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USACE CONTRACT NO. DACW33-94-D-0002
TASK ORDER NO. 017
TOTAL ENVIRONMENTAL RESTORATION CONTRACT

Site: N
Break: 6.2
Other:

FINAL BASELINE GROUNDWATER MONITORING REPORT NEW BEDFORD HARBOR SUPERFUND SITE

New Bedford, Massachusetts

June 2001

(Text revised and Appendix E added,
Appendices A-D are as submitted in March 2001)

Prepared for

U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

2001-017-0195
6/15/01

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Prepared for

U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

Prepared by

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1.0 INTRODUCTION

Under Task Order No. 17 of the New England Total Environmental Restoration Contract (NE TERC) for the U.S. Army Corps of Engineers (USACE), Foster Wheeler Environmental Corporation (Foster Wheeler) will be conducting remedial design and remedial action construction activities for Operable Unit (OU) #1 at the New Bedford Harbor Superfund Site in New Bedford, Massachusetts. In support of these activities FW conducted a baseline groundwater monitoring program, consisting of the sampling and analysis of groundwater monitoring wells. The scope of the program and the analytical results are included in this report.

1.1 Project Description

The sediments in New Bedford Harbor are contaminated with PCBs, and to a lesser extent, other organic compounds and heavy metals. Figure 1-1 shows the location of the New Bedford Harbor Superfund Site. The remedy for the site will involve the dredging and excavation of contaminated sediments to Record of Decision (ROD) defined action levels for PCBs and placing the sediment in shoreline Confined Disposal Facilities (CDFs). The CDFs will ultimately be covered with impermeable caps to isolate the contamination from the environment. Figure 1-2 shows the approximate area to be dredged and the location of the proposed CDFs.

In support of this task, a one-year baseline groundwater monitoring program was implemented. The purpose of the groundwater monitoring program was to assess groundwater contaminant concentration in the vicinity of each proposed CDF. This data will be used as a baseline comparison to post-construction groundwater monitoring results to assess changes in groundwater conditions following filling and capping of the CDFs.

Installation of monitoring wells and observations wells was completed in 1999 and 2000, in accordance with the Sampling and Analysis Plan (SAP), New Bedford Harbor Superfund Site, New Bedford Massachusetts, February 2000 prepared for USACE by Foster Wheeler. Monitoring well completion diagrams are included in this report as Appendix A.

