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Total Environmental Restoration Contract

New England Division

USACE Contract No. DACW33-94-D-0002

FOSTER WHEELER ENVIRONMENTAL CORPORATION

SDMS DocID 286535

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

FINAL
BASIS OF DESIGN / DESIGN ANALYSIS REPORT (100%) DESANDING AND DEWATERING FACILITIES NEW BEDFORD HARBOR SUPERFUND SITE

New Bedford Harbor, Massachusetts

December 2002

Prepared for

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

2002-17-0273
12/02/02

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE

(Read instructions on reverse side prior to initiating this form)

DATE: 12/9/02

TRANSMITTAL NO: 17.20.93.03-003

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (This section will be initiated by the Contractor)

TO:
U.S. Army Corps of Engineers - New Bedford Resident Office
130 Sawyer Street
New Bedford, MA 02746
Attention: Mr. Maurice Beaudoin

FROM:
Foster Wheeler Environmental Corporation
New Bedford Harbor Superfund Site Project Office
130 Sawyer Street
New Bedford, MA 02746

CONTRACT NO: DACW33-94-D-0002

CHECK ONE:
— THIS IS A NEW TRANSMITTAL
THIS IS A RESUBMITTAL OF TRANSMITTAL X

SPECIFICATION SECTION NO: (Cover only one section with each transmittal) NA

PROJECT TITLE AND LOCATION: New Bedford Harbor Superfund Site OU#1 and OU#2 Remedial Design and Remedial Action

ITEM NO. a.	DESCRIPTION OF ITEM SUBMITTED (Type, size, model number, etc.) b.	MFG. OR CONTR. CAT. CURVE DRAWING OR BROCHURE NO. (See instruction No. 8) c.	NO. OF COPIES d.	CONTRACT REFERENCE DOCUMENT: SPEC. PARA. NO. e.	CONTRACT REFERENCE DOCUMENT: DRAWING SHEET NO. f.	FOR CONTRACTOR USE CODE g.	VARIATION (See instruction No. 6) h.	FOR CE USE CODE i.
1	Final BD/DA Desanding and Dewatering Facilities	na	1	na	na	GA		
2	Final Calculations (BD/DA Appendix C)	na	1	na	na	GA		
3	100% Specifications	na	1					
4	100% drawings	na	2					
5	Response to comments on 90% submittal	na	1					
	Note: Drawings and specifications are for D-lite infrastructure							
	(site work, utilities, permanent building and rail)							
	and do not include process equipment acquisition or operation.							

REMARKS
FWENC Document #: 2002-017-0273
2002-017-0252, 2002-017-0253
Distribution: See attached table

I certify that the above submitted items have been reviewed in detail and correct and in strict conformance with the contract drawings and specifications except as otherwise stated.

Mark Otten

NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED (List by Item No.)	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE

Distribution for 100% Desanding / Dewatering Infrastructure Design Documents

Name	Drawings		Specifications	BD/DA Report	Calculations
	Full-size	Half-size			
D. Dickerson, EPA		1	1	1	1
J. Brown, EPA		1	1	1	1
P. Craffey, DEP		1	E	1	E
G. Morin, USACE		1		1	
R. Simeone, USACE	3		1	1	1
M. Beaudoin, USACE	2		1	1	1
TOTAL (hard copies)	**5**	**4**	**4**	**6**	**4**
E is electronic submittal.					

Name	Drawings		Specifications	BD/DA Report	Calculations
	Full-size	Half-size			
File	1	1	1	1	1
G. Willant		1	E	E	E
M. Otten		1	E	E	E
J. Brinkman		1	1	1	1
D. Martoccia		1	1	1	1
L. Toroyan		1	1	1	1
J. Zhao		1	E	E	E
H. Rana		1	E	E	E
J. Weeks		1	E	E	E
R. Francisco		1	1	1	E
J. Kraycik	1	1	1	1	1
F. Menichelli	1	1			
J. Holwell		1	E	E	E
D. Beck		2	1	E	E
E. Plye	1	1	1	1	E
TOTAL (hard copies)	**4**	**16**	**8**	**7**	**5**
E is electronic submittal.					

FOSTER WHEELER ENVIRONMENTAL CORPORATION
TOTAL ENVIRONMENTAL RESTORATION CONTRACT (TERC)
CONTRACT NO. DACW33-94-D-0002, NEW BEDFORD HARBOR SUPERFUND SITE

ANNOTATED RESPONSES TO REVIEW COMMENTS

The following are responses to USACE, ERDC, and MADEP comments on the Draft Final Basis of Design/Design Analysis Report (90%) Desanding and Dewatering Facilities dated May 24, 2002. The comments are provided in italic type followed by Foster Wheeler's responses in bold type.

Reviewer: R. Schmidt – USACE Date: March 21, 2002

Comment 1: *Page 3-1/Para. 3.1: Feasibility Investigation – Dewatering. Physical Separation. Text notes that desanding would most likely consist of removal of material with a specific gravity greater than 2.3 and particle size coarser than the No. 200 mesh (0.075 microns), i.e., the coarser mineral fraction. WES' preliminary data on their density separation work were forwarded to Rich Otoski via e-mail today. The preliminary information generally shows PCB concentrations about twice as high for the material with SG less than 2.0. Grain size analyses have not yet been done on the separated fractions. While PCB concentrations for the denser fraction (SG > 2.0) are lower, they are still significant (> 50 ppm in many cases). These results may be affected by the inclusion of lightweight organic matter with SGs somewhat greater than 2.0 (2.0 to 2.4, say). Grain size analyses of the two fractions may also shed light on the presence of coarse, organic particles.*

It's possible for WES to do additional separations, using various SG fluids to make the cuts, followed by grain size analyses, but they would need additional sample, and it's unclear when this work could be scheduled. The Corps and FW should discuss potential benefit of having WES do additional separation work on New Bedford sediment.

Response: **PCBs have been shown to have a greater affinity for organic material. Therefore, it is not surprising that the PCB concentrations were found to be lower in the denser (inorganic) material. The PCBs that are present in the coarse fraction are likely the result of organic fines being present (i.e., less than 100% capture). It is agreed that grain size analyses would help develop a relationship between PCB concentration and particle size.**

Additional laboratory/bench scale testing for material separation is not considered beneficial. However, the North Lobe Dredging task to be conducted fall/winter 2002 will allow for a better evaluation of the desanding systems efficiency, and the potential to generate non-TSCA +3/8 inch and +100/200 mesh material.

Comment 2: *Page 5-2/Table 5-1: Basis of Design. Desanding Operation. The Design Objective for this operation makes no mention of minimizing the amount of TSCA material generated from desanding. Please add this objective to the table and the text, and add a discussion of what efforts could be made to render this material non-TSCA, plus the relative costs/benefits of doing so (sending sand through an additional V-tank, adding spray nozzles to the linear motion shaker, etc.).*

Response: **Both the text and Table 5-1 will be revised to include a discussion of efforts to be made to render separated material non-TSCA.**

Comment 3: *Page 6-1/Para. 6.1.1: Coarse/Fine Material Separation. Text states that coarse fraction will be dry enough to pass the paint filter test, but does not mention whether it will be clean enough to be disposed as non-TSCA (<50 ppm) or for use as daily cover (< 2 ppm). Please expand on conceptual design approach to achieve this objective.*

Response: **It is anticipated that the separated material will be non-TSCA and the text will be revised to state as such. The text will also be expanded to discuss methods that may be incorporated to achieve non-TSCA separated materials.**

Comment 4: *Page 6-2/Para. 6.1.3: Asphalt Pad/Foundation. Please clarify whether the storage areas for the 3/8"+ material and sand will be covered; I believe the areas are shown to be covered elsewhere in this document. Storage areas should be covered to reduce problems with windblown dust (free silica and PCBs).*

Response: **TSCA regulations require that the storage areas be covered and the text will be revised accordingly.**

Comment 5: *Page 6-17/Para. 6.10: Desanding/Dewatering Air Emissions. Text here does not appear to address sand storage areas, as it relates to site workers or protection of the public. Please add.*

Response: **The PCB emissions from the desanding operations are anticipated to be relatively low compared to those from the dewatering process. This is due to the fact that less surface is exposed to open air in the desanding process. The flux test results on the filter cake indicated that the PCB emissions were less than 1.25% of the total PCB emissions and this value is expected to be lower for the separated materials. The majority of the potential PCB emissions will be emitted from the wet slurry operations (storage tanks, mixing/conditioning tanks, desanding systems). Fugitive dust emissions to ambient air from desanding material handling operations are expected to be negligible. However, the generation of dust inside the storage areas as it relates to occupational exposures will be evaluated for on-site worker protection and the appropriate controls implemented. The text will be revised to address the sand storage areas.**

Comment 6: *Figure 6-2 Area C Flow Diagram: Diagram shows one 2,000 gpm recirculation pump for sending slurry from the bottom of the tank to the hydrocyclones. It's also noted that each tank is capable of processing up to 2,500 gpm from the dredge. It's my understanding that you need to have the recirculation pump pumping at a rate, say twice that of the flow rate from the dredge, in order to increase the removal efficiency. By recirculating at a rate twice that of the feed, the travel distance through/within the tank and hydrocyclones doubles. As a result, slurry – on average – makes two passes through the hydrocyclones. Each time slurry passes through the hydrocyclone, and coarse material is removed, the slurry becomes more dilute and the coarse fraction content decreases, all leading to increased removal efficiency (fewer fines reporting w/ the sand, and less sand reporting w/ the fines). Therefore, you would need two recirculation pumps, for this scenario, which may be a worst-case (only two out of three tanks in operation, and dredge producing 5,000 gpm of slurry). BD/DA should discuss pros and cons of designing for this case – additional cost to have two recirculation pumps for each tank, vs. effects of having low removal efficiency under this scenario (generating TSCA material, etc.).*

It's understood that these tanks are generally very robust pieces of equipment, and that the pumps are generally responsible for the most down time related to this operation. Adding a second recirculation pump to each tank would build in some additional redundancy which may be warranted.

Response: **The proposed desanding systems (which has been utilized on similar desanding/dewatering projects) will have two (2) 1,000 gpm recirculation/feed pumps for each pair of 10" hydrocyclones and the figure will be revised accordingly. Increasing the recirculation rate would likely increase the separation efficiency but these systems typically only have the two 1,000 gpm pumps. A second recirculation pump would not increase the capture rate enough to justify its inclusion. The separation efficiency of the desanding systems will be demonstrated/evaluated during dredging of the North Lobe sediments. Based on past project experience these pumps are pretty hardy and the only operational problem with them is an occasional leaky seal.**

Comment 7: *Appendix D: Technical Memorandum on Dewatering. Please replace with the second revised version of this memorandum, transmitted May 2, 2001, which also addresses my comments.*

Response: **This Appendix has been deleted from the BD/DA.**

Comment 8: *General: At the On-board Review Meeting yesterday, the dredging of the channel at the North Lobe was de-linked from the bulkhead construction work. Given the quantity (roughly 20,000 cy) and nature (TSCA) of the sediment to be dredged at the North Lobe, I believe a small, mobile filter press (recessed plate or diaphragm) with desanding units, will likely be the most cost-effective method to dewater this material. The cost of dewatering will likely be made up by the decreased cost for disposal (total tonnage will be less due to squeezing out the water). The contract for this work should build in elements to test our ideas about methods and equipment to optimize the dewatering operation from a total project cost perspective, such as rendering sand non-TSCA. Information generated from this project should be provided to the contractors bidding on the dewatering spec. The spec could be revised to incorporate more prescriptive criteria, if warranted based on project results, and if the project is completed within such timeframe that this would be possible*

Response: **The North Lobe dredging task will include a desanding system and mechanical dewatering with belt filter presses. While the objective of this task is to dredge, dewater and off-site dispose of approximately 31,100 in-situ yd^3 of sediment such that the North Lobe can be made available for the Packer relocation, the intent is to also evaluate/optimize the desanding operations. The separated material will be analyzed for PCBs and the process modified to the extent practical to achieve a non-TSCA material.**

Reviewer: R. Simeone – USACE Date: April 1, 2002

Comment 1: *Page 3-1, Para. 3.1: The final tech memo rev. 2 is dated May 2001 not April.*

Response: **The text will be revised accordingly.**

Comment 2: *Page 4-1, Para 4.0: Facility Criteria need to be clear and separate from operational dewatering process criteria i.e., the % solids requirement for cake and the minimum requirement for % solids by wt in the slurry. The later should be in Section 5.0 only.*

Response: **The text has been revised accordingly.**

Comment 3: *Table 5-1: Mechanical Dewatering Operations – Basis of Design – no min % solids defined for filter cake characteristics?*

Response: **The table will be revised to include a minimum 65% solids filter cake.**

Comment 4: *Page 6-4, Para. 6.3.6: The requirement that no visible dust shall be permitted inside the building does not seem very feasible.*

Response: **This requirement has been removed from the text.**

Comment 5: *Page 6-5, Para 6.4.1: Sitting of Buildings: There should be mention of non-TSCA filter cake leaving the facility in this para.*

Response: **The text has been revised accordingly.**

Comment 6: *Page 6-15, Para. 6.8: 2nd para. States that a USACE/EPA contractor will perform switching etc. It may be CSX or another contractor under the T&D contract.*

Response: **The text has been revised to indicate that a "separate subcontractor" will perform switching.**

Comment 1: *Section 2.3 Discharge Standards: Shouldn't filtrate be listed as a liquid discharge?*

Response: **Yes. The text will be revised to include filtrate generated by the mechanical dewatering process.**

Comment 2: *Page 3-1 Mechanical Dewatering "...only the filter press and the bladder press were shown to be capable of achieving the project's volume reduction or weight reduction objectives...." Filter press is a very generic term. Clarify.*

Response: **The text will be revised to state "... only the** diaphragm **plate and frame filter press ...".**

Comment 3: *Page 3-2. Dewatering Bench Scale Testing - First sentence of first paragraph...run-on sentence, unclear....*

Response: **The text will be revised accordingly.**

Comment 4: *Page 3-2 Physical separation – 1st bullet – "...During full-scale operations solids separation would be based on specific gravity (i.e. hydrocyclones). As a result, the small organic particles which would have low specific gravity would not be retained in a separation/screening process but passed on to the dewatering process....". Separation in a cyclone is actually a function of both size and density, just as settling is, but I think your point is that some coarse organic particles would report with the fines, and the resulting underflow of the cyclones would be less contaminated than the screened coarse material was. Small organic particles would largely report with the fines in either operation.*

Response: **Separation in a hydrocyclone is a function of mass. Those particles having sufficient mass settle to the wall of the vessel and move downwards towards the cone apex, becoming more concentrated as the cone narrows. As the cross-sectional area decreases the less dense fluid nearer to the cone axis turns back towards the top of the cone and exits via the vortex finder and overflow outlet. This fluid carries with it those particles having insufficient mass (primarily organics) to settle. The centrifugal force developed in the hydrocyclone is about 700 to 1,000 times that of gravity giving a cut-point of about 65 um in desanders and 30 um in desilters. The text was attempting to indicate two points: 1) that the screening method utilized during the bench scale testing (manually screening with +3/8 inch and +200 mesh screens) was not representative of the anticipated full-scale operations (hydrocyclones), and 2) that the PCB contamination is primarily associated with the organic material that would be more effectively removed in a hydrocyclone operation. The text will be revised to more clearly state these points.**

Comment 5: *2nd bullet – State how the gradation analysis was performed. As previously discussed, if coarse organics are present, contaminant distributions based on screened materials can be different from that obtained at full scale (depending upon the full scale process). Contaminant concentrations may also be higher in the coarse fraction if oil and grease is deposited on the coarse materials during screening. Adherence of fines to coarse materials could have a similar effect. It is usually possible to obtain a sand fraction relatively free of fines when wet sieving. Since the fines appear to have adhered to the*

sands in this case, it is probably fair to ask if it isn't possible that this will also happen at full scale unless some dispersing agents, detergents, or attritioning are employed. It may be inappropriate to conclude that the results obtained are not representative of full scale operations with respect to inclusion of fines in the coarse materials. This may in fact present a processing problem that must be anticipated and addressed.

Response: **Grain size analyses were performed per ASTM D 422. While some fines will likely adhere to the coarse materials, the majority will continue on to the dewatering system. The separation method utilized for the bench scale study was not representative of the anticipated full scale operation (hydrocyclone/vibrating screen). Similar project experience indicates that hydrocyclones will be much more effective in separating the coarse material. The separation process will be optimized during startup.**

Comment 6: *Page 4-1 Dewatering Capacity – What was the reasoning behind a predetermined maximum dewatering system production rate? Filter cake will be sampled and % solids measured as it comes off the press? What happens if the 65% solids criteria is not met? Will this spec drive bid costs up so high that a less efficient, lower cost, process is an equivalent value? The optimum scenario would seem to be for the criteria and bidding process to capture the objective of lowest overall cost, including trucking and disposal costs. It may be helpful to estimate the differences in T&D costs for the achievable range of cake % solids. This would give some basis for a best value determination. Would contractor incentive to achieve maximum weight and volume reduction be more effective than a rigid % solids criteria?*

Response: **It was decided at the December 6, 2001 On-Board Review Meeting with the USEPA and USACE that the dewatering facility would be sized to house four (4) 650 ft^3 diaphragm plate and frame filter presses capable of producing approximately 17 yd^3/cycle with each 2 hour cycle. Based on these parameters the maximum dewatering system production rate is approximately 816 yd^3/day.**

The filter cake will be sampled and the % solids measured as it comes off the press. The 65% solids criteria will be based on a daily average. Penalties/incentives will be established for deviations from this daily average.

The bench scale tests indicated that the 65% solids criteria is a reasonable value and will not drive up the bid costs. A cost evaluation was performed to compare the operational and TSCA T&D costs for the belt press (50% solids filter cake); the Recessed Plate and Frame Filter Press (60% solids filter cake) and the diaphragm Plate and Frame Filter Press (65% solids filter cake). Based on this evaluation it was determined that the diaphragm filter press provided the best value for the project. Experience has shown that the maximum weight and volume reduction is achieved with the diaphragm plate and frame filter press.

Comment 7: *Page 4-2 Desanding/Dewatering Process Equipment – Why test both fine slurry and cake? Is the maximum capacity of the dredge 7500 gpm (1st bullet) or 5000 gpm (following paragraph).*

Response: **The reference to testing has been deleted from this section and will be address in Section 7.1.3 – Filter Cake. The maximum capacity of the dredge (based on the**

mass balance calculations) is approximately 4,500 gpm. The 1st bullet is merely indicating the maximum dredge volume that could be handled by three (3) desanding systems.

Comment 8: *Table 5-1 Basis of Design – Desanding Operation:*

The sand specification needs some clarification. It might be better stated in terms of % fines and constituent concentrations. While a density spec of 2.3 to 2.64 will exclude organics, it does not necessarily exclude silts and clays. Similarly, the requirement that the coarse material be cohesionless does not necessarily exclude organics or silts.

Liquid from gravity drainage of sand will also require management. Analytical sampling of solids refers to reject and sands only? Will field screening be utilized? If so, what methods? Frequency of sampling and size of samples to be address in QAPP? Interval of filtrate sampling and for calculation of average TSS to be specified?

Response: **The desanding operation design basis will be revised to indicate that +100/200 mesh material will be separated based on mass and particle size. The goal is maximize separation of coarse and +100/200 mesh materials. Separation is not excepted to be 100% effective and a minimum capture rate of 65% will be included in the design basis.**

Liquid from gravity drainage of sand and coarse materials will be collected and returned to the slurry storage tanks. Both field screening and laboratory analysis will be utilized to characterize the PCB concentration in the separated materials. The specifics of these sampling methods and frequencies will be addresses in the FSP and QAPP.

Comment 9: *Table 5-1 Basis of Design – Mechanical Dewatering Operation*

Is least volume also a design objective? Are there problems with residual polymer in the recycled filtrate affecting the ultimate dosage?

Response: **Least volume is not a specific design objective. However, the volume of potential TSCA material will reduced by desanding. Residual polymer within the recycled filtrate is not anticipated to be a problem.**

Comment 10: *Section 6.1 Conceptual Desanding Process Description: Are the calculations for these relative design flows incorporated in the document?*

Response: **The calculations for these relative design flows are included in Appendix C – Design Calculations (P-01: Dredging, Dewatering, and Water Treatment Mass Balance).**

Comment 11: *Section 6.1.1 Coarse/fine Material Separation*

2nd bullet – Settling is a function of size and density, not just density. Some fine material may, by definition, be incorporated with the higher specific gravity material, or may simply be entrapped as the material settles.

4th bullet – What is expected percent solids of the material discharged by the desanding pumps? Percent solids feed requirements for the cyclones? Make up water to achieve dilution needed here?

5th bullet – Replace "reject" with "underflow".

Response: **Agreed. Separation will be based on mass and particle size. The text will be revised accordingly.**

The percent solids of the material discharged by the desanding pumps will vary with the % solids of the slurry transferred from the dredge to the desanding system. The material discharge from the desanding system could range from 4.6% to 17.85%. No makeup water to achieve dilution is needed.

The 5th bullet has been deleted from the text.

Comment 12: *Section 6.1.2 – Assuming the dredge discharge rate is constant at 2500 gpm, what is the relevance of the in-situ percent solids on total volumetric production for a specified period? (Solids production would obviously be different for different slurry solids contents.) Calculations? Clarification?*

Response: **If the discharge rate from the dredge is constant the total volumetric production for a specified period would only be dependent on the solids content of the slurry. However, the in-situ solids content will effect the volume of water that can be recycled to the dredge. Calculation P-01 Dredging, Dewatering and Water Treatment Mass Balance (Appendix C) addresses a range of in-situ solids and transfer slurry solids concentrations.**

Comment 13: *Section 6.3 Dewatering Process Description: 816 yd^3/day at 65% solids – is this an assumed rate to correspond to the dredging rate, or a maximum capacity for the equipment?*

Response: **This is the anticipated maximum capacity of four (4) 650 ft^3 diaphragm plate and frame filter presses.**

Comment 14: *Section 6.3.4 – State feed rate and percent solids of feed used as basis in this estimate.*

Response: **The text will be revised to include the % solids and flowrate of the dewatering system feed.**

Comment 15: *Section 6.3.5 Dewatering Filtrate Storage/Transfer: Basis?*

Response: **The text has been revised to include the basis for the building sump sizing.**

Comment 16: *Section 6.6 Transfer Pipeline: Spill protection contingency and action plan?*

Response: **A spill protection contingency and action plan will be prepared for this project.**

Comment 17: *Section 6.10.1 Emissions Control for Protection of the Public*

1st paragraph – specify reference containing "health-based allowable ambient exposure limits"

2nd paragraph – specify references containing regulatory thresholds for PCBs process emissions, and health-based allowable limits (for offsite). Emissions systems may also need to address particulates capture.

Response: **The references utilized to develop the health-based allowable ambient exposure limits at commercial and residential receptors are provided in Appendix B.**

Comment 18: *Section 6.10.2 Emissions Control for Worker Health and Safety*

Is there any concern about pathogens in the sediment, such as from sewage outfalls? http://cfpub.epa.gov/iris/quickview/cfm?substance_nmbr=0294 (EPA IRIS) contains Quantitative Estimate of Carcinogenic Risk from Inhalation Exposure - Air Unit Risks values, which may or may not be relevant in this case, but may be better than no information at all.

No mention of PPE requirements. Monitoring?

Response: **The desanding/dewatering facilities were not designed to address potential pathogens in the sediment. However, they are a concern from a Health and Safety perspective and these have been addressed in the Site Health and Safety Plan. Section 6.10.2 will be revised to include PPE requirements.**

Comment 19: *Section 6.12 Dewatering Facility Operators: Process training?*

Response: **Project specific process training will be conducted during startup operations and the text will be revised accordingly.**

Comment 20: *Figure 6-2 – Has there been any testing done to verify that 10" cyclones will give the desired cut? Will additional washing occur on the +200 screens to remove any fines reporting with the coarse underflow? Previous description suggested +200 screens are principally for coarse dewatering.*

What is acceptable % solids of feed to desanding units? Process capacity will be a function of both solids handling capacity and volumetric capacity and residence time requirements for all elements (tank, auger, cyclones, and screens).

Response: **Similar project experience indicates that 10" hydrocyclones will give the desired cut. However, if grain size analyses conducted during startup indicate that the 10" hydrocyclones are not providing the desired capture rate the size of the hydrocyclones can be adjusted/changed without too much difficulty. Additional washing of the +200 mesh material can be conducted if operations indicate a need. The +200 mesh screens are for separation of +200 mesh material and the text will be revised to reflect this.**

The acceptable % solids feed to the desanding units is 5% to 20 %. The conceptual desanding system design includes three (3) desanding units which provide sufficient capacity to handle a wide range of dredging conditions as well as allow for recycle/re-washing of separated materials if necessary.

Comment 21: *Section 7.1 Waste Streams: Filtrate is not listed.*

Response: **The text will be revised to include filtrate from the dewatering process.**

Comment 22: *Section 7.1.1 Dredge Debris: How will large organic debris be sampled? What specifically will the debris be analyzed for?*

Response: **The large organic debris (wood, root mats, plants) will be assumed to be TSCA and disposed of accordingly. Other large inorganic debris (steel, concrete, etc) will be washed, wipe sampled and analyzed for PCBs. The text will be revised accordingly.**

Comment 23: *Section 7.1.2 Coarse Material and Sand Reject: Reference EPA regulations stating reject material may be non-TSCA even if dredged from TSCA area.*

Response: **The text has been revised to include a reference to 40 CFR 761.61.**

Comment 24: *Section 7.1.4.2 And filtrate?*

Response: **The text has been revised to include filtrate.**

Comment 25: *Appendix F Mass Balance Calculations*

Mass Balance Summary Sheet Filter Cake Solids 70%: Not clear how desanding loading (gpm) was calculated.

Spreadsheet Calculations for Filter Cake Solids 70%: 1st Spreadsheet: 37% In-Situ Solids, SPU=10%, S.G. 2.41 +200 mesh, 70% Sand Removal, 70% Filter Cake:

> *Seawater properties: For the stated specific gravity of 1.015, assuming a density for freshwater of 1.0 g/cm^3, simple units conversion gives a density of 63.4 lbs/ft^3 and 8.47 lbs/gallon. The values given here are for freshwater, although calculations appear to use a value corresponding to salt water, with the exception if the calculation for water volume (yd^3/day) for the process stream Recycling from Press to SPU. Converting from tons per day to yd^3/day, using 63.4 lbs/ft^3 gives a total of 7275 yd^3/day versus the stated 7390 yd^3/day...a difference of over 23,000 gallons/day. I was also unable to reconstruct the last figure (133,379) in the Total Volume (yd^3/day) and Water Volume (yd^3/day) (Filtrate to Treatment row). Are the number of press cycles used as a multiplier to obtain this? Applied to what? This question would apply to all subsequent spreadsheets.*

Response: **Mass balance calculations are located in Appendix C. The desanding loading was determined using the weight of dry solids, the percent solids of the transfer slurry from the dredge, converting to gallons and the dividing by 1,440 to obtain gpm.**

The reviewer is correct in pointing out that the fresh water density rather than the seawater density was used. However, while 23,000 gallons is a large volume, when spreadout over a 24 hour day, it results in a difference of approximately 16 gpm which is considered insignificant.

There is an error in the cell for Filtrate to treatment which will be corrected. The correct value for the 1st spreadsheet should be 2,223 gallons.

Reviewer: P. Craffey – MADEP Date: June 14, 2002

Comment 1: *This is the second 90% Design sent for the Desanding and Mechanical Dewatering Facilities. It is suggested that if a design is sent after the 90% Design that the next draft be called a 95% Design.*

Response: **The next design submittal for the Desanding and Dewatering Facilities will be the 100% Design.**

Design Report – The following comments were also sent on March 19, 2001.

