from 30.0% to 34.2%. Sieve analysis of sediment sample R-B retained 50.3% of the dried sand and gravel between US Sieves Nº 60 and Nº 230, sample R-C retained 23.3% between US Sieves Nº 10 and Nº 230, sample R-F(A) and duplicate sample R-F(B) retained 60.6% and 63.2%, respectively, between US Sieves Nº 4 and Nº 230. The remaining silt and clay in sediment samples R-B, R-C, R-F(A) and duplicate R-F(B) passing through US Sieve Nº 230 was 16.3%, 44.5%, 8.4%, and 7.8%, respectively.

9.1.4 Interpretations/Discussion

Total semi-volatile concentrations found in Appendix IX analysis of sediment samples R-A and R-E exceeded the New Jersey ECRA Guidance Value of 10 ppm for total base neutrals.

Four river sediment samples listed in Table 9-2 had beryllium concentrations that exceeded the proposed Federal Action Level of 0.2 ppm and/or the New Jersey ECRA Guidance Value of 1.0 ppm. However, natural beryllium concentrations found in the surficial soil of Southern Maine range from 1.0 to 7.0 ppm, (Shacklette and Boerngen, 1984).

Two river sediment samples listed in Table 9-2 had chromium concentrations that exceed the New Jersey ECRA Guidance Value of 100 ppm. Natural chromium concentrations in the surficial soil of Southern Maine range from 1.0 to 7.0 ppm (Shacklette and Boerngen, 1984). Chromium concentrations suggest contamination above expected background levels may exist.

TABLE 9-2

SUMMARY OF METAL CONCENTRATIONS--SEDIMENT EXCEEDING NEW JERSEY ECRA GUIDANCE VALUES AND/OR PROPOSED FEDERAL ACTION LEVELS

RIVER AND BACK CHANNEL PORTSMOUTH NAVAL SHIPYARD

AUGUST 20-22, 1990

PARAMETER	McLAREN/HART SAMPLE I.D.	CONCENTRATION (PPM)	NEW JERSEY ECRA GUIDANCE VALUE (PPM)	PROPOSED FEDERAL ACTION LEVEL (PPM)
BERYLLIUM	R-C	0.77	1.0	0.2
	R-B(10-12)	2.00	1.0	0.2
	R-B(16-18)	1.80	1.0	0.2
	R-D(8-11)	1.20	1.0	0.2
CHROMIUM	R-C(10-12)	113.00	100.0	NA
	R-C(13-15)	115.00	100.0	NA
MERCURY	R-A(10-12)	2.30	1.0	20.0

NA = Not Available

River sediment sample R-A(10-12) had a mercury concentration exceeding the New Jersey ECRA Guidance Value of 1.0 ppm. Natural mercury concentrations found in the surficial soil of Southern Maine range from 0.2 to 1.3 ppm (Shacklette and Boerngen, 1984). The mercury concentration suggests contamination above expected background levels may exist.

An additional sampling program should be implemented in the general vicinity of the elevated metal concentrations and at other locations in the river and back channel to further characterize the extent and concentrations of contamination.

9.1.5 Conclusions/Recommendations

Two river samples, R-A and R-E, exceeded the New Jersey ECRA Guidance Value of 10 ppm for total semi-volatile compounds. These two samples were collected from river locations which were widely separated from one another (see Figure 9-1). These semi-volatile compounds may be indicative of a petroleum product, the source or sources of which are unknown at this time.

The TOC values from the river samples ranged from 0.3% to a high of 2.9% with the highest values being associated with fine grained sediment. High TOC would be expected in fine grained, organic rich tidal flat sediment and is not necessarily indicative of industrial contamination.

One river sample (R-B) upstream of the Portsmouth Naval Shipyard (PNS) and five of eight samples collected in the back channel exceeded the New Jersey ECRA Guidance Value of 100 ppm for TPH in soil or sediment (see Table 9-1). The TPH concentrations were not exceedingly high but they may be indicative of widespread, albeit mild, petroleum contamination in the river sediment.

Four river samples exceeded either New Jersey's ECRA Guidance Value or the proposed Federal Action Level for beryllium in soil/sediment (see Table 9-2). The beryllium concentrations are low, however, and fall within the range of naturally occurring concentrations reported by Shacklette and Boerngen, 1984 for Southern Maine.

Two river samples from location R-C immediately upstream of the PNS had concentrations of total chromium which exceeded New Jersey's ECRA Guidance Value of 100 ppm (see Table 9-2). These chromium concentrations also exceed reported natural occurrences of this metal in Southern Maine suggesting that this may be an industrial pollutant.

Mercury was found to exceed New Jersey's ECRA Guidance Value of 1.0 ppm in river sample R-A(10-12) (see Table 9-2). The concentration measured (2.3 ppm) also exceeds what may be expected to occur naturally. The source of this mercury is unknown but may be related to a scrap yard which is located on the river near this sampling location.

McLaren/Hart recommends that additional sampling be conducted in the river to attempt to determine the source of the contaminants discussed in this section. In addition, a detailed historical review of the industries along the Piscataqua River may increase our understanding of the potential point sources and non-point sources of contaminants in the vicinity of the PNS.

10.0 SOIL AND DEVELOPMENT/PURGE WATER SAMPLING

The following section describes the Phase II field work program for sampling containerized soil and development/purge water. The purpose of the sampling was to analyze the materials collected for hazardous waste characterization and to determine proper disposal procedure.

10.1 Soil Sampling

10.1.1 Sampling Procedures

Drilling of test borings at the JILF (November 8 through December 1, 1989), and Mercury Burial Sites (November 28 through December 5, 1989) produced auger cuttings. These auger cuttings were containerized in DOT approved 55 gallon drums supplied by PNS. These drums were then labeled and stored at the PNS Hazardous Waste Storage Area. Three composite soil samples were collected from the DOT approved drums containing the auger cuttings on August 13 and 20, 1990.

The composite soil samples were obtained using separate precleaned stainless-steel trowels. Each soil sample was then placed in a precleaned stainless-steel bowl, homogenized and transferred to a laboratory-supplied sample bottle. The samples were labeled (DR-JB-4 & 7; DR-JB-11, MB-4 & 5; and DR-MB-1, 2 & 3) and stored on ice in a cooler for hand delivery to RAI. All soil samples were analyzed, to determine the hazardous characteristics of using the Toxicity Characteristic Leaching Procedure (TCLP), ignitability, corrosivity and reactivity. Through a discussion with RAI on December 10, 1990, it was learned that because of an error on a chain-of-custody, the laboratory did not analyze for semi-volatile organics, pesticides, or herbicides for samples DR-JB-4 & 7 and DR-JB-11, MB-4 & 5. These samples will be resampled during Phase III field activities.

10.1.2 Laboratory Analytical Results

Three soil samples were collected from DOT approved 55 gallon drums used for containerizing soil during Phase I field activities. The samples were analyzed for TCLP volatile organics, semi-volatile organics, herbicides, pesticides, and metals as well as the hazardous waste characteristics of ignitability, corrosivity, and reactivity. As was previously stated, because of an error on a chain-of-custody, the laboratory did not analyze for semi-volatile organics, pesticides, or herbicides for samples DR-JB-4 & 7 and DR-JB-11, MB-4 & 5. A summary of the valid results of the soil samples collected on August 13 and 20, 1990 are provided in Appendix II. Laboratory-supplied analytical results are provided in Appendix III.

10.1.3 Interpretations/Discussion

Hazardous waste characteristics as defined under 40 CFR Part 261.24 were used to determine the maximum allowable concentrations of contaminants exhibiting the characteristic of TCLP Toxicity. There were no detectable concentrations of volatile organics, semi-volatile organics, herbicides, or pesticides in any of the samples analyzed. Detectable concentrations of metals were found in all three soil samples collected from the drums. All metal concentrations were below the maximum allowable concentrations and are, therefore, not a hazardous waste as defined under 40 CFR Part 261. None of the samples exhibited the hazardous waste characteristics of ignitability, corrosivity, or reactivity.

10.2 Development/Purge Water Sampling

10.2.1 Sampling Procedures

On August 13, 20, and 27, 1990, twelve water samples were collected from development/purge water containerized in DOT approved 55 gallon drums, supplied by

PNS, or in 300 gallon polyethylene tanks. All drums and tanks were labeled and later transferred to the PNS Hazardous Waste Storage Area. The development/purge water was evacuated from monitoring wells at the JILF (August 9 through August 23, 1990), the Mercury Burial Sites (December 6 through December 12, 1989, and August 15 through August 22, 1990), and the DRMO (August 21 through August 27, 1990).

Development/purge water samples were collected using a new section of WaTerra tubing and a Delrin foot valve. The tubing was actuated at the surface by hand and transferred directly into laboratory-supplied sample bottles. The sample bottles were labeled (DR-JW-7 & 4; DR-JW-7 & 8; DR-MW-4 & 5; DR-MW-2 & 3; DR-JW-5; DR-JW-6; T-DW-1, 2, 4-7; DR-JW-3; T-JW-9 & 10; DR-DW-3; T-MW-4 & 5; and T-MW-2 & 3) and stored on ice in coolers for hand delivery to RAI. All development/purge water samples were analyzed for TCLP Toxicity and Hazardous Waste Characteristics.

On September 20, 1990, McLaren/Hart was informed by RAI that the six development/purge water samples collected on August 27, 1990 for TCLP analysis exceeded the seven day extraction holding times as per 40 CFR 136.

On October 1, 1990, RAI personnel resampled the development/purge water containerized in the DOT approved 55 gallon drums and in the 300 gallon polyethylene tanks for TCLP analysis.

Development/purge water samples were collected by using separate, pre-cleaned teflon bailers for each 55 gallon drum and 300 gallon tank. Bailers were decontaminated prior to use according to the protocol described in Table 2-2.

Samples were transferred directly into laboratory-supplied bottles, labeled, and stored on ice for hand delivery to RAI.

10.2.2 Laboratory Analytical Results

Twelve water samples were collected from DOT approved 55 gallon drums and 300 gallon polyethylene tanks used for containerizing development/purge water during Phase I and Phase II field activities. The samples were analyzed for TCLP volatile organics, semi-volatile organics, herbicides, pesticides, and metals as well as the hazardous waste characteristics of ignitability, corrosivity, and reactivity. A summary of the valid results of the water samples collected on August 13, 20 and 27, 1990 are provided in Appendix II. Laboratory-supplied analytical data is provided in Appendix III.