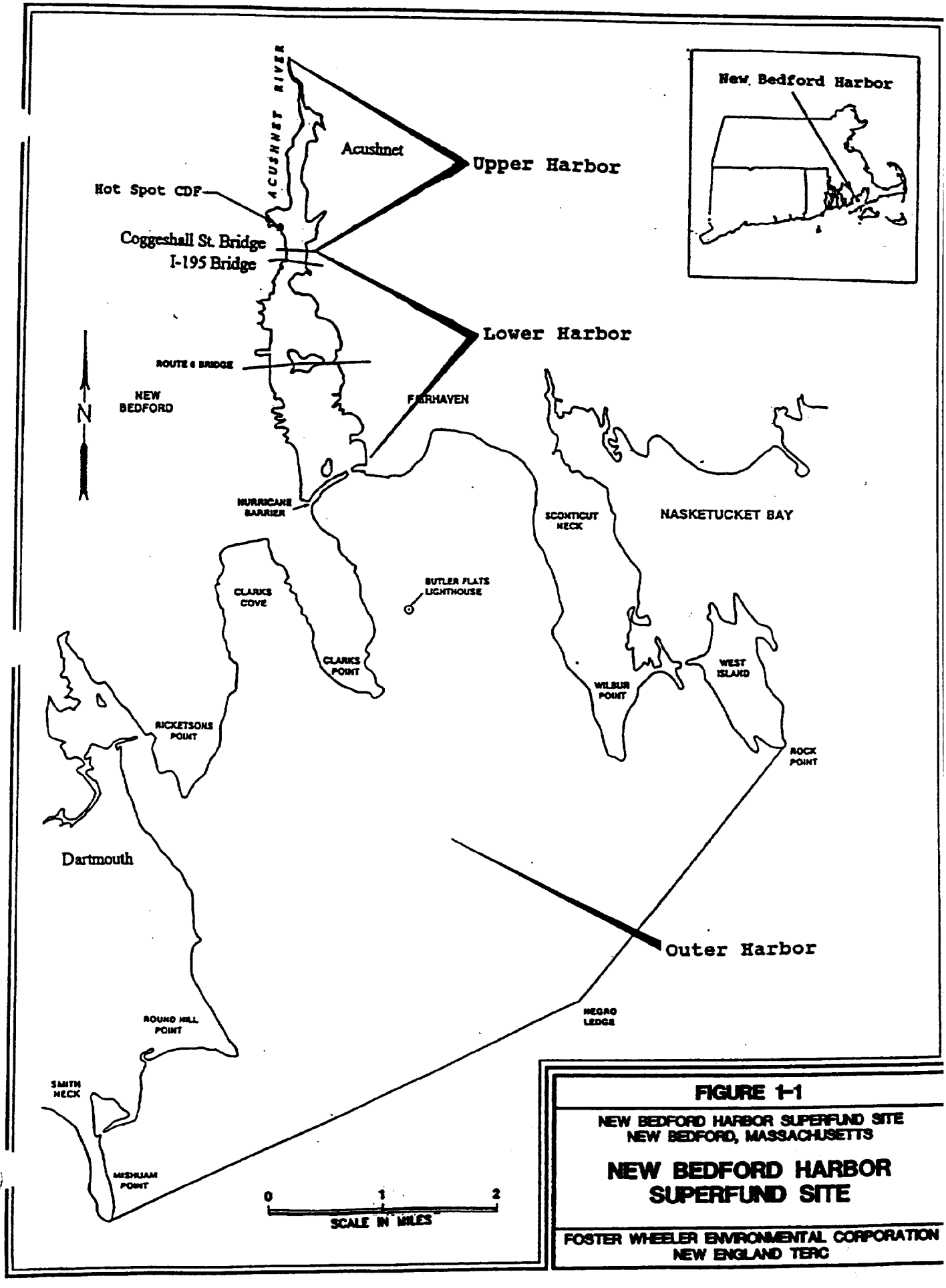


FIGURE 1-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

NEW BEDFORD HARBOR SUPERFUND SITE

FOSTER WHEELER ENVIRONMENTAL CORPORATION
NEW ENGLAND TERC

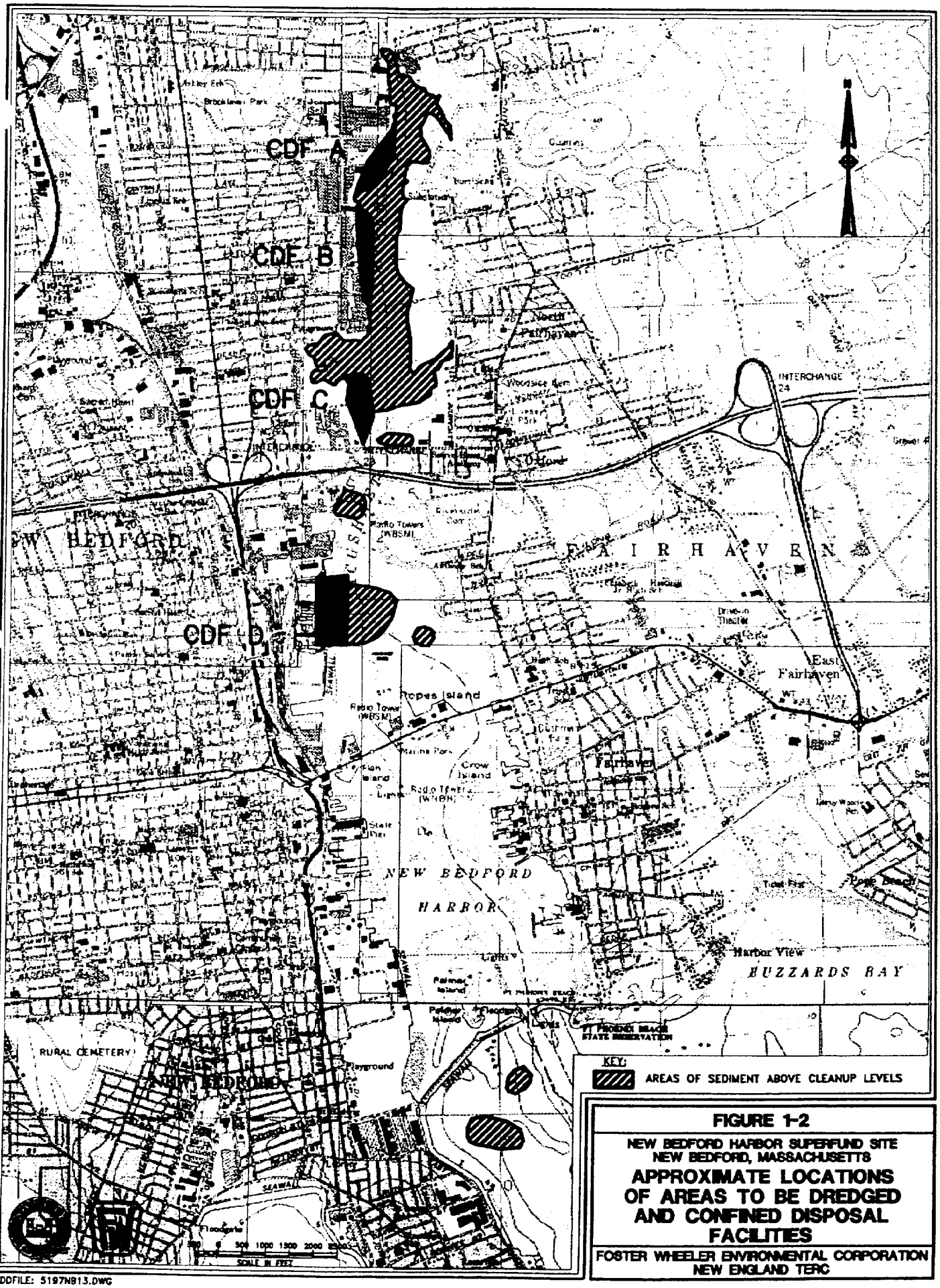


FIGURE 1-2

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

APPROXIMATE LOCATIONS OF AREAS TO BE DREDGED AND CONFINED DISPOSAL FACILITIES

FOSTER WHEELER ENVIRONMENTAL CORPORATION
NEW ENGLAND TERC

CADDFILE: 5197NB13.DWG

2.0 FIELD ACTIVITIES

2.1 Well Installation

Installation of monitoring wells and observations wells was completed in 1999 and 2000, by Nobis Engineering, Concord, New Hampshire in accordance with the Sampling and Analysis Plan (SAP), New Bedford Harbor Superfund Site, New Bedford Massachusetts, February 2000 prepared for USACE by Foster Wheeler.

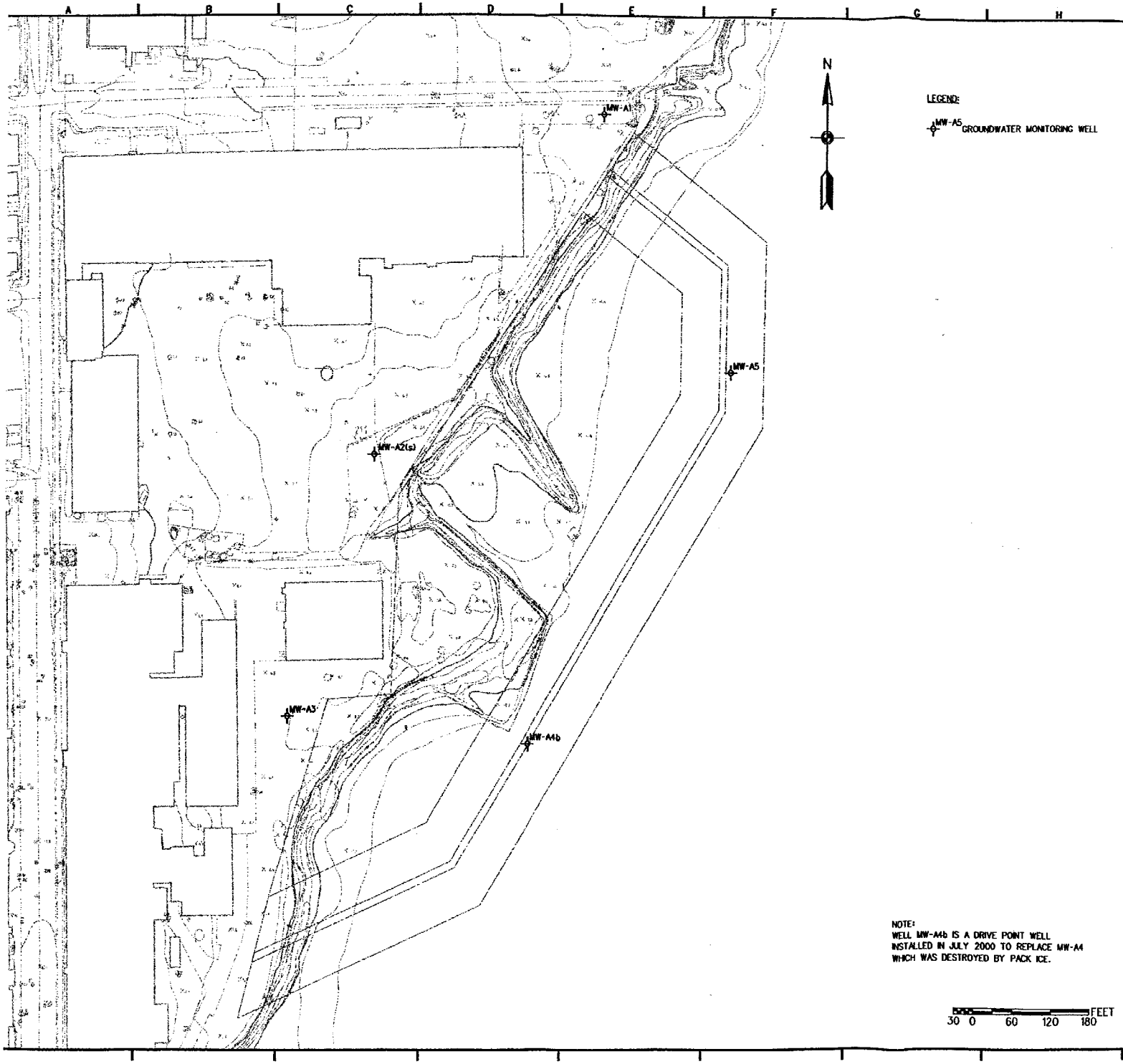
The locations of the wells were chosen such that wells are evenly distributed long the shoreline side of the CDFs, approximately 40 to 50 feet inland (west) from the sheet pile alignment to avoid CDF construction activities. Three monitoring wells per CDF (2 at CDF C) were installed to depths of approximately 20 feet and one well was installed to a depth of approximately 50 feet below the ground surface at each CDF except CDF A. Bedrock was encountered at 20 feet at CDF A and a deep well was not installed.