Comment 2: *General Comment – Please only send the materials that have changed for the final design. I do not have the time to review materials I have reviewed already. Sending only new materials will save on paper and other resources.*

Response: **There were significant changes between the March 2002 and May 2002 design submittals. Therefore, the entire document was sent out for review. However, for the 100% design submittal only new material will be sent to the MADEP.**

Comment 3: *Page 1-3, Section 1.3.3, Table 1-1, Work Package 13 – Any fire protection systems for Area C?*

Response: **The dewatering contractor will be responsible for the structures to be installed at Area C. Therefore, they will be responsible for any fire protection required per the local Codes.**

Comment 4: *Page 1-5, Figure 1-1 – Is there a water line back to the dredge? If so, indicate on the Figure.*

Response: **Yes, if a mechanical dredge with recycle capabilities is used there will be a water line back to the dredge. However, in order to simplify Figure 1-5 this line was not shown.**

Comment 5: *Page 2-1, Section 2.3, 1st paragraph – Check that the rain water runoff does not discharge into the decontamination and rinse water collection system. Make sure the rain runoff system is large enough to handle any expected flows.*

Response: **The dewatering facility was designed such that stormwater will be collected and treated separately from process waters. The process waters (including decontamination waters) generated within the dewatering building will be collected within the main sump and transferred to the Area C for recycle and/or treatment. Storm waters collected on the pavement surrounding the building will be collected in a catch basin/storm water system and treated prior to discharge. Precipitation collected on the roof of the facility will be discharged directly to the harbor and will not be mixed with other storm waters. Each of these systems has been sized to handle a 10-year rain event and the anticipated process flowrates.**

Comment 6: *Page 2-1, Section 2.3, 1st paragraph, last sentence, "...discharged to the harbor." – Make sure that this is alright with the city.*

Response: **Waters to be discharged to the harbor are considered to be clean or will be treated (storm water) prior to discharge. No potentially contaminated waters will be discharged to the harbor at Area D. Prior to actually discharging these waters to the harbor a Stormwater Management Plan will be prepared and submitted to the City of New Bedford for review and comment.**

Comment 7: *Page 4-3, Section 4.5, 2nd paragraph – There is a need to distinguish between the emissions from equipment in a controlled building from the emissions that are released into the environment. It is suggested that emissions refer to just the releases into the environment.*

Response: **Emissions are considered to originate from the individual desanding/dewatering processes. Based on these emissions the appropriate controls will be required to prevent unacceptable discharge to the environment.**

Comment 8: *Appendix B, page B-4, 6th paragraph – See comment 7 regarding emissions.*

Response: **See response to Comment #7.**

Comment 9: *Appendix B, page B-5, Section 2.2.2, 1st paragraph – See comment 7 regarding emissions.*

Response: **See response to Comment #7.**

Comment 10: *Appendix B, page B-6, Section 3.1, 5th paragraph, last sentence – The DEP Threshold Effects Exposure Limits (TEL for 24 hour average) for PCBs is 0.003 ug/m^3 and Allowable Ambient Limits (AAL for annual average) for PCBs is 0.0005 ug/m^3. Explain how "The health-based allowable limit are more stringent than the MADEP policy guidance..."?*

Response: **The basis for this statement is provided in the "Draft Final Development of PCB Air Action Levels for the Protection of the Public", Foster Wheeler Environmental Corporation, August 2001.**

Comment 11: *Appendix E, page 2, Section 1.2, East and North Wall Design Criteria, Number 7. "Seismic forces will be considered in the final bulkhead design." – The seismic forces should be considered before the design is finalized. Please have any designs reviewed by the appropriate person before the design is finalized.*

Response: **The USACE has indicated that seismic loading will be included as part of the final bulkhead design.**

Comment 12: *Appendix E, page 3, Section 3.1, 1st paragraph, 4th and 5th sentences - The seismic loading should be considered before the design is finalized. Please have any designs reviewed by the appropriate person before the design is finalized.*

Response: **See response to Comment #11.**

Comment 13: *The City should be informed that sampling has indicated that MA DEP MCP reporting limits have been exceeded for certain materials. The City should be told that they are*

required to report this to DEP's Southeast Regional Office. These hazardous materials are not related to the Superfund releases (PCBs) and the remediation of this property is needed.

Response: **The list of contaminants which exceed the MCP reporting limits will forwarded to the USEPA and USACE for review. It is suggested that a separate meeting be scheduled to discuss resolution of this issue.**

Design Report – New comments

Comment 14: *Appendix B, page B-2, 1st paragraph, last sentence, "Figure 1 presents..." – Figure 1 is missing from the latest design. I will use the Figure 1 from the March 90% Design.*

Response: **Figure 1 is the same for both design submittals.**

Comment 15: *Appendix C – Place a colored page between each section of this Appendix.*

Response: **Color pages will be inserted between each design calculation.**

Comment 16: *Appendix C (formerly Appendix H in March 2002 Design) – The following calculations were in the March Design but do not seem to be in the May Design: Fence Design and Air Emissions.*

Response: **These calculations have been deleted and the appropriate text included in the BD/DA text.**

Comment 17: *Appendix G (formerly Appendix J in March 2002 Design) – The 3rd and 4th pages to the end of Appendix J (March 2002 Design) seem to be missing from Appendix G.*

Response: **These pages will be included in the next design submittal.**

Comment 18: *Appendix D - Geotechnical Investigation Report, page 2-2, section 2.2, 3rd paragraph, 1st sentence, "Evidence of olfactory soil contamination were noted on the test pit logs."- The City should be informed that sampling has indicated that soil contamination may be present. The City should be told that they are required to report this to DEP's Southeast Regional Office. These hazardous materials are not related to the Superfund releases (PCBs) and the remediation of this property is needed.*

Response: **See response to Comment #13.**

Comment 19: *Appendix F (March 2002 design), Mass Balance Calculation – Is this calculation in the new design?*

Response: **The design calculations are now located in Appendix C.**

Comment 20: *Appendix F, page 3-12, section 3.8.1, 1st paragraph, 1st sentence, "Electrical service to the building will be 120/208 –volt,..." – Should this not be "120/240 volt"?*

Response: **The text will be changed to 240 volt.**

Design Drawings

Comment 21: *Design drawing not sent with May 2002 Design.*

Response: **A set of the May 2002 design drawings will be forwarded to you for review.**

Comment 22: *Send small drawings - Half size or 8 ½ in. x 11 in. size are fine.*

Response: **Half size drawings will be sent in the future unless full size drawings are specifically requested.**

Comment 23: *Drawings G-101, G-201, and G-202 titles should indicate that these drawing are for the dewatering facility.*

Response: **The drawings have been revised accordingly.**

Technical Specifications

Comment 24: *Section 01410, part 1.6.3 – Include the following. "The Contractor shall comply with all Federal, State (310 CMR 30.00), and local requirements for Hazardous Waste storage and disposal."*

Response: **The technical specification will be revised accordingly.**

FOSTER WHEELER ENVIRONMENTAL CORPORATION
TOTAL ENVIRONMENTAL RESTORATION CONTRACT (TERC)
CONTRACT NO. DACW33-94-D-0002, NEW BEDFORD HARBOR SUPERFUND SITE

ANNOTATED RESPONSES TO REVIEW COMMENTS

The following are responses to ERDC and USACE comments on the Desanding/Dewatering Technical Specifications dated May 24, 2002. The comments are provided in italic type followed by Foster Wheeler's responses in bold type.

Reviewer: T. Olin-Estes – ERDC Waterways Experiment Station Date: June 10, 2002

General Comments

Comment 1: *Process flow diagrams should indicate the anticipated or required influent and effluent properties for each unit operation, including hydraulic flow rate and percent solids. (It is possible to be within the hydraulic loading capacity of a piece of equipment while exceeding the solids loading capacity, and vice versa.) This information will give some indication of the sensitivity of the process to variations in feed as well as potential impacts on downstream operations. A complete description of equipment-specific operating specifications should accompany the package, including material size restrictions, if any, and normal and maximum operating ranges.*

Required sampling and compositing is inadequately detailed. Sample size, frequency, and means of sampling used to make up daily sample composites must be specified. Location of sampling is often very important when working with slurries, and will require consideration of the specific pieces of equipment to be utilized. Sampling of oversize material (woody debris, trash) should be further described.

Lab SOPs, qualifications, level of data package, and data validation are marginally addressed here. It has been our observation that problems with laboratory procedures are not infrequent, even with EPA certified laboratories. These problems can be identified with a full data validation review of a level IV package. However, rapid sample turn-around time required for this project may preclude completion of such review in a meaningful time frame. If level IV data validation is not feasible, some intermediate level of data validation acceptable to regulators should be developed and proposed.

Response: **The in situ sediment properties (% solids, sand content) and desanding/dewatering operational parameters both have ranges which are better presented in mass balance calculations rather than the process flow diagrams. Both the process flow diagrams and mass balance calculations will be provided in the Statement of Work developed for procurement of these systems.**

The sensitivity of both the desanding and dewatering operations are indicated in the mass balance calculation (P-01). Both the desanding and dewatering operations specifications are performance based. Therefore, equipment specific operating specifications are not applicable. The specifications have been written such that a contractor can provide the types/number of equipment they feel is required to meet the project requirements.

The contractor is required to submit a sampling and analysis plan for the project. Within this plan he will be required to indicate at a minimum sampling locations, sampling methods, analysis, and analytical methods to be utilized for the separated materials/debris. Government approval of this document is required prior to mobilization to the site.

The contractor will be required to use a USACE certified laboratory and submit the laboratories SOP for review. The contractor will be required to conduct QC checks on the lab. The project currently required a modified Tier I data validation. The text will be revised accordingly to include this information.

Comment 2: *Performance Requirements for Desanding System (Section 1.3.1)*

It is not clear from the information provided how the assumed flow rates and slurry percent solids were arrived at in the performance spec assumptions, or the relevance of in-situ percent solids without a corresponding in-situ production rate. For purposes of sizing confined disposal facilities for hydraulic disposal, the solids content of the dredge discharge may be estimated as follows:

$$C_{solids} = \%\,fines + 3\%sand$$

Using this relationship, for a range of sand contents, the following solids concentrations would be representative of a typical dredge discharge:

Table 1. Dredge Discharge Solids Concentration as a Function of Grain Size

Sand	*Solids Concentration*
(%)	*(g/l)*
0	*100*
10	*120*
20	*140*
30	*160*
40	*180*
50	*200*
60	*220*

Using the minimum, maximum and average production rates provided in the specifications, an assumed solids density of 2.5 g/cm^3 before desanding, and 2.4 g/cm^3 after desanding, the specified sand separation efficiency of 65%, 16 hrs/day dredge operation, dredge discharge solids concentrations from Table 1, and 65% solids in the cake, the daily cake production ranges from approximately 245 to 2747 yd^3 (Table 2).

Table 2. Estimated Cake Production Rates			
Production Rate (gpm)	*540*	*1423*	*4510*
% Sand	*Cake Production (yd^3/day)*		
0	*245*	*646*	*2047*
10	*275*	*725*	*2297*
20	*298*	*787*	*2494*
30	*316*	*832*	*2637*
40	*327*	*860*	*2727*
50	*331*	*872*	*2764*
60	*329*	*867*	*2747*

Note that the specified 65% removal efficiency for the sand may not be an adequate target. Table 3 illustrates the %sand in the desanded stream reporting to the dewatering presses for different initial sand contents. This value ranges from 0 to 34%, which may be problematic in terms of equipment abrasion and particle settling in pipelines and holding tanks, although higher sand contents would certainly be beneficial in terms of material permeability. Sand removal might be better stated in terms of maximum permissible sand concentration in the influent to the dewatering system. A specified d_{50} cut size is often utilized in selecting equipment for size separations, but an appropriate d_{50} would still have to be developed taking into account the relative material percentages present prior to separation so that the amount of coarse material reporting with the fines did not exceed the maximum permissible amount.

Table 3. %Sand in Desanded Stream as Function of Initial Sand Content and Sand Removal Efficiency of 65%				
Sand Content before Desanding	*Slurry Solids Concentration*	*Weight Sand*	*Weight Fines*	*Sand Content after Desanding*
(%)	*(g/l)*	*(g)*	*(g)*	*(%)*
0	*100*	*0*	*100*	*0*
10	*120*	*12*	*108*	*4*
20	*140*	*28*	*112*	*8*
30	*160*	*48*	*112*	*13*
40	*180*	*72*	*108*	*19*
50	*200*	*100*	*100*	*26*
60	*220*	*132*	*88*	*34*
** In unit volume slurry*				

Note that the use of the term "fine material" is inappropriate when applied to +200 mesh material. Materials with a grain size ranging from 63-75um up to between 2.0 to 4.75 mm (.079 – 0.187 in) are classified as sands (coarse material) in the common soil classification systems. Additionally, the "cut" for cohesive and non-cohesive sediments is given as +200 mesh and specific gravity greater than 2.40. This is largely a misuse of terms. Cohesiveness is attributable to the presence of clay, normally in the size range of 3 um and below, but with specific gravity values as high as 2.8 reported in the literature.

Clay particles often adhere to larger, non-cohesive silt particles (3-75 um size range), but materials are not cohesive simply by virtue of being <200 um in size, or cohesive by virtue of having a specific gravity lower than 2.4. Similarly, clays also adhere to sands, but in small amounts would not affect the engineering properties of the sand and the material would be normally be considered non-cohesive by virtue of being >200 um in size, whether or not organic materials are present. In any case, the objective of this specification is unclear. The intent is to separate the sand and fine size fractions, whatever their composition, at a cut size of 200 um, and further, to remove low density organic materials from the sand, presumably to minimize the contaminant concentration in the sand.

Response: **The performance requirements provided in Section 1.4 are based on the mass balance calculations (P-01). The text will be revised to include the corresponding dredge rate determined from the mass balance calculations. The empirical approach of the mass balance calculations agreed with anticipated values based on past field experience. The specifications will be revised to include a required minimum separation efficiency of 65% (by weight). Should the dewatering process equipment require a larger % of the sand be removed for maintenance purposes the Contractor (if he is smart) will increase the amount removed.**

The text will also be revised to better define the materials that will be separated from the dredged sediment slurry (+3/8 inch and +100/200 mesh materials). The reviewer is correct in stating the intent of the desanding operation is to maximize to the extent possible the amount of coarse (+3/8 inch) and sand type (+100/200 mesh) material whatever their composition. The purpose of this separation is to reduce the volume of TSCA material requiring off-site disposal. The vibrating screen will separate by particle size while the hydrocyclones will separate by mass which can be associated with density and particle size. The hydrocyclone will be the primary method of separating the low density organic materials from the sand. The text will be revised accordingly to indicate the intent of the desanding process.

Comment 3: *Stockpiling Capacity*

3 days stockpiling capacity is specified for all major project streams. However, depending upon the time period over which sample composites were obtained, with an analytical turn around time of up to 52 hours before results are in-hand in the field, it would appear that 4 days stockpiling capacity may be needed to prevent process interruptions. (If the last sample of the daily composite sample is taken at the end of the first processing day, by the end of the second processing day, 24 hours have elapsed and 2 days stockpiling capacity has been used. At the end of the 3rd processing day, 48 hours have elapsed and 3 days stockpiling capacity has been used. Removal of the first day's production must be initiated, if not completed, before processing can continue. Availability of an additional production day capacity would permit this taking place concurrently with ongoing production.)

Response: **The stockpiling capacity for the separated materials will be increased from 3 days to 5 days.**

Comment 4: *Equalization/Holding Tanks*

Section 1.3.4 specifies a minimum volume for equalization equivalent to 8 hours production. Section 1.3.1 gives assumed dredge production rates ranging from 540 gal/min to 4510 gal/min; an 8 hour reserve would require from 259,200 gal to 2,164,800 gal capacity (683040 gal for the stated average production rate of 1423 gal/min.). Section 1.3.4 specifies a production rate of 1600 cy/day at 42% solids in situ, and 15% solids in dredge discharge. Based on this specification, the total daily volume produced is approximately 1,101,545 gallons. Assuming this volume is produced over a period of 16 hours, 8 hours production would require a holding capacity of approximately 550,773 gallons, slightly less than that calculated for the average dredge discharge rate given in Section 1.3.1. This would provide only 2 hours holding time at the maximum production rate provided in Section 1.3.1.

Response: **The performance requirements provided in the specification are based on the mass balance calculation (P-01). This calculation determined the various process flow rates by fixing the size of the dewatering process (i.e., 816 yd^3/day). The calculation did not put any limits on the dredge rate and as a result the influent conditions currently presented in the technical specification may not be realistic. However, during concurrent preparation and coordination of the dredging specifications, the maximum slurry flow rate that the dredge can send to the desanding equipment is limited to 2,500 gpm. Therefore, the desanding specification will be revised to reflect the average and maximum dredge rates specified.**

Comment 5: *Emissions Controls*

Section 1.3.8 of the dewatering specification indicates that emissions controls will be required to ensure that emissions do not exceed health based allowable limits for PCBs off site. Section 1.3.8 simply states that no emissions controls are required for control of PCBs emissions. Is this an oversight or are emissions expected to be less at the desanding operation than at the dewatering operation?

Response: **PCB emissions for the desanding operations is expected to be less than the dewatering operations. The technical specification requires that the desanding operations be housed within a temporary structure with the appropriate emission controls installed. Air emission controls are required for hydrogen sulfide emissions that are expected to be higher at the desanding site (Area C) than at the dewatering sites (Area D). Emission controls will also be required for PCB.**

Comment 6: *Sampling, Monitoring and Control Requirements*

Section 1.3.10 of the desanding performance spec requires daily sampling and analysis of stockpiled material for PCBs. Is this the only constituent of concern with respect to disposal requirements? Additionally, while dredge discharge (desanding plant influent) and desanded slurry (dewatering plant influent) are to be tested, there is no corresponding requirement to test the produced cake (Section 1.3.10 of dewatering performance spec). Recommend that cake be tested for constituents of concern as well, and that total weight of cake produced be monitored, in addition to the percent solids and

paint filter testing specified. It will be easier to obtain a representative sample of the cake than of slurry, and it would seem to be necessary documentation for disposal of the materials. This will also provide an additional check for mass balance calculations, which can be difficult with continuous flow systems. Additionally, use of in-line density and flow meters may facilitate mass balance calculations and polymer dosing. Measuring concentration of solids in the slurry (g/l) would be more straightforward than measuring % solids, which requires an estimate of material densities to obtain total PCBs production. For example, dredge production rate X solids concentration X PCBs concentration X operating time gives total mass PCBs produced:

$$\left(\frac{Gal\ slurry}{hr}\right)\left(\frac{liters\ slurry}{Gal\ slurry}\right)\left(\frac{g\ solids}{liter\ slurry}\right)\left(\frac{g\ PCBs}{g\ solids}\right)(hr) = g\ PCBs$$

This could be compared to initial estimated PCBs mass by multiplying in-situ sediment volume X in-situ wet density of sediment X percent solids in-situ X PCBs concentration:

$$\left(yd^3\ sed\right)\left(\frac{cm^3\ sed}{yd_3\ sed}\right)\left(\frac{g\ wet\ wt\ sed}{cm^3\ sed}\right)\left(\frac{g\ solids}{g\ wet\ wt\ sed}\right)\left(\frac{g\ PCBs}{g\ solids}\right) = g\ PCBs$$

Response: **PCBs is the primary constituent of concern. However, additional constituents will have to be analyzed for based on where the material will be disposed. These additional chemical parameters will be included in the technical specification for the T&D contract. The reasoning for sampling the slurry is to determine if a correlation can be made between PCBs concentrations in the slurry and filter cake.**

Comment 1: *General – Comments were previously provided (march 21, 2002) on the Draft Basis of Design/Design Analysis Report (90%) for Dewatering; it's not clear that these comments have been addressed, or if they are reflected in the present submittal of Draft Plans and Specifications. Please indicate how previous comments were incorporated into design.*

Response: **These comments were not incorporated into the May 2002 submittal of the Desanding and Dewatering Facilities BD/DA but will be addressed in the next submission of the design.**

Section 13990 - Desanding Operations

Comment 2: *Para 1.2 Submittals/SD-03 Desanding Work Plan – Recommend combining Desanding and Dewatering Work Plans into one document, to avoid unnecessary repetition, and to allow for smoother meshing of the work efforts, since the desanding and dewatering work is integrally related.*

It's not even clear that separate sections are required, unless one is contemplating contracting these items separately, which I would not recommend, given the interdependence of the two systems, the potential for contractual disputes over responsibility for piping between facilities, etc., and that this arrangement would likely not be very attractive to bidders, and this would be reflected in the price. Recommend combining Desanding (Section 13990) and Dewatering (Section 13991) into one section.

Response: **It is agreed that the desanding and dewatering work is integrally related and there are no plans to contracting these items separately for the primary reason the reviewer indicated above. However, given the amount of information required for both the desanding and dewatering operations it was decided that it would be more effective to provide this information in two separate technical specification sections.**

Comment 3: *Para 1.3.2 Feed System and Cut Size Requirement – Please revise wording; using the term "fine-grained material" to describe material between the 3/8-inch sieve and the No. 200 sieve is misleading, given that particle diameters between about ¼ inch and 0.075 mm classify as sand, using the Unified Soil Classification System. Recommend using the term "sand-sized;" especially given that we're calling this the desanding section, and it is – generally – sand-sized material we are trying to pull out from the stream, to reduce wear and tear on the equipment, but also to reduce tonnage of material requiring TSCA disposal.*

Prescribed sand removal efficiency should be opened for discussion with Corps team members, including WES team members. Section calls for an average of 65 percent. It would seem that 65% should be a minimum acceptable removal efficiency, and it should be tied into the objective of producing as much non-TSCA sand as reasonable practicable. It is understood that, as the sand removal efficiency goes up, there is an increased risk (or probability) of more heavily contaminated fines (material finer than 0.075 mm, i.e., silt and clay) reporting with the sand, and therefore an increased risk of generating TSCA sand. However, if we set the bar too low (low efficiency requirement), then we may be missing cost savings that could have been realized by pulling out additional sand that was still non-TSCA. Currently, there is nothing driving the

contractor to bring out suitable and sufficient equipment to ensure that as much sand as possible is rendered non-TSCA, just enough to result in 65% removal efficiency. It's not clear that, as the specification is currently written, a Contractor would consider mobilizing extra desanding equipment (to improve efficiency) and linear motion screens equipped with high-pressure nozzles, etc., as we have discussed throughout conceptual design. Please either revise section wording or bidding schedule (incentives?) to provide the proper motivation to the contractor to achieve our desired objectives.

Response: **The wording of the specification will be revised to better describe the separated +3/8 inch and +100/200 mesh materials. In addition, the specification will be revised to stated that the minimum % sand removal is 65% and that higher removal efficiencies are desired in order to minimize TSCA materials. The bidding schedule will also be revised to include incentives for maximizing volume of non-TSCA sand removed from the sediment.**

Comment 4: *Para 1.3.4 Equalization/Holding Tanks – Required holding capacity will be approximately 500,000 gallons, based on text here. Please indicate whether there is sufficient space at the Sawyer Street facility for this volume.*

Response: **The minimum required desanded slurry storage capacity is approximately 380,000 gallons based on the average flow of 10% slurry from 42% in-situ sediment for 16 hours/day (2,155 gpm). This storage capacity would include 120,000 gallons at Area C (6 – 20,000 gallon frac tanks) and 260,000 gallons at Area D (2 – 50,000 gallon equalization tanks and 8 – 20,000 gallon frac tanks). Figure 6-3: Area C Desanding Facilities Layout within the BD/DA shows that there is sufficient room at Area C for the six (6) initial frac tanks and six 96) additional frac tanks if a larger storage volume is required.**

Comment 5: *Para 1.3.10 – There is no mention of using PCB immunoassay test kits in lieu of or in addition to fixed laboratory analysis (until correlation has been established), though it appears that Immunoassays will have a role on the project. Text should reflect current understanding of how immunoassays will be used at site.*

Response: **Immunoassay test kits may have a role in the project. This will be determined as part of the Sampling and Analysis Plans prepared for each phase of the project.**

Comment 6: *Para 1.4 Qualifications – Recommend increasing the number of previous successful desanding systems that the qualified contractor has operated, from one to three. I would not feel comfortable having a contractor responsible for desanding who has only operated one other desanding system prior to this project.*

Response: **The number of successful desanding systems that the qualified contractor has operated will be increased from one (1) to three (3).**

Section 13991 - Mechanical Dewatering Operations

Comment 7: *Para 1.3.1 Performance Requirements – Question the need for contingency capacity in the dewatering equipment, given current funding scenarios. Suggest that it may be best to give the dredge a maximum allowable production rate instead.*

Response: **The performance requirements do not include a contingency capacity. The draft dredging specifications do limit both the maximum slurry flow rate and the average daily solids production. The average and maximum dredge rates are being reviewed by USACE and EPA in light of project funding and will be finalized for each phase of the project at the time final Work Plans are prepared.**

Comment 8: *Para 1.3.4 Equalization/Holding Tanks – Text here, indicating that because of TSCA regulations, the largest vessel for holding slurry in the process area is 55,000 gallons. Does this same restriction apply to the desanding operation? If so, then this should be noted as it relates to desanding. See also comment 2.*

Response: **The volume of the largest slurry storage vessel is limited by the available secondary containment volume of the process area within the dewatering facility. The available secondary containment volume is approximately 108,000 gallons. Therefore, the largest slurry storage vessel cannot exceed ½ this volume or approximately 50,000 gallons. This volume does not apply to the desanding operation since it is not located within the dewatering facility. However, the desanding operations will be required to provide adequate secondary containment for the slurry storage tanks.**

Comment 9: *Para 1.3.10 Sampling – No PCB testing is mentioned. Are we not considering the possibility of producing non-TSCA cake? Or are we relying on the PCB results from the slurry influent. PCB testing of slurry is not discussed anywhere.*

Response: **The text will be revised to include PCB analysis of the filter cake.**

Comment 10: *Para 3.4.1 Testing – Text here mentions samples of filter cake being sent for laboratory analysis, but analytes are not listed. Please clarify; see previous comment.*

Response: **The samples will be tested for PCBs, paint filter liquids test and % solids (by weight). The text will be revised to include this parameters.**

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

FINAL
BASIS OF DESIGN / DESIGN ANALYSIS REPORT (100%) DESANDING AND DEWATERING FACILITIES NEW BEDFORD HARBOR SUPERFUND SITE

New Bedford Harbor, Massachusetts

December 2002

Prepared for

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

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Revision	Date	Prepared By	Reviewed By	Approved By	Pages Affected
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12/02/02

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1.0 INTRODUCTION

Under Task Order No. 17 of the U.S. Army Corps of Engineers (USACE) Total Environmental Restoration Contract (TERC) No. DACW33-94-D-002, Foster Wheeler Environmental Corporation (Foster Wheeler) developed a conceptual design for the sand separation (desanding) and the mechanical dewatering systems associated with the dredging activities for Operable Unit #1 (OU #1) of the New Bedford Harbor Superfund Site located in New Bedford, Massachusetts. These conceptual designs were utilized to design the associated desanding and dewatering facilities. This Basis of Design/Design Analysis (BD/DA) Report documents the facilities design development.

1.1 Site History

The New Bedford Harbor Superfund Site (the Site), located in Bristol County, Massachusetts, extends from the shallow northern reaches of the Acushnet River estuary south through the commercial harbor of New Bedford and into 17,000 adjacent acres of Buzzards Bay. Industrial and urban development surrounding the harbor has resulted in sediments becoming contaminated with high concentrations of many pollutants, notably polychlorinated biphenyls (PCBs) and heavy metals, with contaminant gradients decreasing from north to south. From the 1940s into the 1970s, two electrical capacitor manufacturing facilities, one located near the northern boundary of the site and one located just south of the New Bedford Harbor hurricane barrier, discharged PCB-wastes either directly into the harbor or indirectly via discharges to the City's sewerage system.

The New Bedford Harbor Site has been divided into three operable units, or phases of site cleanup: the Hot Spot OU #2, the upper and lower harbor OU #1, and the Buzzards Bay or outer harbor operable unit. This report provides the design basis for the desanding/dewatering system for OU #1.

1.2 New Bedford Harbor Cleanup Remedy

Approximately 450,000 yd^3 of PCB-contaminated sediment spread over about 170 acres will be dredged from the upper and lower harbor. In the upper harbor, north of Coggeshall Street, sediments above 10 mg/kg (parts per million [ppm]) PCBs will be dredged, while in the lower harbor and in the salt marshes, sediments above 50 ppm PCBs will be dredged. Inter-tidal sediments in specific areas adjacent to homes or in areas prone to beach combing will be removed if PCB levels are above 1 and 25 ppm, respectively.

The dredged sediments will be pumped to a desanding/dewatering system and the resultant filtrate will be pumped to the water treatment facility. The desanding facility, to be located at Area C, will include coarse/fine desanding, equalization tanks for the desanded slurry material, optional slurry tanks for sampling capabilities, and pumping facilities to convey the slurry to the dewatering facility at Area D. The dewatering facility will include the dewatering system, which consists of filter presses, chemical storage, and sediment truck and rail loading areas. A separate water treatment plant located at Area C will handle water generated in the dewatering facility. The water treatment plant will consist of a series of physical and chemical processes to remove suspended solids, heavy metals and PCBs. The Water Treatment Plant (WTP) will be located adjacent to the existing WTP. Figure 1-1 shows the locations of the proposed desanding facility, dewatering facility, and WTP.

1.3 Dewatering System Design Objectives

This Basis of Design/Design Analysis Report is for design, procurement, and construction of the Desanding Facilities (Area C) and Mechanical Dewatering Facilities (Area D) for the New Bedford Harbor Superfund Site OU #1.

The level of detail required for design (calculations, drawings and specifications) is dependent upon the procurement plan for construction. The most detail is required for prescriptive designs where the drawings and specifications will be used by the TERC contractor to self perform work or to solicit fixed-price bids with award to the low bidder. Less detail is required for work self-performed by the TERC contractor. Significantly less detail is needed for performance designs that will be used by TERC contractors to solicit proposals for detailed design and installation on equipment.