10.2.3 Interpretations/Discussion

Hazardous waste characteristics defined under 40 CFR Part 261.24 were used to determine the maximum allowable concentrations of contaminants exhibiting the characteristic of TCLP Toxicity. There was only one detectable volatile organic compound, chlorobenzene at 14 ppb in DR-MW-2&3, in the samples analyzed. This concentration is well below the maximum allowable concentration established in 40 CFR Part 261.24. There were no detectable concentrations of semi-volatile organics, herbicides, or pesticides in any of the samples analyzed. Detectable concentrations of metals were found in all twelve water samples collected from the drums and polyethylene tanks with the exception of samples T-DW-1, 2, 4-7 and T-MW-4 & 5. All metal concentrations were below the maximum allowable concentrations and are, therefore, not a hazardous waste as defined under 40 CFR Part 261. None of the samples exhibited the hazardous waste characteristics of ignitability, corrosivity, or reactivity.

10.3 Conclusions/Recommendations

None of the soil and/or water samples collected from the drums and tanks exhibited hazardous waste characteristics as defined under 40 CFR Part 261. Based on these results, no special procedures for material disposal are required and the soil and water may be disposed of at any time.

11.0 REFERENCES

Ingmanson, Dale E., and Wallace, William J., 1973, Oceanology: An Introduction, Wadsworth Publishing Company, Inc., 325 p.

Perket, Cary L., (ed), May 1986, Quality Control in Remedial Site Investigation: Hazardous and Industrial Solid Waste Testing, ASTM-STP 925, Fifth Volume, p. 37-38.

Shacklette, Hansford T., and Boerngen, Josephine G., 1984, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270, 105 p.

Williams, Jerome, 1973, Oceanographic Instrumentation, United States Naval Institute Series In Oceanography, 189 p.

APPENDIX I

FIELD NOTE BOOKS

①

MONDAY Aug. 6, 1990

2:45 Hart personnel arrive at Gate one and obtain permits.
Hart personnel are
Hal Hatfield
Mike D'Eufemia
Jon Klink
Scott Bryant

3:15 M.D. left site to pick up keys to the house.

3:20 HH met briefly with Jim Tayon.

3:30 Set up office/truck at JILF.

3:50 J. Tayon @ office/truck. HH left with J. Tayon to look at access at SWMU - Boiler blowdown tank (#12).

4:15 M.D. at site. HH and J. Tayon at office/truck.

4:30 J. Tayon leaves.

4:40 Hart personnel leave site.

Hal Hatfield
8-6-90

②

TUESDAY Aug. 7, 1990

Weather: Cloudy, foggy, occasional drizzle, 75°

7:00 Hart personnel on-site. Prepared to re-establish grid and to sample surface soil.
HART personnel: H. Hatfield, M. D'Eufemia, J. Klink, S. Bryant

7:30 MD + SB began re-establishing grid at JILF. HH + JK decon equipment for sampling.

8:15 HH + JK picked up 300 gal (3) tanks from Industrial Waste Treatment Plant.

9:00 JK assisted MD + SB with grid. HH phoned office and Lab. Ordered plugs missing from 300 gal tanks.

9:30 HH spoke with Dick at DRMO concerning the placement of a 300 gal tank during development and sampling. He assured HH that a spot would be cleared. All wells at DRMO are intact.

9:50 HH spoke with resident in Quarters 'N'. No one home at 'S'.

Told resident of the environmental soil sampling. Resident had not been notified by the NAVY as HART had requested.

10:15 HH assisted with grid surveying.

11:15 Jim Tayon at JKF. Prepared to sample boiler blow down tank.

11:20 J.T. leaves.

11:45 JK+HH Met with J.T. and Cliff Allen (Electrical Foreman) to discuss test pit locations at SWMU 27.

12:00 JK + HH sampled boiler blowdown water with JT observing. Field PH of 11.29 Labeled sample as BB-01.

12:15 At Bldg. 40 to meet again with Cliff Allen. Went to SWMU 27 to look at access.

12:45 Left CIA area. JK+HH left J. Tayon + C. Allen.

1:00 JK showed excavator test pit locations.

1:15 HART personnel left site for lunch and to purchase supplies.

2:20 Back at site. Picked up a truck pass to go into the CIA.

2:40 SB+MD resumed grid layout. HH+JK prepared for soil sampling.

3:00 Sampled SS-14S (~2-4') deep took Duplicate + labeled as SS-14I. Hole (sample) is 5'9" east of fence and 3' south of fence. Attempted to take deep sample. Hand auger refusal at 9" at 4 different locations.

3:30 Sampled SS-15S (~2-4"). Hole is 6' north of fence. 4'9" south of Maple tree. 43' south of SE corner of porch.

3:40 Sampled SS-15D (~18-20") Sample material throughout hole is light brown fine sand and silt with little fine gravel.

3:50 Sampled SS-16S (~2-4"). Brown med to fine Sand and Silt, some med to fine Gravel. Hole is 35'4" west of fence.

32' North of fence and 32' south of fence.

4:00 Sampled SS-16D (12-14")
Augering was difficult.

4:10 Sampled SS-17S (2-4")
Brown to red brown sand + silt with little fine gravel.
Hole is 11'4" south of paved driveway. 28'10" north of fence.

4:15 MD + SB finished with grid, join soil sampling.

4:20 Sampled SS-17D (~18-20").

4:30 Sampled SS-18S (~2-4"). Took Duplicate and labeled as SS-18I.
Brown fine Sand + Silt, little fine Gravel.
37' west of fence.
44' north of fence.
45' 7" south from paved circular driveway.

4:40 Sampled SS-18D (~18-20").
Picked up equipment.

5:30 Hart personnel leave site.

Hal Hatfield
8-4-90

Wednesday August 8, 1990
Weather: Cloudy, Showers, 75°

7:00 Hart personnel: H. Hatfield, M. D'Eufemia, J. Klink, S. Bryant at site. Met with backhoe operator from H.L. Smith, Inc.

7:30 JK + SB went with backhoe operator to SWMU #27 and begin test pit operations.
HH + MD fill out paper work and prepare for soil sampling.

8:25 Took equipment rinsate field blank (RB-01) for soil sampling at Quarters 'S' + 'N'.
Analyses: PP metals, Pesticides, PCBs, TPH.

8:50 Sampled SS-19S (~2-4")
Soil is lt. brown fine Sand + Silt with some med to fine gravel.
Hole is 18' east of fence, 28'8' North of Bldg 146

9:00 Sampled SS-19D (~12-14")
Augering was difficult due to rock fragments at 12".

9:20 Sampled SS-20S (~2-4").
Brown fine Sand an Silt with
some med to fine gravel.
Hole is 22.6' South-SW of
apple tree. 59.2' SE of porch.
48.3' north of Bldg 146.
9:25 Sampled SS-20D (18-20").
9:45 Sampled SS-21S (~2-4").
Sample material is same as
described in SS-20S+D.
Hole is 11.9' west of fence.
15' north of fence. 7.9' ~~E-SE~~ HH
West-NW of dying Pine tree.
9:50 Jim Tayon stops by sampling
area.
SB+JK back from Test pit
operations.
10:05 J. Tayon leaves site.
10:25 Sampled SS-22S (~2-4").
Soil is Brown Silt+fine Sand,
with rock fragments.
Hole is 21.7' South of fence.
44.5' east of Bldg A-20.
10:30 Sampled SS-22D (~12-14")
Augering difficult due to
rock fragments.

10:40 Sampled SS-23S (~2-4").
Brown Silt+Sand (fine) with
numerous rock fragments.
Hole is 3.5' west of fence.
2' south of lilac bush.
Unable to get below 6" due to
rock fragments a 4 locations.
Did not sample at a deep location.

TEST PIT (SWMU#27) Activities

7:40 AT CONTROLLED INDUSTRIAL AREA
(CIA) TO EXCAVATE TEST PITS.
JK AND SB FROM McLAREN/HART
AND GLEN I MONETTI, JEFF
(BACKHOE OPERATOR) AND DAN
(JACKHAMMER OPERATOR) ALL FROM
H.L. SMITH, INC., NORTH
HAMPTON, N.H. CURRENTLY
GLEN AND CREW ARE BREAKING
THE ASPHALT AT TP-1. NO NAVY
OVERSEER AS YET.
7:45 NAVY OVERSEER ARRIVES - JEFF
ALLEN - O3 ELECTRICIAN.
ASPHALT CUTTING COMPLETED AT TP-1

MOVE TO TP-3.

7:50 BICYCLES OVER TP-2 LOCATION ARE MOVED.

8:05 ASPHALT CUTTING AT TP-3 AND TP-2 IS COMPLETE.

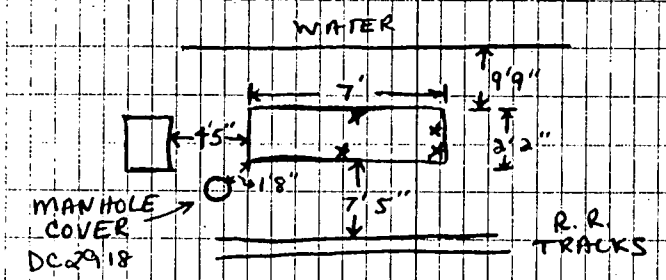
8:10 FITTING ON BACKHOE ARM IS LEAKING HYDRAULIC FLUID — DELAY TO REPAIR.

8:15 FITTING REPAIRED - RESUME EXCAVATION SOIL IS FILL MATERIAL CONSISTING OF ASPHALT, GRAVEL, ROCK, SLAG AND SAND. FILL IS DARK BROWN WITH WEAK PETROLEUM ODOR - DIESEL?

8:25 TP-1 COMPLETE - COARSE FILL MATERIAL. TOTAL DEPTH WITH BACKHOE IS 3', DEPTH AND AREA OF EXCAVATION WAS LIMITED BY CONCRETE DUCT WORK AND UNDERGROUND UTILITIES.

8:35 EXCAVATION AT TP-2 IS COMPLETE MOVE TO TP-3. SAMPLES COMPLETE AT TP-1. PREPARING TO SAMPLE EXCAVATION TP-2

TP-1 DIMENSIONS



SAMPLES TP-01S - TAKEN AT 8:40 - COMPOSITE FROM LOCATIONS IN TP-1 MARKED *. ONE END OF EXCAVATION NOT SAMPLED DUE TO EXCESSIVE FALL IN.

TP-01B TAKEN AT 8:35 FROM 3.5' BGS.