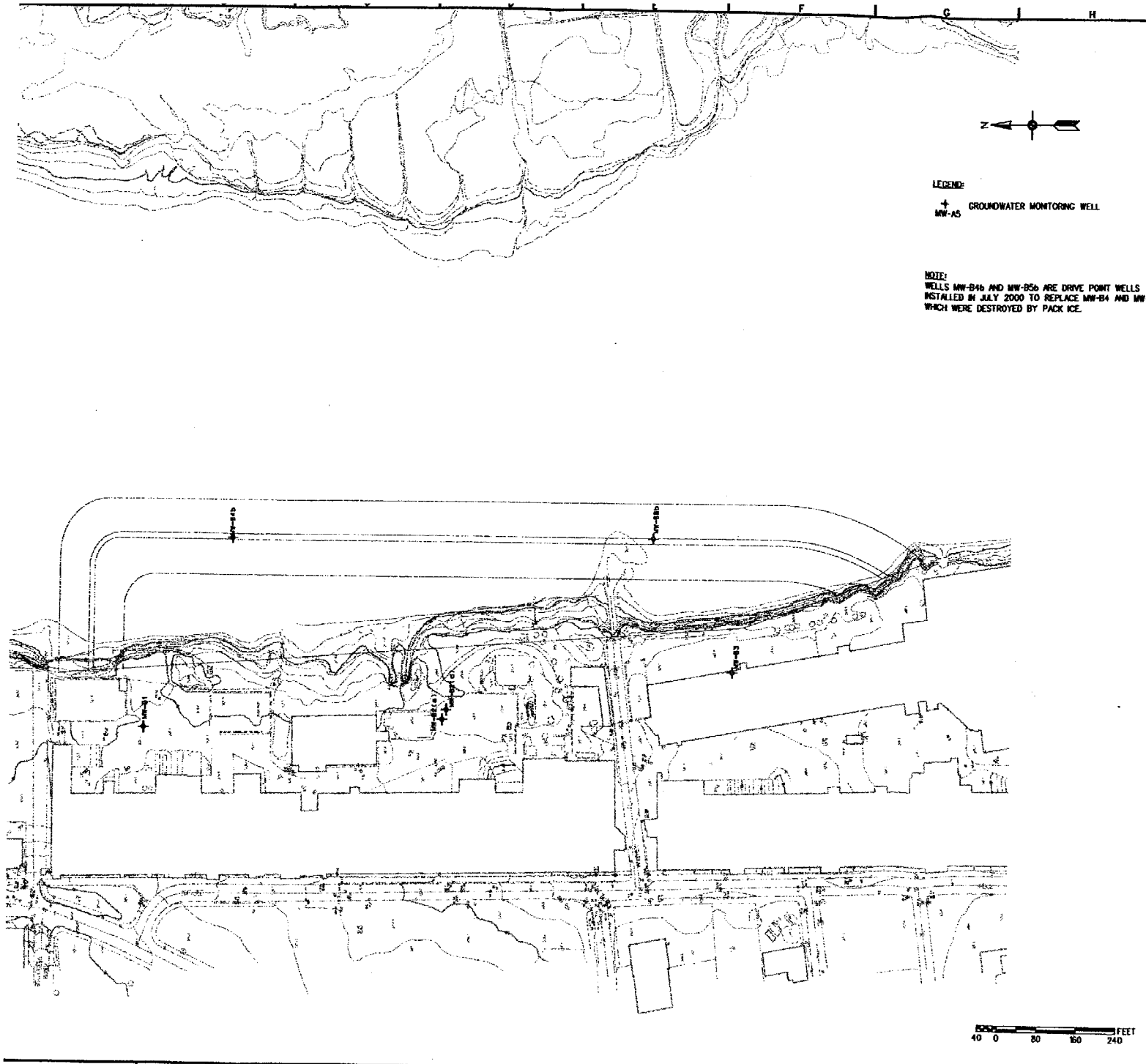
Offshore well points were installed along the proposed dike locations within the footprint of the CDFs (two per CDF). Only one offshore point was installed at CDF D so as not to interfere with harbor boat traffic. Wells were designated sequentially by proposed CDF location (A, B, C, and D) with the suffixes "s" or "d" to designate the shallow and deep pair. Temporary drive points were designated using the same sequential number as the initial well with the suffix "b". Monitoring well completion diagrams detailing screen types and depth, as well as filter pack material are included in this report as Appendix A.

2.2 Description of Sampling Activities

The baseline groundwater monitoring program was designed to consist of four quarterly sampling rounds of up to 21 monitoring wells; 14 land-side wells, and 7 wells installed in the harbor along the proposed CDF dike alignments. Due to the installation schedule, and severe winter (ice) conditions, the program was extended to include an additional round of sampling in November, 2000. Offshore wells that were destroyed by pack ice during the winter of 1999-2000 were replaced using temporary drive points and sampled during this additional round. Figures 2-1 through 2-4 show the locations of the monitoring wells with respect to each proposed CDF.