In order to minimize the size and cost of the dewatering building the dewatering process vendor would have to be selected in advance of building design. Due to the procurement lead times for the dewatering and building subcontractors and the approval cycles of the various submittal packages, this would extend the design and construction schedule for the dewatering facilities by 6-12 months. After discussions with the USACE and U.S. Environmental Protection Agency (USEPA), it was agreed to design the building in a manner that would accommodate a range of dewatering equipment systems so that the building could be designed and constructed concurrently with the procurement of the dewatering vendor. In general, this means that building design may be more conservative in some aspects to allow different dewatering vendors the option to bid on the project. It was determined that this would provide the government with a more competitive range of prices on the dewatering process and thereby save on the overall life cycle cost of the project.

1.3.1 Area D Contract Strategy

There are three distinctly different types of procurements at Area D. These procurements were developed based on the design life of the facility (Permanent vs. temporary) and the design level determined to achieve best value for the owner (i.e., performance-based vs. prescriptive design). This approach was reviewed and approved by USACE and USEPA during On-Board Review meetings in 2001. The types of procurements and contents are listed below:

- Permanent site infrastructure (e.g., bulkhead, site backfill, underground utilities, site grading, pavement, rail and building foundation). These facilities will be constructed by Foster Wheeler Environmental based on prescriptive drawings and technical specifications.
- Permanent building facility (e.g., building structure, walls, roof, doors, windows, interior finishes, plumbing fixtures, general ventilation and heating, general lighting, and general fire protection). This will be constructed by Foster Wheeler Environmental using performance-based specifications. Drawings will show the general arrangement of building features. Detailed design will be completed by subcontractors.
- Temporary mechanical dewatering equipment (e.g., slurry pipeline, slurry mixing, polymer storage and mixing, mechanical dewatering, filter cake loading, filtrate pumping, exhaust vapor collection and treatment). This system will be constructed by the dewatering subcontractor using performance-based specifications and drawings. No construction drawings will be provided to the bidders. The subcontractors will select specific types of process equipment and all associated pumps, piping controls, etc.

1.3.2 Area C Design and Procurement Types

The only design and procurements at Area C are the extension of utilities and the temporary desanding equipment and associated systems. The systems will include low-permeability pavement under process and stockpile areas, run-off collection system, desanding equipment, slurry holding tanks, slurry pump to Area D, temporary building with exhaust vapor collection and treatment, utilities, truck decontamination, and stockpile areas. This system will be constructed by the dewatering subcontractor using performance-based specifications. The only drawings provided will be site drawings showing the limits of work, locations for connections to existing utilities, and the existing grading plan for installation of the temporary building and equipment.

In addition to the desanding and dewatering facilities design and procurements discussed above, activities associated with the water treatment plant, dredging shore side support and trucking of separated material and debris will also be ongoing in parallel with the desanding options. The desanding subcontractor will have to coordinate their activities accordingly.

1.3.3 Procurement Packages

The drawings and technical specifications will be assembled into procurement packages. The work within each package will be determined based on the best value to the government. The proposed list of major procurement packages and the type of procurement package and associated design are shown in Table 1-1.

1.4 Design Overview

1.4.1 Desanding Facility Overview

Operations for removal of debris and coarse grained, non-cohesive sediments from the dredged slurry are anticipated to occur at Area C. The area east of Cell #1 known as the Debris Disposal Area (DDA) will serve as process/holding/loadout area.

1.4.2 Dewatering Facility Overview

Mechanical equipment and appurtenances for the liquid/solids separation process will be installed in the permanent dewatering building at Area D. Building and site layout was developed based on the general types of equipment to be used for the dewatering operation and the need for truck or rail transport of materials. The layout will accommodate different types of dewatering equipment. The required dewatering treatment capacity reflects the capacity needed to complete the NBH remedial action within a reasonable time with the anticipated variable annual funding and site space constraints.

1.4.3 Bulkhead Overview

In order to provide sufficient space on the subject property to construct the dewatering facility, a bulkhead is necessary. The bulkhead will consist of a cellular sheet pile structure which will form the north and east sides of the site. The bulkhead will be designed to support all loads associated with the dewatering building site activities, vehicle operations, rail car loading and staging operations, and potential on/off loading of barges berthed along the east bulkhead. Upon completion of the Harbor cleanup operations, use of the bulkhead will be transferred to the City of New Bedford. Therefore, the bulkhead will also be designed to support future use activities, which include using the site as a marine terminal capable of servicing container vessels.

Table 1-1
Desanding/Dewatering Facility Work Packages

Procurement Package	Components of Work	Design Type
Building Subcontract	• Process/Loadout/Support Building Design/Erection • Support Building Interior Work • Concrete Foundation Design/Installation • Process/Loadout Building Sump Installation • Support Building HVAC Design/Installation/Startup	Performance
Area C/D Site Work	• Overall Site Soil & Erosion Control • Overall Site Grading • Buried Utilities Outside Buildings • Area C/D Pipelines at Area D • Excavation for Building Foundations, Sumps, etc. • Insulation and Vapor Barriers • Backfilling for Area D Building Foundation/Slab • Installation of Area D Building Ground Grid	Prescriptive
Concrete Floor	• Installation of Building Floor Slabs • Installation of Trench Drains • Prepare for Floor Coatings	Prescriptive
Electrical	• Electrical Transformers • Process/Loadout/Support Building Conduit, Wiring and Lighting • Site Trailers/Guard Shack Wiring • Exterior Wiring and Lighting	Performance
HVAC – Process/Loadout	• Provide Specified HVAC Equipment • Perform Startup and Balancing	Prescriptive
Plumbing	• Interior Plumbing up to 5 ft beyond Building Perimeter • Supply and Install Sump Pumps, Controls and Piping • Water Supply to Process/Support Buildings • Water Supply to Fire Protection Systems	Performance
Painting	• Coating of Concrete Slabs • Coating of Interior Piping	Prescriptive
Fire Safety	• Design/Installation of Wet and Dry Pipe Sprinkler Systems • Design/Installation of Fire Alarm System • Integration of Security Alarm System for Dial-Out	Performance
Rail Track	• Prepare Site to Accept Rail Ties • Detailed Design and Installation of Rail Systems	Performance
Paving	• Final Grading of Site • Installation of Paving • Painting of Paving Markings • Installation of Car Stops	Prescriptive
Landscaping	• Provide and Installation of Landscaping • Design/Installation of Irrigation System	Prescriptive
Bulkhead	• Installation of Bulkhead at Area D	Prescriptive
Bullrail and Fendering	• Installation of Bullrail/Fendering Systems for Bulkhead	Prescriptive
Security System (Area D)	• Design/Installation of Building Security System	Performance
Desanding/Dewatering	• Design/Installation of Desanding Support Facilities • Design/Installation/Operation of Desanding System • Design/Installation/Operation of Dewatering System	Performance
Fencing	• Installation of Fencing and Gates	Prescriptive

1.4.4 Related Design Documents

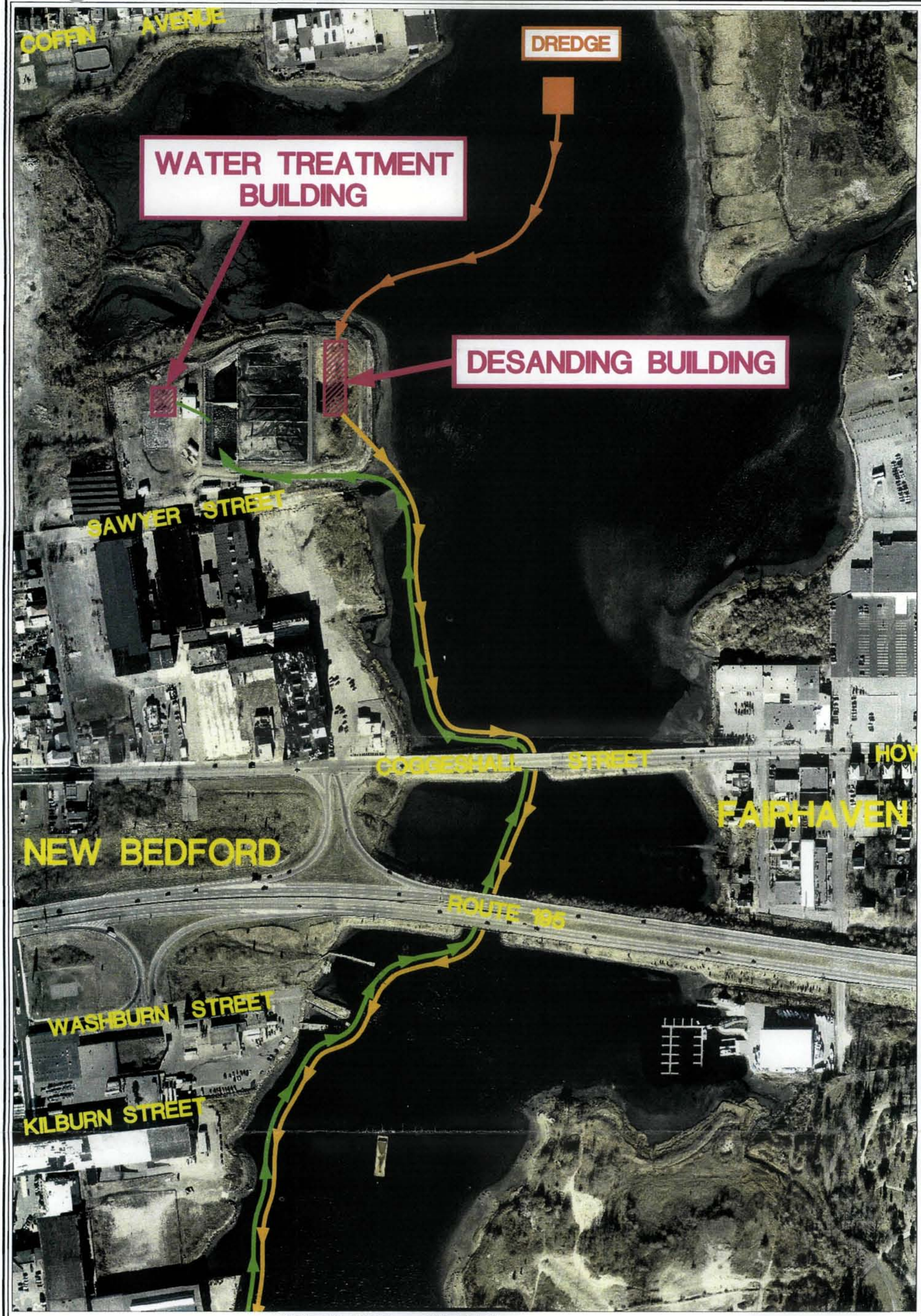
The following Basis of Design/Design Analysis Reports were prepared by Foster Wheeler for activities associated with the dredging, excavation, and water treatment portions of the New Bedford Harbor Superfund Project – OU #1:

- Final Basis of Design/Design Analysis Report – Dredging (October 2002);
- Final Basis of Design/Design Analysis Report – Excavation (October 2002); and
- Draft Basis of Design/Design Analysis Report – 700 to 2,000 gpm Water Treatment Plant (June 2002).

Information provided in these reports was utilized in the development of the Draft Basis of Design/Design Analysis Report – Desanding Facilities and Mechanical Dewatering Facilities.

1.5 Organization of the Report

The document is organized such that this section, Section 1.0, summarizes the background information leading to the desanding/dewatering system design, presents the design objectives and overview, presents procurement packages, and describes the report organization. Section 2.0 summarizes the Applicable or Relevant and Appropriate Requirements (ARARs). Section 3.0 describes results of the previous investigations and other relevant documents that relate to this BD/DA. Section 4.0 summarizes the design criteria. Section 5.0 identifies the basis of design for the facilities. Section 6.0 presents the facility descriptions. Section 7.0 describes the transportation and management of the waste streams that will be generated from this remedial action. Section 8.0 summarizes the site management, including traffic concerns and work hours. Section 9.0 presents the anticipated schedule for completion of the detailed design and construction. Section 10.0 lists the technical specifications and drawings. The appendices contain applicable figures, relevant reports, design calculations, and the draft project schedule.



MATCH LINE SHEET 2

KEY:

- DREDGED SEDIMENT
- SEDIMENT SLURRY
- WATER FROM DEWATERING PROCESS

0 300 600
SCALE IN FEET

FIGURE 1-1

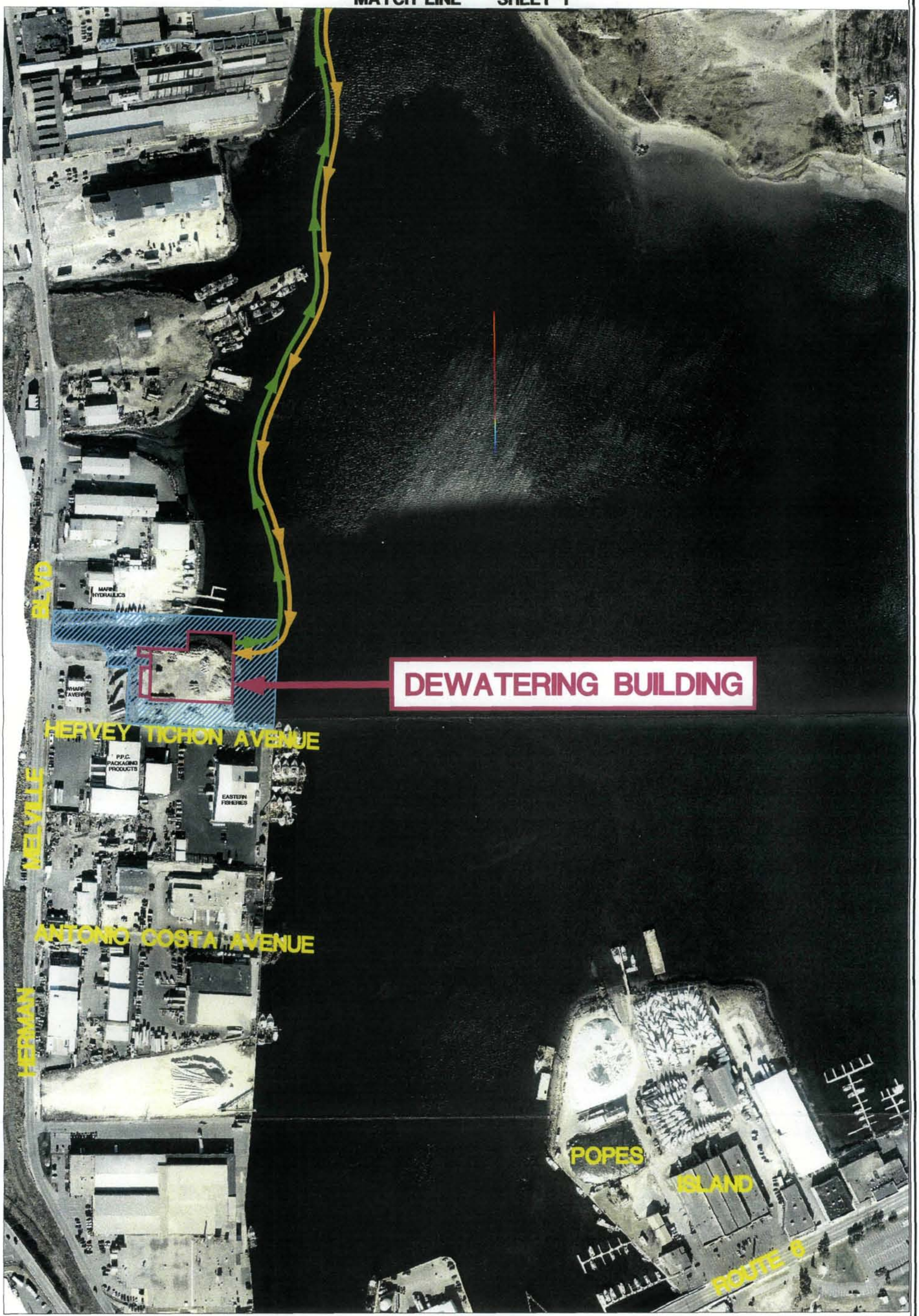
NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SITE LOCATION MAP

DESANDING FACILITY, DEWATERING FACILITY AND WATER TREATMENT PLANT

SCALE: AS SHOWN | SHEET 1 OF 2

CAD FILE: 172093-SITEPHOTO-1F.DWG



KEY:

- DREDGED SEDIMENT
- SEDIMENT SLURRY
- WATER FROM DEWATERING PROCESS

0 300 600
SCALE IN FEET

FIGURE 1-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SITE LOCATION MAP

DESANDING FACILITY, DEWATERING FACILITY AND WATER TREATMENT PLANT

SCALE: AS SHOWN | SHEET 2 OF 2

CAD FILE: 172093-SITEPHOTO-1F.DWG

2.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

Dredged sediments will be pumped to the desanding/dewatering system and the resultant filtrate will be pumped to a water treatment facility. The dewatered material will be shipped offsite for disposal.

2.1 Record of Decision Requirements

Table 2-1 summarizes the specific Federal and State ARARs of the ROD apply to the desanding/dewatering facility design. A subsequent Explanation of Significant Differences (ESD) suggested that the excavated sediments be dewatered and shipped off-site. Refer to Appendix A for a draft version of the ESD.

2.2 Local Regulations

Local jurisdictions have been contacted concerning local regulations on noise, light, working hours, and local transportation restrictions. New Bedford is the primary residential community near the proposed facility. New Bedford does not have any written limits on noise or work hours. However, local police recommended that working hours in the vicinity of the residential areas be limited to a reasonable time period.

2.3 Discharge Standards

2.3.1 Water

There will be four types of liquid discharges: (1) process water; (2) decontamination wash and rinse water; (3) domestic wastewater; and (4) stormwater runoff from roof and parking areas. Process, decontamination and rinse water will be collected in the dewatering building at Area D where it will be pumped to the water treatment plant at Area C. Process and decontamination water from the desanding system at Area C will also be pumped to the water treatment plant. Discharge standards for the water from the dewatering facility after treatment in the site water treatment system are defined in the Basis of Design/Design Analysis Report for the Water Treatment System (Foster Wheeler, 2002). Runoff from the Process/Loadout roof areas as well as areas surrounding the rail tracks and the swale will discharge directly to the harbor. Runoff from the parking areas with asphalt will be treated for suspended solids and discharged to the harbor.

2.3.2 Sewer

Sewer discharges will be in accordance with City of New Bedford Sewer Use Ordinance. The wastewater discharges to the City of New Bedford will be typical of domestic wastewater.

2.3.3 Air

Based upon previous experience with dewatering of contaminated sediments, it was determined that the primary releases of potential concern to the public include emission of PCBs and the generation of odors and fugitive dust. Using a conceptual dewatering process, the potential for air emissions was evaluated using a combination of available test data and USEPA-approved air emission rate models. Based on conservatively estimated emission, controls will be necessary to ensure protection of public health. The complete air emissions analysis is provided in Appendix B.

2.4 Accessibility Standards

The Standards for Accessible Design (29 CFR 36-Appendix I) promulgated under Title III of the Americans with Disabilities Act (ADA) (42 U.S.C. 12181) prohibits discrimination on the basis of disability by public accommodations and requires places of public accommodation and commercial facilities to be designed, constructed, and altered in compliance with the accessibility standards established.

The support facility will include a conference/meeting room that may be utilized for public meetings. Therefore, the support facility will be designed and constructed to be compliant with the ADA requirements. However, given the physical nature of the dewatering operations, the process and loadout buildings will not be constructed to be ADA compliant. The design will allow for the process and loadout buildings to be modified to be ADA compliant after completion of the desanding/dewatering project.

2.5 Decontamination Facility Standards

The regulations for Hazardous Waste Operations and Emergency Response (29 CFR 1910.120) include requirements for toilets, showers, and change rooms associated with decontamination procedures at hazardous waste sites. 29 CFR 1910.120 includes by reference the sanitation regulations presented in 29 CFR 1910.141. Both of these regulations will be followed in the design of the facilities.

2.6 Construction Standards

Building construction will be completed in accordance with the following general building standards:

- Massachusetts State Building Code
- National Fire Protection Association (NFPA) 70, National Electric Code
- NFPA 101, Fire Safety Code
- NFPA 13, Standard for the Installation of Sprinkler Systems
- Commonwealth of Massachusetts Fuel Gas and Plumbing Code
- Commonwealth of Massachusetts Electrical Code

Detailed design drawings will be prepared and will be stamped by Massachusetts-registered design professionals. Massachusetts licensed plumbers and electricians will be used for all plumbing and electrical work and utility connections.

2.7 List of Anticipated Utility Applications

The City of New Bedford (City) required application for utility services will be acquired prior to starting construction of the desanding/dewatering facilities. The appropriate City officials will be consulted prior to beginning the construction.

Applications required for construction of the desanding/dewatering facilities include, but are not limited to, the following:

- Sewer Connection
- Electrical
- Construction in Street Right-of-Way
- Fire Suppression System
- Gas Service
- Water Service
- Telephone Service
- Electrical Service
- Plumbing
- Curb Cut

2.8 ARAR Summary

Table 2-1 summarizes the ARARs for this project. The table summarizes the requirements and briefly describes design and construction actions that will be taken to comply.

Table 2-1
ARAR Compliance Summary

Requirement	Citation	Status	Synopsis	Actions to be Taken to Attain ARAR
Clean Water Act - Section 404 and Rivers & Harbors Act Requirements	40 CFR 230.70-76; 33 USC 401-426(m)	Applicable	Controls discharges of fill material in order to restore and maintain the chemical, physical, and biological integrity of waters of the U.S. Requires coordination and approval of USACE for construction of structures in navigable waters of the U.S.	USEPA has found that the OU #1 remedy, including building structures along the shoreline, is the least damaging alternative to remediating the harbor. The desanding/dewatering facility design is being conducted in coordination with USACE and with their review and approval. The impact of bulkhead and shoreline construction activities on the environment will be minimized and/or mitigated.
National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Requirements for Construction Activities	40 CFR 122.26(a)(14)(x), 122.26(c)(1)(ii)(c) and (d); Federal Register, Vol. 63, No. 31, 9/17/98, Part IV, SWPP Requirements	Applicable	Regulation requires best management practices to control pollutants in stormwater discharges during and after construction including erosion and sediment control.	Erosion control will include implementation of best management practices for control of pollutants in stormwaters and erosion and sediment control during construction.
Floodplain Management - Executive Order 11988	40 CFR Part 6, Appendix I	Applicable	Federal agencies are required to reduce the risk of flood loss, minimize impact of floods, and restore and preserve the natural and beneficial values of floodplains.	The remedy will occur within the 100-year coastal floodplain as there is no practical acceptable alternative location.
Coastal Zone Management Act	16 USC Parts 1451 et seq.	Applicable	Requires that any actions must be conducted in a manner consistent with State approved management programs.	The entire site is located in a coastal zone management area. The remedy is consistent with the State coastal zone management program to the maximum extent possible.*
Fish and Wildlife Coordination Act	16 USC Part 661 et. seq.; 40 CFR 6.302(g)	Applicable	US Fish & Wildlife Service and appropriate State agencies must be consulted during project planning to determine ways to avoid or minimize potentially adverse effects to fish and wildlife.	USEPA Region I has consulted with the MA Dept. of Marine Fisheries. USEPA has told Foster Wheeler that construction and operation activities may occur throughout the year and there is no constraint due to fish migration.
Federal Endangered Species Act	16 USC Part 1531 et. seq.; 40 CFR 6.302(h)	Applicable	Appropriate Federal and State agencies must be consulted if a threatened or endangered listed species or their habitat may be affected.	The USACE will make the final determination with the appropriate agencies. However, the area where the desanding/dewatering facilities will be located is in a heavily industrialized area and it is unlikely that this area is a habitat for the roseate tern.
National Historic Preservation Act of 1966; National Preservation of Historical and Archeological Data Act of 1974	16 USC 470 et. seq. & 40 CFR 800, as amended; 16 USC 469 et. seq.	Applicable	Requires an assessment be conducted to determine potential project impacts to cultural resources that are eligible for, nominated to, or listed in the National Register of Historic Places (NRHP). Specifically, cultural resources concerns will involve evaluation of project impacts to potentially significant (per 36 CFR 60.4 - NRHP Criteria for Evaluation) cultural resources.	A cultural resources evaluation, including an architectural survey, has been conducted in the area where the desanding/dewatering facilities will be constructed. The evaluation concluded that there are no structures present of historic interest and therefore, there would be no impacts to cultural resources.

Table 2-1
ARAR Compliance Summary - *Continued*

Requirement	Citation	Status	Synopsis	Actions to be Taken to Attain ARAR
Wetlands Protection Act - Sedimentation and Erosion Control Plan	131 MGL 40	Applicable	Standards regulate filling and altering of coastal and inland wetland resource areas and associated buffer zone of either 25 feet from riverfront, 100 feet inland of a coastal bank/beach or dune, or within Land Subject to Coastal Storm Flowage (from 100-year storm event).	An Erosion Control Plan will be prepared reflecting best management practices to minimize adverse impacts during construction, including preventing erosion and siltation of adjacent waterbodies and wetlands in accordance with USDA Soil Conservation Service methods. USACE and USEPA will review and approve the plan. Comments will be requested from MADEP and City of New Bedford.
Massachusetts Surface Water Discharge Requirements	31 MGL 27; 314 CMR 3.000	Applicable	Outlines requirements for discharges to surface waters.	A Stormwater Management Plan will be prepared. USACE, USEPA, MADEP, and City of New Bedford will review the plan. The Plan will be prepared for the desanding/dewatering facilities construction activities and will address best management practices to properly manage and control stormwater, in accordance with applicable Federal and State regulatory requirements.
Certification for Dredging, Dredged Material Disposal, and Filling in Waters	21 MGL 26-53; 314 CMR 9.06(1-2)	Applicable	Establishes procedures and criteria for administration of Section 401 of the Federal Clean Water Act for the discharge of dredged or fill material in waters of the U.S. within the Commonwealth.	Design and placement of fill for the bulkhead construction will be done to minimize any adverse impacts.
Administration of Waterways Licenses Law	91 MGL 1.00 et seq.; 310 CMR 9.00	Applicable	Criteria for work within flowed and filled tidelands. Focus on long term viability of marine uses and protecting public rights in tidelands. Applicable provisions are Restrictions on Fill and Structures 9.32(1)(a)(2,3)(b)(3,4); Preserving Water-Related Public Rights 9.35(1)(2)(a)(1 and 3)(a and b); Protecting Water Dependent Uses 9.36(2)(3)(4)(5)(a)(1,2)(5)(b); Engineering and Construction Standards 9.37(1)(c), (3)(a), (b)(4); and Dredging and Dredged Material Disposal 9.40(2), (3)(e).	Temporary unavoidable impacts to public access rights to the water and to water dependent users will occur during the construction. And operation of the desanding/dewatering facilities.
Surface Water Discharge	21 MGL 23(12) and 34; 314 CMR 3.10(3)(4-6); (9)(a); (19)(3-6), (10), (12)(a-b), (13)	Applicable	This section outlines the requirements for obtaining a NPDES permit in Massachusetts. The waters of New Bedford Harbor adjacent to the site are classified as SB.	Discharge from desanding/dewatering facilities will meet USEPA-approved effluent limitations. Discharges will be monitored in accordance with site monitoring plans. Runoff from open areas where vehicle traffic and other activity occurs will be collected and discharged to the Acushnet River following on-site treatment that includes removal of suspended solids. Roof drainage is considered clean and will be directly discharged to the Acushnet River.

Table 2-1
ARAR Compliance Summary - *Continued*

Requirement	Citation	Status	Synopsis	Actions to be Taken to Attain ARAR
Surface Water Quality Standards	27 MGL 27; 314 CMR 4.03(1)(3)(c); 4.04(1)(2)(4)(6); 4.05(4)(a-b), (5)	Applicable	MADEP surface water quality standards incorporate the Federal ambient water quality criteria (AWQC) as standards for surface waters of the State. Standards establish acute and chronic effects on aquatic life for contaminants including PCBs, cadmium, chromium, copper, and lead.	Foster Wheeler will sample and analyze dewatering water and provide treatment, as required, prior to discharge to the Acushnet River. As an alternate to on-site treatment, the dewatering water may be sent to the POTW.
Coastal Zone Management	301 CMR 21.00	Applicable	Requires that any actions must be conducted in a manner consistent with State approved management programs.	The entire site is located in a coastal zone management area. Actions taken will be consistent with substantive portions of identified policies of CZM.*
Coastal Zone Management Policies	MCZM	To Be Considered	Statements of the State environmental policy for coastal zone areas that are implemented through identified ARARs, particularly the Wetlands Protection Act and the Waterways Law. Policies to be considered are Habitat 1; Water Quality 1; Coastal Hazard 2, 3; Ports 1, 2, 3; Ports Management Principle 1; Protected Areas 3; Public Access 1; Public Access Management Principle 2, 4; and Growth Management Principle 1.	These policies will be considered throughout construction, dredging, and operation and maintenance of the remedy. Compliance with the identified substantive portions of the State ARARs will meet the intent of these policies.* State ARARs and actions to attain them are incorporated within this table.
Air Pollution Control	111 MGL 142A-J; 310 CMR 7.09(1-4); 7.10(1-2)	Applicable	Standards for, among other things, fugitive dust, excessive odor, and noise at construction sites. Pollution abatement controls may be required.	Engineering controls will be used as necessary to meet air action levels for dust, odor and noise. During dredging activities work will be performed by underwater excavation of marine sediments, which will be discharged as a slurry via pipeline and no dust is expected. During construction of the desanding/dewatering facilities, controls such as water spraying may be utilized to control dust. Controls during operation of the mechanical system are included in Appendix B.
Ambient Air Quality Standards	111 MGL 142D; 310 CMR 6.04(2)	Applicable	Establishes ambient air level for contaminants and particulates.	Emissions during construction will meet the particulate standard. Dust suppression will be used to reduce particulate emissions.
Noise Control	310 CMR 7.10(1) & (2)	Applicable	Activities must not cause or contribute to unnecessary emissions that may cause noise.	Engineering controls will be used during construction of the desanding/dewatering facilities and operations such that the activities do not cause or contribute to unnecessary noise emissions. Such controls may include modifying equipment by having enclosures to reduce sound or having the equipment operated in a manner such that sound is minimized. Use of supplemental or replacement mufflers or other sound-suppression devices on equipment must meet the manufacturer's specifications for the original device.