TP-01S TAKEN FROM 2.0' BGS

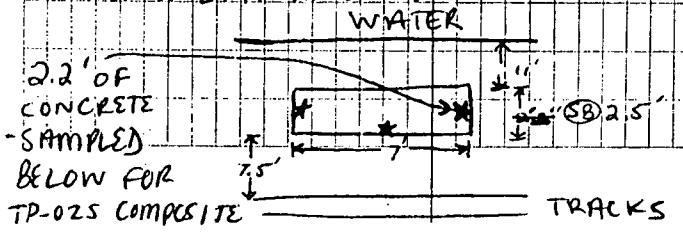
8:40 TP-3 STOPPED TEMPORARILY DUE TO CONCRETE DUCTING GUARDING A PIPE. CUT AWAY ~4" MORE OF THE ASPHALT

8:45 RESUME EXCAVATION AT TP-3

8:55 TP-3 EXCAVATION IS COMPLETE

9:00 TP-1 IS BACKFILLED

TP-2 DIMENSIONS:



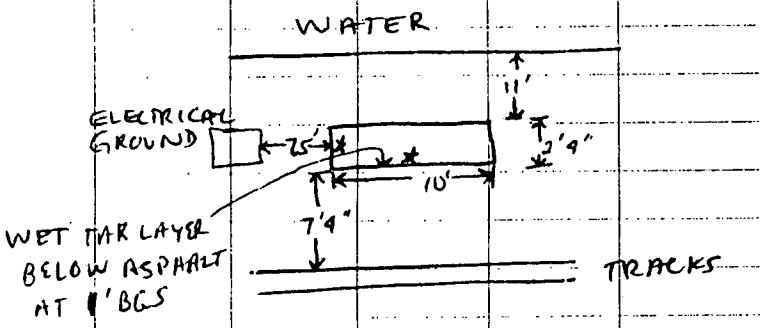
9:00 SAMPLED TP-02B FROM 5' BGS
TOTAL DEPTH OF TP-2 EXCAVATION
WITH BACKHOE WAS 4.5'

9:03 SAMPLED TP-02S AND DUPLICATE
TP-02I (9:05) FROM 2-3.5' BGS
TP-02S AND TP-02I WERE
COMPOSITES FROM POINTS MARKED
*. NO SAMPLE WAS COLLECTED
FROM THE WATER SIDE OF THE
EXCAVATION DUE TO CONCRETE,
PIPE, AND LARGE ROCK.

9:05 TP-2 SAMPLING COMPLETED

9:10 SAMPLE AT TP-3

TP-3 DIMENSIONS:



TOTAL DEPTH OF EXCAVATION WITH
BACKHOE = 4.5' BGS

9:10 SAMPLED TP-03S FROM POINTS
MARKED * ~2.5' BGS

TWO OTHER SIDES NOT INCLUDED IN
THE COMPOSITE DUE TO CONCRETE,
FALL IN AND/OR LARGE ROCKS.

9:15 TP-03B SAMPLED ~5.0' BGS

NOTE: ALL THREE TEST PITS CONSISTED
OF DK BROWN ASPHALT, CONCRETE,
LARGE ROCKS, SAND AND SLAG.

6" OR 8" DIAMETER PIPE RUNS THE
LENGTH OF THE PIER BY THE TEST
PITS AND IS OVERLAIN BY CONCRETE.
ALL SAMPLES MAY HAVE ASPHALT
PIECES FROM FALL IN. NO OTHER
PETROLEUM ODORS WERE NOTICED
OTHER THAN IN TP-1 WHICH
MAY HAVE BEEN DUE TO THE ASPHALT
ALSO.

9:45 ALL TEST PITS SAMPLED AND
BACKFILLED

Scott K. Bryant
8/8/90

8-8-90 cont.

11:00 Filled out paperwork. Looked at possible locations for off-site DRMO surface soil locations.

12:15 Met Jeff Smith of Northeast Research Institute at Gate 1. Showed J.S. sampling points for JAF soil-gas survey.

12:45 Hart personnel left site for lunch and purchase field supplies. J. Smith began installing soil-gas collectors.

2:30 Hart personnel back at site. Checked in with J. Smith. Prepared for sampling off-site DRMO samples.

3:15 J. Tayon, Linda Resta, F. Labreca arrive at office/truck.

3:30 JT, LR + FL leave area.

3:45 Sampled SS-24 for pp metals, TPH, Pest. + PCBs. Sample is 72'-west-NW of SS-1. 14' W-NW of corner of fence 15.5' south of railroad tracks and 8' south of pavement.

Dk brown f Sand + silt.

4:15 Sampled SS-25. Brown m-fine sand, little silt, little fine gravel. Sample is 6.2' north of fence 47.8' E-SE of SE corner of Bldg 310

4:25 Sampled SS-26. Brown f Sand + Silt, some rock fragments. Sample is 13' NE of edge of cliff 128' SE of paved driveway.

4:30 Sampled SS-27. Same material as SS-26. Sample is 18.6' SE of paved driveway 52.4' south of corner post of fence.

4:45 Filled out paperwork + deconed equipment.

5:10 Hart leaves site.

Hal Hatfield
8-8-90

THURSDAY August 9, 1990
Weather: Partly cloudy, breezy, 78°

7:00 Hart personnel: H. Hatfield, M. D'Eufemia, J. Klink, S. Bryant at site. Prepared for well development.

8:30 WL at JW-8 is 12.04' from Top of Casing (TOC). Total depth of well is 15.99' from TOC. Water column is 3.95'. 1 Volume = 0.64 gallons. Set up WaTerra.

8:40 Jeff Smith of Northeast Research Institute on site to finish installing soil-gas collectors. 13 remain for installation.

9:02 Began developing well JW-8. Water is clear. After 2 gals. removed NTU is 1.64. Pumping well at 0.5 gpm.

9:10 Jim Tayon, Linda Resta, F. Labreca at JLF.

9:19 Parameters after 10 gals.
pH = 6.72
Temp = 20.5 °C
Conduc = 790
NTU = 0.68

9:32 Removed 15 gals - water clear
pH = 6.97
Temp = 20.6°C
Conduc = 791
NTU = 0.50

9:44 pH = 6.97 after 20 gals.
Temp = 20.7
Conduc = 788
NTU = 0.48

Stopped development.
Picked up equipment.

9:50 JK & MD left site for the lab.

10:20 Set up WaTerra for development at JW-7.
Navy personnel leave area.
WL @ JW-7 7.29' from TOC
TD = 13.67' from TOC
Water column = 6.38 1 Vol. = 1.04 gals

10:45 Began developing JW-7 @ ~0.5 gpm

10:54 Parameters after 5 gallons
pH = 6.74
Temp = 16.3
Conduc = 1,502
NTU = 40.3
water is slightly turbid

11:06 10 gals removed
pH = 6.73
Temp = 15.7
Conduc = 1,514
NTU = 39.4

11:15 15 gals removed
pH = 6.72
Temp = 15.7
Conduc = 1,531
NTU = 38.3

11:22 20 gals removed
pH = 6.72
Temp = 15.6
Conduc = 1,497
NTU = 33.3

11:33 25 gals removed
pH = 6.72
Temp = 15.5
Conduc = 1,534
NTU = 33.0

11:43 30 gals removed
pH = 6.72
Temp = 15.8
Conduc = 1,539
NTU = 25.6

11:43 - 11:50 shut off pump
11:50 Resumed pumping.
12:00 35 gals. removed
pH = 6.70
Temp = 15.8
Conduc = 1,534
NTU = 33.1

12:12 40 gals removed
pH = 6.65
Temp = 15.5
Conduc = 1,546
NTU = ~~37.3~~ HH 35.3

12:20 45 gals removed. Shut off pump.
pH = 6.65
Temp = 15.5
Conduc = 1,565
NTU = 33.2

Picked up equipment

12:30 SB + HH took lunch break.
1:10 Resumed picking up equipment.
1:15 M. D'Eufemia back at site.
Loaded truck. Picked up (2) 300 gal. tanks. Phoned lab and office. Moved 55 gallon drums to well locations.

2:10 Entered data onto computer for past samples.

3:15 MD left site to purchase supplies. Entered more data on computer. Turbidimeter on low battery. Unable to further develop wells today.

3:55 MD back at site. Labeled 2 drums containing purge water.

4:30 Hart left site.

Hal Hatfield

8-10-90

FRIDAY August 10, 1990

Weather: Cloudy, Breezy, 75°

8:00 Hart personnel: H. Hatfield, M. D'Eufemia, and S. Bryant arrive at site. Set up to develop JW-4.

8:17 WL 5.32' from TOC.
TD = 11.79' from TOC
Water Column = 6.47'
1 volume = 1.05 gallons

8:30 Began developing JW-4 by hand with Watera tubing. Linda Resta and F. Labreca arrive at JW-4.

8:37 Took parameters after removing 5 gallons.
pH = 6.56
Temp = 15.8
Conduc = 522
NTU = 130.4

8:41 Removed 10 gallons
pH = 6.54
Temp = 15.6
Conduc = 502
NTU = 86.7

8:47 Removed 15 gallons
pH = 6.54
Temp = 15.4
Conduc = 504
NTU = 169.5

8:57 Removed 20 gallons
pH = 6.54
Temp = 15.5
Conduc = 519
NTU = 67.9

9:04 Removed 25 gallons
pH = 6.56
Temp = 15.5
Conduc = 517
NTU = 97.7

9:16 Removed 30 gallons
pH = 6.58
Temp = 16.1
Conduc = 530
NTU = 89.0

9:29 Removed 35 gallons
pH = 6.55
Temp = 15.8
Conduc = 524
NTU = 56.8

L. Resta + F. Labreca leave area.

9:42 Removed 40 gallons
pH = 6.63
Temp = 16.6
Conduc = 528
NTU = 22.5

10:00 Removed 45 gallons
pH = 6.63
Temp = 16.2
Conduc = 527
NTU = 11.9

10:17 Removed 50 gallons
pH = 6.56
Temp = 16.2
Conduc = 529
NTU = 8.8

10:37 Removed 55 gallons
pH = 6.59
Temp = 16.2
Conduc = 528
NTU = 15.9

10:50 Removed ~~55~~ 60 HH gallons
pH = 6.58
Temp = 16.2
Conduc = 531
NTU = 8.9

11:04 Removed ~~60~~ 65 gallons
pH = 6.54
Temp = 16.1
Conduc = 527
NTU = 4.41

11:17 Removed ~~65~~ 70 gallons
pH = 6.53
Temp = 16.0
Conduc = 528
NTU = 4.50

11:32 Removed ~~70~~ 75 gallons
pH = 6.54
Temp = 16.0
Conduc = 527
NTU = 4.46

End of development. Picked up equipment.

12:00 Hart personnel leave site.

Hal Hatfield
8-10-90

MONDAY August 13, 1990
Weather: Sunny, 80°, Breezy

2:30 Hart personnel: H. Hatfield, J. Klink, S. Bryant arrive at site. Prepare to sample soil + water drums from Phase I field work and drums recently filled.

2:50 Sampled DR-JW 7+4 for TCLP (water). Sample is a composite from Development water from wells JW 4 + JW 7 (2 drums).