Groundwater sampling was performed in accordance with the *EPA Region I Low Stress (flow) Purging and Sampling Groundwater Procedure for the Collection of Groundwater Samples from Monitoring Wells, Revision 2, July 30, 1996* Water was purged from the wells using dedicated bladder pumps located at the approximate midpoint of each well-screen interval, and teflon lined PVC tubing installed in each well following development. During each sampling event, water quality parameters were measured using a YSI 600XI Water Quality Meter with a flow-through cell calibrated each morning prior to sampling, and calibration checked each afternoon following sampling. Water quality parameters measured include specific conductivity, temperature, dissolved oxygen, oxidation reduction potential, and pH. Additionally, depth to groundwater was measured with a water level indicator, and turbidity was measured with a turbidity meter. Following groundwater parameter stabilization, samples were collected from the tubing prior to the water passing through the flow-through cell, into pre-preserved sample containers.


MW-A1
MW-A2(s)
MW-A3
MW-A4b
MW-A5
N
LEGEND:
MW-A5 GROUNDWATER MONITORING WELL
NOTE:
WELL MW-A4b IS A DRIVE POINT WELL
INSTALLED IN JULY 2000 TO REPLACE MW-A4
WHICH WAS DESTROYED BY PACK ICE.
30 0 60 120 180 FEET
U.S. Army Corps of Engineers New England District
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS
FOSTER WHEELER ENVIRONMENTAL CORP.
133 FEDERAL STREET
BOSTON, MASSACHUSETTS
NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS
MONITORING WELLS
AT CDF A
Reference number:
FIGURE
2-1