Table 2-1
ARAR Compliance Summary - *Continued*

Requirement	Citation	Status	Synopsis	Actions to be Taken to Attain ARAR
Toxic Substance Control Act	40 CFR 761.61(c); (a) (5) (ii); 40 CFR 761.65 (9) (c)	Applicable	Require sediments containing PCB concentration above 50 ppm be disposed of in a regulated facility. Allows separated material with <50 ppm to be disposed of in an applicable facility. Require desanding facilities at Area C to meet TSCA Runon/Runoff requirements.	Foster Wheeler will sample and analyze waterways and dispose of appropriately. Desanding facility at Area C to be designed to meet Runon/Runoff requirements of TSCA.
Air Quality Guidelines	MADEP Memorandum dated 12/6/1995	To be Considered	Provides short term and long term exposure point concentrations for air contaminants that were developed to be protective of public health.	Compliance with these guidelines will be ensured through an ambient air monitoring program that is designed to protect the public. Health based allowable ambient limits were developed for residential and commercial receptors. These ambient limits were used in conjunction with sampled background concentrations and dispersion modeling to develop air action levels. Air action levels define the upper ambient air concentration limits (above Baseline), which would pose an acceptable/minimal risk to the most sensitive receptors. The air action levels then were used to develop cumulative exposure budgets. The cumulative exposure budgets will be integrated into an ambient air management program.
Allowable Sound Emissions	DAQC Policy 90-001; 2/1/90	To Be Considered	Establishes guideline where source of new noise should not emit more than 10 decibels above the existing (background) level.	Site operations noise level will be minimized and will follow the suggested noise limit to the extent practicable. *
Massachusetts Stormwater Management Policy	131 MGL 40; 310 CMR 10	To Be Considered	Regulates work conducted within coastal and inland wetlands and riverfront areas. For construction activities, the regulated area is 25 feet inland from the riverfront and the land subject to coastal storm flowage.	The desanding/dewatering facilities construction will comply with the substantive requirements of this policy where possible and practicable. The Stormwater Management Plan and Erosion Control and Sedimentation Plan required by the construction specifications will be reviewed for consistency with the Policy requirements.

* Direct reference from Record of Decision, Upper and Lower Harbor Operable Unit, New Bedford Harbor Superfund Site, September 1998.

3.0 SITE CONDITIONS AND INVESTIGATIONS

This section presents a summary of the investigations/bench scale test work completed by Foster Wheeler to support the design of the desanding/dewatering facilities. These investigations/tests included the Final Technical Memorandum, Rev. 2 Feasibility Investigation of Sediment Dewatering Alternatives" (July 2001), "Final Summary Report Bench-Scale Dewatering" (August 2002), and "Final Geotechnical Report Investigation for Remedial Design of Operable unit No. 1" (May 2002).

3.1 Feasibility Investigation - Dewatering

In 2000, Foster Wheeler conducted a feasibility investigation of desanding and mechanical dewatering technologies, and disposal options for the sediment to be removed from the New Bedford Harbor Superfund Site – OU #1. This Final Technical Memorandum, Rev. 2 "Feasibility Investigation of Sediment Dewatering Alternatives" dated May 2001 was based on a combination of literature searches, bench scale dewatering tests with representative sediment from the New Bedford Harbor Superfund Site, and conversations with mechanical dewatering vendors.

In order to evaluate the feasibility of desanding and mechanical dewatering, three different (3) bench scale dewatering tests were conducted at the New Bedford Harbor Superfund Site in July 2000. The vendors selected were Koester Environmental Services, Inc. (Koester), Mineral Processing Services (MPS), and JCI/UPCYCLE. Each vendor represented a different mechanical dewatering technology (belt filter press, diaphragm filter press and bladder press) and a different industrial application (environmental and commercial). Based on the information gathered for this feasibility investigation the following conclusions and recommendations have been developed:

Physical Separation

Physical separation of the +100/+200 mesh material from the dredged sediment is technically feasible and would result in a reduction of approximately 5 to 10% of the volume of material requiring dewatering. The most likely separation process would include pre-processing with a grizzly at the dredge to remove +4 inches followed by coarse separation of the +3/8-inch material, and desanding to remove material with a specific gravity greater than 2.3 and +200 mesh particle size. PCB results indicate that +3/8 inch material would be considered TSCA and the +200 mesh material non-TSCA.

Mechanical Dewatering

All three of the dewatering technologies evaluated are considered technically feasible. However, for the New Bedford Harbor project only the diaphragm plate and frame filter press and the bladder press were shown to be capable of achieving the project's volume reduction or weight reduction objectives during bench scale testing. Both technologies demonstrated during bench scale testing proved that they are capable of producing a filter cake with a solids content of 50 to 60% solids (by weight).

3.2 Dewatering Bench Scale Testing

The results from the 2000 Feasibility Investigation could be considered a "yes or no" for the application of mechanical dewatering with no methods of refinement (i.e., optimization of polymer addition rates, recessed chambers and diaphragm plate technology up to 225 psig, and solids capture rates). Side by side tests using the different technologies with the same sample (or sample mix) were not performed.

A field change notice (FCN) was prepared to provide additional controlled process-orientated test results that a dewatering contractor would find useful for bidding strategy. In-situ samples from specific areas were taken to better represent the changes in sediment geotechnical parameters from area to area. By testing each sample separately, a contractor would have more data to determine in the choice of equipment for the best volume reduction, feed rates, solids capture rates, and chemical conditioning that would be flexible and cost effective to successfully process varying material throughout the harbor.

From September to November of 2001, Foster Wheeler conducted additional bench-scale dewatering tests to further evaluate mechanical dewatering methods for the purpose of developing the necessary data for the design of a full-scale dewatering system. Based upon the results of the testing, mass balances were developed for various operational parameters. These balances are included in Appendix C.

The results of this most recent bench-scale dewatering testing were used to develop the following conclusions and recommendations:

Physical Separation

Analytical results from the bench-scale testing that was conducted to replicate the desanding process indicated that material retained on +100 and +200 mesh screens may exceed 50 ppm of PCBs. The following variables that were encountered during bench-scale testing which could have contributed to a higher PCB concentration than what may be achievable during full-scale operations are as follows:

- The screening method used during bench-scale testing separated solids based strictly on particle size. Many organic particles such as minute twigs, stems and leaf matter were retained on the screen. It is believed that these organic particles have a higher PCB concentration than the sand. During full-scale operations solids separation will likely be based on both particle size and specific gravity (i.e., hydrocyclones). As a result, the majority of the small organic particles which have low specific gravity would not be retained in a separation/screening process but passed on to the dewatering process.
- Gradation analyses performed on the material retained on the +100/200 mesh during the bench-scale dewatering testing indicated that a large percentage of the material retained was actually finer than the +100/200 mesh screen. This shows that the screening process used in bench-scale dewatering testing was not efficient and is not likely to be representative of material processed during full-scale dewatering operations.
- Additional testing of hydrocyclones and/or providing for an extra desanding step would likely enable achievement of non-TSCA levels in separated sands (+200 mesh).

Mechanical Dewatering

The three methods of mechanical dewatering that were simulated during bench-scale dewatering testing included: a diaphragm plate filter press with both a 100 psi and 225 psi squeeze cycle; a recessed chamber filter press taken to 225 psig; and a standard belt press. The highest solids content of the dewatered sediment was achieved with the diaphragm filter press with a 225 psi squeeze cycle. Average percent solids by weight from the varying devices in order of success are as follows:

Diaphragm filter press – 225 psig squeeze	= 69.4%
Diaphragm filter press – 100 psig squeeze	= 66.7%
One-inch recessed chamber – 225 psig filter press	= 63.5%
Belt press	= 50.4%

Wastewater

Analytical results from the filtrate from the diaphragm press reinforced previous results obtained from the wastewater treatment bench-scale and pilot-scale studies. The PCB concentration (total Aroclors) in the filtrate ranged from non-detect to 44 ppb and averaged 10.9 ppb. Total suspended solids (TSS) in the filtrate ranged from 2 to 58 ppm and averaged 23 ppm. The maximum concentrations of total cadmium, chromium, copper and lead detected in the filtrate were 6.7 ppb, 21 ppb, 27 ppb and 20 ppb, respectively.

3.3 Geotechnical Investigation

The following is a brief summary of geotechnical work, primary findings of the subsurface exploration, and recommendations related to the design and construction of the proposed dewatering facility/rail access facility at the Site. Refer to Appendix D for the Geotechnical Investigation Report.

Geotechnical information for the proposed site location has been generated throughout the development of remedial alternatives for the New Bedford Harbor Superfund Site. Geotechnical evaluations included review of existing information, including; soil and rock boring logs, cone penetrometer testing, standard penetration testing, test pit, geotechnical laboratory testing, geophysics (electromagnetic induction and ground penetrating radar), and analytical analyses conducted on soil samples. Additional geotechnical borings were conducted to supplement previous site data, and used to evaluate the engineering parameters of the subsurface conditions required for the facility design.

The subsurface conditions at the site vary both onshore and offshore. Groundwater elevations fluctuate with the tide and were observed to range from 1.0 to 2.8 feet NGVD. The onshore stratigraphy of the site is, in general, characterized by fill overlying stiff inorganic sandy silts and dense sand, with the exception of two borings where a thin organic soil layer was encountered between the fill and the sandy silts. The fill layer contains varying amount of construction debris densely compacted with gravel, sand, and silts. The offshore portion of the site is generally characterized by organic soil overlying the inorganic sandy silts and dense sand.

4.0 DESIGN CRITERIA

The desanding/dewatering facility design criteria were developed in accordance with the ARARs, ROD requirements, USACE Engineering Guidance, and the work plan. Results of additional studies described in Section 3.0 were also used to develop the design criteria. The following design criteria were established for the project:

- Building and site improvements will be designed for a 20-year life. The bulkhead will be designed for a 50-year design life. Design life for process and air handling equipment will be 20 years.
- TSCA sediment, slurry and filter cake will be processed, stockpiled, or handled only inside building or protected areas. The building areas will be subject to potential spillage. Therefore, the slabs and floor drains will be designed to protect underlying soil from contamination.
- Layout of the dewatering facility will be limited to the Southern Lobe (with the exception of coarse material and sand separation plus slurry storage, which will be done at the Sawyer Street site). The Wharf Tavern structure will remain and most of the Wharf Tavern property will remain in use.
- The dewatering facility floor load design will be 750 pounds per square foot (psf). USEPA stated that the pier and wharf design, as well as any other areas of new improvements, will be 1,000 psf vertical loading. This criteria applies after completion of the sediment remediation; therefore, asphalt pavement is not designed for 1,000 psf.
- Rail and truck access and loading/decontamination areas will be at the north side of the dewatering facility at present grade. Barge access will be at the east side of the cellular sheet pile cofferdam. Rail and truck access will be designed now; modifications for barge will be made at a later date, if needed. Road crossing to be designed by others.
- The overall site layout minimizes impact on CSX/MBTA plans and impact on local traffic.
- Sludges and sand filter backwash generated from the WTP at Area C will be pumped to the desanding operation equalization tanks.

4.1 Dewatering Capacity

The anticipated site layout and conceptual dewatering process equipment footprint were presented to USEPA at the December 6, 2001 On Board Review meeting. The layout is based upon four (4) 650 ft^3, 225 psig diaphragm plate and frame filter presses but is sized to accommodate other dewatering arrangements. The required dewatering treatment capacity is based on balancing the capacity needed to complete the New Bedford sediment remedial action within a reasonable time with the anticipated variable annual funding and site space constraints. At the meeting, the following criteria were approved.

- Allow sufficient space to support the operation of four of the largest presses capable of producing approximately 17 yd^3/cycle with each 2-hour cycle.
- Filter cake will be produced from a 10 to 20% solids by weight slurry pumped from the dredging process to the Sawyer Street coarse/fine debris and sand removal process. Filter cake will be a minimum of 65% solids by weight.
- Provide on-site rail track for six (6) empty gondola and six (6) full gondola rail cars.

- Provide ability to load gondola cars, intermodal rail cars, or trucks with TSCA filter cake.
- Provide ability to transfer TSCA soil from vegetated uplands to rail cars.
- Trucks with TSCA filter cake will exit directly to Herman Melville Boulevard. Full and empty trucks can access the site from Hervey Tichon Avenue.
- Provide fence for visual barrier around the facility.

Equalization and holding tanks at the Sawyer Street site and Area D will be sized to buffer the intermittent pumping rates and variances in solids by weight from the dredges and provide for 4 hours of storage at peak cake production rate.

4.2 Desanding/Dewatering Process Equipment

The desanding system(s) will be designed for the following:

- Hydraulic capacity of 2,500 gpm each
- Removal of +3/8 inch debris
- Removal of +200 mesh non-cohesive particles

The systems will also have 200% redundancy (3 units total) to provide maximum flexibility (residence time for separation and washing) for the desanding operation. Per the mass balance, 1,667 gpm is assumed to be the highest rate of dredged slurry.

The desanding system that will be located at Sawyer Street will include coarse/fine sand separation, equalization tanks, and pumping facilities to convey the slurry to the dewatering facility at Area D. The site layout will provide for addition of slurry holding tanks to test PCB concentration. The dewatering facility at Area D will include sediment holding tanks, polymer storage/make-up/feed system, slurry/polymer conditioning tanks, slurry dewatering equipment, material handling, and filtrate storage/transfer. An area for equipment such as equalization tanks located in the treatment train between the coarse/fine separation and slurry holding tanks at Area D, will be located at the Sawyer Street site. When space allows, these tanks will be housed in the desanding and dewatering structures, respectively to facilitate containment and process operations.

4.3 Bulkhead Wall Design

In order to accommodate a dewatering facility in the Southern Lobe, a bulkhead will be constructed to enlarge the existing area of the South Lobe. The bulkhead walls will be designed as a cellular sheet pile cofferdam filled with clean engineered backfill and capable of carrying a uniform load of 1,000 pounds per square foot (psf) on the backfill. The east and north walls will be capped with a concrete cap. The bulkhead wall design will be conducted by the USACE-NED with input from Foster Wheeler as to the structural requirements of the mechanical dewatering facility. See Section 4.10 for USACE Design Criteria and Appendix E for the Area D Bulkhead BD/DA prepared by USACE.

4.4 Site Layout

Rail and truck loading/decontamination area will be at the north side of the dewatering facility based upon the present grade of Herman Melville Boulevard at the location of the rail crossing. Additional truck access will be on the east side of the building for delivery of soil and debris to be shipped off-site by rail or truck. Barge access will be provided on the east side of the east section of the bulkhead. The

bulkhead, rail and truck access will be designed now to accommodate future modification for transport of dewatered cake by barge if needed. The rail crossing over Herman Melville Boulevard will be designed and constructed by others. The design of the on-site rail will be just what is needed to support the project (i.e., no separate line for the City to use while we are on-site).

4.5 Facility Design

The facility will contain segregated vehicle loading and decontamination areas to allow for decontamination and exit of one vehicle while another is being loaded.

Floor drains, sumps, personnel decontamination area, sanitary facilities, and separate office trailer facilities will be included in the design.

In order to control emissions from the desanding and dewatering systems, the process system will include collection of H_2S and other emissions at the point source areas in the process train, then treatment via scrubbers or granular activated carbon (GAC). The facility will also include permanent heating and ventilation systems. From modeling, a conservative estimate of one (1) T/yr. of PCB emissions is expected from the process system in the dewatering facility.

Emissions controls will be based on the following:

- PCB concentrations in air outside of the desanding and dewatering facilities will be controlled at point sources within the processes to be within health-based allowable ambient exposure limits at commercial and residential receptors.
- H_2S outside of the desanding and dewatering facilities will be controlled at point sources within the processes as a potential odor-causing agent.
- Potential fugitive dust will be controlled by containment within the dewatering facility.
- On site worker protection will be done to comply with occupational health and safety guidelines.

4.6 Material Handling Equipment

Material handling for coarse debris, sand, dry filter cake and soil will be designed to convey/place the materials into gondola cars or trucks and covering such materials for transport by others from the desanding and dewatering facilities.

Roll-up doors will separate the process and loading/decontamination areas.

The materials handling equipment, rail and truck transport facilities to convey materials off-site will be designed to reliably handle dewatered cake or excavated materials, that, either separately or in combination will not exceed 1,200 tons per day.

4.7 CSX Interfacing/On-Site Rail

The mechanical dewatering facility design will include a detailed design of the on-site rail system. This design will include horizontal alignment of rail centerlines and distances from structures in accordance with Army TM 5-850-2. The mechanical dewatering facility will include on-site rail capabilities for off-site disposal of dewatered materials. The trackage is required on-site to connect with CSX, and to

permit loading, storage and switching of cars. The rail will be built on the sheet pile cofferdam on the north side of the site. Rail stops will be placed on the ends of all stub tracks. Car stops and bumping posts will be designed consistent with the load weight for the rail cars filled with dewatered cake and appropriate factors of safety for maximum load and 5 miles per hour.

To minimize the number of trips across Herman Melville Boulevard to the CSX railyard, sufficient on-site storage is provided for six (6) gondolas while six are being loaded. This arrangement will allow for one to two trips per day of material (soil and filter cake) from the site.

A static rail scale will be provided for weighing operations.

4.8 Truck Facilities Criteria

Loading and decontamination logistics are identical to those described for rail cars except that trucks would enter directly into the loading area through a motorized roll-up door. This entry into the facility allows for direct access without need for backing up and minimizes potential interference between the two parallel trucks being loaded/decontaminated. Additionally, it has been assumed that local off-site weigh stations will be utilized for weighing operations.

4.9 Barge Facilities Criteria

The bulkhead on the east side of the site will be designed to accommodate future modification for shipping dewatered sediment off-site by barge. Also, the bulkhead and the dewatering site paved areas will be designed to accommodate future modification for a traveling crane to move sediment in containers to the barges.

4.10 Waterfront Structures Criteria

The following general design criteria were used for the design of the east and north bulkhead walls. It should be noted that in all cases the design objectives associated with the City of New Bedford's future use requirements govern the design. The complete Basis of Design for the Area D Material Dewatering Transport Facility as prepared by USACE-NED is provided in Appendix E.

4.10.1 East Wall Design Criteria

The design criteria for the east wall of the bulkhead is as follows:

1. Top of wall elevation of +10.5 feet NGVD.
2. Future dredge depth at the harbor line of –35.0 feet NGVD (which corresponds to –30 feet MLLW plus over dredge allowance).
3. Structure (including fendering) shall extend out to the harbor line, which corresponds with the alignment of the existing North Terminal Pier just south of Area D.
4. Fifty-year design life.
5. Shall support a uniform vertical load of 1,000 psf on top of and behind the structure.
6. Shall withstand horizontal (vessel impact and mooring) loads associated with a yet to be determined design vessel. In the absence of a design vessel being identified, the design criteria utilized for the existing North Terminal Pier will be used.
7. Seismic forces will be considered in the final bulkhead design.

North Wall Design Criteria

The design criteria for the north wall of the bulkhead is as follows:

1. Top of wall elevation of +10.5 feet NGVD.
2. Future dredge depth along the north wall –20.0 feet NGVD (which corresponds to –15 feet MLLW plus over dredge allowance).
3. Structure alignment (including fendering) shall not extend beyond the projected property line on the north of Area D.
4. Fifty-year design life.
5. Shall support a uniform vertical load of 1,000 psf behind the bulkhead, and a uniform rail loading on top of the bulkhead of 2,050 psf.
6. Horizontal (vessel impact and mooring) loads are expected to be minimal along the north wall due to the shallow water depth. Therefore, the loads have been considered negligible for the north wall.
7. Seismic forces will be considered in the final bulkhead design.

4.11 Support Facility Criteria

The sizing of the decontamination room, shower and locker rooms, and lunch/break room will be based on the following staffing levels:

Number of shifts per day:	2
Length of shift (hours):	12
Number of staff per shift:	20
Ratio of male to female staff:	5 to 1
Number of days per week	6

The dewatering contractor will operate and maintain the Sediment Dewatering Facility. The Operations Contractor will determine the exact number of staff. The ADA requirements will apply to the support facility only. The support facility will be designed to handle personnel, protective equipment, and clothing. Tools, equipment, instruments, etc. will be handled in the Sediment Dewatering Facility building. A conceptual design analysis for the support facility is provided in Appendix F.

4.12 Geotechnical

Detailed information on geotechnical information for the site is available in the Geotechnical Investigation (Foster Wheeler, 2002) provided in Appendix D. The onshore portion of the site is, in general, characterized by fill overlying dense inorganic sandy silts and dense poor to well graded sand, with the exception of two borings where a thin organic soil layer was encountered between the fill and the sandy silts.

Where fully penetrated, the fill encountered in the onshore borings and test pits ranges from approximately 6 to 23 feet in depth, with the average thickness being approximately 16 feet. The fill is mostly granular in nature and consists of poorly graded sands with varying amounts of silt and gravel. Other components include boulders, brick, concrete, wood, asphalt, and polypropylene plastic. The fill layer was typically dense to very dense, with frequent obstructions which often prevented casing advancement during the borehole installation. Upper portions of the fill were denoted by a moist brown matrix, where as lower portions of the fill strata were typically wet gray to black matrix. This lower

discoloration is likely attributed to the mixing of the dark gray organic soils and the fill during historic backfilling of the shoreline.

Spread footing foundations are recommended to support buildings. Rail access will be founded partially over new fill and the northern portions of the bulkheads. Concrete slabs bearing on granular subgrade are recommended for the dewatering building to accommodate heavy equipment and machinery. It is expected that some areas will be subject to heavy equipment loads and others lightly loaded. Appendix D presents recommendations for the floor slab design.

4.13 Architectural

The following two sections provide the design criteria for the support and dewatering facilities.

4.13.1 Support Facility

The design and layout of the Support Facility will be in compliance with the requirements of ADA regulations. Unless noted otherwise, interior partition walls and interior surfaces of exterior walls shall be gypsum board over light-gauge, steel framing.

Doors and frames shall be hollow metal. Exterior doors shall be insulated. Where doors lead into spaces that are curbed for containment, ramps shall be provided at the door. A door shall be provided to the mechanical room to allow moving of equipment into and out of the space.

4.13.2 Dewatering Facility

The design and layout of the dewatering building will not be required to be in compliance with the requirements of ADA regulations.

Doors and frames shall be hollow metal. Exterior doors shall be insulated. Where doors lead into spaces that are curbed for containment, ramps shall be provided at the door.

4.14 Structural

The following publications or documents form a part of the basis of design for providing the design and construction of the structural elements for both the support and dewatering facilities consisting of:

Applicable Building or Design Codes and References:

- American Concrete Institute (ACI): ACI 318 – (1995) Building Code Requirements for Structural Concrete.
- American Concrete Institute (ACI): ACI-350 – Tightness Testing of Environmental Engineering Concrete Structures.
- American Institute of Steel Construction (AISC): AISC M016 – (1989) ASD Manual of Steel Construction, 9th Edition.
- American Institute of Steel Construction (AISC): AISC M017 – (1989) ASD Manual of Steel Construction, Volume II, Connections.
- American Institute of Steel Construction (AISC): AISC M018L – (1998) LRFD Manual of Steel Construction, 2nd Edition.

- American Institute of Steel Construction (AISC): AISC M019L - (1998) LRFD Manual of Steel Construction, Volume II, Connections.
- American Society of Engineers (ASCE): ASCE 7 – (1995) Minimum Design Loads for Buildings and Other Structures.
- American Welding Society (AWS): AWS D1.1 – (1996) Structural Welding Code Steel.
- Commonwealth of Massachusetts, Board of Building Regulations and Standards: (1997 with all current amendments) Massachusetts State Building Code.
- Metal Building Manufacturers Association (MBMA): MBMA LRMBSM – (1996) Low Rise Metal Building Systems Manual.
- Underwriters Laboratories (UL): UL 580 – (1997) Uplift Resistance to Roof Assemblies.

4.14.1 Building Descriptions

Support Facility

The building for the Support Facility shall consist of a pre-engineered metal building with steel framing and metal roof and wall panels. The building provided shall be complete and weather-tight and suitable for the functional requirements indicated. The building plan dimensions shall be as provided by the building manufacturer's standard, but not less than the dimensions indicated on the Conceptual Layout Design Drawing nor exceeding the indicated dimensions by more than the amount of 2 feet. The inside clear height between the finished floor and bottom of roof steel shall be a minimum of 10 feet.

The Support Facility building shall consist of vertical walls and a sloped roof. The roof slope shall be a minimum of 1 to 12 (vertical to horizontal) to a maximum of 3 to 12. The building framing shall be rigid frame type providing a clear interior span.

Dewatering Facility

The building for the Dewatering Facility shall consist of a pre-engineered metal building with steel framing and metal roof and wall panels. The building provided shall be complete and weather-tight and suitable for the functional requirements indicated. The building plan dimensions shall be as provided by the building manufacturer's standard, but not less than the dimensions indicated on the design drawings, nor exceeding the indicated dimensions by more than 2 feet. The inside clear height between the finished floor and bottom of roof steel shall be a minimum of 30 feet within the process area and 36.5 feet within the loadout area. The higher clear height within the loadout area is to accommodate a potential overhead crane.

4.14.2 Building Design Requirements

Design Loads

Loading combinations used shall be in accordance with the Massachusetts State Building Code or ASCE 7 or MBMA LRMBSM, as required.

The metal buildings shall be designed using the following minimum loads:

a) Dead Loads – Dead loads shall be determined from actual building components to be used.
b) Minimum Roof Live load – Use 16 pounds per square foot (psf).

c) Snow Loads – Compute and apply roof snow loads based on a flat (<30°) roof slope and the following parameters:

- Ground Snow Load, Pg = 30 psf
- Snow Exposure Factor, C_e = 0.7
- Importance Factor, I = 1.1

d) Wind Loads – Compute and apply wind pressures to building walls, roof and components based on following parameters:

- Basic Wind Speed, V = 90 mph
- Wind Exposure = C
- Importance Factor, I = 1.1

e) Seismic Loads – Compute and apply loads to building components as required to satisfy seismic requirements based on the following parameters:

- Effective Peak Velocity-Related Acceleration Coefficient, Av = 0.11
- Effective Peak Acceleration Coefficient, Aa = 0.11
- Seismic Hazard Exposure Group = I
- Seismic performance Category = C
- Site Soil Coefficient, S = 1.2
- Structural System – ordinary moment frame.

f) Collateral Loads – Include loads as required for HVAC equipment, mechanical equipment, fire protection system, or interior wall or ceiling finishes. Minimum of 5 and 15 psf shall be applied on framing systems for collateral loads of the support and dewatering buildings, respectively.

Deflections

The building shall be designed to limit deflections to the maximum values indicated below, unless building finishes to be used require more restrictive deflection limits.

a) Structural Members – The maximum deflection of main framing members shall not exceed 1/240th of their respective spans.

b) Roof System – The maximum deflection due to the live roof loads for roof panels and purlins shall not exceed $1/180^{th}$ of their respective spans, except that when interior finishes to be used require more restrictive deflection limits. Roof panels shall be provided to satisfy UL 580, Class 90. Maximum deflections of roof panels shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect. In addition to the live loads indicated above, roof decking shall be designed for a 200-pound and 300-pound concentrated load at midspan for the support and dewatering facilities, respectively.

c) Wall System – The maximum deflection due to wind on wall panels and girts shall be limited to 1/120th of their respective spans, except that when interior finishes to be used require more restrictive deflection limits.

Building Materials

The pre-engineered building framing system, wall and roof panels, and other components shall consist of the steel and/or aluminum materials. Roof insulation shall be R-38 and R-19, respectively. Exterior walls insulation for the support and dewatering facilities shall be R-13 and R-11, respectively.

4.15 Foundation Criteria

4.15.1 Design Loads

The building foundations shall be designed using worst case bearing, uplift, overturning, or sliding forces determined by the building manufacturer. A minimum factor of safety of 1.5 shall be used for overturning, sliding and uplift. The support facility floor slab shall be designed for a minimum 100 psf uniform load with a minimum slab thickness of 6 inches. The dewatering building floor slab shall be designed in accordance with the anticipated loads listed in Table 4-1.