3:00 Sampled DR-JB-4+7 (1 Drum) TCLP soil - VOAs + Metals

3:05 Sampled DR-JB 11, MB-4+5 (1 Drum) soil - TCLP VOAs + Metals

3:15 Sampled DR-JW 7+8 (1 Drum) development water for TCLP

3:35 Took samples to Lab. Unable to access remaining drums from Phase I today.

Hal Hatfield
8-13-90

TUESDAY August 14, 1990
Weather: Partly cloudy, breezy, 80°

7:00 Hart personnel: H. Hatfield, S. Bryant, J. Klink arrive at site. Prepare for well development.

7:30 Depth to water at JW-5 is 6.96' from top of casing (TOC).
Total depth = 14.76 from TOC.
Water column = 7.8'
1 volume = 1.27 gallons
Set up to develop JW-5.

7:51 Began developing JW-5 by hand using waterra tubing.

7:55 Removed 5 gallons
Parameters:
pH = 6.43
Temp = 14.5
Conduc = ~~Off scale~~ #4 8,690
NTU = 70.4

8:02 Removed 10 gallons
pH = 6.70
Temp = 14.4
Conduc = 8,680
NTU = 29.5

Removed 15 gallons
8:12 pH = 6.71
Temp = 14.7
Conduc = 9,470
NTU = 16.7

8:22 Removed 20 gallons
pH = 6.74
Temp = 15.1
Conduc = 9,900
NTU = 11.81

8:32 Removed 25 gals
pH = 6.76
Temp = 15.5
Conduc = 10,000
NTU = 5.19

8:46 Removed 30 gals
pH = 6.78
Temp = 15.8
Conduc = 10,130
NTU = 11.43

9:02 Removed 35 gals.
pH = 6.80
Temp = 16.3
Conduc = 9,980
NTU = 5.43

9:15 Removed 40 gallons
pH = 6.83
Temp = 16.5
Conduc = 9,890
NTU = 3.17

9:30 Removed 45 gallons
pH = 6.84
Temp = 16.4
Conduc = 9,680
NTU = 2.05

9:45 Removed 50 gallons
pH = 6.84
Temp = 16.2
Conduc = 9,680
NTU = 3.06
End of Development.

Estuary surface turbidity measurements.
8:30 NE of JW-5 = 7.6 NTU
9:05 SW of DRMO = 2.25 NTU
9:15 SE of JILF = 1.75 NTU

10:11 WL @ JW-6 is 7.18' from TOC.
TD = 19.92'
water column = 12.74'
1 Volume = 2.08

Set up to develop JW-6.
10:19 Began developing JW-6 by hand with WaTerra tubing.
Jim Tayan arrives.
10:23 Removed 5 gallons
pH = 7.00
Temp = 13.5
Conduc = 915
NTU = off-scale
10:30 well dried after removing 7.5 gallons.
10:45 J. Tayan left area. Mobilized to JW-10. Partially set up for development.
11:10 Hart personnel left site to purchase supplies and have lunch.
11:55 Hart personnel back at site. Set up to develop JW-10 with WaTerra Pump + tubing.
WL = 12.00' from TOC.
TD = 14.33' from TOC
Water Column = 2.33'
1 Volume = 0.38 gallon
12:08 Began developing well JW-10. Water is black with a sewer

odor. Removed ~0.5 gallon and well went dry. Water began to clear just before the well went dry.

12:20 WL at JW-9 is 7.69' from TOC. TD = 16.58' from TOC. Installed WaTerra tubing. Water column = 8.89' 1 volume = 1.45 gallons

12:39 Began developing JW-9 with WaTerra pump.

12:50 Removed 5 gallons
pH = 6.73
Temp = 15.2
Conduc = off-scale
NTU = 130.2

12:58 Removed 10 gallons
pH = 6.76
Temp = 15.5
Conduc = Off-scale
NTU = 60.4

1:06 Removed 15 gallons
pH = 6.81
Temp = 14.9
Conduc = off-scale
NTU = 44.7

1:15 Removed 20 gallons
pH = 6.81
Temp = 15.0
Conduc = off-scale
NTU = 31.6

1:23 Removed 25 gallons
pH = 6.81
Temp = 15.5
Conduc = off-scale
NTU = 25.0

1:31 Removed 30 gallons, J. Tayon arrives.
pH = 6.80
Temp = 15.4
Conduc = Off-Scale
NTU = 22.4

1:40 Removed 35 gallons. J. Tayon leaves.
pH = 6.81
Temp = 15.6
Conduc = Off-Scale
NTU = 20.1

1:48 Removed 40 gallons
pH = 6.84
Temp = 15.6
Conduc = Off-scale
NTU = 23.4

1:56 Removed 45 gallons
pH = 6.84
Conduc = Off-scale
Temp = 15.7
NTU = 21.8
J. Tayon arrives. Brings bubble wrap for shipping soil-gas samples. Also, brings a bottle for sample of water at JW-10.
1:59 J. Tayon leaves. Did not take sample.
2:05 Removed 50 gallons
pH = 6.84
Temp = 15.6
Conduc = Off-Scale
NTU = 22.0
End of development.
2:06 Began developing JW-10
2:17 Removed 10 gals @ JW-10.
pH = 6.97
Temp = 18.0
Conduc = Off-scale
NTU = 130.6
Hooked up WaTerra Pump.
2:31 Resumed developing.

2:47 Removed 15 gals.
pH = 7.07
Temp = 18.8
Conduc = Off-scale
NTU = 36.4
3:00 Removed ~~18~~ 20 gals. (mb)
pH = 7.09
Temp = 18.3
Conduc = Off-scale
NTU = 31.3
3:12 Removed ~~20~~ 25 gals. (mb)
pH = 7.06
Temp = 18.3
Conduc = Off-scale
NTU = 43.0
3:22 Removed ~~25~~ 30 gals. (mb)
pH = 7.08
Temp = 18.2
Conduc = Off-scale
NTU = 37.4
3:33 Removed ~~30~~ 35 gals. (mb)
pH = 7.05
Temp = 18.1
Conduc = Off-scale
NTU = 31.6

3:45 Removed ~~35~~ 40 (MD) gallons
pH = 7.07
Temp = 18.0
Conduc = Off-scale
NTU = 30.6

3:55 Removed ~~40~~ 45 (MD) gallons
pH = 7.06
Temp = 18.0
Conduc = Off-scale
NTU = 30.7

4:02 Removed ~~45~~ 50 (MD) gals.
pH = 7.09
Temp = 18.2
Conduc = Off scale
NTU = 30.9

End of development. Picked up equipment.

4:30 Hart personnel left site.

Hal Hatfield
8-14-90

WEDNESDAY August 15, 1990
Weather: Sunny, Breezy, 80°

7:00 Hart personnel: H. Hatfield, M. D'Eufemia, J. Klink, S. Bryant arrive at site.

7:19 WL at JW-6 is 7.03' from TOC.
TD = 19.92'
Water column = 12.89'
1 Volume = 2.10 gallons
Began developing JW-6

7:25 Well dry after removing 4 gals. Mobilized to JW-3.

7:36 Depth to water at JW-3 is 7.57' from TOC. TD = 19.01' from TOC.
Water column = 11.44
1 Vol = 1.87

7:43 Began developing JW-3 by hand with WaTerra tubing.

7:46 Well dried after removing 2.5 gallons. Water is turbid.

7:55 Mobilized to MW-4 + MW-5.

8:05 WL at MW-4 is 14.64' from TOC. TD = 20.55' from TOC.
Water column = 5.91
1 Volume = 0.96 gal.

8:10 WL at MW-5 = 15.05'
TD = 22.10'
Water column = 7.05'
1 volume = 1.15
Set up WaTerra pump at MW-4. Also, set up to develop MW-5 by hand with WaTerra tubing.
8:20 Began developing MW-5 by hand. Organic odor, slight sheen.
8:24 Began developing MW-4 with WaTerra pump.

MW-5 Development

TIME	pH	Temp	Con.	NTU
8:27	7.42	11.0	1,670	70.5
8:34	7.45	10.5	8450	off scale
8:40	7.57	11.2	10,230	216
8:48	7.60	10.1	11,500	off scale
8:55	7.68	10.5	11,570	23.2
9:00	7.74	10.9	11,740	45.2
9:06	7.82	10.6	12,620	17.0
9:10	7.71	10.5	10,830	39.5
9:16	7.70	10.4	11,160	65.4
9:21	7.74	11.0	11,150	31.8
9:30	7.69	11.1	9,990	46.8

MW-4 Development

TIME	pH	Temp	Con	NTU
8:36	7.33	11.3	1,990	84.4
8:44	7.27	11.4	1,940	88.8
8:52	7.27	11.3	1,960	73.0
9:01	7.44	11.9	1,973	33.3
9:11	7.66	11.7	2030	30.1
9:18	7.37	11.6	1,890	24.8
9:27	7.31	11.7	1,910	23.5
9:35	7.27	11.3	1,890	21.3
9:43	7.28	11.8	1890	18.7
9:52	7.29	12.6	1880	16.9
10:01	7.28	12.1	1880	14.8

MW-5

TIME	pH	Temp	Con	NTU
9:37	7.61	10.9	8970	45.4
9:45	7.60	10.7	8920	15.3
9:49	7.67	11.1	9510	9.1
10:02	7.66	11.0	8850	9.9
10:12	7.64	11.3	8890	7.7
10:20	7.73	10.3	10,270	37.8
10:26	7.69	10.6	10200	14.3
10:34	7.75	10.7	11080	6.1
10:43	7.60	10.5	8530	22.6
10:53	7.69	10.9	9630	132.1
Hooked up WaTerra Pump				
11:13	7.62	11.0	7780	46.7
11:26	7.58	10.8	7840	18.5
11:39	7.63	10.6	7970	11.5
11:53	7.63	10.9	7850	7.3
12:07	7.63	11.2	7680	5.8
12:19	7.63	10.9	7750	6.0
12:32	7.62	10.7	7790	5.8

End of Development @ MW-5
Removed 140 gallons
Picked up equipment.

MW-4

TIME	pH	Temp	Con	NTU
10:08	7.25	11.7	1910	12.5
10:16	7.25	11.5	1936	14.2
10:25	7.27	11.5	1933	12.5
10:35	7.36	11.8	1930	12.6
10:45	7.29	11.3	1915	12.6

End of Development
Removed 80 gallons

11:05 Purged JW-3
11:10 Removed 2.5 gallons before water HH well dried. Water appeared dry
11:15 Purged JW-6
11:25 Removed 7.5 gallons before well dried. Water brown and very turbid.
12:45 Hart left site for lunch.
1:20 Hart back on-site. Unable to drive truck to JILF due to a drill. Walked to wells MW-2 + MW-3.
1:42 WL at MW-3 = 15.42'
TD = 19.16'
Water column = 3.74'
1 volume = 0.61 gallon
1:46 WL @ MW-2 = 17.41'
TD = ~~20~~ HH 21.84'
Water Column = 4.43'
1 volume = 0.72 gallon
Set up to develop MW-3.
1:56 Began developing MW-3 by hand using Waterra tubing.
Set up Waterra pump at MW-2

2:05 Began developing MW-2.