U.S. Army Corps of Engineers New England District

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS CONCORD, MASSACHUSETTS

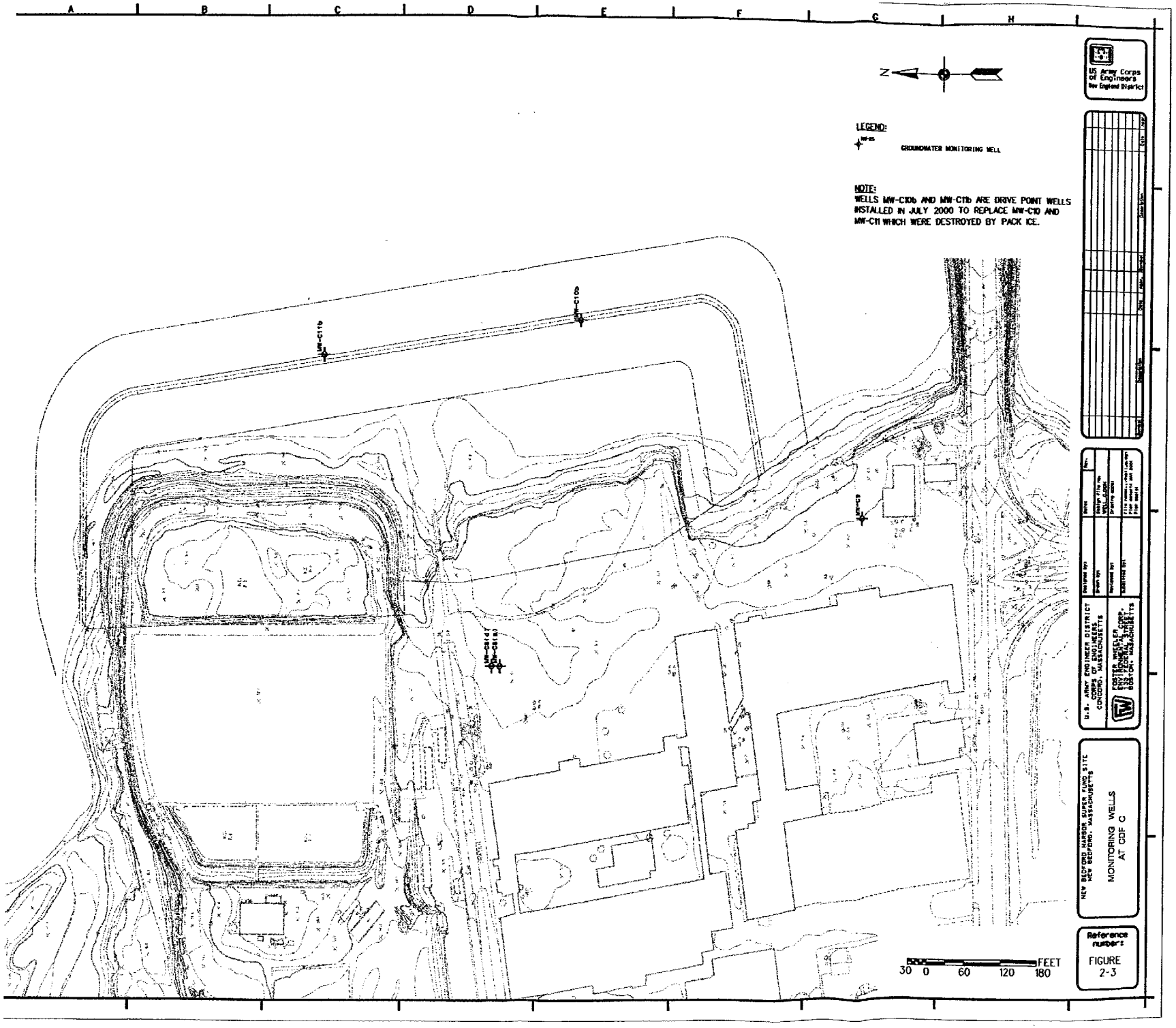
FOSTER WHELER ENVIRONMENTAL CORP. 55 FEDERAL ROAD BOX 351, MASSACHUSETTS

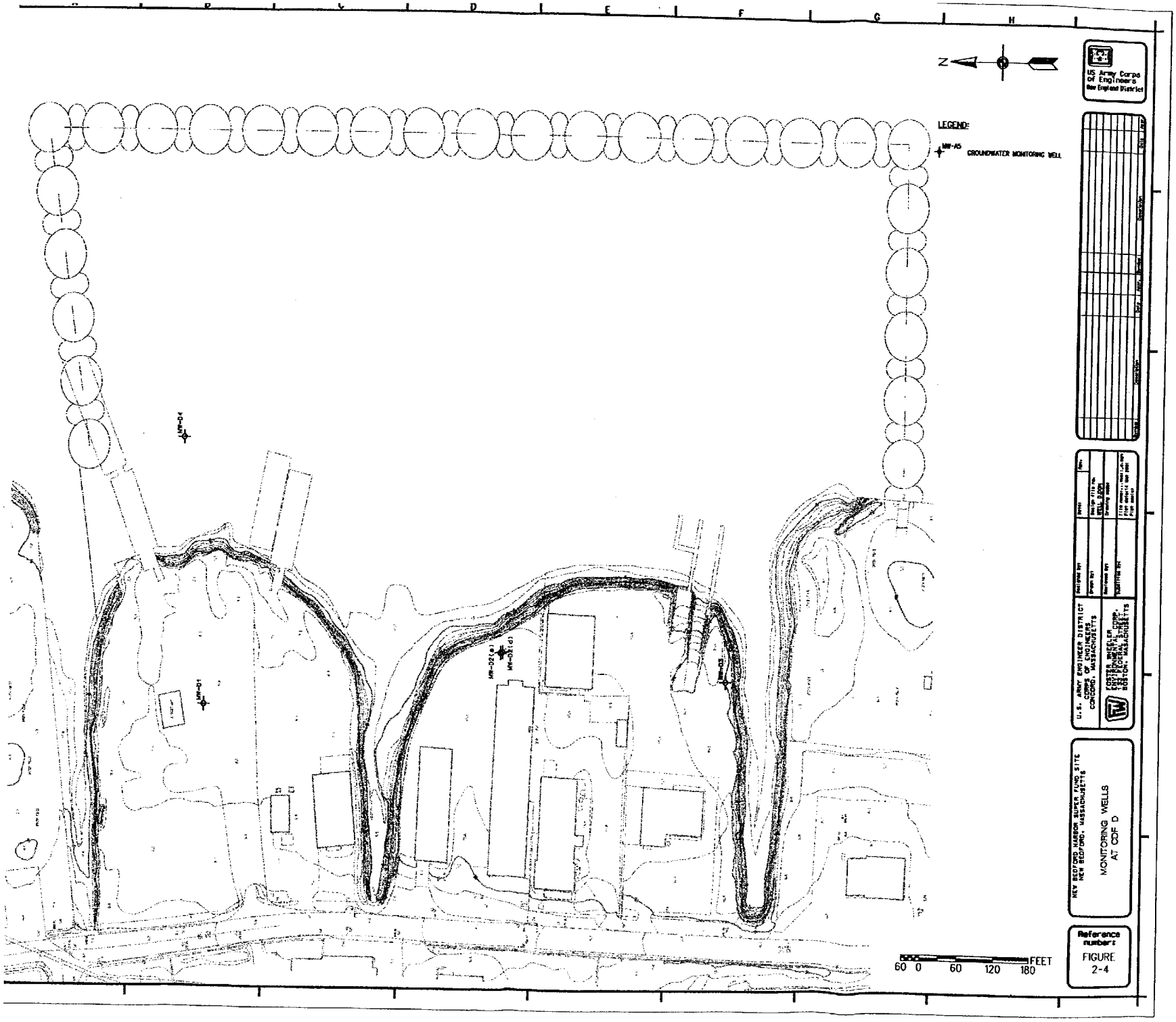
NEW BEDFORD HARBOR SUPER FUND SITE NEW BEDFORD, MASSACHUSETTS

MONITORING WELLS AT CDF B

Reference number:

FIGURE 2-2


LEGEND:
GROUNDWATER MONITORING WELL
NOTE:
WELLS MW-C10b AND MW-C11b ARE DRIVE POINT WELLS INSTALLED IN JULY 2000 TO REPLACE MW-C10 AND MW-C11 WHICH WERE DESTROYED BY PACK ICE.
MW-C11b
MW-C10b
MW-C11(b)
MW-C9
N
FEET
30 0 60 120 180
US Army Corps of Engineers New England District
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS CONCORD, MASSACHUSETTS
FOSTER WHEELER ENVIRONMENTAL CORPORATION BOSTON, MASSACHUSETTS
NEW BEDFORD HARBOR SUPER FUND SITE NEW BEDFORD, MASSACHUSETTS
MONITORING WELLS AT CDF C
Reference number:
FIGURE 2-3


LEGEND:
MW-A5 GROUNDWATER MONITORING WELL
MW-D1
MW-D2(a)
MW-D2(d)
MW-D3
MW-D4
N
60 0 60 120 180 FEET
US Army Corps of Engineers New England District
U.S. ARMY ENGINEER DISTRICT CONCORD, MASSACHUSETTS
FOSTER WHEELER ENVIRONMENTAL CORP. 100 FEDERAL STREET BOSTON, MASSACHUSETTS
NEW BEDFORD HARBOR SUPER FUND SITE NEW BEDFORD, MASSACHUSETTS
MONITORING WELLS AT CDF D
Reference number:
FIGURE 2-4

2.3 Quality Control

Quality control procedures were implemented to assure that the data quality objectives would be met for this task. These procedures included the use of dedicated sampling equipment to prevent cross-contamination, immediate field preservation of samples, and prompt placement of samples on ice following their collection. In addition, QC samples were submitted for analysis at the following frequencies, in accordance with the SAP:

- Trip Blank (Volatile Organic Compounds only, 1 per shipment);
- Duplicate Sample (1 per 10 samples, or fraction thereof);
- Matrix Spike/Matrix Spike Duplicate Sample (1 per 10 samples, or fraction thereof); and
- Quality Assurance Split Sample (1 per 10 samples, or fraction thereof).

2.4 Sampling Events

Five sampling events were conducted as part of the baseline groundwater monitoring program. Table 2.4-1 presents a summary of the wells sampled during each monitoring event. Sections 2.4-1 through 2.4-5 give a detailed summary of each individual sampling event.

Table 2.4-1
Summary of Wells Sampled
During Each Sampling Event

Well ID	August 1999 Sampling Event	November 1999 Sampling Event	March 2000 Sampling Event	June/July 2000 Sampling Event	November 2000 Sampling Event
MW-A1	X	X	X	X	Not sampled
MW-A2s	X	X	X	X	Not sampled
MW-A3	X	X	X	X	Not sampled
MW-A4	Not installed	X	Destroyed	Destroyed	Destroyed
MW-A4b	Not installed	Not installed	Not installed	X	X
MW-A5	Not installed	X	Destroyed	Destroyed	Destroyed
MW-B1	Not installed	X	X	X	Not sampled
MW-B2s	X	X	X	X	Not sampled
MW-B2d	X	X	X	X	Not sampled
MW-B3	X	X	X	X	Not sampled
MW-B4	Not installed	X	Destroyed	Destroyed	Destroyed
MW-B4b	Not installed	Not installed	Not installed	X	X
MW-B5	Not installed	X	Destroyed	Destroyed	Destroyed
MW-B5b	Not installed	Not installed	Not installed	X	X
MW-C8s	X	X	X	X	Not sampled
MW-C8d	X	X	X	X	Not sampled
MW-C9	X	X	X	X	Not sampled
MW-C10	Not installed	X	Destroyed	Destroyed	Destroyed
MW-C10b	Not installed	Not installed	Not installed	X	X
MW-C11	Not installed	X	Destroyed	Destroyed	Destroyed
MW-C11b	Not installed	Not installed	Not installed	X	X
MW-D1	X	X	X	X	Not sampled
MW-D2s	X	X	X	X	Not sampled
MW-D2d	X	X	X	X	Not sampled
MW-D3	Not installed	X	X	X	Not sampled
MW-D4	Not installed	X	X	X	X

Note: The letter "X" means the well was sampled during the respective round.