The dewatering building foundation slab and rail foundation will be designed in accordance with ACI 318 with the exception of the main building sump, which will be designed to ACI 350.

4.15.2 Soil Data

The allowable soil bearing capacity is expected to be on the order of 4,000 psf. The bottom of footing depth shall be a minimum of 48 inches below final grade for frost protection. Frost wall and column footings shall be constructed on undisturbed firm subgrade material exposed during foundation excavation. The floor slab shall be placed on 6 inches of compacted granular material or structural fill.

4.15.3 Foundation Materials

Cast-in-place concrete for the building foundation and floor slab shall be reinforced and have a 28-day compressive strength of 4,000 pounds per square inch (psi).

4.16 Plumbing

Plumbing shall be per the Commonwealth of Massachusetts Fuel Gas and Plumbing Code. All sanitary flow from the toilet/shower area and the kitchenette sink shall flow by gravity to the municipal system in the road adjacent to the site.

Drainage for the Decontamination Room shall be directed to a sump in that space and shall be pumped to the main sump within the Sediment Dewatering Facility.

The Support and Dewatering facilities shall have sprinklers in accordance with NFPA 13 and Commonwealth of Massachusetts Fire Prevention Regulations.

4.17 Heating and Ventilation

4.17.1 General

Fuel for space and water heating shall be natural gas, which is available in the street adjacent to the site. The design of the HVAC systems shall be in accordance with the energy usage section of the Massachusetts State Building Code, ASHRAE Standard 90.1-1999 (Energy Standard for Buildings), and

ASHRAE 62-1999 (Ventilation for Acceptable Air Quality). Space heating will be gas-fired, forced hot air units. Gas-fired water heater(s) shall provide hot water for showers, domestic use, and for the decontamination process. Cooling shall be provided by split-system, DX units. Cooling will be provided only in the lunch/meeting rooms of the support facility.

Table 4-1
Anticipated Foundation Loads – Dewatering Facility

Equipment	Load (Tons)	Dimensions	Load Distribution
Plate & Frame Filter Presses (650 ft^3, 80 tons empty, 105 tons loaded)	105 tons	60 feet x 13 feet (skid mounted)	2 – Longitudinal steel beams 60 feet long & 6 – cross beams 12 feet on center
Slurry Conditioning Tanks (20,000 gal frac tanks with slurry density of 70 lbs/ft^3)	94 tons/tank	40 feet x 8 feet	Uniform over surface area (320 $feet^2$)
Slurry Equalization Tanks (2 – 64,000 gal tanks each with slurry density of 70 lbs/ft^3)	302 tons/tank	36 feet x 30 feet (8 feet liquid level)	Uniform over surface area (1,080 $feet^2$)
Filter Cake Storage Container (Roll-off box with 17 yd^3 of filter cake with a density of 100 lbs/ft^3)	30 tons	7 ft x 24 feet	4 point loads on steel rollers
Lift Truck (H700F Hyster Fork Truck)	Assuming a 35 ton live load: Total static load on front axle = 71 tons Total static load on rear axle = 59 tons		Front axle wheel base = 104 inches Rear axle wheel base = 94 inches
Truck Loading (HS20-44)	36 tons		16 tons/axle
Filter Cake Storage Bins (Maximum one cycle – 17 yd^3 with filter cake density of 100 lbs/ft^3)	25 tons		
Future Use: Marine Cargo Terminal	Unknown	Unknown	750 psf USEPA Direction. (Discrete loaded areas with aisle space)

4.18 Electrical and Other systems

4.18.1 General

Electrical service to the support building will be 120/240-volt power and 120/460 volt power to the dewatering facility. Each building will have a main breaker and associated power panels sized per NEC requirements. All electrical equipment, conduit, wiring, and systems shall meet NEC, the Massachusetts Electrical Code, and the Massachusetts Energy Code.

General power receptacles will be located throughout the facility. Ground fault, weatherproof receptacles will be provided in the Decontamination Room.

Standby or emergency power is not required for the dewatering building support facilities except as required by code. The desanding/dewatering contractor shall be responsible for emergency power required for the processes.

4.18.2 Electrical Area Classifications

The desanding/dewatering facilities electrical area classification will be Unclassified (Non Hazardous) as there will be no accumulation of explosive gases and/or dust in sufficient quantity for explosion.

4.18.3 Communications

There will be a plant phone and a public phone. No data connections will be provided.

An intercom system shall be installed throughout the Support Facility that ties into the plant-wide system. Paging from this building will not be provided.

4.18.4 Fire Protection

The fire protection classifications for the dewatering facilities based on the Massachusetts State Building Codes are as follows:

- Support Facility – Group B
- Process Facility – Group H-4
- Loadout Facility – Group-H-4

4.18.5 Fire Alarm and Security Alarm

The Support Facility will have a fire alarm that is tied into the City of New Bedford Fire Department but is independent of the dewatering building fire alarm system. The main fire alarm control panel shall be located in the Support Facility. Remote annunciation shall be provided in the guard facility. Communication for the fire alarm system shall be via master box or radio telemetry, as approved by the local authority.

Security alarms will be provided in both the Support and Dewatering facilities.

5.0 BASIS OF DESIGN FOR DESANDING/DEWATERING FACILITIES

This section provides the basis of design for the desanding/dewatering facilities. This basis is the result of site investigations, field tests, and design criteria presented in the previous sections. A description of the conceptual facilities is provided in Section 6.0.

The December 6, 2001 OBR meeting with USACE and USEPA, established that the size of the dewatering facility would be based upon a mechanical dewatering process of four (4) diaphragm plate filter presses. As a result, the mechanical dewatering system is the limiting process and all other associated operations were sized based upon the maximum production rate of the four 650 ft^3 filter presses (816 cy/day). The basis of design for each of the processes is provided in Table 5-1.

5.1 Dredging/Desanding/Dewatering Mass Balance

Utilizing the data generated during the Bench Scale Dewatering Tests, mass balances were developed to determine the impacts of various process parameters on the desanding, dewatering and water treatment operations anticipated for New Bedford Harbor OU #1. Process parameters which were varied included in-situ sediment solids content (% by weight), in-situ sand (+200 Mesh) content (% by weight), and % solids (by weight) of the filter cake. The complete mass balance calculation is provided in Appendix C.

5.1.1 Assumptions

In order to develop the mass balances the following assumptions were utilized for each unit operation:

Physical Properties

- The 15 sediment samples collected for the bench scale dewatering tests are considered representative of the variety of in-situ conditions anticipated during the dredging of New Bedford Harbor OU #1.
- Specific gravity of dry solids within sediment = 2.41.
- Specific gravity of seawater = 1.015.
- Density of fresh water @ 60°F= 62.371 lbs/ft^3 (7.4805 gallon/ft^3).

Dredging Operations

- A mechanical excavating, hydraulic transport (MEHT) type dredge will be utilized to remove the in-situ sediments for the harbor.
- Dredging operations will be conducted in two 10 hour shifts/day, 6 days/week.
- Effective operating time will be 8 hours/shift.
- Solids content of in-situ sediments will be based on sediment samples collected for bench scale dewatering tests.
- +4 inches material will be removed from dredged sediment prior to being transferred to the desanding operations.
- Dredged material will be transferred to the desanding operations in a 10 to 20% solids slurry (by weight).

- Filtrate generated by the dewatering operations will be utilized to produce the 10% to 20% solids (by weight) slurry.
- Filtrate generated by the dewatering system will be acceptable to the dredging contractor for recycle.
- Excavation bucket will be 75% effective during dredging operation (i.e., 25% of each bucket volume is excess seawater).
- Maximum allowable dredge rate limited by maximum feed rate of desanding system, maximum production rate of the dewatering system, and maximum treatment capacity of water treatment plant.

Desanding Operations

- Desanding operations will separate the +3/8 inch and +200 Mesh material prior to transferring dredged material to the dewatering system.
- +3/8 inch material is 1.1% (by weight) dry solids based on data obtained during bench scale dewatering test.
- % solids (by weight) of +200 Mesh material varies from 19% to 80% based on data obtained during bench scale dewatering test.
- Desanding operations will remove 100% of the +3/8 inch material and 70% of the +200 mesh material.
- Separated material will have a solids content of 70% (by weight).
- Desanding operations will operate in parallel with the dredging operations and will be conducted in two 10 hour shifts/day, 6 days/week.
- Effective operating time will be 8 hours/shift.
- Maximum allowable feed rate cannot exceed 2,500 gpm and/or 1.6 mgd based on a transfer slurry with a 15% solid content.

Dewatering Operations

- Based on the design criteria approved at the December 6, 2001 Dewatering On Board Review Meeting, the dewatering system will include four (4) 650 ft^3, 225 psig diaphragm plate and frame filter presses.
- Dewatering system will operate 24 hours/day, 6 days/week.
- Maximum dewatering system production rate is 816 yd^3/day.
- Filter cake will be produced from dredged slurry with the +200 mesh material removed.
- Each filter press will generate 17 yd^3 of filter cake per operating cycle.
- Each filter press completes a full cycle every 2 hours. Therefore, the maximum number of cycles/day is 48.
- % solids of filter cake will average 65% but could vary from 45% to 70% (by weight) depending on the mechanical dewatering systems utilized.

Water Treatment Operations

- The existing CDF Cells #1 and #2 will be available for water treatment.
- The water treatment system will operate 24 hours/day, 7 days per week.

5.1.2 Mass Balance Calculations

Based on the assumptions and bench scale data, mass balance spreadsheets were developed for a variety of potential operational conditions. Spreadsheets were developed for each of the following six filter cake % solids (by weight): 45%, 50%, 55%, 60%, 65%, and 70%. Process variables that were adjusted for each are: a) the solids content of the transfer slurry from the SPU (10%, 15%, and 20%); and b) the in-situ solids content and the associated sand content. As a result 12 mass balance spreadsheets for each filter cake % solids were developed.

5.1.3 Conclusions

Based on the results of the mass balance calculations the following observations were made:

Dredging

- Assuming the dredge rates determined in the mass balances are achievable, the limiting factor for a MEHT dredging operations is the mechanical dewatering operation.
- The highest dredge rate was 2,384 yd^3/day and occurred at 37% in-situ solids content, 15 to 20% solids dredge transfer slurry, and 70% solids filter cake.
- The lowest dredge rate was 605 yd^3/day and occurred at 77% in-situ solids, 10 to 20% solids dredge transfer slurry, and 45% solids filter cake.
- The average dredge rate was 2,002 in-situ yd^3/day at 42% in-situ solids, 15% dredge transfer slurry, and 65% solids filter cake.

Desanding

- The highest flowrate to the desanding system was 1,667 gpm and occurred at a variety of operational conditions.
- The lowest flowrate to the desanding system was 540 gpm and occurred at 37% in-situ solids, 20% solids dredge transfer slurry, and 45% solids filter cake.
- The average flowrate to the desanding system 1,423 gpm and occurs at 42% in-situ solids, 15% dredge transfer slurry, and 65% solids filter cake.
- The largest quantity of +3/8 inch material generated was 17 dry tons/day and occurred at 77% in-situ solids content, 20% solids dredge transfer slurry, and 60 to 70% solids filter cake.
- The lowest quantity of +3/8 inch mesh material generated was 5 dry tons/day and occurred at 37% in-situ solids, 10 to 20% solids dredge transfer slurry, and 45% solids filter cake.
- The average quantity of +3/8 inch mesh material generated was 10 dry tons/day and occurs at 42% in-situ solids, 15% dredge transfer slurry, and 65% solids filter cake.
- The largest quantity of +200 mesh material generated was 868 dry tons/day and occurred at 77% in-situ solids content, 20% solids dredge transfer slurry, and 65% solids filter cake.
- The lowest quantity of +200 mesh material generated was 66 dry tons/day and occurred at 37% in-situ solids, 10 to 20% solids dredge transfer slurry, and 45% solids filter cake.
- The average quantity of +200 mesh material generated was 213 dry tons/day and occurs at 42% in-situ solids, 15% dredge transfer slurry, and 65% solids filter cake.

Dewatering

- The highest flowrate from the desanding operations to the dewatering operations was 1,644 gpm and occurred at 37% in-situ solids content, 10% solids dredge transfer slurry, and 60 to 70% solids filter cake.
- The lowest flowrate from the desanding operation to the dewatering operations was 525 gpm and occurred at 37% in-situ solids, 20% solids dredge transfer slurry, and 45% solids filter cake.
- The average flowrate from the desanding operation to the dewatering operations was 1,376 gpm and occurs at 42% in-situ solids, 15% dredge transfer slurry, and 65% solids filter cake.

Dewatering System Filtrate

- The highest hourly average filtrate flowrate from the dewatering operations was 1,010 gpm and occurred at 37 to 77% in-situ solids content, 10% solids dredge transfer slurry, and 70% solids filter cake.
- The lowest hourly average filtrate flowrate from the dewatering operations was 235 gpm and occurred at 37% in-situ solids, 20% solids dredge transfer slurry, and 45% solids filter cake.
- The average hourly average filtrate flowrate from the dewatering operations is 803 gpm and occurs at 42% in-situ solids, 15% dredge transfer slurry, and 65% solids filter cake.

Required WTP Capacity

- The highest required WTP capacity was 267 gpm, which occurred at 37% in-situ solids content, 15 to 20% solids dredge transfer slurry, and 70% solids filter cake.
- The lowest required WTP capacity was –32 gpm which occurred at 77% in-situ solids, 15 to 20% solids dredge transfer slurry, and 45% solids filter cake. The negative capacity indicates that all the filtrate water is recycled and make-up water (32 gpm) is required.
- The average required WTP capacity is 196 gpm which occurs at 42% in-situ solids, 15% dredge transfer slurry, and 65% solids filter cake.

Table 5-1
Basis of Design

Operation	Design Objective	Design Basis	Operational/Other Parameters
Desanding Operation	Process full range of slurry flowrates from dredging operations.	- Dredge Production Rate calculated back from allowable daily filter cake production. - ≥ 4-inch material removed at dredge. - Separate the +200 mesh material from dredge stream using specific gravity criteria (2.3 to 2.64). - Produce coarse, cohesionless material (+200 mesh) and 70% solids by weight. - Control air emissions/odor. - Control stormwater (25-year event)	- Hydraulically handle up to 4,500 gpm with one treatment unit out of service of 10 to 20% solids by weight slurry with ≥ 4-inch material removed during dredging operations. - Neither chemicals nor additives used in the separation process. - Allow segregation of reject on a daily basis. - Provide an impervious work pad with containment for a lay down storage area. - Provide enclosed building for equipment in order to capture, control, and treat point source emissions. - Provide redundancy and ensure equipment reliability. - Provide available utilities connections. - Truck route with decontamination area after loadout area for materials handling of TSCA/non-TSCA reject. - Capture rainwater, decontamination water, and liquid from gravity drainage of reject, and any cleanup water from decontamination pad. Pump to Cell #1. - Storage capacity of desanded slurry for flow equalization. - Pumps and slurry line to transport material to Area D. - Provide covered storage capacity for analytical sampling of solids to determine TSCA/ non-TSCA characteristics (must take into account laboratory turn around times). - Must control odors/emissions (must meet all discharge limit criteria). - Receive sand filter backwash and clarifier sludge from WTP.
Mechanical Dewatering Operation	- Produce the driest filter cake that passes a paint filter test and be adequate for transportation and disposal using the most economically feasible method.	- Filter cake produced per 24-hour day. - Chemical conditioning parameters - Filter cake characteristics. - Total suspended solids (TSS) of filtrate. - Filtrate disposal and treatment. - Air emissions/odor limitations. - Dewatering operations must occur within the space provided in the process area of the building.	- Size system to produce 816 cy of filter cake for a 24-hour work day. - No conditioning chemicals other than polymer will be allowed. The polymer can be delivered either as an emulsion, solution, or dry mix. - Polymer may be added in the conditioning/mixing tanks prior to dewatering or metering in-line with the slurry. - Reliability, housekeeping, and dust control preclude the use of conveyors for cake handling. - Storage capacity for slurry pumped from Area C for equalization prior to dewatering. - Filtrate will average 30 ppm TSS. - Recycled filtrate can be used for polymer makeup. - All open tanks will be covered with exhaust emissions directed to an air treatment process prior to discharge. - Provide available utilities connections.

Table 5-1 – *Continued*
Basis of Design

Operation	Design Objective	Design Basis	Operational/Other Parameters
Dewatering Facility	- Building and site improvements should be designed to accept mechanical dewatering process equipment, loadout area, support building, and disposal via rail or truck.	- Four (4) 225 psig, 650 cf pre-squeeze volume diaphragm plate filter presses with appurtenant equipment used for sizing building. - Building size should be based upon potential dewatering equipment and equipment loads. - Open floor plan should be used to allow alternate dewatering equipment and layouts. - Secondary containment requirements. - Sump sizing and drains. - Foundation design criteria. - Building design assumptions – snow and wind loads, drainage, flood, and fire protection. - Eave height. - Heating, ventilation, and air conditioning (HVAC).	- Building and site improvements designed for a 20-year life. - Wharf Tavern and most of existing paved parking area will not be impacted. - Building floor load design 750 psf. Pier and wharf load design 1,000 psf. - Six-inch continuous curb inside building perimeter to provide secondary containment for a maximum spill of 50,000 gallons. - Transport options (rail or truck). - Loadout options (fork truck, crane, and/or loader). - Clear height minimum 30 feet in process area; 36.5 feet in loadout area. - Vents and louvers provided for cooling in both process and loadout areas. - Sprinkler system installed for fire suppression. - Floor areas are flat with drains sloping to sump. - Process floor, loadout floor, and sump will be treated with an impervious coating to resist chemical/physical degradation. - In ground sump to have a useable volume of 26,000 gallons based on an hourly average flowrate and a 2,000 gpm transfer pump. - Sanitary facilities will be connected to existing public sewer. - Railyard and loadout area to provide storage of twelve (12) gondolas. This will allow for one or two trips per day across Herman Melville Blvd. - Adjacent support building will have an HVAC system separate from the main building (decontamination room, showers, lockers, changing area, bathrooms, and kitchen/break area will be included in the support building). - Transformer will be located near the outside southwest corner; Motor Control Center (MCC) will be located on the inside wall of the southwest corner.

6.0 DESANDING/DEWATERING FACILITIES DESCRIPTION

The following desanding/dewatering facilities descriptions were developed based upon the design criteria and basis of design previously presented in Sections 4.0 and 5.0. **These descriptions are provided to demonstrate that the building facilities and layouts are adequately sized to accommodate a desanding/dewatering system and should not be interpreted as the detailed design for the desanding/dewatering processes specifically.** The desanding/dewatering processes will be procured under a separate contract based on the performance criteria presented in the technical specifications.

Figure 6-1 shows the general process flow for the overall harbor remedial action. The major elements are: (1) dredging or excavation; (2) desanding and mechanical dewatering; (3) transportation and disposal of dredged materials; and (4) water treatment. This report describes desanding and dewatering.

6.1 Conceptual Desanding Process Description

The desanding system will include coarse/fine material separation, equalization tanks for dredged slurry material, sampling capabilities, and pumping facilities to convey the slurry to the dewatering facility at Area D. The design flowrate from the dredge is 2,500 gpm. The specifications will require a peak capacity of 5,000 gpm, with one treatment unit out of service. The high redundancy is included to ensure that the separated materials can be made non-TSCA. This can be achieved through a higher residence time. A process flow diagram of a typical desanding system that would meet the design criteria is provided in Figure 6-2. The Area C site plan and equipment layout is shown in Figure 6-3.

6.1.1 Coarse/Fine Material Separation

The conceptual coarse/fine material separation system is comprised of three (3) 12,000-gallon V-bottom desanding units, which will operate in parallel to accept the dredged sediment slurry. Each unit will have an influent capacity of 2,500 gpm and be comprised of the following:

- A four (4) feet x eight (8) feet scalping shaker to remove the +3/8 inch material. This is the initial screening of all dredged sediment. Material passing the screen will gravity flow into the tank. Reject will fall off the screen edge.
- A 12-inch-diameter shaftless screw auger located at the V-bottom base and will continue along the total length of the tank. The higher specific gravity material will settle out and be augured to the intakes of the desanding pumps.
- The desanding pumps draw the augured, heavier solids towards them and pump the material to two (2) sets of three (3) hydrocyclones located atop the tank.
- The hydrocyclones will separate this material based upon specific gravity and particle size. The lighter, smaller particle material is rejected and will be sent back towards the top of the unit and discharged back into the tank. The denser material will settle to the sides of the unit and eventually progress downward towards the cone apex. This material drops on linear motion shakers.
- Two (2) four (4) feet x eight (8) feet linear motion shakers with +200 mesh screens accept the coarser reject that will discharge from the bottom of the hydrocyclones. The reject is separated from any extraneous carriage fluid, and will drop off the edge of the shaker. This material should be dry enough to pass a paint filter test.

Technical information for the coarse/fine material separation equipment described on previous page is provided as part of the material separation calculation located in Appendix C.

6.1.2 Equalization/Slurry Transfer Tank

Desanded slurry will be held in equalization tanks prior to pumping to Area D. Since the dredge will operate at a rate of about 16 hours/day, this combined capacity of these tanks and the storage and mixing tanks at Area D will, at a minimum, hold enough slurry to keep the mechanical dewatering process in full operation 24 hours/day. Average flow of 15% slurry from 42% in-situ sediment for 16 hours is 1,321,000 gallons/day. A minimum storage capacity of 345,000 gallons is required based on the average flow of a 10% slurry from 42% in-situ sediment for 16 hours/day (2,155 gpm). This storage capacity would include 120,000 gallons at Area C (6-20,000 gallon frac tanks) and 260,000 gallons at Area D (2-50,000 gallon equalization tanks and 8-20,000 gallon frac tanks). Should additional storage be required, additional frac tanks could be installed at Area C.

6.1.3 Separated Material Storage

A total of five (5) storage bins will be provided for separated material. One (1) for oversized material separated at the dredge, one (1) for +3/8 inch material, and three (3) for the +200 mesh material. All five (5) storage bins will be of equal size to provide for flexibility in the dredging/desanding operations. The storage bins were sized to store three days worth of +200 mesh material at the average dredge rate. The minimum storage capacity of 629 yd^3 which was based on the daily volume of +200 mesh material generated when excavating in the mudflats (77% in-site solids, 81% sand, 15% solids in slurry, 1.6 gpd). Each storage bin will be 47 feet by 47 feet and will be capable of holding a minimum 621 yd^3 of material. Detailed calculations supporting the storage bin sizing are provided in Appendix C.

6.1.4 Desanding Building and Support Facilities

The desanding units and equalization/slurry transfer tank will be housed within a temporary building. The building system will include ventilation and heating systems, air emissions control systems, an asphalt pad/foundation, site drainage, and support facilities. A brief description of each of these is provided below.

<u>Ventilation and Heating</u>

An air inlet opening will be provided on the opposite side of the desanding facility from exhaust blower to achieve effective cross flow ventilation of the structure. The opening and exhaust are located such that blower effectively draws air contaminants away from workers while providing outside fresh air through the inlet opening. Site personnel will operate the exhaust blower as required to provide equipment and general area ventilation. Flow modulation will be conducted using an inlet damper to achieve required flow. HVAC calculations are provided in Appendix C. Figures and process flow diagrams for the conceptual HVAC system are provided in Appendix G.

<u>Asphalt Pad/Foundation</u>

A curbed asphalt pad will be placed on the Debris Disposal Area (DDA) that will be large enough to support the process equipment, holding tanks for desanded slurry, storage area for +3/8 inch and +200 mesh reject, and truck loadout. An impervious protective geomembrane with stone and sand will be used as subgrade materials for the asphalt pad.

Grading and Drainage

The area east of CDF Cell #1 previously identified as the DDA will be graded to divert stormwater runoff away from the asphalt pad. The asphalt pad will be designed to collect stormwater runoff and wash water for process equipment to a sump. The sump pumps, to be supplied by the desanding contractor, will be designed to handle the run-off from a 25-year storm event. All stormwater, which comes in contact with any sediment, will be diverted to the sump. The collected water will be pumped to Cell #1.

Support Facilities

Existing personnel support facilities will be used at Area C. A truck decontamination pad will be required at the exit from the DDA.

Perimeter Fence

The existing 10 feet high chain link fence will be used at Area C. No additional fence will be installed. Refer to design drawings for fence location.

6.2 Desanding Facilities

The Debris Disposal Area (DDA) located just east of Cell #1 will be made available for all desanding operations.

6.2.1 Utilities

A potable cold water system will be extended from the existing on-site water supply line to the desanding facility area for future connection. The existing 2 inch backflow preventer will be replaced with a 4 inch unit. The desanding facility electrical service (480 volts, 3 phase, and 60 hertz) will be extended from existing service located on Sawyer Street.

6.3 Dewatering Process Description

The dewatering system layout is based on a diaphragm plate filter press system, which will generate 816 yd^3/day of 65% filter cake. The dewatering facility at Area D will include sediment holding tanks, polymer storage/make-up/feed system, slurry/polymer conditioning tanks, slurry dewatering equipment, material handling for TSCA and potential non-TSCA materials, and filtrate storage/transfer. A process flow diagram of the dewatering system is provided in Figure 6-4. The Area D site plan is shown in Figure 6-5. The equipment layout was used to determine the size of the building and required truck routes are shown in Figure 6-6.

6.3.1 Equalization/Holding Tanks

The desanded slurry generated at the desanding system will be pumped from Area C to slurry equalization/holding tanks located at Area D. The slurry holding tank(s) must accommodate the material generated from the desanding operation and provide a feed to the dewatering system with the following requirements. Slurry will be kept in suspension using manifolds fitted with eductors at the tank bottom to draw the material out of the tank and pump it back into the tank. An enclosure will be placed atop both tanks with a vacuum to draw out air that comes into contact with the slurry surface. This air will be treated prior to discharge.

6.3.2 Polymer Storage/Makeup/Feed System

An area has been set aside in the northwest corner of the building for polymer storage/makeup/feed. Storage for 20 tons of dry polymer or 5,000 gal. of raw water based or emulsion polymer is available. The makeup/feed system will consist of an eductor arrangement for dry or simple dilution of the wet. Dilution water will consist of recycled filtrate water to bring the polymer to 1% solution. Polymer feed will be directly to the polymer conditioning tanks or metered in-line as the fill pumps feed in the filter presses.

6.3.3 Polymer Conditioning Tanks

Polymer conditioning will be conducted to enhance dewatering ability. A predetermined amount of polymer can be added to condition slurry for subsequent dewatering. As with the larger equalization tank(s), the polymer/slurry conditioning tanks are also covered with accommodations to vent the emissions through a closed system to the vapor treatment process.

6.3.4 Mechanical Dewatering System

The material will then be transferred to 225 PSIG diaphragm plate filter presses capable of producing 1,117 (816 yd^3) tons of cake per day at 65% solids. For the proposed building layout and sizing four (4) 650 ft^3 presses were used. After the diaphragm squeeze cycle, each press will produce between 17 and 20 cy per cycle depending upon the percent solids of the feed slurry, permeability of the filter cake as it dewaters, and length of the feed cycle. Filter press cake should not drop below 65% solids with possibly 70% solids attainable. General technical information on the diaphragm plate filter press is provided in Appendix H.

6.3.5 Dewatering Filtrate Storage/Transfer

Filtrate leaving the presses will gravity flow through closed pipes to the building sump. Sump pumps will transfer the filtrate as well as decontamination water and general clean up wastewater to the Sawyer Street water treatment plant.

The sump has been sized to hold approximately 26,500 gallons based on the following assumptions:

- Maximum filtrate instantaneous flowrate from a 650 ft^3 diaphragm plate and frame filter press = 3,000 gpm. This flowrate occurs at the beginning of the dewatering operational cycle and last for approximately 5 minutes. Following this initial fill rate the filtrate flowrate decreases.
- Two (2) filter presses will not be filled at the same time.
- Based on the mass balance calculations (P-01) the average filtrate flowrate is 803 gpm. This value is based on an hourly average flowrate and does not reflect the higher initial flowrate of 3,000 gpm.
- Filtrate transfer line has been sized for a 3,000 gpm flowrate.
- The filtrate transfer pumps will be rated for 1,500 gpm.
- Transfer system will allow for two (2) pumps to operate in parallel to accommodate potential flowrates greater than 1,500 gpm.
- Sump will be sized such that the pumps cycle less than four (4) times an hour. (Calculation p. 06, Appendix C.)

The pipe used to transfer water to the Sawyer Street WTP will be the same type as used for the incoming slurry – high density polyethylene pipe (HDPE). As with the slurry line, this pipe will be anchored to the harbor bottom. Discharge will be directly transferred to Cell #2.

6.3.6 Filter Cake Handling

At Area D, filter cake will not be allowed on the floor. All slurry and filtrate will be contained in enclosed equipment at all times. After dewatering, filter cake will be immediately placed into covered conveyors or containers and directly loaded into trucks or rail cars. Filter cake in containers may be left uncovered inside the building for only a limited time. This requirement will minimize the generation of H_2S and thus minimize noxious odors within the facility. All dredged material (slurry, filtrate, filter cake, etc.) that inadvertently contacts the floor shall be promptly removed.