MW-3

Time	pH	Temp	Cond	NTU
2:09	7.19	13.8	1,119	66.1
2:21	7.18	14.0	1,096	31.7
2:38	7.15	14.3	1,070	18.1
2:49	7.14	14.5	1070	10.6
3:07	7.10	14.0	1078	8.5
3:25	7.13	14.0	1078	10.8
3:36	7.14	14.1	1060	11.9
3:47	7.14	14.2	1030	11.6
4:01	7.13	14.1	1050	11.8

END of Development
Removed 45 gallons.

MW-2

Time	pH	Temp	Cond	NTU
2:19	7.42	13.6	988	12.8
2:30	7.39	13.5	997	5.8
2:42	7.49	13.8	970	3.5
2:53	7.33	13.7	992	3.7
3:04	7.33	13.4	984	3.2

END of development
Removed 25 gals.

3:33 Purged JW-6
3:38 Removed 5 gallons. Water is light brown + very turbid.
pH = 7.19
Temp = 11.8
Cond = 900
NTU = off-scale
3:42 Dried JW-6 after removing 7.5 gals.
Removed total of 19 gals today.

3:57 Purged JW-3
3:58 Removed 1 gallon.
pH = 6.51
Temp = 14.2
Cond. = 355
NTU = 28.8
4:00 Dried JW-3 after removing 2 gallons. Removed a total of 7 gallons today.
4:10 Picked up equipment.
4:30 Hart personnel left site.

Hal Hatfield
8-15-90

THURSDAY August 16, 1990
Weather: Sunny, Breezy, 85°

7:00 Hart personnel: H. Hatfield, M. D'Eufemia, J. Klink, S. Bryant arrive at site.
7:21 JK + MD went to dry wells JW-6 and JW-3. HH + SB pull time test tubes for soil-gas survey.
7:35 Pulled Time Test 1 (TT1) location 35, Grid location E-3
7:45 Pulled TT1, loc. 32, G-8
7:55 Pulled TT1, loc. 10, O-8
7:25 WL @ JW-6 is 7.06 from TOC.
7:30 Began purging JW-6
7:35 Removed 2 gallons
pH = 7.14
Temp = 11.9 Water H, brown
Cond = 846 very turbid + silty
NTU = Off-scale
7:38 Removed 5 gallons
pH = 7.14
Temp = 11.6
Cond = 868
NTU = off-scale
7:40 Removed 8 gals. Well is dry.

7:58 Purged JW-3
Removed 1 gallon
pH = 6.38
Temp = 13.7
Cond = 354
NTU = 13.8

8:00 Well dried after removing 2 gallons.
Packed Soil-gas tubes for shipment.

8:30 Mobilized to DRMO and made preparations for well development

9:20 WL at DW-7 = 11.88
TD = 21.67
Water column = 9.79
1 Volume = 1.60

9:25 WL at DW-2 = 9.48'
TD = 14.48'
Water column = 5'
1 Volume = 0.82 gal.

9:33 Began developing DW-2 by hand with Waterra tubing.

9:36 Began developing DW-7 with Waterra pump and tubing.

DW-2

TIME	pH	Temp	Con	NTU
9:40	7.39	20.2	OFF SCALE	27.2
9:51	7.67	19.8	"	25.5
10:00	7.51	20.5	"	22.4
10:13	7.64	20.5	"	19.0
10:24	7.67	20.2	"	10.9
10:37	7.66	20.1	"	10.4
10:50	7.58	20.1	"	32.5
11:05	7.62	20.1	"	30.0
11:23	7.64	20.2	"	6.6
11:45	7.57	20.0	"	1.9

DW-7

TIME	pH	Temp	Con	NTU
9:49	7.59	18.9	OFF Scale	4.3
9:55	7.60	18.9	"	2.3
10:00	7.60	18.9	"	2.3
10:09	7.58	18.8	"	2.2

END OF DEVELOPMENT
Removed 20 gals.

well dried after removing 50 gals. due to tide drop.

10:15 WL @ DW-6 = 14.28'
TD = 16.91'
Water column = 2.63'
1 volume = 0.43 gallon
Set up to develop with Waterra Pump

10:29 Began developing DW-6.

10:50 Removed 5 gals.
pH = 7.50
Temp = 18.0
Conduc = Off-scale
NTU = 6.0

11:11 Removed 10 gals. Well dried due to drop in tide.
pH = 7.65
Temp = 20.1
Conduc = off-scale
NTU = 8.0

12:00 Hart left site for lunch.

1:40 Hart back on-site. Picked up probe for new conductivity meter. Had a brief meeting with Jim Tayon

2:30 mobilized to DW-3.

2:50 WL @ DW-3 = 17.46
TD = 22.38
Water column = 4.92'
1 volume = 0.8
Set up WaTerra pump.

3:02 Began developing DW-3.

3:18 Removed 5 gals.
pH = 7.69
Temp = 19.8
Cond = 35,400
NTU = 6.0
Salinity = 24.2

3:24 Removed 10 gals.
pH = 7.67
Temp = 19.7
Cond = 36,000
NTU = 2.4
Salinity = 24.9

3:34 Removed 15 gals
pH = 7.60
Temp = 19.8
Cond = 37,000
NTU = 1.3
Salinity = 27.0

3:41 Removed 20 gals
pH = 7.57
Temp = 19.9
Cond = 36,900
NTU = 1.4
Salinity = 26.2

3:54 Removed 25 gals.
Temp = 20.0
Cond = 37,000
NTU = 1.5
Salinity = 26.2
pH = 7.52
End of development

3:32 SB+MD attempted to purge JW-6. Well was dry. Removed a total of 8 gals today and a total of 34.5 gals over a 3 day period.

3:40 Purged JW-3.

3:45 Removed 1 gallon.
pH = 6.31
Temp = 14.8
Cond = 453
NTU = 10.0

3:47 JW-3 dry after removing 2.5 gals. Removed a total of 4.5 gals today and a total of 11.5 gals over a 2 day period.

4:00 Picked up equipment.

4:30 Hart personnel left site.

Hal Hatfield
8-16-90

FRIDAY August 17, 1990

Weather: Sunny, 85°

7:00 Hart personnel: H. Hatfield, M. D'Eufemia, J. Klink, S. Bryant arrive at site. Prepared for developing and sampling boiler blowdown tank.

7:30 Met with J. Tayon.

7:50 HH+JK Sampled boiler blowdown tank (BB-01-02)
Temp = 33.3°C
pH = 10.24

7:21 MD+SB go to JW-6
WL = 6.58'

7:26 Began developing JW-6

7:42 Removed 5 gals. Go to get turbidity meter and set up Waterra pump at JW-10

7:47 Set up Waterra pump.

8:00 Back at JW-6, resumed developing.

8:06 Took parameters HH after removing 7.5 gallons.
pH = 7.03 Cond = 660
Temp = 13.6 NTU = 82.6

8:21 Removed 12.5 gals.
pH = 7.07
Temp = 13.1
Cond = ~~62~~ HH 650
NTU = 46.0

8:35 Removed 20 gals.
pH = 7.07
Temp = 12.8
Cond = 650
NTU = 22.3

8:45 Removed 25 gals.
pH = 7.10
Temp = 13.0
Cond = 650
NTU = 72.3

8:55 Removed 30 gals
pH = 7.09
Temp = 13.0
Cond = 650
NTU = 27.2

9:07 Removed 35 gals
pH = 7.06
Temp = 13.2
Cond = 650
NTU = 23.5

9:20 Removed 40 GALS
pH = 7.09
Temp = 14.7
COND = 660
NTU = 102.6

9:30 REMOVED 45 GALS
pH = 7.09
Temp = 14.0
COND = 650
NTU = 84.6

9:42 Removed 50 gals.
pH = 7.09
Temp = 13.0
Cond = 650
NTU = 30.0

9:51 Removed 55 gallons
pH = 7.09
Temp = 13.1
Cond = 640
NTU = 70.6

10:04 Removed 60 gallons
pH = 7.09
Temp = 13.2
Cond = 650
NTU = 10.5

10:19 Removed 65 gallons
pH = 7.06
Temp = 13.2
Cond = 650
NTU = 8.4

10:36 Removed 70 gallons
pH = 7.06
Temp = 13.3
Cond = 650
NTU = 10.5

10:51 Removed 75 gallons
pH = 7.07
Temp = 13.3
Cond = 650
NTU = 10.4

End of development.
Removed a total of 109.5 gallons over 4 day period.
Picked up equipment.

11:06 Depth to water at JW-3 is 8.05'. Began purging.

11:11 Removed 1 gal.
pH = 6.70
Temp = 14.9°C
Cond = 285
NTU = 5.0

11:25 Removed 6 gals.
pH = 6.46
Temp = 15.4
Cond = 302
NTU = 30.6

11:32 Dried well after removing 7.5 gals.
Removed a total of 19 gals over a 3 day period.
Picked up equipment. Deconed sampling equipment from boiler blowdown tank sampling.

12:00 Hart personnel left site for the day.

Hal Hatfield
8-17-90

MONDAY August 20, 1990

Weather: Sunny, 70°, breezy

1:30 Hart personnel: H. Hatfield, M. D'Eufemia, J. Klink, S. Bryant on-site.

1:40 SB + MD go to JW-3 for further development. JK + HH phone lab. Lab may not have supplied the appropriate bottles for development water sampling. Unable to speak to someone at the lab. Will call later.

1:45 Began developing JW-3.

2:02 Field parameters after removing 5 gallons.
pH = 6.62
Temp = 13.9
Cond = 290
NTU = 11.7

2:10 Phoned lab. Lab did not provide proper bottles. Will use bottles supplied for well sampling.

2:45 JK + HH sampled drums at Hazardous Waste Storage Facility. Composited one water sample

from 3 drums labeled MW-4 and MW-5. Labeled sample as DR-MW4+5.

3:00 Took DR-MW2+3 - a water sample composited from 3 drums labeled MW-2 and MW-3.

3:10 Sampled drum (soil) labeled MB-1, 2+3. Labeled sample as DR-MB1,2+3.

3:25 Sampled DR-JW5 - a water sample from one drum labeled JW-5 (8-14-90).

3:35 Sampled DR-JW6 - a composite water sample from 2 drums labeled JW6.