2.4.1 August 1999 Sampling Event

The initial sampling round was completed between August 11 and August 24, 1999. During this round, twelve of the twenty-one proposed monitoring wells were sampled. The remaining nine monitoring wells were not installed and/or developed at the time of the sampling event. Field indicator parameters in Table 2.4-2 represent final values taken during purging, prior to sampling. Field notes documenting development of each parameter within the EPA Region I criteria are presented in Appendix B.

Table 2.4-2
Field Measured Water Quality Parameters
August 1999

Well ID	Date Sampled	Static Water Level[1]	Flow Rate (ml/min)	Turbidity (ntu)	Redox (mV)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	Temp. (°C)
MW-A1	8/17/99	4.38	300	3.0	-49.8	1.19	6.1	6.0	17.2
MW-A2s	8/16/99	3.48	350	6.3	19.0	62.9	48.9	6.7	22.8
MW-A3	8/16/99	2.58	250	25.6	-66.1	0.39	3.9	6.4	19.4
MW-A4	Not Installed								
MW-A5	Not Installed								
MW-B1	Not Installed								
MW-B2s	8/12/99	2.96	300	1.9	-27.7	10.53	40.2	6.2	24.9
MW-B2d	8/12/99	3.02	400	6.6	-47.2	2.47	41.8	6.1	18.5
MW-B3	8/11/99	5.90	275	1.7	166.7	0.61	0.43	4.5	21.0
MW-B4	Not Installed								
MW-B5	Not Installed								
MW-C8s	8/12/99	4.21	275	5.1	-56.9	0.91	58.9	6.5	18.1
MW-C8d	8/12/99	3.83	400	18	-118.5	1.84	36.3	7.0	16.3
MW-C9	8/11/99	3.71	250	0.1	166.1	51.2	19.8	6.4	22.8
MW-C10	Not Installed								
MW-C11	Not Installed								
MW-D1	8/24/99	8.38	400	16.6	-64.7	52.8	39.4	6.8	19.8
MW-D2s	8/24/99	7.82	350	4.9	-237.7	1.79	38.9	7.7	22.8
MW-D2d	8/24/99	10.11	400	16.2	-129.4	1.67	41.7	7.3	16.1
MW-D3	Not Installed								
MW-D4	Not Installed								

Note: [1] Static water level indicates distance to the water table from the top of riser. See Appendix A for elevations in NGVD for top of riser.

2.4.2 November 1999 Sampling Event

The second sampling round was completed from November 8 to November 15, 1999 and included each of the twenty-one monitoring wells. Field measured water quality parameters are presented in Table 2.4-2 and field notes documenting development of each parameter within the EPA Region 1 criteria are presented in Appendix B. Field indicator parameters in Table 2.4-3 represent final values taken during purging, prior to sampling.

Table 2.4-3
Field Measured Water Quality Parameters
November 1999

Well ID	Date Sampled	Static Water Level[1]	Flow Rate (ml/min)	Turbidity (ntu)	Redox (mV)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	Temp. (°C)
MW-A1	11/9/99	4.32	300	10	NM	0.4	1.38	5.7	15.5
MW-A2s	11/9/99	2.91	400	6	NM	49.7	6.54	7.5	11.78
MW-A3	11/9/99	2.65	400	24	NM	0.23	7.13	6.5	15.6
MW-A4	11/11/99	4.40	500	19	44.8	9.84	7.98	6.6	12.31
MW-A5	11/11/99	2.33	500	26	5.3	5.52	5.44	6.0	12.6
MW-B1	11/9/99	2.94	300	19.2	-125.1	1.20	2.24	7.3	15.3
MW-B2s	11/8/99	3.12	400	5	-9.6	1.3	3.84	6.5	18.22
MW-B2d	11/8/99	3.12	700	6.1	NM	7.34	3.02	5.8	18.39
MW-B3	11/9/99	5.96	400	1.79	234.6	0.59	2.45	6.5	17.1
MW-B4	11/12/99	5.30	400	22	-69.3	15.21	8.20	6.3	12.54
MW-B5	11/12/99	6.40	400	35	-131.2	9.32	9.68	7.0	12.30
MW-C8s	11/8/99	4.25	400	20.2	NM	0.99	5.01	6.5	16.97
MW-C8d	11/8/99	4.88	400	12	-15.8	0.79	3.99	6.7	15.14
MW-C9	11/8/99	4.30	400	17.7	178.4	7.88	4.52	6.3	15.97
MW-C10	11/15/99	3.25	500	24	-54.6	6.53	9.20	6.8	12.98
MW-C11	11/15/99	5.18	350	18	-156.7	24.86	4.54	7.5	11.47
MW-D1	11/9/99	8.21	500	7.8	-82.4	25.81	1.55	7.0	15.37
MW-D2s	11/10/99	7.68	250	2.3	NM	1.97	2.99	7.2	19.26
MW-D2d	11/10/99	7.26	500	3.7	NM	1.98	1.82	7.3	15.68
MW-D3	11/10/99	7.70	400	3.0	271.7	54.57	4.19	6.9	15.25
MW-D4	11/15/99	5.70	700	12	-84.8	32.52	4.26	7.2	12.47

Note: NM means not measured due to probe malfunction.

[1] Static water level indicates distance to the water table from the top of riser. See Appendix A for elevations in NGVD for top of riser.

2.4.3 March 2000 Sampling Event

The third round of sampling was completed between March 2 and March 15, 2000. Fifteen of the twenty-one monitoring wells were sampled during this event. The remaining six wells, MW-A4, MW-A5, MW-B4, MW-B5, MW-C10, and MW-C11, located offshore, were destroyed by heavy pack-ice in the harbor over the winter of 1999/2000. Field measured water quality parameters are presented in Table 2.4-3 and field notes documenting development of each parameter within the EPA Region I criteria are presented in Appendix B. Field indicator parameters in Table 2.4-4 represent final values taken during purging, prior to sampling.

Table 2.4-4
Field Measured Water Quality Parameters
March 2000

Well ID	Date Sampled	Static Water Level[1]	Flow Rate (ml/min)	Turbidity (ntu)	Redox (mV)	Specific Conductance (uS/cm)	Dissolved Oxygen (mg/L)	pH	Temp. (°C)
MW-A1	3/7/00	3.47	400	15	38.0	0.286	0.90	5.9	11.50
MW-A2s	3/7/00	2.98	400	2	142.9	0.280	0.77	6.3	12.20
MW-A3	3/7/00	2.95	400	140	-13.1	0.102	1.59	6.4	10.39
MW-A4	Destroyed								
MW-A5	Destroyed								
MW-B1	3/6/00	3.02	400	108	-107.9	0.497	0.29	7.2	13.21
MW-B2s	3/6/00	3.42	400	2	21.5	0.196	1.47	6.3	9.77
MW-B2d	3/6/00	3.27	250	0.5	12.5	0.698	19.30	6.0	14.55
MW-B3	3/6/00	6.00	300	2.8	258.4	0.245	10.70	6.5	11.66
MW-B4	Destroyed								
MW-B5	Destroyed								
MW-C8s	3/2/00	4.19	350	16	-28.8	0.280	0.68	6.5	13.07
MW-C8d	3/7/00	5.01	300	8	58.9	0.604	5.50	6.5	14.31
MW-C9	3/2/00	4.24	250	14	136.0	1.235	1.71	6.4	15.01
MW-C10	Destroyed								
MW-C11	Destroyed								
MW-D1	3/4/00	7.74	375	3.5	4.8	2.367	5.51	7.3	7.11
MW-D2s	3/3/00	7.80	350	8	-125.5	0.743	0.53	7.3	10.44
MW-D2d	3/3/00	9.93	350	1.0	-92.6	0.662	1.47	7.3	13.25
MW-D3	3/3/00	8.33	350	6	167.6	18.44	6.42	7.1	5.98
MW-D4	3/14/00	6.91	300	5	0.30	18.46	82.9	7.2	10.14