6.4 Dewatering Site Description

The following sections describe a process layout that could support the anticipated production rates. This layout has been used to size and specify the support building and facilities. Other process designs could be accommodated by the proposed support facility design. The required dewatering treatment capacity is based on balancing the capacity needed to complete the New Bedford sediment remedial action within a reasonable time with the anticipated variable annual funding and site space constraints.

6.4.1 Site Design

The Area D mechanical dewatering facility is proposed to be located on contiguous lots in a Waterfront Industrial District as defined by the Zoning Laws of the City of New Bedford (Zoning). These lots are AP72 Lot 284, AP72 Lot 294, and in part on AP72 Lot 283 currently occupied by the Wharf Tavern Restaurant. The site will be designed to minimize any encroachment to Lot 283 so that the current use of the property can be maintained. The eastern extent of Lots 294 and 284 will be extended by the construction of a cellular sheetpile bulkhead.

The following primary factors are considered in the site design:

- Siting of building(s)
- Development of vehicular traffic circulation, including railroad access
- Development of pedestrian traffic circulation
- Adequate grading and drainage
- Location and access to existing utility systems
- Physical security

<u>Siting of Buildings</u>

Issues influencing placement of buildings on the site include, but are not limited to, the following:

- Functional relationships for operations as described in the above mentioned sections
- Dimensional parameters as required by the Zoning
- The location and condition of soils at the property
- The facilities relationship to the existing business on Lot 283

In general, the dewatering facility site will be designed to serve: (1) transportation for disposal of non-TSCA/TSCA material off-site by rail service; (2) truck transportation service for non-TSCA/TSCA material brought on-site from vegetated upland areas that will be transported off-site by rail; and (3) transportation and disposal of all non-TSCA/TSCA material by truck, if rail service is not available.

The building facilities were placed within the buildable zone of the contiguous lots as defined in Section 9-297, *Dimensional Regulations* of the City of New Bedford zoning regulations.

The site is to be extended by the design of a cellular sheetpile bulkhead to accommodate the dewatering facilities. Existing soil conditions on the site, and placement of structures and fill for the bulkhead have further restricted the buildable area of the available property. For design, the facilities were placed to provide adequate foundation conditions.

The Wharf tavern operates a restaurant and truck washing service on Lot 283. Facilities were placed to minimize the impact to this business, while providing reasonable and safe relationships for the dewatering facilities operations and access to the site.

Development of Vehicular and Pedestrian Traffic Circulation

In general, standard design practices have been incorporated to determine the geometric layout and design of on-site vehicular circulation. Circulation is designed to promote safety, movement efficiency and to mitigate conflicts for different site activities. Vehicles expected on-site include passenger cars (P), single unit trucks (SU), and large semitrailer trucks (WB-50). Design vehicle size, dimensional traveled way requirements, and designations are as defined in Chapter 2 of the American Association of State Highway Transportation Officials (AASHTO). A Policy on Geometric Design of Highways and Streets. Additionally, a portion of the site is used for rail transportation.

Direct access to the facility is provided by two public rights of way: Herman Melville Boulevard along the West perimeter and Hervey Tichon Avenue along the South perimeter. Herman Melville Boulevard is a north-south roadway extending from Wamsutta Street to the north to MacArthur Drive to the south. Herman Melville Boulevard is the primary traffic collector for properties along the Acushnet River in this area. Hervey Tichon Avenue is a local secondary street that provides access to Herman Melville Boulevard for industrial properties in the immediate waterfront area. Efforts have been made to optimize the space required for operation. The key components of circulation for the dewatering facility are summarized below:

- A rail corridor is provided at the North side of the property to transport TSCA material off-site. A rail grade crossing is at Herman Melville Boulevard. The location and use of on-site rail was designed to avoid interruption other site movements, and security fencing is provided to control pedestrian traffic.

- Normal vehicular traffic (P)(SU) for parking access and delivery are provided via Hervey Tichon Avenue. One access driveway is provided to the lot with a total of 40 parking spaces, including two handicapped accessible spaces. Parking space and dimensional lot requirements were designed in accordance with the Section 9-207A of the zoning. Handicapped accessibility requirements were designed in accordance with the rules and regulations of the Architectural Access Board (521 CMR) pursuant to the zoning. Parking is aligned to lead pedestrian flow toward the main building entrance area and limit the number of places where pedestrians cross-vehicular traffic. Security fencing and signage are used to

prevent vehicular and pedestrian traffic from conflict with other site operations. The access driveway for parking areas was designed with the appropriate radii (15 feet) at curb cuts to accommodate design vehicles. Adequate throat length (25 feet) and width (25 feet) for the access aisles was provided to channel vehicles into the proper lanes and provide storage space for at least one vehicle to prevent vehicles which have slowed or stopped on-site from blocking the path of vehicles entering or exiting the site. Additionally, this provides an area to stop at security checkpoints as needed.

- SU trucks used on-site for delivery of materials, maintenance and solid waste pick-up at dumpster locations are planned to access and exit the site from Herman Melville Boulevard. This location was designed with the minimum width (24 feet) to accommodate design vehicles. The driveway was extended from the working area of the facility to Herman Melville Boulevard, providing approximately 180 feet of throat length. The aisle width was maintained at 24 feet to provide enough space to channel vehicles into the proper lanes during entry and exit to the driveway. Enough storage space is provided for several trucks to prevent vehicles which have slowed or stopped on-site from blocking the path of vehicles entering or exiting the site. Additionally, this provides an area to stop at security checkpoints as needed.

- Semitrailer trucks (WB-50) used on-site as an alternative to rail transport require use of a drive-in style truck loading area. For drive-in type facilities, clear establishment of traffic patterns is normally provided to maintain a continuous flow of traffic. A two-way approach and departure does not lend itself to this type of operation, therefore, truck circulation is provided in a loop system. To accomplish this efficiently, two options are provided. Trucks (WB-50) can access the site from Herman Melville Boulevard (Option #1) and/or Hervey Tichon Avenue (Option #2). Traffic movement for entry into the facility will be controlled by the use of signs and directional arrows. A more detailed description of each of these transportation routes is described below.

- For Option #1, the empty WB-50 trucks would enter the site from Herman Melville Boulevard north of the rail lines, drive east along the north bulkhead, and make a 180 degree turn into the loadout portion of the dewatering building. Trucks would line up along the 12-foot drive to prevent back up of trucks into Herman Melville Boulevard. A guard rail system would be installed along the northern portion of this road to prevent trucks from potentially driving off the bulkhead. The back lot is sized to accommodate the path of these vehicles. Trucks which enter the site via Herman Melville Boulevard will exit by way of the entrance located south of the rail tracks. All trucks used at this facility travelling on public streets will conform to all applicable State and local regulations.

- For Option #2, the empty WB-50 trucks would enter the site from Hervey Tichon Avenue through the 30-foot wide sliding gate. Trucks entering at this location are required to enter at an angle to navigate the required turns, therefore, a 50-foot curb cut was provided. As with Option #1, the back lot is sized to accommodate the path of these vehicles. Enough storage space to meet the peak design hourly volume (2-3 trucks/hour) is provided in the back lot to prevent the back up of trucks into Hervey Tichon Avenue. The trucks will exit the site at Herman Melville Boulevard (south of the rail grade crossing). The loop described here, limited to truck traffic used in site operations, prevent backup of trucks by reducing conflicts with trough traffic on-site and maintains orderly flow of trucks out of the facility. All trucks

used at this facility travelling on public streets will conform to all applicable State and local regulations.

- If rail transport were used for vegetated sediment, the loaded trucks would enter the site as described in Option #2 above. However, an alternative route for the trucks would be from Herman Melville Boulevard south of the rail lines, drive through the loadout area inside the building west-to-east, then turn around and return east-to-west through the loadout area inside the building. It is expected that only single-unit trucks (i.e., no trailer trucks) would be used for vegetated sediment transport due to the need to travel over narrow, congested city streets.

- Semi-trailer trucks for delivery of materials or process equipment do not have room to turn around west of the building. The building has an internal truck route, so that semi-trailers can pass through from either east-to-west, or west-to-east.

- Walkways are provided at parking areas and along the south face of the facility to lead pedestrian traffic to the main entrance area of the building and to the rear lot without crossing vehicular traffic lanes. Access aisles, accessible routes and ramps are designed to provide handicapped accessibility to the dewatering facility, attached support building and office trailers in accordance with the rules and regulations of the Architectural Access Board (521 CMR). A walkway is designed to lead pedestrian traffic from the dewatering building to a guard shack near Herman Melville Boulevard.

6.4.2 Grading and Drainage

Site grading was designed to manage stormwater run-off and to meet functional relationships for site operations and access to facilities. In general the following parameters were used as a basis for site grading and drainage:

- Maximum cross slope for driveways and parking areas – 0.02 feet/feet
- Maximum slope for driveways – 0.10 feet/feet
- Minimum slope along curb and gutter used to control drainage – 0.004 feet/feet
- Minimum slopes in paved areas – 0.01 feet/feet
- Maximum slope in paved areas – 0.04 feet/feet
- Minimum slope for surface drainage reaches of 50 feet or less – 0.01 feet/feet
- Minimum slope for surface drainage reaches of greater than 50 feet – 0.02 feet/feet
- Maximum cross slope for sidewalks – 0.02 feet/feet
- Minimum slope for sidewalks – 0.015 feet/feet
- Maximum slope for sidewalks – 0.083 feet/feet
- Maximum slope for ramps – 0.083 feet/feet

Generally, grading was designed to divert stormwater away from building facilities. Larger paved areas of the site were divided into catchment areas and drained toward the center of each where it is collected by an inlet. Driveways and the south side of the parking lot were drained with a cross-slope to the curb line. Drainage is collected along the curb by an inlet. Draining along the curb allows for flatter slopes. In parking areas this reduces problems that may occur on steeper slopes with rolling vehicles and opening cars doors.

Stormwater was divided into two areas: (1) Surface drainage and (2) roof drainage. Stormwater management was designed in accordance with the requirements of the Massachusetts Stormwater

Management Policy. Run-off from most impervious areas of the site is collected in a collection system and discharged to the Acushnet River following on-site treatment designed to remove 80 percent Total Suspended solids (TSS). Stormwater in the rail corridor will be sheet flow, and is expected to infiltrate. A grass-lined treatment swale (slope = 0.05 feet/feet) at the north perimeter of Lot 294 has been designed to divert run-on from Lot 248 to the River. Stormwater run-off from the dewatering facility roof will be collected and discharged to the River. Roof drainage is considered clean, and does not require treatment.

The dewatering facilities have been designed to meet requirements of a Special Flood Hazard Area pursuant to the zoning Division 12. The finish floor elevation has been designed to 9.0 feet NGVD29. This is above the base flood elevation, also known as the 10-year flood level, defined by the Flood Insurance Rate Maps (FIRM) for New Bedford as Flood Zone A being elevation 6.0 feet NGVD.

6.4.3 Landscaping

Due to proximity to adjacent buildings in the area of the dewatering facility, landscaping will be designed to minimize the impact of the operation of this facility. Exposed soils will be seeded with a specified grass mix. Additional vegetation (trees, shrubs, etc.) will be placed to improved the aesthetics of the site. This landscaping design will be in compliance with local zoning and ordinances and will be more aesthetically pleasing than the existing site conditions. The landscaping design will also provide permanent vegetative cover on exposed soils to provide long-term soil stabilization.

6.4.4 Perimeter Fence

Physical security is accomplished by the use of site fencing. Two types of fencing are designed: (1) perimeter fencing and (2) interior fencing. The key components of site fencing are summarized below:

Perimeter Fencing:

- Eight (8) foot high chain link fence.
- Designed to restrict site access for security and safety.
- Green winged PVC privacy slats screen site operations from abutters and general public.
- Access gates along the perimeter of the site will also be eight (8) foot high chain link fence with winged PVC privacy slats for screening purposes.
- Removable jersey barriers along eastern perimeter for safety.

Interior fencing:

- Six (6) foot high chain link fence without privacy slats.
- Designed to segregate the different areas of the site (i.e., seclude the parking lot area from the rest of the site operations, separate the railways from vehicular traffic and separate 2000 KVA transformer from personnel) and will not function as a screen, with the exception of the transformer fence.
- Eight (8) foot high chain link fence will be used in the area along the southern end of the proposed location of the support trailers. This section of fencing will also have winged PVC privacy slats. This shall be to screen the site operations along the western end of the

dewatering facility from abutters and general public when the access gate located to the south is open.

Gates:

- Two gates are to be provided along Hervey Tichon Avenue. The gate to the parking lot area shall be a eight (8) foot high, 26 feet wide, swing gate with winged PVC privacy slats. This gate will be primarily used by site personnel and visitors.

- The second gate along Hervey Tichon Avenue will be a 50 feet wide, eight (8) feet high, slide gate constructed to the east of the parking lot area. This gate will provide primary access to the site for transport trucks. This gate will also have winged PVC privacy slots to screen site operations from abutters and the public.

- Two access gates will be installed along Herman Melville Boulevard. One will be a 16 feet wide, eight (8) feet high, cantilever type single sliding gate and the other will be a eight (8) feet high, 30 feet wide, double swing gate. Both gates will have winged PVC privacy slats for screening purposes.

- The 16 foot wide cantilever gate along Herman Melville Boulevard will provide secondary access to the site for transport trucks should traffic become too congested at the Hervey Tichon Avenue entrance.

- The 30 foot wide double swing gate along Herman Melville Boulevard will installed across the proposed railroad tracks and will only be opened for rail traffic, which will be infrequent.

- A cantilever type slide gate will also be installed at the east end of the driveway off of Herman Melville Boulevard. This gate will be 30 feet wide and 8 feet high.

Pedestrian Gates:

- Pedestrian gates will be installed to provide pedestrian access where pedestrian routes intersect interior fencing. The height of the pedestrian gates will match the height of the adjoining interior fence. The widths of the gates will vary between 5 and 7 feet as needed.

Guard Posts:

- Because of the projected site vehicular traffic, guard posts (bollards) will be installed around the proposed dumpster, HVAC and electrical transformer pads, at building corners exposed to site traffic and at the overhead bay door entrances for protection from potential vehicular damage.

Guard Rail:

- A guard rail will be installed along the northern portion of the bulkhead to mitigate the potential for vehicles to drive off.
- Guard rail will be installed at other select locations to protect the building from adjoining traffic.

Jersey Barriers:

- Jersey barriers will be placed along the east side of the bulkhead to mitigate the potential for personnel and vehicles to drive off the bulkhead.

6.4.5 Utilities

Utility services are available in close proximity to the dewatering facility from Hervey Tichon Avenue. The following utility service connections are planned:

- Sanitary Sewer
- Electric
- Natural Gas
- Potable Water
- Potable water for fire suppression
- Telephone

All utility systems will be designed to meet the applicable requirements of Section 9-324 of the zoning for Special Flood Hazard Areas.

A potable cold water system will be extended from the exterior main into the building. A potable hot water system will be provided with hot water produced by natural gas water heaters. The potable cold water system will support the dewatering facility's dewatering operations, site personnel, fire suppression system, fire hydrants, and other miscellaneous water requirements. Natural gas service will be provided to support the dewatering facility's heating system and water heaters. Electrical service will be obtained at 480 volts, 3 phase, 60 hertz. Telephone service will be acquired for voice and data communications. In addition, a dedicated phone line will be provided for the instrumentation system. Sanitary sewer lines will connect the personnel support area and support trailers with the existing sanitary sewer lines.

The utility lines to the dewatering facility will run from services located along Hervey Tichon Avenue. The piping will be installed in suitable bedding material and backfilled with clean common fill.

6.4.6 Bulkhead Wall Design

In order to accommodate a dewatering facility in the Southern Lobe, a bulkhead will be constructed to enlarge the existing area of the Southern Lobe. The bulkhead walls will be designed as cellular sheet pile cofferdams filled with clean engineered backfill and capable of carrying a uniform load of 1,000 psf on the backfill. The east and north walls will be capped with a reinforced concrete cover. The bulkhead wall design will be completed by the USACE-NED and a draft copy of the basis of design is included in Appendix E.

6.5 Dewatering Building

6.5.1 Building Description

A building size of 53,550 gross sf with 30 feet and 36.5 feet clear heights was selected to provide sufficient space for the dewatering system. This building size is based on the bench scale dewatering tests and USACE and USEPA approval at the OBR Meeting in December 2001. The building will be a double span with a uniform loading criteria and overhead load-bearing steel members to maximize the

flexibility of the placement of the dewatering system equipment that meet the specified performance criteria and to support mechanical and electrical appurtenances.

The building will also contain segregated vehicle loading and decontamination areas to allow for decontamination and exit of one vehicle while another is being loaded. Refer to Figures 6-7 and 6-8 for elevation views of the dewatering facility. The building shall be designed for the following requirements:

- Wind loads, snow loads, seismic loads, etc., shall be designed according to the Commonwealth of Massachusetts State Building Codes, Chapter 16-Structural Loads.
- 36.5 feet clear height in cake loading area and rail track area to accommodate a large crane and 30 feet clear height in equipment area.
- Roof slope is 0.5:12.
- Refer to drawings S-501 through S-504 for external and internal column locations and column sizes.
- Refer to drawings G-201 and G-202 for the architectural views.

6.5.2 Foundation

The foundation for the dewatering facility has been conservatively designed to accommodate the likely dewatering process equipment, truck loading and rail loading. Refer to Appendix C for detail foundation calculations. The elevation of the slab for the general building was determined by drainage of the entire site and is set at 9 feet. Since the rail design is required to remain at the same elevation from Herman Melville Boulevard to the rail loading area inside the dewatering facility, the top of rail ties will be elevation 9 feet 8 inches. The main slab area has a 6-inch curb for containment of decontamination wash-down and possible spills. This curbed area is adequate to contain a 50,000 gallon spill should a catastrophic failure occur. Ramps have been designed into the slab to allow vehicles to enter the facility over the curb. To aid in collecting spills and filtration process water, a sump has been designed into the main slab foundation. Trench drains have been included in the design to properly drain the excess water and are sloped towards the sump pit. Trench drains have also been designed into the rail section of the slab and are recessed 6 inches to capture the water. There are no ramps in the rail area due to the requirement of the rail section to remain at the same elevation.

The foundation has been designed to meet various loads listed in Table 4-1.

The foundation will require a certain sequence of events to allow for construction which is anticipated to occur during the winter months. The first step begins with excavation and pouring of the concrete for the sump pit, bottom and sidewalls. The concrete for the slab will not be poured until the building is erected. Therefore, the exterior and interior footings will be poured and then the columns and building components will be erected. Trench drains, piping, and rebar shall be installed. Once these activities are complete, the slab can be poured under controlled temperature conditions to control curing and cracking.

6.5.2.1 Footings

The footings have been designed to withstand the building and the pressure of the subgrade. The reaction forces on the columns were calculated using design requirements below. These reaction forces and design requirements (Number 1 below) were used to design the footings. The calculations for the footings are included in Appendix C.

1. Maximum soil bearing pressure of 4,000 psf under dead load plus live load (service loads).
2. Wind loads, snow loads, seismic loads, etc., shall be designed according to the Commonwealth of Massachusetts State Building Codes, Chapter 16-Structural Loads.
3. 36 feet eave height in cake loading and rail track areas and 30 feet eave height in equipment area.

6.5.2.2 Building Sump

As mentioned in the above section, the purpose of the sump is to receive drainage from the trench drains and filtration process water. The sump has been analyzed for 750-pounds per square foot maximum live load on top of the sump. The sump is 30 feet square by 6 feet tall and has a volume capacity of approximately 26,000 gallons. It includes five internal columns to meet the 750 pounds per square foot requirement. Two five (5) feet square double leaf doors have been included in the design to allow access to the sump for cleaning and pump maintenance. The sump was designed to resist uplift from a temporary rise in groundwater to elevation 6.0 feet NGVD. Sump calculations are included in Appendix C.

6.5.3 Heating and Ventilation

Process and Loadout Facility Heating and Ventilation:

The Process and Loadout Areas are adjoining "General Purpose" high bay metal buildings. The support building also adjoins the process building on the West wall. Refer to Appendix H for figures, process flow diagrams, equipment schedules relating to the HVAC, and a description of design parameters and other details. Also refer to design calculations in Appendix C.

The process building which requires "Freeze Protection" heating utilizes wall insulation having a minimum thermal resistance of R-13 (hour-ft^2-^{o}F)/Btu and roof insulation having a minimum thermal resistance of R-19 (hour-ft^2-^{o}F)/Btu. The loadout area does not require insulation, unless condensation is a concern, since its temperature is not controlled.

The process building is bordered on the East wall by the loadout area and on the West wall by the Support Facility. South, West, and North walls are exposed to the outside environment. Heating requirements resulting from losses through the East Wall consider the loadout area to be 11°F, or equal to the outside design temperature, since it is unheated.

Personnel traffic flow generally enters the Support Building Breakroom, through the Restroom/Locker Rooms, and exits through the Decontamination Area into the process building. Airflow subsequently is managed so the Breakroom is the most positively maintained area with exfiltration from the Breakroom into the Restroom/Locker Rooms, out into the Decontamination Area, where the exfiltrated air becomes mixed with the process building ventilation air. This exfiltration pattern results in airflow from the "cleaner" facility area to less clean areas.

Outside air from the Support Building HVAC unit is supplied to the Decontamination Area to provide fresh conditioned air adjacent to the process building /Locker Room passageway.

An operating goal is to maintain the process building at a negative pressure with respect to the support facility and a positive pressure with respect to the loadout area and negative pressure with respect to outside air.

6.5.4 Fire Protection

The fire alarm system will be multi-zone, electronically operated, and electrically supervised. The system will include heat and smoke detectors, as well as dual-action manual pull stations. Alarm notification to the City of New Bedford Fire Department will be via a fire alarm system master box, hardwired to the fire department. In addition, the entire facility including the support facilities will have a sprinkler system.

6.5.5 Support Facilities

The support facility will consist of a building connected to the sediment dewatering building. The building will provide support services including decontamination, locker rooms, and a lunch/break room for the staff working in the dewatering facility. The support facility will consist of eight rooms or spaces: a decontamination room; male shower area; male locker room; female shower area; female locker room; lunch/break room; mechanical room; and cleaning/janitor's room. These facilities will have both heating and air-conditioning units.

6.5.6 Personnel Decontamination Area

The decontamination room will serve as the transition area from the dewatering facility to the shower/locker room. Personnel working in the dewatering facility will have to follow a decontamination procedure prior to entering the shower/locker room. For design purposes, the decontamination room will be designed for Level C personal protective equipment (PPE) decontamination, although lower PPE levels may be used. The primary contaminants of concern are PCBs and metals. Drums will be available for PPE disposal.

6.6 Transfer Pipeline

As part of the operations at the dewatering facility, two 14-inch diameter HDPE transfer lines will connect Area C with the dewatering facility. The first line will transfer slurry material from the desanding facility in Area C to the dewatering facility and the second line will transfer filtrate from the dewatering facility to the water treatment plant also in Area C. The final diameter calculations for these transfer pipelines will be made by the dewatering subcontractor.

These transfer lines will enter the site in the northwest area of the bulkhead and will penetrate a headwall. After the headwall, the transfer pipelines be distributed through twin 24-inch diameter carrier pipes (i.e. sleeves) from the headwall to the Facility. The carrier pipes will be comprised of HDPE and steel. In accordance with Section 5.3.4.3 of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual, the carrier pipes will be comprised of steel under the tracks and will terminate not less than 25 feet from the centerline of the outermost railroad track. Therefore, the carrier pipes in the area between the headwall and 25 feet north of Track 1 will be comprised of HDPE and the remaining portions of the carrier pipes will be comprised of steel.

The steel portions of the carrier pipes will be 24 inches in diameter, have a minimum thickness of 0.375 inches and will have a specified minimum yield strength of at least 35,000 psi. The HDPE portions of the carrier pipes will be SDR 11 HDPE pipes. In addition, the twin carrier pipes and joints will be leak proof.

After penetrating the headwall, the pipe system will then continue west approximately 45 feet before elbowing south toward the Facility. After this elbow, the pipe system will continue south approximately 115 feet, under the railroad tracks, and then terminate at the Facility's foundation wall. The transfer pipes will penetrate the Facility's foundation wall and empty into a sump constructed within the Facility's foundation.

In conformance with the AREMA, the carrier pipes under the railroad tracks will be installed at a minimum depth of 4.5 feet below the top of the railroad ballast. In addition, the carrier pipes will slope toward the Facility at an approximate slope of 0.2%.

The transfer lines within the carrier pipes will be properly supported and braced as necessary in accordance with the manufacturer's instructions and recommendations.

6.7 Truck Facilities

Loading and decontamination logistics are identical to those described for rail cars except that trucks would enter directly into the loading area through a motorized roll-up door. This entry into the building allows for direct access without need for backing up and minimizes potential interference between the two parallel trucks being loaded/decontaminated. Additionally, it has been assumed that local off-site weigh stations will be utilized for weighing operations.

6.8 CSX Interfacing/On-Site Rail

The dewatering facility will include on-site rail capabilities for off-site disposal of dewatered materials. The dewatering facility design includes a detailed design of the on-site rail system which is described in the section titled "Rail Description". This design includes horizontal and vertical alignment of rail centerlines and distances from structures in accordance with Army TM 5-850-2, the American Railway Engineers Maintenance of Way Association (AREMA) Manual, and CSX standard yard track guidelines. The rail will be partially built on the sheet pile cofferdam on the north side and the rest of the rail will be built on the new fill.

The trackage is required on-site to connect with a new rail spur across Herman Melville Boulevard that is currently being designed by the City of New Bedford. The spur will connect to a proposed rail yard that is also being designed by the City. Based on information from CSX representatives, they will bring railcars in and out of New Bedford once a day, five days a week. A separate subcontractor will perform the switching and moving of railcars from the dewatering facility to the off-site rail yard across the street and back.

To minimize the number of trips across Herman Melville Boulevard to the proposed rail yard, sufficient on-site storage is provided for six (6) gondolas or four (4) intermodals during the loading process time. This arrangement will allow for one to two trips per day of material (soil and filter cake) from the site. TSCA facilities require a maximum of 90 tons per railcar; therefore, gondolas are limited to carrying 90 tons. Holding capacity for intermodals is four (4) 20 tons, 20 feet long containers, per 90 feet long intermodal, and therefore, they carry a total of 80 tons. The off-site rail yard will have the capacity to

store approximately 60 gondolas or 35 intermodals on five lanes leased to CSX by the City of New Bedford.

6.9 Rail Description

6.9.1 Railcar Movement

Rail sequence of movement involves utilization of six 55 foot long gondolas or four 90 foot long intermodals simultaneously. The cars are first placed on Track 1 of the design. The on-site railcar pusher then moves the empty railcars to be filled one at a time from Track 1 to Track 3, which enters into the rail facility. When the railcar is filled, the railcar pusher then moves the loaded railcar out of the facility and places it on Track 2. Once all six gondolas or four intermodals are loaded on Track 2, they are taken across the street to the off-site rail yard for shipment to the TSCA facility. The facility is then replenished with empty railcars.

The loading building is designed primarily to handle 55 feet long gondolas or flat deck cars. However, there is a possibility that 90 feet long intermodal cars could be used in the future. These cars have two sections that are permanently attached. Therefore, the rail loadout area is 90 feet long (east-west direction).

The railcars are to filled and decontaminated at the east end of the track inside the building. When a railcar have been filled, closed, and decontaminated, the railcar will be moved west toward the weigh scale at the western end inside the building. Each axle shall be weighed and added up for the total weight of the railcar. This weight shall be added to the shipping papers that will be prepared by USACE/USEPA subcontractor before leaving the site. The shipping papers shall be in accordance with DOT regulation, Hazardous Materials Regulations 49 CFR, Parts 100 – 178.

6.9.2 Rail Layout

Due to the width restrictions of the dewatering facility site, the layout has utilized a No. 8 Lap Turnout and two 12-degree curves. Since this is a yard facility on the water, railcars are not to move faster than 5 mph. In the profile drawing, stations 3+75 to 0+00 slope a total of one inch from west to east, in order to compensate for potential settlement of the new fill material, which would slope the track forward allowing the railcars to roll. The west-end of Tracks 1 and 2 shall have hinge type car stops to prevent railcars from rolling west into the road, shown in Figure 6-9. The hinge type car stops allow for manual control of railcar movement on the property. The east-end of Tracks 1 and 2 shall have bolt-on heavy-duty bumping posts as illustrated in Figure 6-10.

6.9.3 Crossing Signal

The rail crossing across Herman Melville Blvd. Is being designed, supplied, and installed by the City of New Bedford. Automatic switches cannot be used since the existing length of track and property does not meet relative requirements.