3:45 HH + JK took samples to lab.

4:55 HH + JK back at site.

Development

2:30 Removed 10 gals from JW-3
pH = 6.63
Temp = 13.7
Cond = 288
NTU = 76.0

2:38 Dried JW-3 after removing 11.5 gallons. Removed 30.5 gals over 4 day period.

2:45 SB+MD arrive at JW-10 to re-develop the well. Well was re-developed because the conduc. meter the field team was using previously did not go above 20,000 µmhos. A new meter was sent to the field team.
Depth to water @ JW-10 is 10.45'.

3:06 Began developing JW-10 with WaTerra pump.

3:10 Pump is not working properly. May be a problem with grease (lack of) in the cranking system. JK+HN bought a grease gun when out to the lab.

3:25 Began purging JW-10 by hand with WaTerra tubing.

3:40 Removed 5 gals
pH = 7.23
Temp = 16.7
Cond = 30,000
NTU = 13.0
Salinity = 23

3:55 Removed 10 gallons
pH = 7.19
Temp = 16.7
Cond = 32,900
NTU = 6.0
Salinity = 24.2

4:07 Removed 15 gallons
pH = 7.17
Temp = 16.7
Cond = 33,000
NTU = 2.2
Salinity = 24.4

4:25 Removed 20 gallons
pH = 7.15
Temp = 16.6
Cond = 33,000
NTU = 2.8
Salinity = 24.3

4:38 Removed 25 gallons
pH = 7.15
Temp = 16.7
Cond = 33,000
NTU = 2.4
Salinity = 24.3

4:50 Removed 30 gallons
pH = 7.14
Temp = 16.6
Cond = 33,100
NTU = 2.8
Salinity = 24.5
End of development. Removed 45 gallons on 8-14-90, giving a total of 75 gallons removed.
5:10 Hart personnel left site.

Hal Hatfield
8-20-90

①

TUESDAY August 21, 1990
Weather: Partly sunny, breezy, 70°

7:05 Hart personnel: H. Hatfield, M. D'Eufemia, J. Klink, S. Bryant arrive at site. Prepared for development.
7:25 Began developing JW-3.
7:55 Removed 5 gals.
pH = 6.47
Temp = 13.7
Cond = 292
NTU = 10.0
Salinity = NA
8:17 Removed 10 gals.
pH = 6.52
Temp = 13.8
Cond = 292
NTU = 10.2
8:38 Removed 15 gals.
pH = 6.52
Temp = 13.7
Cond = 298
NTU = 9.8
End of development. Removed 45.5 gals over 5 day period.

②

8:55 mobilized to DRMO.
9:00 Check WL at DW-2. Not enough water for development. SB worked on Waterra pump.
9:10 Checked WL at DW-1. Well is dry.
9:15 Checked WL at DW-5.
WL = 11.02' from TOC.
TD = 13.41
Water column = 1.39'
1 volume = 0.23 gallon
9:30 WL at DW-7 = 15.58'
TD = 21.67'
Water Column = 6.09'
1 vol = 0.99 gallon
9:45 Hooked up Waterra pump to DW-7.
9:50 Began developing DW-7. Pump needs new belt.
10:00 SB + MD left to find belt for Waterra pump. Developed DW-7 by hand.
10:10 Removed 5 gals.
pH = 7.26
Temp = 17.2
Cond = 32,200
NTU = 2.2
Salinity = 23.4

10:17 Removed 10 gals.
pH = 7.47
Temp = 17.2
Cond = 33,500
NTU = 1.9
Salinity = 23.4

10:25 Removed 15 gals
pH = 7.50 NTU = 1.4
Temp = 17.1 Salinity = 23.5
Cond. = 33,800
End of development. Removed 20 gallons 8-16-90 for a total of 35 gallons removed.

10:35 SB + MD back at site. Put new belt on Waterra pump.
WL at DW-6 = 13.48'.
TD = 16.91'
Water column = 3.43'
1 volume = 0.56
Set up Waterra Pump at DW-6.

10:45 Began developing DW-6.

11:00 Removed 5 gals.
pH = 7.46 NTU = 8.0
Temp = 16.2 Salinity = 24.9
Cond = 33,500

11:04 Shut off pump. Need hex key set to fix pump.

11:15 resumed developing by hand.

11:20 10 gals removed from DW-6
pH = 7.57 NTU = 16.5
Temp = 16.7 Salinity = 24.2
Cond = 32,900

11:30 Hart personnel left site for lunch + supplies.

12:20 Hart back at site. Repaired Waterra pump.

12:30 Resumed developing DW-6.

12:36 WL at DW-2 = 7.43'
TD = 14.48'
Water column = 7.05'
1 volume = 1.15
Began development.

12:42 Removed 15 gals from DW-6
pH = 7.66 NTU = 12.8
Temp = 17.2 Salinity = 22.0
Cond = 32,300

12:43 Removed 5 gals from DW-2
pH = 7.60 NTU = 6.8
Temp = 18.1 Salinity = 22.1
Cond = 31,500

12:54 Removed 20 gals from DW-6
pH = 7.67 NTU = 9.1
Temp = 17.5 Salinity = 21.8
Cond = 31,300

12:55 Removed 10 gals from DW-2
pH = 7.64 NTU = 5.0
Temp = 18.2 Salinity = 22.1
Cond = 31,200

1:05 Removed 25 gals from DW-6
pH = 7.71 NTU = 7.9
Temp = 17.6 Salinity = 24.7
Cond = 34,500

1:05 Removed 15 gals from DW-2
pH = 7.66 NTU = 4.2
Temp = 18.5 Salinity = 24.5
Cond. = 34,300

1:12 Removed 20 gals from DW-2
pH = 7.57 NTU = 3.9
Temp = 18.7 Salinity = 24.5
Cond = 34,400

1:15 Removed 30 gals from DW-6
pH = 7.73 NTU = 6.5
Temp = 17.6 Salinity = 24.7
Cond = 34,600

1:17 Removed 25 gals from DW-2
pH = 7.53 NTU = 3.9
Temp = 18.5 Salinity = 24.5
Cond = 34,400
End of development. Removed 50 gallons on 8-16-90 for a total of 75 gallons removed.

1:25 Removed 35 gals from DW-6
pH = 7.66 NTU = 6.5
Temp = 17.6 Salinity = ~~23.0~~ HH 24.8
Cond = 34,200

1:31 WL at DW-1 = 10.70'
TD = 14.11'
Water column = 3.41
1 volume = 0.56
Set up WaTerra tubing in DW-1.

1:36 Removed 40 gals from DW-6
pH = 7.65 NTU = 6.5
Temp = 17.7 Salinity = 23.1
Cond = 32,900
End of development at DW-6.
Removed 10 gallons on 8-16-90 for a total of 50 gallons removed.

1:45 WL at DW-5 = 10.43'
TD = 13.41
Water column = 2.98
1 vol = 0.49

Setup WaTerra pump at DW-5.

1:45 Began developing DW-1 by hand.

1:52 Removed 5 gallons from DW-1
pH = 7.08 NTU = 6.1
Cond = 29,100 Salinity = 21.0
Temp = 16.7

2:02 Removed 10 gallons from DW-1
pH = 6.97 NTU = 5.8
Temp = 16.7 Salinity = 19.4
Cond = 30,000

2:03 Began developing DW-5 w/ WaTerra pump.

2:10 Removed 5 gallons from DW-5
pH = 6.23 NTU = 48.4
Cond. = 8,900 Salinity = 5.0
Temp. = 16.1

2:16 Removed 15 gallons from DW-1
pH = 6.9 NTU = 6.4
Temp = 16.4 Salinity = 21.0
Cond. = 31,500

2:20 Removed 10 gallons from DW-5
pH = 6.26 NTU = 19.7
Cond. = 9300 Salinity = 6.5
Temp = 16.1

2:30 Removed 20 gallons from DW-1
pH = 6.81 NTU = ~~30,400~~ 10.7
Cond. = 30,900 Salinity = 20.8
Temp = 16.6

2:32 Removed 15 gallons from DW-5.
pH = 6.28 NTU = 14.4
Cond. = 10,000 Salinity = 6.9
Temp. = 16.1

2:36 Removed a total of 17 gallons from DW-5 until dry.

2:49 Removed 25 gallons from DW-1.
pH = 6.84 NTU = 4.6
Cond. = 30,100 Salinity = 21
Temp. = 16.8

2:51 Removed 25.6 gallons from DW-1 until dry. Higher reading at 2:30 for NTUs due to problems with check valve and the accelerated motion necessary to make the valve work properly. Well is considered to be developed.

3:07 WL at DW-4 = 10.18'
TD = 14.86
Water column = 4.68'
1 vol = 0.76
Installed WaTerra tubing.

3:30 Hart personnel left site.

Hal Hatfield 8-21-90

WEDNESDAY August 22, 1990

Weather: Sunny, 75°, breezy

7:05 Hart personnel (H. Hatfield, M. D'Eufemia, S. Bryant, J. Klink) arrive on-site.

7:20 WL at DW-4 = 12.08'

7:25 Began developing DW-4.
TD = 14.86'
Water column = 2.78'
1 vol = 0.45 gal.

7:32 Removed 5 gallons
pH = 6.55 NTU = 23.2
Temp = 15.1 Salinity = 13.5
Cond = 18,200

7:40 REMOVED 10 GALS
pH = 6.55 NTU = 13.0
TEMP = 15.0 SALINITY = 6.5
COND = 19,000

7:58 Removed 15 gals
pH = 6.57 NTU = 2.0
Temp = 15.0 Salinity = 11.0
Cond = 17,000

8:15 Removed 20 gals
pH = 6.58 NTU = 0.8
Temp = 15.3 Salinity = 10.5
Cond = 16,800

8:25 Removed 25 gals.
pH = 6.57 NTU = 1.6
Temp = 15.1 Salinity = 11.0
Cond = 16,800
End of Development
Picked up equipment.

8:55 Pulled up Soil-gas time test tube TT2, loc. 10, 0-8

9:05 Pulled up TT2, loc. 32, G-8

9:15 Pulled up TT2, loc. 35, F-3

9:30 WL at DW-5 = 11.09'
Began developing DW-5 by hand.
J. Tayon, Scott Cyr (Maine DEP) at our office/truck.

9:40 J. Tayon + S. Cyr leave area.

9:50 Removed 5 gals from DW-5.
pH = 6.14 NTU = 18.9
Temp = 16.3 Salinity = 5.0
Cond = 7500

10:10 Removed 10 gals.
pH = 6.23 NTU = 4.8
Temp = 16.2 Salinity = 5.2
Cond = 7900

10:21 DW-5 dried after removing 17 gals. 11.5 gals removed on 8-21-90. Total of 23.5 gals removed. Picked up equipment.