Note: [1] Static water level indicates distance to the water table from the top of riser. See Appendix A for elevations in NGVD for top of riser.

2.4.4 June/July 2000 Sampling Event

Activities associated with the fourth sampling event were completed between June 29 and July 11, 2000. During this event, subcontractors, Pine & Swallow Associates, Incorporated, Groton, Massachusetts, were mobilized on July 5, 2000 to replace the offshore monitoring wells destroyed by ice during the winter. Temporary well points were chosen as a cost-effective alternative to permanent wells likely to be destroyed during future winter conditions. Global Positioning System survey techniques were used to reoccupy the locations of the destroyed wells. Once on position, replacement well points constructed of 0.84 inch OD, five-foot long steel screens, with steel risers were driven to a depth of approximately 25 feet below mudline. The newly installed drive point wells were designated with the same identification as previously, with the suffix "b" added (i.e., MW-A4b, MW-B4b, MW-B5b, MW-C10b, and MW-C11b in Table 2.4-4). Each well point was completed approximately 1-foot above the mudline with a permanent water-tight well head assembly. To protect the well from future damage due to heavy ice conditions, flexible tubing was tethered from the top of the steel riser to the water surface with a buoy. MW-A5 was not replaced as the location could not be accessed during the tidal cycles at the time of the drive point installation.

Each well was sampled during this event with the exception of MW-A5. Field measured water quality parameters are presented in Table 2.4-5 and field notes documenting stability of each parameter within the EPA Region I criteria are presented in Appendix B. Field indicator parameters in Table 2.4-5 represent final values taken during purging, prior to sampling.

Table 2.4-5
Field Measured Water Quality Parameters
June/July 2000

Well ID	Date Sampled	Static Water Level[3]	Flow Rate (ml/min)	Turbidity (ntu)	Redox (mV)	Specific Conductance (uS/cm)	Dissolved Oxygen (mg/L)	pH	Temp. (°C)
MW-A1	7/10/00	4.20	450	12	18.1	1.488	1.91	5.8	14.84
MW-A2s	7/10/00	4.26	150	2	164.9	0.631	2.20	6.3	16.0
MW-A3	7/11/00	3.11	300	29.8	-16.1	0.927	3.78	6.6	15.6
MW-A4b	7/7/00	NM[1]	350	48	-20.3	48.31	3.70	7.2	18.41
MW-A5	Destroyed								
MW-B1	7/6/00	2.75	250	43	-77.4	1.19	1.21	7.7	16.3
MW-B2s	7/12/00	3.45	375	1	77.6	0.833	0.20	6.7	22.18
MW-B2d	7/6/00	3.31	300	2	26.7	0.822	1.68	6.5	15.98
MW-B3	7/5/00	5.83	425	4	193.4	1.393	0.76	6.6	18.43
MW-B4b	7/11/00	NM[1]	300	26	-1.3	20.7	1.3	6.5	17.80
MW-B5b	7/10/00	NM[1]	150	51	-22.1	6.21	1.39	7.6	23.80
MW-C8s	6/30/00	4.35	400	8	-45.0	0.28	0.06	6.4	16.00
MW-C8d	6/30/00	4.28	450	8	11.6	2.734	0.46	6.6	15.55
MW-C9	6/30/00	4.00	350	1	183.0	9.06	1.79	6.4	17.20
MW-C10b	7/10/00	NM[1]	300	28	-94.2	17.50	0.15	6.7	16.11
MW-C11b	7/11/00	NM[1]	325	120	-102.3	30.45	0.38	7.2	17.81
MW-D1	7/3/00	7.67	300	5	-48.1	15.54	1.68	7.3	15.44
MW-D2s	7/3/00	7.45	255	20.4	-79.0	2.394	0.48	7.1	17.70
MW-D2d	7/3/00	7.27	350	5	-96.8	2.114	NM[2]	7.3	15.41
MW-D3	7/5/00	7.74	350	1.7	213.7	123.3	2.81	7.0	21.26
MW-D4	7/11/00	6.74	400	12	14.5	38.09	4.30	7.3	16.07

Note: b denotes a replacement drive point well.
[1] Water level could not be measured as riser is flexible tubing.
[2] Not measured.
[3] Static water level indicates distance to the water table from the top of riser. See Appendix A for elevations in NGVD for top of riser.

2.4.5 November 2000 Additional Sampling

A fifth round of groundwater sampling was performed between November 15 and November 17, 2000. The purpose of this event was to provide additional data for offshore wells not sampled during previous sampling rounds due to the installation schedule and due to destruction by pack ice. Monitoring well MW-A5 was not sampled due to damage below the mudline, as discussed above. Field measured water quality parameters are presented in Table 2.4-6 and field notes documenting development of each parameter within the EPA Region 1 criteria are presented in Appendix B. Field indicator parameters in Table 2.4-6 represent final values taken during purging, prior to sampling.

Table 2.4-6
Field Measured Water Quality Parameters
Offshore Wells November 2000

Well ID	Date Sampled	Static Water Level[2]	Flow Rate (ml/min)	Turbidity (ntu)	Redox (mV)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	Temp (°C)
MW-A4b	11/17/00	NM[1]	450	55	-71.0	10.69	3.19	7.5	12.82
MW-A5	Destroyed								
MW-B4b	11/17/00	NM[1]	450	2	-35.3	5.98	3.60	6.6	13.06
MW-B5b	11/16/00	NM[1]	200	42	-17.6	1.33	11.43	8.0	12.75
MW-C10b	11/16/00	NM[1]	325	3	232.6	0.00	11.96	7.3	8.73
MW-C11b	11/17/00	NM[1]	450	1	-139.0	7.99	2.94	7.2	12.42
MW-D4	11/15/00	5.83	450	1	23.8	11.41	1.15	8.3	12.60

Note: b denotes a replacement drive point well.

[1] Water level could not be measured as riser is flexible tubing.