10:35 TO-11 Set up and deconed bailers for sampling.

11:45 Deconing completed. Hart left site for supplies and lunch.

1:20 Hart returned to site. MD + SB went to DRMO to continue developing DW-5. HH + JK prepared to take water levels and purge wells at Mercury burial sites.

1:35 WL at MW-2 = 17.58'
TD = 21.84'
Water column = 4.26'
1 volume = 0.69 5 vols. = 3.45 gals

1:42 WL at MW-3 = 15.61'
TD = 19.26'
Water column = 3.65'
1 vol = 0.59 5 vols = 2.95 gals

1:50 WL at MW-4 = 14.61'
TD = 20.54'
Water column = 5.93
1 vol. = 0.97 5 vols = 4.85 gals

1:53 WL @ MW-5 = 14.68'
TD = 22.11
Water column = 7.43
1 vol. = 1.21 5 vols. = 6.05 gals.
Set up to purge MW-2 + MW-3.

2:15 Purged MW-2 + MW-3

2:23 Removed 5 vols. from MW-2 + MW-3

2:35 Purged MW-~~2~~ HH 4 + MW-5.

2:45 ~~Re~~ Purged 5 vols from MW4 + MW5.

3:15 Sampled MW-02 and Took Duplicate (MW-01-02) for TCL + TAL.
pH = 7.20 NTU = 56.7
Temp = 13.7 Salinity = NA
Cond = 750 Water gray to black

3:35 Sampled MW-03 for TCL + TAL
pH = 6.92 NTU = 84.6
Temp = 13.6 Salinity = NA
Cond = 850

4:10 Sampled MW-04 for TCL + TAL
pH = ~~6.~~ HH 7.06 NTU = Off-scale
Temp = 11.4 Salinity = 0.6
Cond = 1,370

4:20 Sampled MW-05 for TCL + TAL
pH = 7.27 NTU = Off-scale
Temp = 10.9 Salinity = 5.0
Cond = 6,900

Well development @ DW-5

1:35 MD + SB resume development at DW-5.
1:47 Removed 3 gals (total removed 26.5 gals)
pH = 6.02 NTU = 3.1
Temp = 16.7 Salinity = 11.8
Cond = 16,900
2:06 Removed 31.5 gals
pH = 6.03 NTU = 2.4
Temp = 15.7 Salinity = 11.8
Cond = 16,200
2:25 Removed 36.5 gals
pH = 6.06 NTU = 0.8
Temp = 15.6 Salinity = 12.0
Cond = 16,900
2:36 Removed 41.5 gals.
pH = 6.06 NTU = 1.4
Temp = 15.5 Salinity = 11.8
Cond. 16,200

End of development at DW-5.

5:00 Hart personnel leave site.

Hal Hatfield
8-22-90

Thursday August 23, 1990
Weather: Cloudy, occasional showers, 72°

7:00 Hart personnel (H. Hatfield, M. D'Eufemia, J. Klink, S. Bryant) arrive at site. Prepared for sampling JLF wells.

7:31 WL at JW-4 = 4.76'
TD = 11.79'
Water column = 7.03'
1 vol = 1.15 gal 5 vols. = 5.75 gals.

7:36 Began purging JW-4.

7:45 Purged 5 vols.
Sampled JW-4 for TCL+TAL.
pH = 6.45 NTU = off scale
Temp = 15.3 Salinity = 0%
Cond = 368

8:08 WL at JW-5 = 7.04'
TD = 14.77'
Water Column = 7.73'
1 vol = 1.36 5 vols = 6.8 gallons
J. Tayon arrives at JW-5.

8:16 Began purging JW-5.

8:25 Removed 5 vols.

8:30 Sampled JW-05 for TCL+TAL
pH = 6.62 NTU = off-scale
Temp = 13.5 Salinity = 4.5
Cond = 6,300

8:42 J. Tayon left area.

8:50 WL at JW-6 = 7.26'
TD = 19.93'
Water column = 12.67'
1 vol = 2.07 5 Vols = 10.35 gals

8:53 Began purging JW-6

9:07 Removed 5 vols.

9:10 Sampled JW-06 for TCL+TAL.
pH = 7.32 NTU = off scale
Temp = 11.7 Salinity = 0%
Cond = 600

9:35 WL at JW-7 = 6.97'
TD = 13.68'
1 vol = 1.09 gals 5 vols = 5.45 gals
Took a rinseate field blank using clean bailer for JW-7.
Labeled as RB-02

9:50 Unable to get bailer past obstruction 5' below TOC.
Set up to purge and sample with Waterra Tubing.

9:53 Began purging JW-7 with Waterra Tubing.
10:00 Removed 5 volumes.
Sampled JW-07 for TCL+TAL
pH = 6.67 NTU = 70.7
Temp = 14.8°C Salinity = 0.2
Cond = 1010
10:22 WL at JW-8 = 12.04'
TD = 14.97' Water Column = 2.93'
1 vol = ~~0.8~~ 0.48 5 vols = 2.4 gals.
10:32 Purged JW-8.
10:36 Removed 5 volumes
10:40 Sampled JW-08 for TCL+TAL
pH = 7.03 NTU = off-scale
Temp = 19.6 Salinity = 0.2
Cond = 540
11:01 WL at JW-9 = 7.82'
TD = 16.57'
Water column = 8.75'
1 vol = 1.43 gals 5 vols = 7.15 gals
11:03 Purged JW-9
11:13 Removed 5 vols.
11:15 Sampled JW-09 for TCL+TAL.
Took duplicate and labeled JW-11 (11:20).

JW-09 parameters:
pH = 6.89 NTU = off-scale
Temp = 15.2 Salinity = 18.5
Cond = 25,200
11:55 Hart left site for lunch and take samples to lab.
2:30 Hart back at site.
2:35 WL at JW-10 = 7.96'
TD = 14.35'
Water column = 6.39'
1 vol = 1.04 5 vols = 5.21 gals.
2:40 Began purging JW-10.
2:47 Removed 5 vols.
2:50 Sampled JW-10 for TCL+TAL
pH = 7.79 NTU = ~~off-scale~~ 88.6
Temp = 17.0 Salinity = 25
Cond = 33,200
3:14 WL @ JW-3 = 7.65'
TD = 18.99'
Water column = 11.34'
1 vol = 1.85 5 vols = 9.25 gallons
3:21 Dried well after removing 2.5 gallons.
3:34-3:36 REMOVED 2 MORE GALLONS - WELL DRIED AGAIN

3:41 Purged JW-3 for a 3rd time
3:43 Well dried. Removed 1 gallon.
Removed a total of 5.5 gallons.
3:50 Sampled JW-03 for TCL + TAL.
pH = 6.67 NTU = 100.2
Temp = 13.9 Salinity = 0
Cond = 327
4:15 WL at DW-1 = 12.46'
TD = 14.07'
Water Column = 1.61'
1 vol = 0.26 5 vols = 1.3 gals
4:17 Purged DW-1
4:20 Removed 10 vols.
4:30 Sampled DW-01 for PP metals,
TCL VOAs, Pest + PCBs
pH = 6.96 NTU = off scale
Temp = 15.4 Salinity = 18.2
Cond = 27,800
4:44 WL at DW-2 = 10.78'
TD = 14.45'
Water column = 3.67'
1 vol. = 0.60 5 vols = 3 gals
4:48 Purged DW-2
4:53 Removed 5 vols.

5:00 Sampled DW-02 for PP metals,
TCL VOAs, Pest + PCBs.
pH = 7.73 NTU = 118.5
Temp = 17.9 Salinity = 24.7
Cond = 34,100
5:20 Hart left site.

Hal Hatfield
8-23-90

Friday August 24, 1990
Weather: Cloudy, 75°

7:15 Hart personnel (H. Hatfield, M. D'Eufemia, J. Klink, S. Bryant) arrive on-site. Prepared for sampling.
7:45 WL at DW-3 = 18.32'
TD = 22.38'
Water Column = 4.06'
1 vol = 0.66 5 vols = 3.3 gals.
7:49 Purged DW-3.
7:53 Removed 5 vols.
7:55 Sampled DW-03 for PP metals, Pest + PCBs, TCL VOAs
pH = 7.64 NTU = 25.3
Temp = 17.5 Salinity = 23.2 %
Cond = 32200
8:15 WL at DW-6 = DRY
TD = 16.89'
8:23 WL at DW-7 = 19.54'
TD = 21.65'
Water column = 2.11'
1 vol = 0.34 5 vols = 1.72 gals
8:26 Purged DW-7.
8:33 Removed 5 vols.
8:35 Sampled DW-07 for PP metals,

TCL VOAs and Pest/PCBs.
pH = 7.65 NTU = 52.1
Temp = 17.3°C Salinity = 23.2 %
Cond = 33100
8:47 WL at DW-5 = 11.19'
TD = 13.42'
Water column = 2.23'
1 vol = 0.36 5 vols = 1.8 gals
8:52 Purged DW-5
9:03 Removed 5 vols.
9:10 Sampled DW-05 for PP Metals, Pest + PCBs, TCL VOAs. Took Duplicate Here and labeled as DW-08 (9:20).
pH = 6.35 NTU = off-scale
Temp = 16.2 Salinity = 6.1
Cond = 9,000
9:22 J. Tayon at well site.
9:25 J. Tayon leaves area.
9:40 WL at ~~M~~ DW-4 = 12.57'
TD = 14.86'
Water column = 2.29'
1 vol = 0.37 5 vols = 1.85 gals
9:55 Took RB-03 an equipment rinseate field blank for

TCL VOAs, PP Metals, Pest + PCBs.
Poured lab water through bailer
used at MW DW-04. Metals
also went through barrel filter.
10:11 Purged DW-04.
10:16 Removed 5 vols.
10:20 Sampled DW-04 for TCL VOAs,
PP Metals, Pest. + PCBs.
pH = 6.77 NTU = 52.7
Temp = 16.9 Salinity = 11.5
Cond = 16,700
10:30 Picked up equipment.
11:00 Hart left site.

Hal Hatfield
8-24-90

MONDAY August 27, 1990
Weather: Sunny, 85°

12:35 Hart personnel (H. Hatfield, M. DEufemia, J. Klink, S. Bryant) at site. Prepared for sampling.
12:42 WL at DW-6 = Dry. Will Sample later.
1:00 Sampled Tank at DRMO for TCLP Haz. Waste Characteristics. Tank sample is labeled T-DW1, 2, 4-7.
1:10 JK + HH left site for ice. SB + MD phoned office and prepared to set up data loggers.
1:25 JK + HH back.
1:35 Sampled drum JW-3 and labeled as DR-JW3. To be analyzed for TCLP Haz. Waste Char.
1:45 Sampled Tank (T-JW9+10) for TCLP Haz. Waste Char.
1:55 Sampled drum (DR-DW3) for TCLP Haz. Waste Char.
Jeff Smith of NERI on-site to pull soil-gas tubes.