[2] Static water level indicates distance to the water table from the top of riser. See Appendix A for elevations in NGVD for top of riser.

3.0 GROUNDWATER CHEMISTRY DATA

3.1 Analytical Chemistry

Groundwater samples collected from New Bedford Harbor were analyzed for polychlorinated biphenyls (PCBs) as total homoglogue groups, volatile organics (VOCs), semivolatile organics (SVOCs), and TAL inorganics. Samples were analyzed for total PCB homologue groups using gas chromatography/high resolution mass spectrometry by Triangle laboratories, Durham, NC. VOCs, SVOCs, TAL metals and cyanide were analyzed by Woods Hole Group, Raynham, MA. Woods Hole Group used EPA SW846 method 5030/8260B for VOCs, method 3510/8270C for SVOCs, method 9010 for total and amenable cyanide. Due to the high salt content of the samples, metals were analyzed using a sequence of preparation and analysis steps. An outline of the inorganic sample preparation and analysis is given in Table 3.1-1.

Table 3.1-1
Inorganic Sample Preparation and Analytical Outline

	Sample Preparation			Sample Analysis				
Analyte	EPA Method 3015	EPA Method 3015 + 1:10 Dilution	EPA Method 3015 + Chelation + HNO_3 Back-extraction	EPA Method 1632	EPA Method 1633	EPA Method 6010B	EPA Method 6020	EPA Method 7470A
Arsenic				X				
Selenium					X			
Barium	X					X		
Calcium	X					X		
Magnesium	X					X		
Potassium	X					X		
Sodium	X					X		
Aluminum		X					X	
Antimony		X					X	
Beryllium		X					X	
Chromium		X					X	
Manganese		X					X	
Silver		X					X	
Thallium		X					X	
Cadmium			X				X	
Cobalt			X				X	
Copper			X				X	
Iron			X				X	
Lead			X				X	
Nickel			X				X	
Vanadium			X				X	
Zinc			X				X	
Mercury								X

Method 1632: Determination of Inorganic Arsenic in Water by Hydride Generation Flame Atomic Absorption
Method 1633: Determination of Inorganic Selenium in Water by Hydride Generation Flame Atomic Absorption
Method 3015: Microwave Assisted Acid Digestion of Aqueous Samples and Extracts
Method 6010B: Inductively Coupled Plasma – Atomic Emission Spectrometry
Method 6020: Inductively Coupled Plasma – Mass Spectrometry
Method 7470A: Mercury in Liquid Waste by Cold-Vapor Atomic Absorption

3.2 Data Quality

Laboratory data was reviewed for quality control by Foster Wheeler chemists. The review was performed using a one-page checklist of quality control elements including blank contamination, spike and surrogate recoveries, duplicate precision, calibrations, and sample preservation/technical holding time. In addition, 10% of the data underwent EPA Region I Tier II validation according to Region I, EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analysis, December 1996. The reviews and validations were summarized in memos for each round of sampling. These memos are included in Appendix C.

The analytical data was reported with minor quality control issues that impact the data usability. Volatile data were reported with trip and laboratory blank contamination for common lab and field contaminants, methylene chloride, acetone, and naphthalene. This contamination had minor impact on the data with some low level sample results (within five times the blank concentrations) qualified as non-detect Laboratory blanks for the inorganics also had low levels of contamination during the program. Inorganic sample data requiring qualification due to blank contamination are considered to be minor. Selenium results from the first round of sampling were rejected due to poor laboratory recovery in the laboratory control sample. The sample results were considered not usable due to the low bias in the laboratory results.

Quality assurance split samples were collected at a frequency of 1 per 10 samples and shipped to the USACE designated laboratory, Phillip Analytical Services, Burlington, Ontario for analysis. The comparison of the QA data and primary lab data showed consistent correlation between the two sets of results with limited exceptions. Some individual inorganic parameters exceeded the ENSR/USACE criteria for major data discrepancies (concentrations differ by more than a factor of 3). Those QA/primary lab results that exceeded the factor of 3 difference are included in Table 3.2-1. Complete chemical quality assurance reports prepared by ENSR on behalf of USACE are included in Appendix D.

The parameters affected (several metals and cyanides) did not appear to correlate with any particular parameter, sampling location, or event. In addition, in some cases, results for an individual homologue group exceeded the criteria; however, results for other homologue groups in the same sample(s) met agreement criteria.

The QA laboratory did not perform the same chelation procedure for metals as the primary laboratory to prepare the salt water matrix samples. The poor correlation for the limited number of elements may be due to the differences in the sample preparation.

Table 3.2-1
Significant Differences in QA Laboratory and Primary Laboratory Analytical Results

Sample	Quarter 1		Quarter 2		Quarter 3		Quarter 4			
Location	MWA-1		MWD-4		MWC-9		MWC-11B		MWA-1	
Laboratory	Prime	QA	Prime	QA	Prime	QA	Prime	QA	Prime	QA
Analyte										
Aluminum					651	99			9860	1900
Arsenic	0.6 U	3.2 J								
Barium									51.8 B	12
Cadmium							0.61 B	0.1 U	0.39 B	1.2
Cobalt									7.1 B	2
Copper			1.9 U	16						
Chromium									48.7	11
Iron			1990	200 U					13900	4000
Lead	0.95 B	0.3 U								
Nickel			1.8 B	27						
Silver	0.35 B	0.1 U	0.12 B	1.6 J			0.23 B	0.1 UJ		
Thallium					1.4 B	0.4				
Vanadium	68.4	2.0								
Cyanide							0.9 U	3		
MonoCB									0.01	0.058
HeptaCB			0.21	1.7 J						
OctaCB							0.07	0.56		

* Quarter 5 not available
B Inorganic result is below the reporting limit but above the instrument detection limit
J Result is estimated
U Result is non detect at sample reporting limit

Note: Significant difference is defined as where the two values have a > 3 X difference.

3.3 Data Results

Results are reported for VOCs, SVOCs, PCBs as total homologue groups, metals, and cyanide (total and amenable) and are included in Tables 3.3-1 – 3.3-4. In some cases, the laboratory reported individual NOAA congeners in addition to the homologue groups. These were not a requirement and were not performed for all samples. Where the data are available, it is included in Table 3.3-3. The results for VOCs, SVOCs and metals are reported in ug/L (ppb), the result for the total homologue groups are reported in ng/L (ppt) and the results for cyanide (total and amenable) are reported in mg/L (ppm).

For reference, Appendix E has been added to summarize chemicals detected in any of the wells sampled, and compare the results to the Massachusetts Contingency Plan (MCP), Reportable Concentrations for groundwater standard GW-2. Note that the objectives of this baseline groundwater program did not include sampling and analytical procedures to analyze for all chemicals that were analyzed on the MCP list. Further, laboratory reporting limits did not achieve MCP limits for those target chemicals. This information is presented in Appendix E for reference only.