2:05 Sampled tank (T-MW4+5) for TCLP Haz. Waste Char.

2:32 Took WL @ DW-6
WL = 13.98'
TD = 16.89'
Water column = 2.91'
1 vol = 0.47 5 vols = 2.37 gals

2:50 Sampled tank (T-MW2+3) for TCLP Haz. Waste Char.

3:07 Purged DW-6.

3:12 Removed 5 vols.

3:15 Sampled DW-06 for TCL VOAs, PP Metals, Pest + PCBs
pH = 7.55 NTU = 103.4
Temp = 18.9 Salinity = 19.7
Cond = 30,900

Data loggers installed at JW-6, JW-8 and JW-9. They are set to start at 4:00pm.

3:45 HH+SB left site to take samples to the lab.

4:15 JK + MD left site.

Hal Hatfield
8-27-90

Tuesday August 28, 1990
Weather: Sunny, 85°

7:00 Hart personnel (H. Hatfield, M. D'Eufemia, J. Klink, S. Bryant) arrive at site.
Began repairing well pads.
Started with MW-4 + MW-5.

8:30 Dug out old pads around MW-2 and MW-3. Added cement to MW-4 + MW-5.

8:45 Dug out old pad at JW-3.

8:55 Mixed and added cement to JW-3.

9:00 Jeff Smith of NERI on-site to pick up remaining soil-gas tubes.

9:10 Mixed and added cement at MW-2 and MW-3.

9:45 Dug out old well pad at JW-7.

10:05 Mixed and added cement to JW-7.

10:25 Jeff Smith leaves site.
Soil-gas survey is complete.
Dug out old pad around JW-4.

10:30 Mixed and added cement.
Chuck Vaughn (PWS) at JW-4.

10:45 Dug out old pad at JW-5.
Mixed cement.
Chuck Vaughn left area.
10:55 Added cement to JW-5.
11:20 Dug out old pad at JW-10.
11:30 Mixed and added cement.
11:50 Hart left site for lunch + cement.
12:40 Hart back at site.
12:50 Dug out old pad at DW-2.
1:05 Mixed and added cement.
Dug out old pad at DW-7.
1:15 Mixed and added cement to DW-7.
1:20 Dug out old pad at DW-1.
1:25 Mixed and added cement.
1:35 Dug out old pad at DW-5.
1:45 Mixed and added cement.
1:55 Dug out old pad at DW-6.
2:10 Mixed and added cement.
2:30 Sanded (wire brush) JW-10 and primed it.
2:50 Sanded and primed MW-5.
3:00 Sanded and primed MW-4.
3:10 Sanded and primed JW-3.
3:20 Sanded and primed MW-2.

3:35 Sanded and primed JW-7.
3:50 Sanded and primed DW-3.
Painted JW-10 and previously primed wells.
4:10 Sanded and primed DW-7.
4:20 Sanded and primed DW-1
4:30 Sanded and primed DW-5
4:45 Sanded and primed DW-6.
4:50 Painted DW-3 and other primed DRMO wells.
5:50 Hart personnel left site.

Hal Hatfield
8-28-90

Wednesday August 29, 1990
Weather: Sunny, 80°, breezy

8:00 Hart personnel (H. Hatfield, J. Klink) on-site.
8:15 Sampled boiler blowdown tank (BB-01-03)
pH = 9.23
Temp = 31.2
8:30 Left site to purchase paint.
8:55 JK + HH back at site. Touched up wells with paint and labeled wells.
9:35 Left site to take sample to the lab.
10:40 JK + HH back on-site. Checked data loggers. Labeled wells.
11:50 Left site.
3:40 Hart personnel on-site. Prepared to pull data loggers and repair remaining 3 wells.
4:00 Pulled up data logger at JW-9.
4:05 Dug up old well pad at JW-9.
4:20 Pulled data logger at JW-8. Mixed and added cement to JW-9.
4:30 Pulled data logger at JW-6.

Primed JW-9.
4:40 Dug out well pad at JW-8.
4:50 Mixed and added cement to JW-8.
5:00 Primed JW-8.
5:10 Dug out well pad at JW-6. Packed data loggers for shipment.
5:30 Painted JW-9 and labeled. Mixed and added cement to JW-6.
5:50 JK + MD leave site to ship data loggers. SB + HH paint and label JW-8
6:20 SB + HH leave site.

Hal Hatfield
8-29-90

SEPT. 15, 1990

WEATHER: SUNNY - 60°F, windy.

12:00 Jon Rink (McLaren/Hart) + John Michard (RAI) arrive @ main gate to check in.

12:10 Arrive @ JW-5. All JILF + Mercury burial site wells are to be resampled for total cyanide.

WELL I.D. (JILF)	(TOC) WL Ft.	(TOC) TOTAL DEPTH Ft.	WELL VOL. (gal.)	3 X VOL. REMOVED (gal.)
JW-3	8.16	17.03	1.77	5.32
JW-4	4.95	11.83	1.12	3.36
JW-5	6.36'	14.79	1.37	4.12
JW-6	7.33'	19.93	2.05	6.16
JW-7	7.16	13.68	1.06	3.19
JW-8	12.43	16.01	0.58	1.75
JW-9	7.42	16.57	1.49	4.47
JW-10	12.06	14.34	0.37	1.15

12:55 Measured water level + total depth @ JW-5.

1:00 Began purging JW-5.

1:04 Calibrated pH meter.

1:05 Removed 4.5 gallons from JW-5.

1:10 Sampled JW-5 for Total Cyanide. Water Light Br. + turbid

1:10 Field parameter for JW-5

FIELD PARAMETERS:

	COND. (umhos)	Temp. (°C)	pH	Salinity (‰)	turbidity (NTU)
JW-3	285	15.0	6.74	0	5.40
JW-4	372	16.0	6.60	0	off scale
JW-5	8100	15.5	6.57	6.3‰	off scale
JW-6	610	13.8	7.22	0	off scale
JW-7	990	14.4	6.63	0.2‰	off scale
JW-8	520	17.8	6.83	0	off scale
JW-9	26,200	14.8	6.86	20.03‰	off scale
JW-10	24,900	14.0	7.02	20.05‰	off scale

1:25 Measured water level + total depth @ JW-4.

1:30 Began purging.

1:35 Removed 3.5 gallons from JW-4. Water is Lt. Br. + turbid.

1:37 Field parameters for JW-4.

1:37 Sampled JW-4 for total cyanide.

1:55 Measured water level + total depth @ JW-6.

2:00 Began purging JW-6. Water is Light Br. + turbid.

2:05 Removed 6.5 gallons. + obtained field parameters.

2:10 Sampled JW-6 for total cyanide

2:40 Measured water level + total depth @ JW-3.
2:45 Obtained rinsate blank sample FB-041890 prior to purging JW-3
2:48 Began purging JW-3
3:00 Removed 3 gallons until dry.
3:02 Obtained field parameters for JW-3
3:05 Sampled JW-3 for total cyanide.
3:15 Measured water level + total depth @ JW-7
3:25 Began purging JW-7 w/ waterra tubing. Water light Br + cloudy
3:30 Removed 3.5 gallons from
3:31 Obtained field parameters for JW-7
3:32 Sampled JW-7 for total cyanide.
3:50 Measured water level + total depth @ JW-8
3:52 Began purging JW-8. Water DK Br + very turbid.
3:54 Removed 2 gallons from JW-8
3:55 Obtained field parameters from JW-8.
3:56 Sampled JW-8 for total cyanide
4:10 Arrived @ JW-9. Measured water level + total depth.

4:20 Began purging JW-9
4:25 Removed 4.5 gallons from JW-9
4:26 Field parameters for JW-9.
4:26 Sampled JW-9 + duplicate JW-11 for total cyanide. Water is DK. Br. + very turbid.
4:35 Measured water level + total depth @ JW-10
4:40 Began purging JW-10
4:45 Removed 2 gallons + obtained parameters.
4:45 Sampled JW-10 for total cyanides. Water DK Br., very turbid + silty.
4:55 All leave site. John Michaud (RAI) leaves for lab w/ samples.

Jan E Clark
4/18/90

WEDNESDAY

WEATHER: SUNNY 50-60°F SEPT 19TH, 1990

8:00 Jon Klink (McLaren/Hart) & John Michaud (RAT) arrive @ the mercury burial sites.

8:00 Measured water level & total depth of MW-2.

WELL ID	(TOC) WATER LEVEL (ft)	(TOC) TOTAL DEPTH (ft)	WELL VOL. (gal)	(3x) WATER TO BE REMOVED (gal.)
MW-2	17.87	21.90	0.66	1.97
MW-3	15.97	19.41	0.56	1.68
MW-4	17.65	20.68	0.98	2.95
MW-5	15.41	22.25	1.11	3.34

FIELD PARAMETERS:

	COND. (umhos)	Temp. (°C)	pH	Salinity (‰)	turbidity (NTU)
MW-2	690	14.8	7.38	0	79.2
MW-3	790	15.2	7.10	0	65.5
MW-4	1450	13.8	7.11	0.7‰	off-scale
MW-5	5900	12.9	7.35	4.2‰	off-scale

8:20 Begun purging MW-2

8:30 Removed 5 gallons from MW-2. Calibrated pH meter & obtained field parameters. Water DK grey w/ solvent odor.

8:30 Sampled MW-2-02 & duplicate MW-1-02 (8:35) for total cyanide.

8:35 Measured water level & total depth @ MW-3

8:40 Began purging MW-3.

8:50 Removed 5 gallons from MW-3. Water DK grey to black w/ slight sheen. Solvent odor detected

8:51 Obtained field parameters from MW-3

8:52 Sampled MW-3-02 for total cyanide.

9:10 Arrived @ MW-4 & measured water level & total depth.

9:20 Began purging MW-4.

9:30 Removed 5 gallons & obtained field parameters. Water is Br & very turbid. Slight odor detected.

9:30 Sampled MW-4-02 for total cyanide

9:45 Measured water level & total depth @ MW-5.

9:47 Began purging MW-5

9:55 Removed 5 gallons from MW-5 & obtained field parameters.

9:55 Sampled MW-5-02 for total cyanide.

10:40 Completed labeling drums used for collecting purge water.

10:45 Began cleaning stainless steel tailers.

11:40 Completed cleaning tailers

11:47 John Michaud (RAI) leaves site w/ samples.

11:55 J.K. leaves site

Jan E Keith

9/14/90