6.9.4 Clearances

Allowable clearances in the State of Massachusetts can be found in the AREMA Manual Volume 4, Chapter 28, Part 3. Clearances for rail layout are listed in the table below:

Table 6-1
Clearances for Rail Layout

Location	Clearance (feet-inches)
Any two subsidiary tracks	13-0
Vertical	
General	22-6
Building Doors	22-6
In Buildings	22-6
Horizontal	
General	8-6
Building Doors	8-6
In Buildings	Not Required

6.9.5 Structural Design

The structural calculations provide sizing of various pieces of the design. A summary including all parts of the calculations is presented in the table below:

Table 6-2
Sizing for Rail Design

Description	Data
General	
Design Load	263,000 lb car (100 ton)
Rail Gage	
Rail Weight	AREMA section 115 lbs/yd
Rail Gage Spacing	4 feet 8 1/2 inches
Rail Length	33 or 39 feet
Ties	
Tie Cross-Section	7 x 9 inches
Tie Length	8 feet 6 inches
Wood Tie	New Hardwood (Oak) tie
Tie Spacing	21 inches
Ballast	
Ballast Depth	8 in
Ballast Grade	AREMA No. 5 (1/4 to 1 inch)
Drainage Quality	Good
Modulus of Elasticity	36,083 psi
Subgrade	
Subgrade Soil Classification	ASTM SW-Well graded sands
Subdrainage Quality	Good
Modulus of Elasticity	11,000 psi

Structural calculations have been completed and are referred to in Appendix C.

6.10 Desanding/Dewatering Air Emissions

A conceptual process design has been developed in order to estimate emissions from the desanding and dewatering processes. These emissions estimates have been used to evaluate regulatory compliance and the potential for on-site worker and public receptor impacts. The process assumptions and emissions calculations are presented in Appendix B. Based upon previous experience with dewatering of contaminated sediment, it was determined that the main releases of potential concern include emissions of PCBs, the generation of odors, and generation of fugitive dust. The anticipated controls that will be required to protect on-site workers and public receptors from potential emissions are summarized below.

6.10.1 Emissions Control for Protection of the Public

The project will be required to be protective of the public by ensuring that off-site impacts are less than health-based allowable ambient exposure limits at commercial and residential receptors. An evaluation of emissions from the process, and their potential for off-site impacts, has been performed. This evaluation is presented in Appendix B, with the conclusions summarized below.

Emissions estimates for PCBs have indicated that potential emissions from the process are less than regulatory thresholds, and therefore do not require controls under the regulatory programs. It is, however, likely that controls would be necessary to ensure that off-site concentrations of PCBs do not exceed the health-based allowable limits. For this reason, it is recommended that the largest sources of PCB emissions in the dewatering building (i.e., the slurry storage tanks, the conditioning tanks, and the filter press blowdown) be controlled. While the final method of control has not been determined, granular activated carbon would be an appropriate system. The specifics of this control system will be designed by the dewatering vendor and evaluated during the submittal process.

An emissions analysis has shown that the greatest potential for odor is at the desanding operations at Area C. As a result, it is recommended that air emission controls be installed with the desanding equipment to capture and remove hydrogen sulfide (H_2S), which is believed to be the primary odor-causing constituent. The most appropriate control system has not been determined, but there are several methods to control H_2S including wet scrubbing and absorption onto solid media. The specifics of this control system will be designed by the desanding vendor and evaluated during the submittal process.

There is the potential for generation of fugitive dust from handling the filter cake. However, the dewatering facilities are being designed so that the entire process will be enclosed in a building. For this reason, dust releases to ambient air (and therefore exposures to the public) are expected to be negligible, as any fugitive dust will likely remain within the building.

6.10.2 Emissions Control for Worker Health and Safety

During operations, there will be a potential for occupational exposures to PCBs, H_2S, diesel exhaust (including NOx), volatile organic compounds, metals and free silica. Refer to Section 6.1.4 for details on ventilation in the desanding facility. The proposed controls to ensure this compliance are summarized below.

Emissions of PCB vapors from the dewatering process are not anticipated to result in exposures to workers in excess of OSHA permissible exposure limits for 54% and 42% chlorine compounds. There are no OSHA standards for other PCB congeners, particularly for 1016, which has been found in

sediment contamination and in air samples during dewatering bench scale tests and other activities. However, the exposures to this and other PCB compounds are expected to be minimal, especially with the controls planned for the tanks in the dewatering facility.

Odors from the desanding and dewatering process will likely be generated from the dewatering process and on-site workers should be protected from these odors. The H_2S control system being proposed to reduce the potential for off-site odors at the desanding facility will also effectively protect on-site workers if it is used in conjunction with a local exhaust ventilation collection system.

There is the potential for fugitive dust generation from handling the filter cake inside the dewatering facility. If the cake were allowed to be handled, spilled or stockpiled on the floor it could dry out. Movement of equipment within the facility could result in dust generation through mechanical crushing and dispersion. This dust would be contaminated with PCBs and also with free silica as demonstrated in the dewatering bench test sediment analysis. Reducing spillage and using material handling methods that do not include stockpiling on the floor should control this hazard.

Workers may be exposed to diesel exhaust, in particular NOx emissions and diesel particulate. Selection of equipment with engines tested in accordance with the *Mine Safety and Health Administration* protocols, and establishing general ventilation flows consistent with the ventilation ratings of the equipment will control exposures to this hazard.

Although VOCs and metals may be found in low concentrations in the contaminated sediments, significant exposures are not anticipated. Controls applied for other contaminants (PCBs, free silica, H_2S) should be sufficient to preclude exposures to these contaminants.

6.11 Operation and Maintenance

The dewatering and desanding facilities will be equipped by the subcontractor with adequate tools, spare parts, equipment and personnel to ensure safe and proper operation. Dewatering and desanding activities will be immediately suspended if either of the facilities fails to operate properly.

In addition, operation and maintenance of the dewatering facility will likely include periodic short-term repairs to the bituminous concrete that will be placed on the east end of the site as the underlying organics consolidate (1-2 feet expected) under the weight of backfill.

6.12 Dewatering Facility Operators

Operators must have the education and skills necessary to operate and maintain the facilities in accordance with the substantive, relevant and appropriate Massachusetts and Federal regulations. Foster Wheeler will develop job descriptions that will provide for the selection of qualified operators. Some of the necessary certifications that could be applicable include 40-Hour HAZWOPER, 8-Hour Supervisor, and First Aid/CPR. Operators may also need to be involved in a medical monitoring program in accordance with 29 CFR 1910.120 and 1910.134 and undergo drug screening. Any additional Massachusetts requirements that are relevant for operators will also be required.

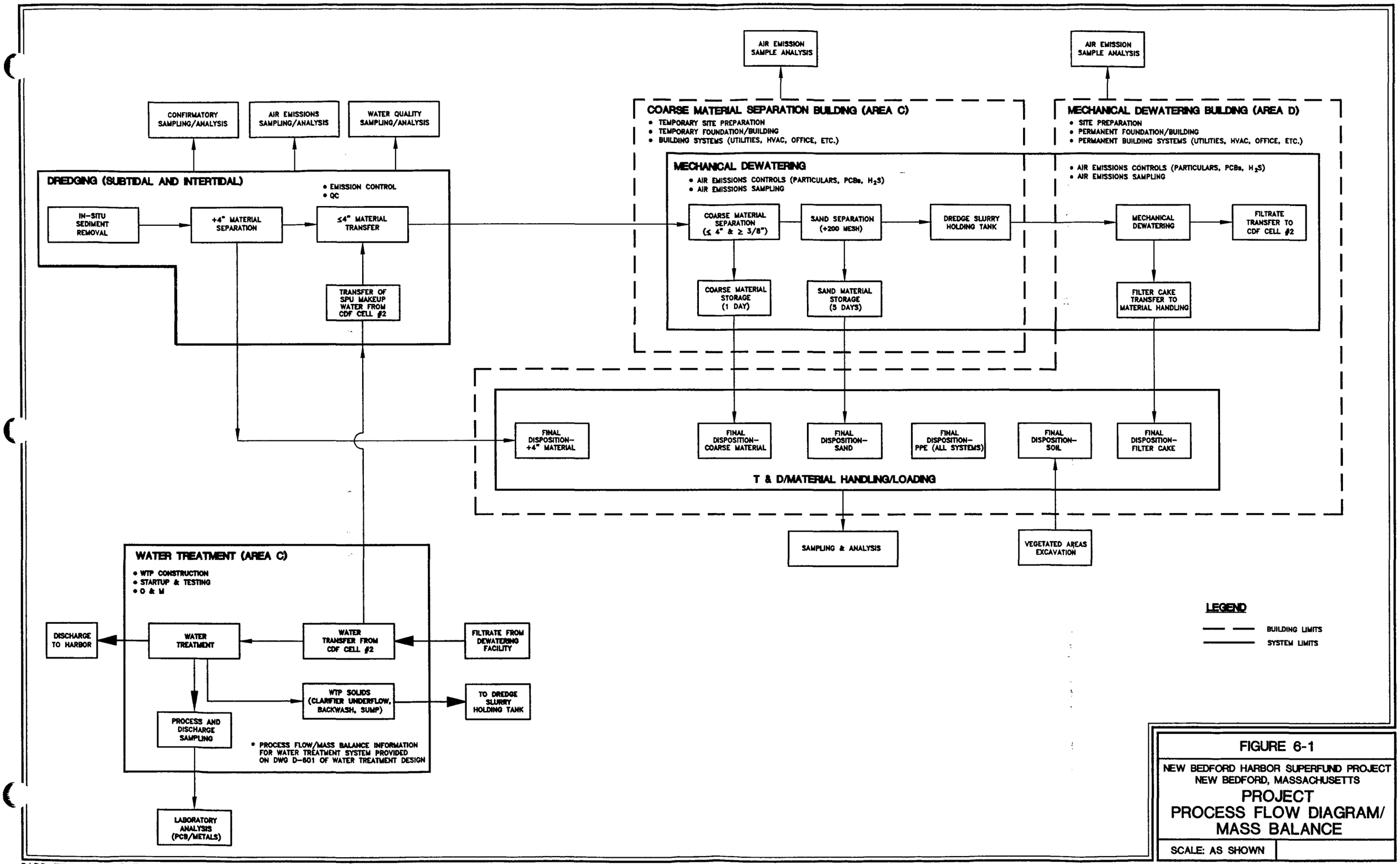


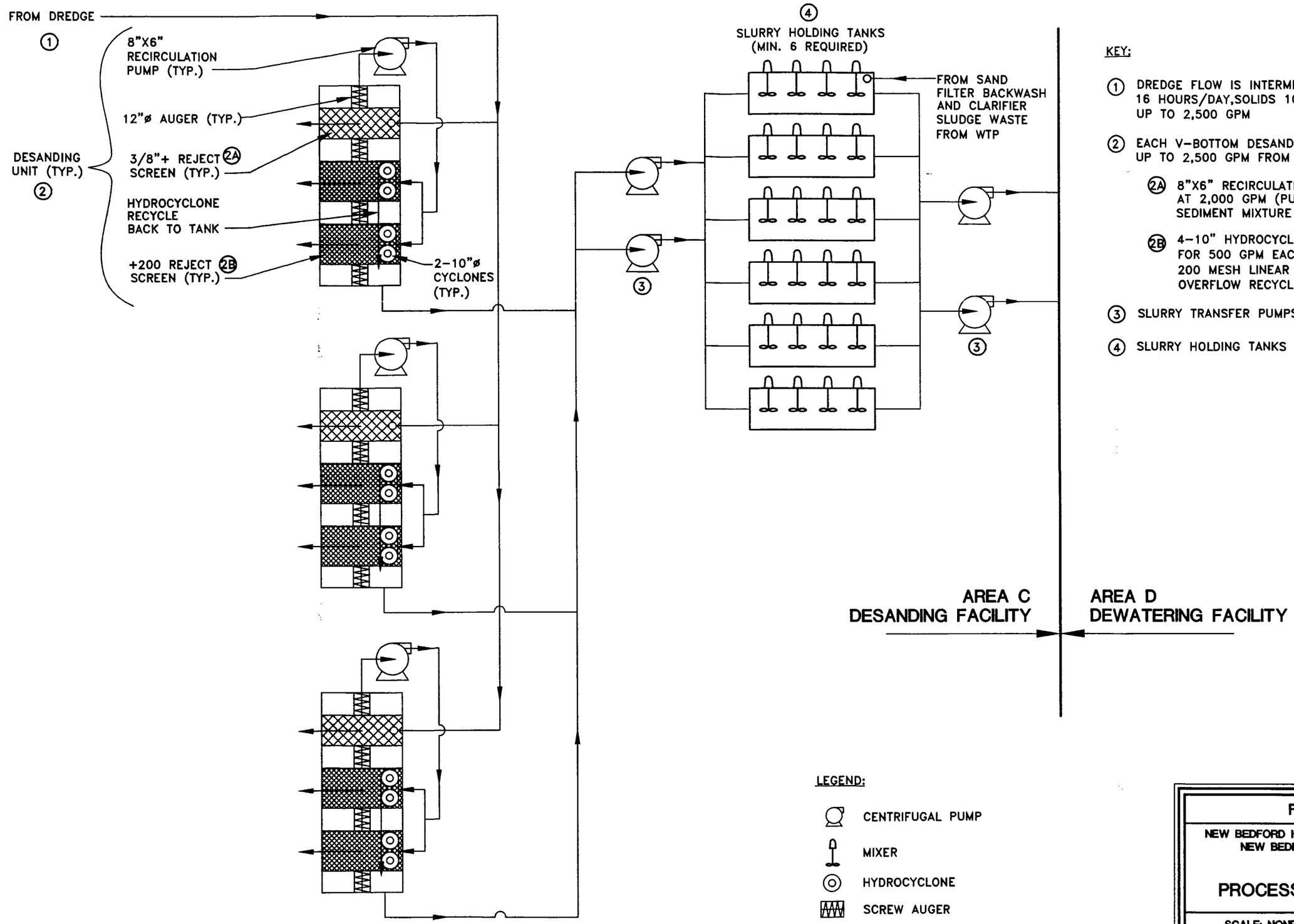
FIGURE 6-1

NEW BEDFORD HARBOR SUPERFUND PROJECT
NEW BEDFORD, MASSACHUSETTS

PROJECT
PROCESS FLOW DIAGRAM/
MASS BALANCE

SCALE: AS SHOWN

CADD FILE: 172093-PID-1F.DWG



KEY:

1. DREDGE FLOW IS INTERMITTENT UP TO 16 HOURS/DAY,SOLIDS 10%-20% (BY WT.) UP TO 2,500 GPM
2. EACH V-BOTTOM DESANDING UNIT CAN PROCESS UP TO 2,500 GPM FROM DREDGE. INCLUDES:
   - 2A 8"X6" RECIRCULATION PUMP, RATED AT 2,000 GPM (PUMPS SAND/ SEDIMENT MIXTURE TO HYDROCYCLONES)
   - 2B 4-10" HYDROCYCLONES ARE RATED FOR 500 GPM EACH, REJECT DROPS TO 200 MESH LINEAR MOTION SCREEN. OVERFLOW RECYCLES BACK TO TANK.
3. SLURRY TRANSFER PUMPS (2,000 GPM EACH)
4. SLURRY HOLDING TANKS (20,000 GAL EACH)

FIGURE 6-2

NEW BEDFORD HARBOR SUPERFUND PROJECT
NEW BEDFORD, MASSACHUSETTS

AREA C
PROCESS FLOW DIAGRAM

SCALE: NONE

CADD FILE: 172093-PID-5F.DWG

GENERAL NOTES

1. BASE MAP COMPILED AND CONTROLLED BY PHOTOGRAMMETRIC METHODS FROM FROM AERIAL PHOTOGRAPHS CONDUCTED BY JAMES W. SEWALL COMPANY OF OLD TOWN, MAINE ON DECEMBER 02, 1998.
2. BATHYMETRY IS BASED ON HYDROGRAPHIC SURVEY CONDUCTED BY THE U.S. ARMY CORPS OF ENGINEERS IN FEBRUARY AND MARCH 1999.
3. PROPERTY BOUNDARY AND EASEMENT DATA TAKEN FROM PLAN ENTITLED "PLAN OF LAND COGGESHALL MITCHELL AND SAWYER STREET PROPERTIES - NEW BEDFORD, MASSACHUSETTS FOR FOSTER WHEELER ENVIRONMENTAL CORPORATION", DATED JUNE 02 1999 BY SAI SURVEYING CORPORATION OF JAMESTOWN, RHODE ISLAND.
4. EXISTING UTILITY LOCATIONS DEPICTED AND NOTED HEREON ARE TO BE CONSIDERED APPROXIMATE.
5. THE LOCATIONS, ELEVATIONS AND DIMENSIONS OF ALL EXISTING UTILITIES, STRUCTURES AND FEATURES AFFECTING THIS WORK SHALL BE VERIFIED PRIOR TO CONSTRUCTION.
6. VERTICAL AND HORIZONTAL CONTROL DATA FOR THE SITE IS AVAILABLE AND WILL BE PROVIDED PRIOR TO CONSTRUCTION.

PROPERTY BOUNDARY LINE TABLE		
LINE	DIRECTION	DISTANCE
L1	N 08°57'38" W	22.40'
L2	S 06°52'44" E	3.00'
L3	N 81°07'16" E	21.95'

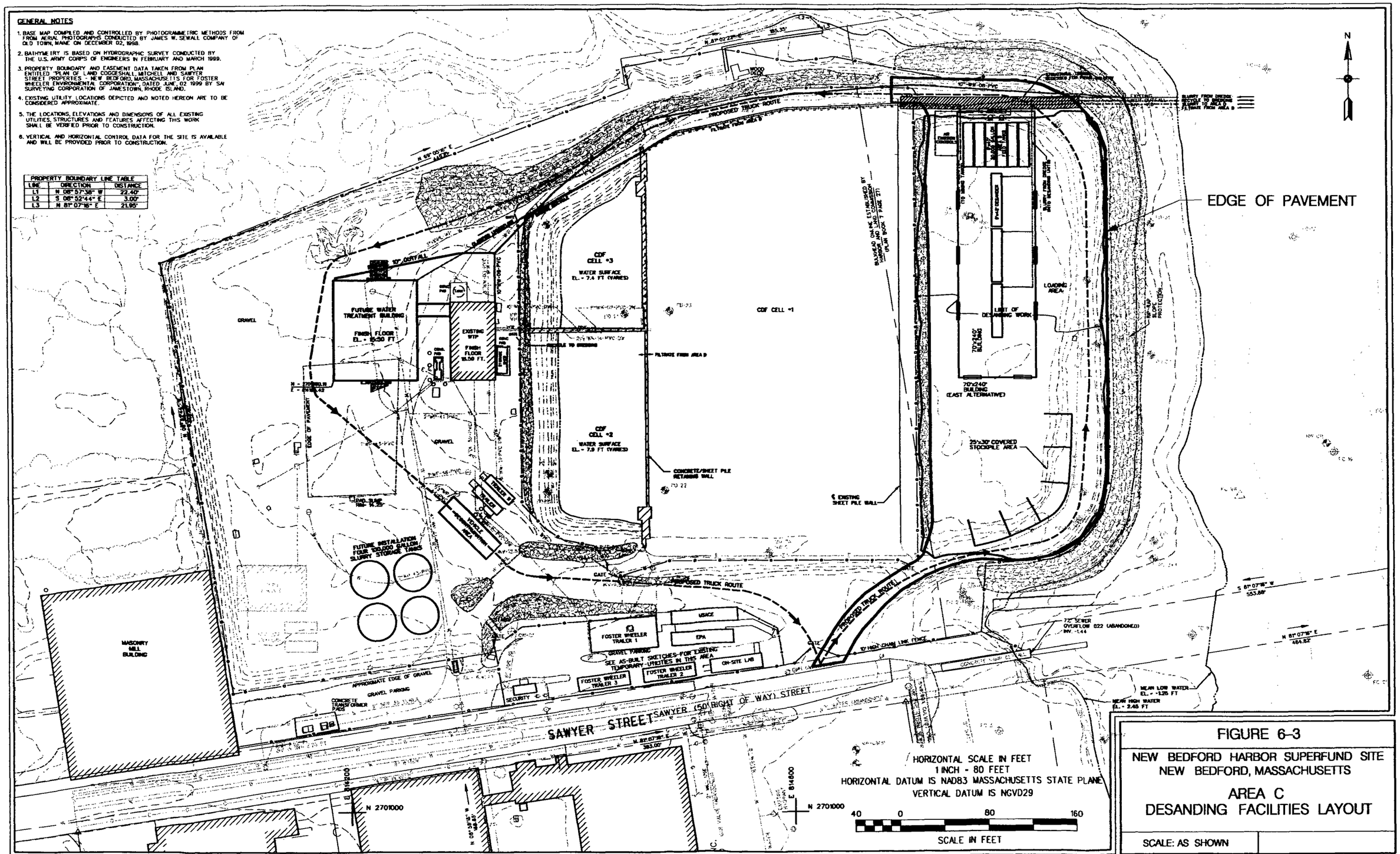


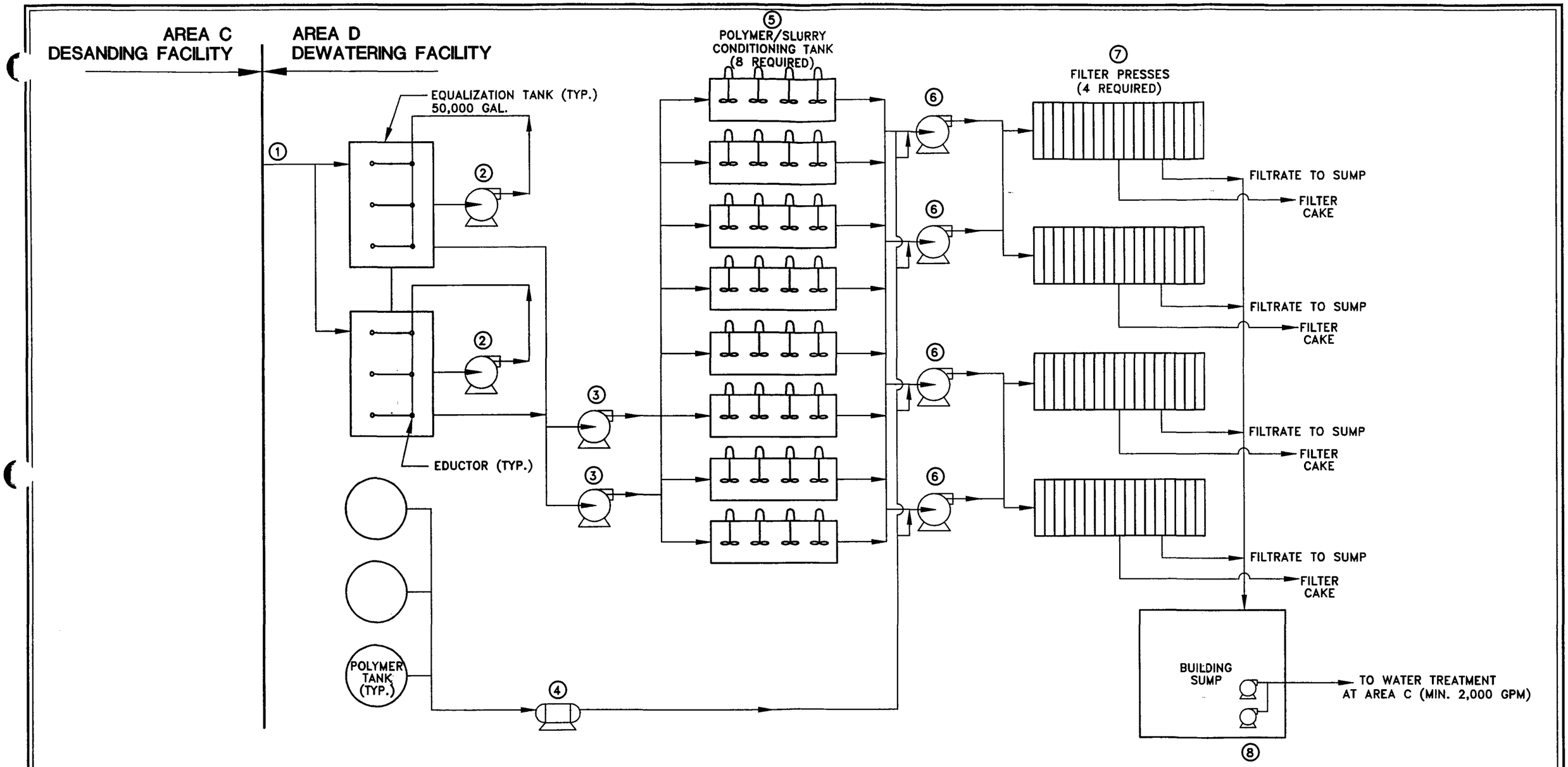
FIGURE 6-3

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

AREA C
DESANDING FACILITIES LAYOUT

SCALE: AS SHOWN

CADD FILE: 172093-C-701-1F.DGN



KEY:

1. SLURRY FEED FROM DESANDING OPERATIONS
2. RECIRCULATION PUMPS
3. SLURRY TRANSFER PUMPS (MIN. 2,000 GPM)
4. POLYMER METERING PUMPS
5. 8 POLYMER/SLURRY CONDITIONING TANKS (20,000 GAL. EACH)
6. FILTER PRESS FEED PUMPS (3,000 GPM)
7. 4-650 CF DIAPHRAGM PLATE PRESSES CAPABLE OF PRODUCING 15-20 CY OF CAKE PER CYCLE
8. FILTRATE PUMPS (1,500 GPM)

LEGEND:

CENTRIFUGAL PUMP

MIXER

FIGURE 6-4

NEW BEDFORD HARBOR SUPERFUND PROJECT
NEW BEDFORD, MASSACHUSETTS

AREA D
PROCESS FLOW DIAGRAM

SCALE: NONE

CADD FILE: 172093-PID-4F.DWG

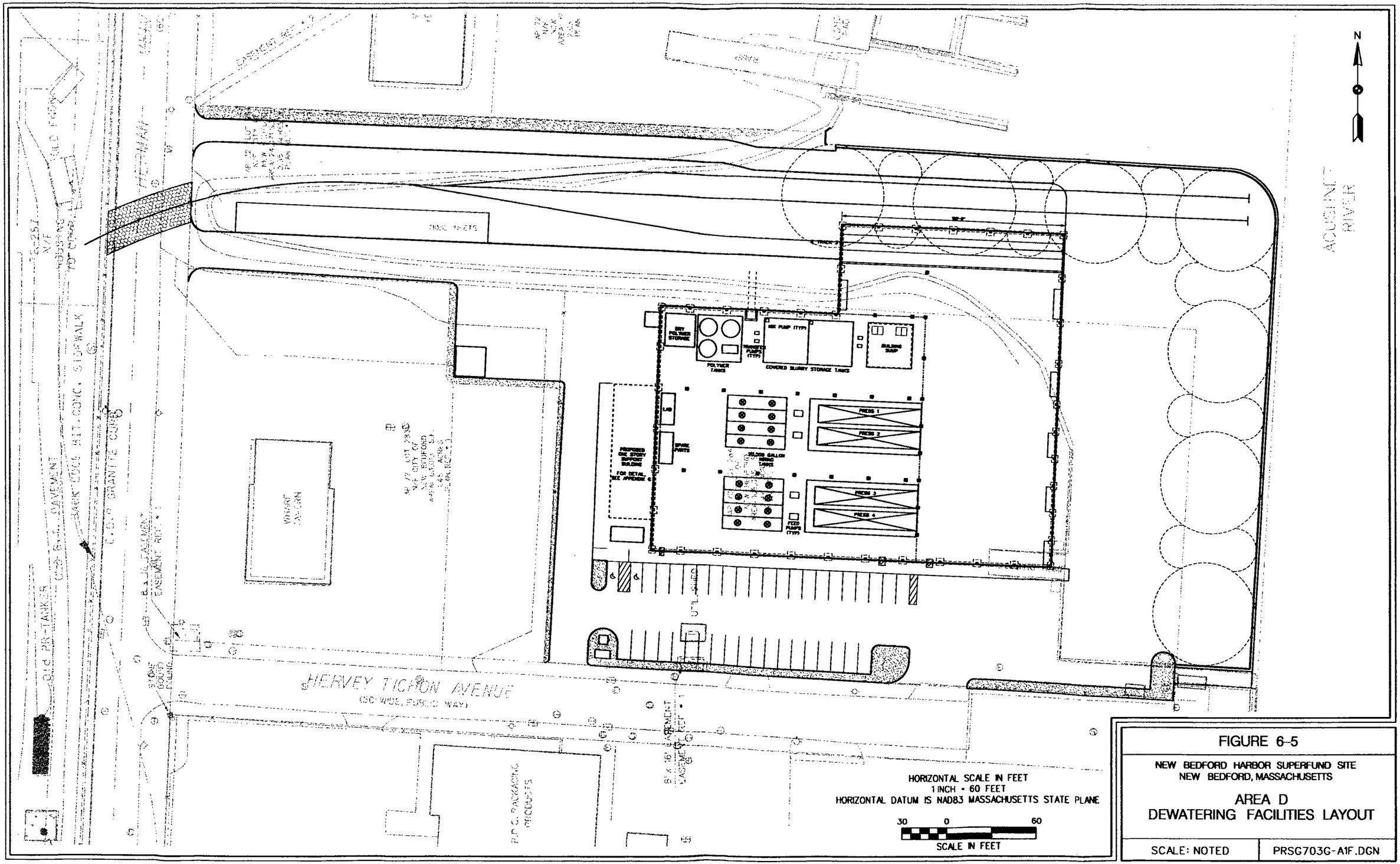


FIGURE 6-5

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

AREA D
DEWATERING FACILITIES LAYOUT

SCALE: NOTED | PRSG703G-A1F.DGN

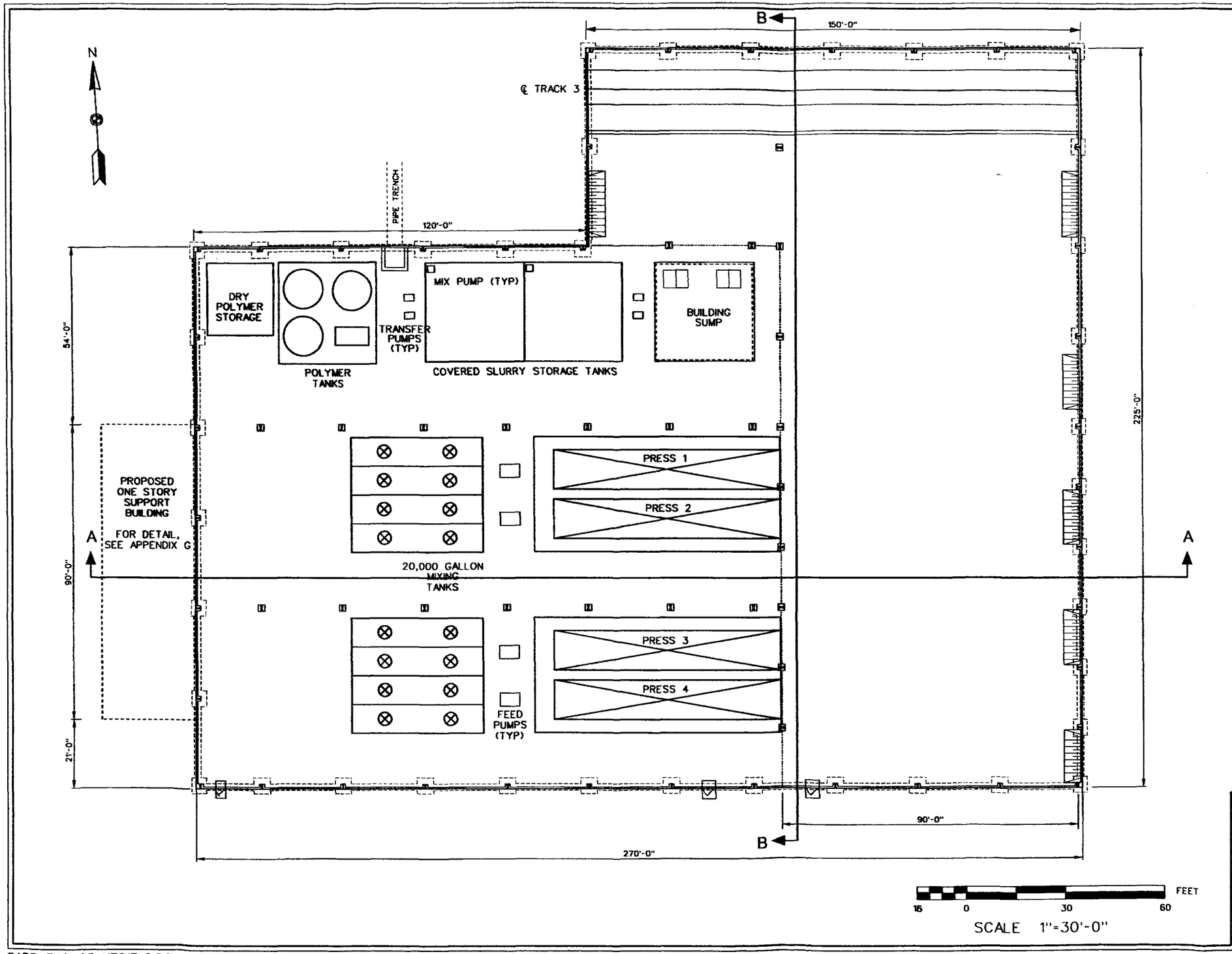


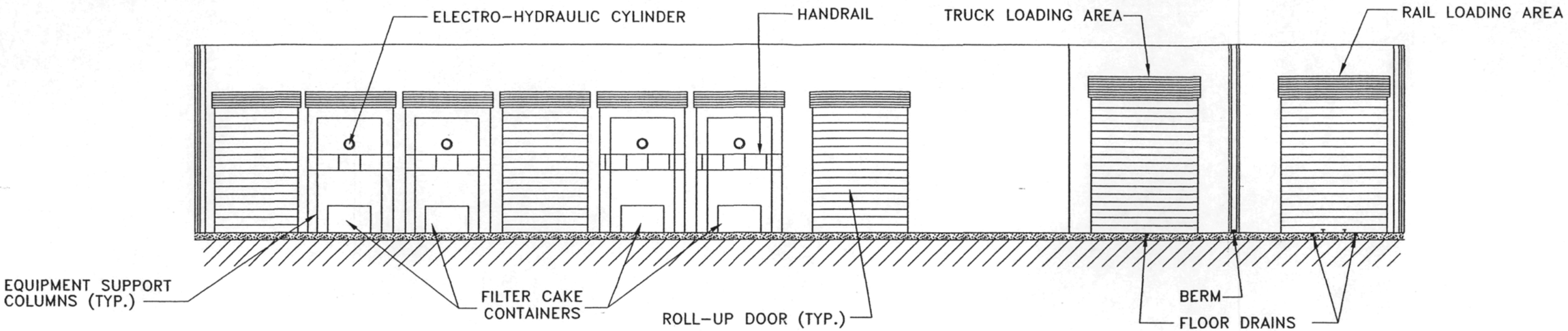
FIGURE 6-6

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

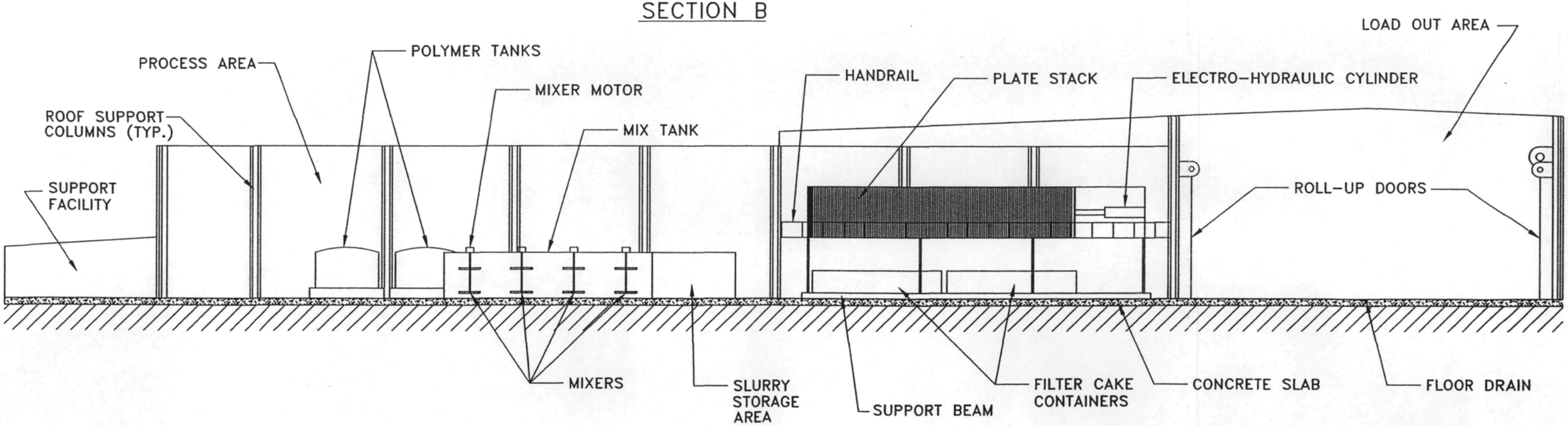
AREA D
DEWATERING EQUIPMENT LAYOUT

SCALE: AS SHOWN

CADD FILE: 93-M701F-2.DGN



SECTION B



SECTION A

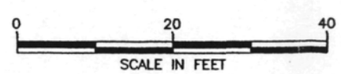


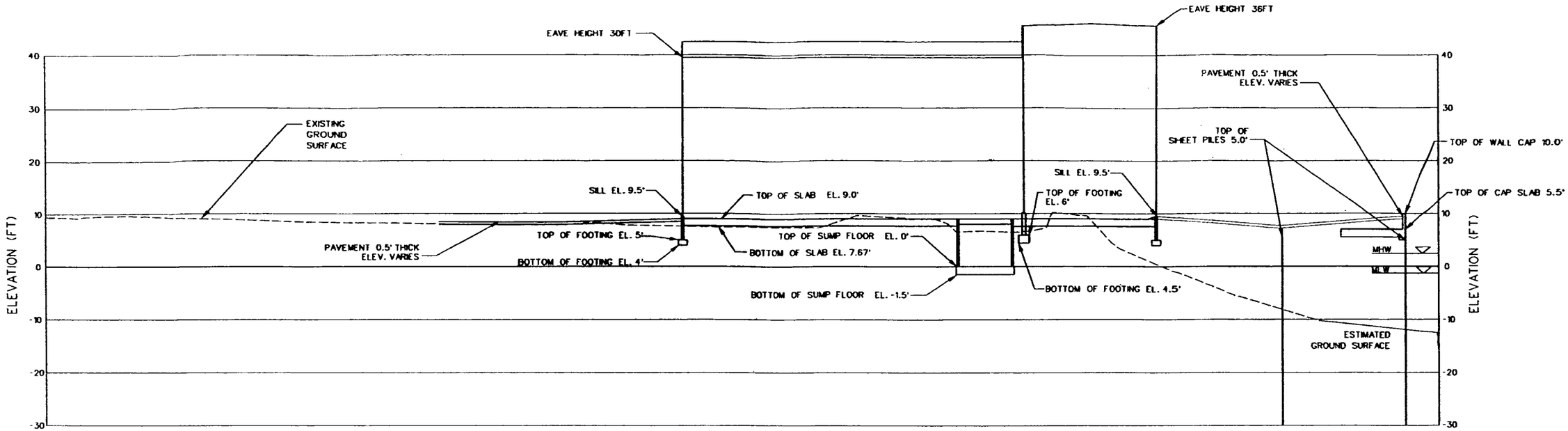
FIGURE 6-7

NEW BEDFORD HARBOR SUPERFUND PROJECT
NEW BEDFORD, MASSACHUSETTS

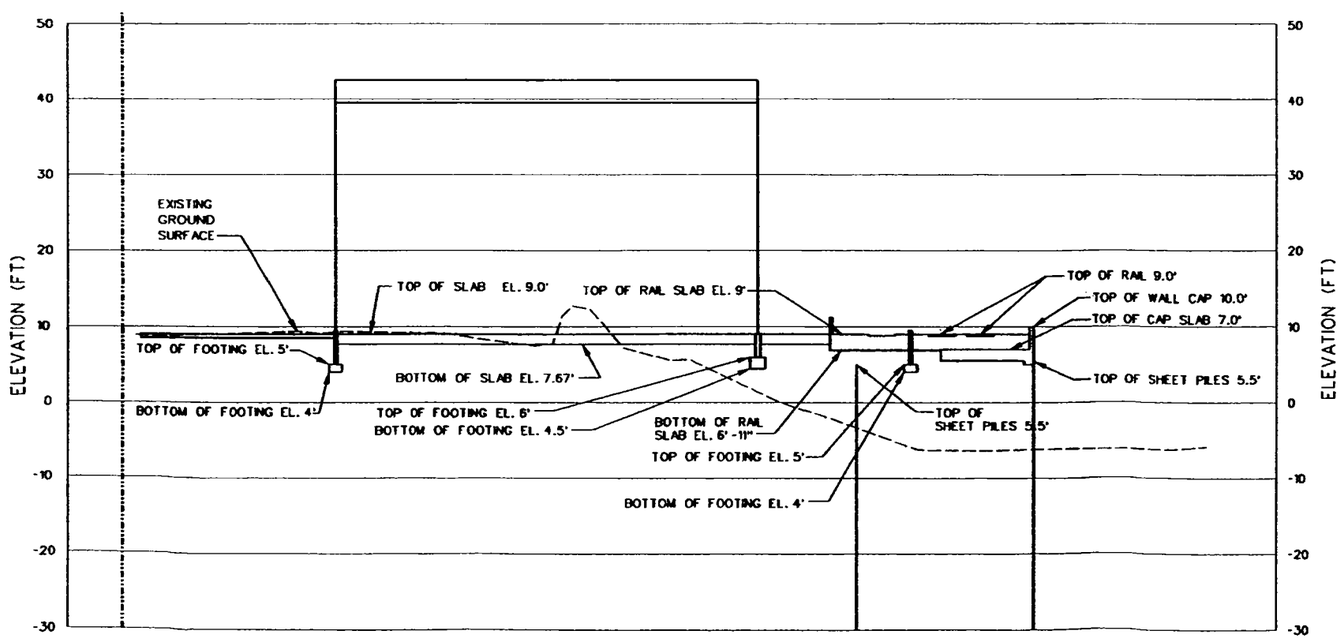
ELEVATION VIEWS OF THE DEWATERING FACILITY

SCALE: AS SHOWN

CADD FILE: 172093-BLDVIEW-A1-2-R14.DWG



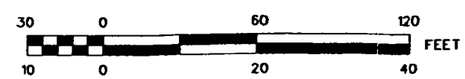
SECTION C



SECTION D

HORIZONTAL SCALE IN FEET
1 INCH = 30 FEET
HORIZONTAL DATUM IS NAD83 MASSACHUSETTS STATE PLANE
VERTICAL SCALE IN FEET
1 INCH = 10 FEET

HORIZONTAL SCALE 1"=60'



VERTICAL SCALE 1"=20'

FIGURE 6-8

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

AREA D
BUILDING SITE CROSS SECTIONS

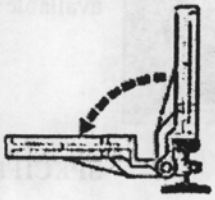
SCALE: NOTED	172093-C-301F.DGN

Figure 6-9 Car Stops

car stops

CS-60 Car Stop

Model CS-60

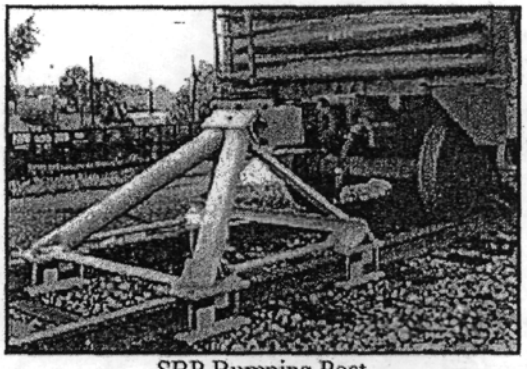


Nolan's model CS-60 is a hinged-type car stop designed for permanent installation on either flush or exposed rails. In the raised position, the CS-60 protects workers, warehouse doors, crossover walks, etc., or it swings down out of the way. The CS-60 may be padlocked in either the up or down position.

SPECIFICATIONS*
WEIGHT EACH: lbs. (kgs.).....91 (41)
FOR USE ON RAILS: lbs. (kgs.)....Specify rail size

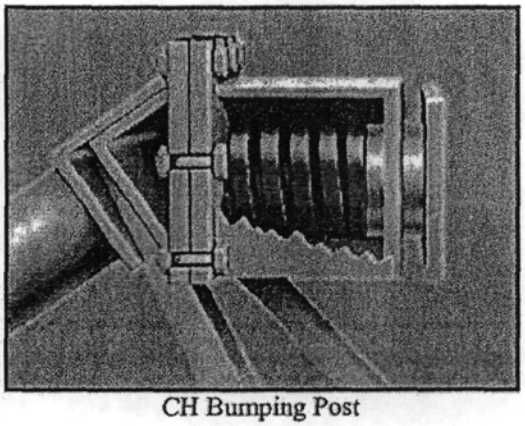
Figure 6-10 Bumping Posts

bumping posts



SBP Bumping Post

Nolan offers a range of bumping posts, some of which can be installed with ordinary hand tools. There is no center rail and spiking is unnecessary. The SBP model clamps to the rails at all four corners. Attached pads rest securely against the ties. Impact force is transferred down into the ties, providing a cushioned stopping action. The SBP-TR model bolts through the rails at all four corners. A cushion head is available for all models.



CH Bumping Post

SPECIFICATIONS*

Model	Type	Length in. (mm.)	Weight lbs. (kgs.)	Yield point lbs. (kgs.)
SBP	Standard	76-5/8 (1,946)	1,045 (474)	486,000 (220,449)
HDBP	Heavy Duty	76-5/8 (1,946)	1,150 (522)	804,000 (364,694)
TBP	Transit	Built to Specifications and Orders		
SBP-TR	Standard Bolt on	76-5/8 (1,946)	1,045 (474)	486,000 (220,448)
HDBP-TR	Heavy Duty Bolt on	76-5/8 (1,946)	1,150 (522)	804,000 (364,692)
TBP-TR	Transit Bolt on	Built to Specifications and Orders		
CH	Cushion Head (Optional)	N/A	500 (227)	N/A

Note: When ordering the TR Models, please specify rail size. **Note:** When ordering a bumping post with optional cushion head, add "CH" to model number of post being

7.0 TRANSPORTATION AND MANAGEMENT OF MATERIAL

The objective of this section is to ensure the proper handling, on-site management, transportation and disposal of TSCA/non-TSCA wastes generated during the New Bedford Harbor Remedial Action. This objective will be achieved through compliance with Federal, State and local regulations. This section identifies the waste streams, waste management, and disposal facility acceptance criteria. Refer to Figure 6-1 for the Process Flow Diagram, which explains the generation of each wastestream. The Mass Balance Calculations in Appendix D define the amount of coarse material, sand material, and filter cake at various dredging and in-situ conditions.

7.1 Waste Streams

It is anticipated that the following waste streams below will be generated from project activities. Refer to Figures 6-2 and 6-4 for Flow Diagrams.

- Dredge Debris
- Upland Excavation (soil, root mat, clearing and grubbling)
- Coarse Material and Sand Reject
- Filter Cake
- Filtrate/Decontamination/Washdown Water
- Miscellaneous Waste
  - PPE
  - General Waste
- Air Emissions Control System Waste

7.1.1 Dredge Debris

The +4 inch material will be captured and removed by the dredge plan prior to pumping to the desanding system. Per the Dredging BD/DA (February 2002), Section 4.11.1, the material may be moved via an intermodal container on a barge or a landing craft type of operation to Area C. The material will be taken to the debris handling pad, washed down, stored and protected from rain, wipe sampled, and analyzed for PCBs. Large organic debris (wood, stumps, etc.) will be assumed to be TSCA.

7.1.2 Coarse Material and Sand Reject

Coarse material (+3/8 inch) and sand (+200 mesh) will be separated from the dredged slurry by the desanding process. The separate waste streams will be stored and protected from rain and analyzed.

Dredge debris, coarse material, and sand (if TSCA) will be transported to Area D for final disposal. Storage will be in daily separated piles with enough protected area to take into account the 3-day laboratory turn around time for analysis. Non-TSCA material will be shipped directly to local approved landfills. Per USEPA regulations (40 CFR 761.61 (a) (5) (ii)), these rejected materials may be rendered non-TSCA even if dredged from TSCA area. This may occur from simple mechanical removal from the dredge slurry without additional processing or rendering the material non-TSCA via a rinse/wash process.

7.1.3 Filter Cake

Filter cake will be considered as TSCA if generated from the dredging of TSCA areas in the river. A Quality Assurance/Quality Control (QA/QC) Plan (to be submitted by the dewatering subcontractor) will define the frequency of testing for percent solids by weight and PCBs. The design currently does not include provisions for processing non-TSCA filter cake that is generated from sediments removed from non-TSCA areas of the river. However, the BD/DA (Figure 6-8) does include a provision for four 100,000 gallon storage tanks for storage of non-TSCA sediment. Due to limited space, the existing Rubb building will need to be relocated or dismantled to install these tanks. In addition, the desanding/dewatering systems would require some form of decontamination prior to processing the non-TSCA material. The method of decontamination will also be defined within the QA/QC Plan.

Any material-handling plan that includes placement of filter cake on the process or load out floor is prohibited. Since dust may be a health issue, personnel should ensure that the cake is handled as little as possible. The preferred handling method includes dropping the cake directly into containers under the presses. Then, via fork truck or overhead crane, the cake would be dumped directly into gondolas. If intermodals are used they would be placed directly onto flatbeds.

7.1.4 Filtrate/Decontamination/Washdown Water

7.1.4.1 Desanding Facility

Decontamination water generated at the decontamination pad will be pumped to Cell #1. Any additional water generated at the desanding facility (i.e., rainwater and liquid from standing piles of coarse and sand reject) will be pumped to Cell #1. No analyses will be conducted on this material at this location. Analysis will be conducted in conjunction with the water treatment plant.

7.1.4.2 Dewatering Building

Any filtrate/decontamination water, washdown water, and personnel decontamination water will be contained within the facility (in floor drains) and directed to the building sump. The building sump will be pumped to Cell #2 at the Area C Water Treatment Plant.

7.1.5 Miscellaneous Waste

7.1.5.1 Personal Protective Equipment (PPE) Waste

PPE will be collected in receptacles. This waste will be treated as non-TSCA and will be disposed in a roll-off container outside of the dewatering facility. A local waste management contractor will handle the offsite disposal.

7.1.5.2 General Waste

A dumpster will be located outside of the building for general waste only. Signs will be placed on the container stating "General Waste Only". A local waste management contractor will handle the offsite disposal.

7.2 Disposal Facility Acceptance Criteria

Materials proposed for off-site disposal must be analyzed for the parameters that are specified in the facility's permit.

A Complete Manifest Package (CMP) will be prepared in accordance with the TERC General Contract requirements for any waste (hazardous and non-hazardous) that will be sent off-site. The CMP will include the following information:

- Waste characterization rationale (Federal and State);
- Any sample analytical data;
- Waste profile;
- Draft shipping papers (e.g., manifest, bill of lading);
- Land Disposal Restriction (LDR) documents (if applicable); and
- US DOT marking, labeling and placarding information.

The CMP will be submitted using a Form 4025 to the USACE Contracting Officer (CO) for approval. The USACE will approve the final waste characterizations and will sign all documents (on behalf of the generator) for all waste streams leaving the site. The USACE CO will review and approve all CMP submittals relating to waste analysis and classifications, waste profile/approval forms, LDR certifications, manifests/shipping papers, and manifest discrepancy and exception reports. The USACE also will approve all off-site treatment/disposal facilities and transporters. The USACE site representative, on behalf of the generator, will sign all waste profiles, manifests, Bills of Lading and any LDR forms.

8.0 SITE MANAGEMENT

A Site Management Plan will be provided by the selected desanding/dewatering Contractor. This Site Management Plan will provide the measures, procedures, and detailed operations of dewatering and desanding facilities operations. The Site Management Plan shall, at a minimum, consist of the following:

- Discussion on implementation of the dewatering and desanding operations;
- List of personnel and subcontractors;
- Equipment list;
- Schedule and operational sequencing;
- Sampling and Decontamination Plans;
- Revisions to the EHS Plan, if necessary;
- Site Soil Reuse Plan, if necessary;
- Dewatering Plan;
- List of waste streams to be generated;
- List of disposal facilities and transporters with alternatives; and
- Site traffic patterns.

8.1 Site Circulation

8.1.1 Site Vehicle Traffic

All site vehicle traffic will be controlled and segregated from pedestrian traffic. Site access will be restricted by the use of gates at the site entrances and exits for security and safety reasons.

8.1.1.1 Area C

Access to the desanding facility will primarily originate at the Sawyer Street entrance. Once on site, vehicular traffic will access the desanding facility via a gravel road that circles CDF Cell 1. Access to the water treatment plant will be via a gravel road. All site traffic to the desanding facility will be regulated and controlled in concurrence with site traffic to the water treatment plant. The existing decontamination facility will be utilized to decon trucks prior to leaving the site.

Site improvements will be made as necessary on the haul road for the DDA. Trucks will enter this area through the gates located along Sawyer Street. Refer to the Design Drawings (Foster Wheeler, 2002c) for truck route through the site.

8.1.1.2 Area D

Access to the dewatering facility will primarily originate through a gate along Hervey Tichon Avenue. There will be a security gate at this location. Transport trucks will then proceed along the proposed driveway to the east of the dewatering facility to the loading area located in the northeast corner of the facility. After the trucks are loaded and decontaminated, they will proceed to the Herman Melville Boulevard and exit through another security gate with guard.

All other vehicular traffic will also enter through the Hervey Tichon Avenue entrance and park in the personnel parking lot that will be located south of the dewatering facility.

8.1.2 Pedestrian Traffic

Pedestrian traffic predominantly consists of site personnel who will be familiar with the site operations. Site personnel will escort all visitors.

8.1.2.1 Area C

The major pedestrian routes will not intersect the major routes of vehicular traffic at the desanding facility. Pedestrians will park in the site personnel parking lots and enter the desanding facility via designated routes.

8.1.2.2 Area D

The major pedestrian routes will not intersect the major routes of vehicular traffic at the dewatering facility. Pedestrians will park in the pedestrian parking lot and enter the dewatering facility or the support trailers through the parking lot.

8.2 Noise Control

Engineering controls will be used during desanding/dewatering operations to minimize noise emissions such that the activities do not cause or contribute to unnecessary emissions that may cause noise (310 CMR 7.10(1) and (2)). Such engineering controls may include modifying the equipment by having enclosures to reduce sound or having the equipment operated in a manner that minimizes sound. Use of supplemental or replacement mufflers or other sound-suppression devices on equipment must meet the manufacturer's specifications for the original device. The MA DAQC Policy 90-001 guideline for allowable sound emissions restricts new sources of noise to no more than 10 decibels above background. This standard will be followed to the extent practicable.

8.3 Working Season and Hours

8.3.1 Seasonal Limits

Massachusetts Wetlands Protection Regulations (310 CMR 10.00) and (310 CMR 9.40(2)) direct that dredging should be timed to avoid the critical life stages of polychaetes, mollusks, macrophytic algae, shellfish beds, fisheries resources and submerged aquatic vegetation whenever practicable. USEPA has directed that there will be no seasonal limits, therefore, influent to the desanding/dewatering operations will not have seasonal limits.

8.3.2 Hours

The New Bedford Police recommended restricting work near New Bedford's residential areas to reasonable working hours. Maximum work hours for the purposes of operating the desanding and dewatering facilities will be assumed to be 24 hours per day since they are not proximate to residential areas.

8.4 Personnel Support Facilities

8.4.1 Desanding Facility

The desanding facility was designed to support two (2) 12-hour shifts or three (3) 8-hour shifts of approximately 5-6 personnel. It is estimated that a crew of 4 personnel will be required to operate the desanding equipment.

8.4.2 Dewatering Facility

The dewatering facility was designed to support two (2) 12-hour shifts or three (3) 8-hour shifts of approximately 15-20 personnel. It is estimated that a crew of 12 personnel will be required to operate the dewatering equipment.

9.0 PROJECT SCHEDULE

The draft Project Schedule for the desanding/dewatering facilities is provided in Appendix I.

10.0 TECHNICAL SPECIFICATIONS AND DESIGN DRAWINGS

The Technical Specifications and Design Drawings will be submitted under separate cover. A list of both the Technical Specifications and Design Drawings is provided in Tables 10-1 and 10-2, respectively.

Table 10-1
List of Technical Specifications

Division 01 – General Requirements

01320 Project Schedule
01330 Submittal Procedures
01356 Storm Water Pollution Prevention Measures
01410 Environment Protection
01451 Subcontractor Quality Control
01500 Construction Facilities and Temporary Controls
01720 Field Engineering
01780 Closeout Submittals

Division 02 – Site Work

02220 Demolition/Debris Removal
02230 Clearing and Grubbing
02315 Excavation, Filling and Backfilling for Structures
02316 Excavation, Trenching, and Backfilling for Utilities Systems
02380 Stone Protection
02510 Water Distribution System
02531 Sanitary Sewers
02556 Gas Distribution System
02630 Storm-Drainage System
02741 Bituminous Concrete Pavement and Gravel Base Course
02763 Pavement Markings
02811 Underground Sprinkler Systems
02821 Fencing
02930 Exterior Planting

Division 03 – Concrete

03100 Structural Concrete Formwork
03150 Expansion Joints, Contraction Joints, and Waterstops
03200 Concrete Reinforcement
03300 Cast-In-Place Structural Concrete

Division 05 – Metals

05120 Structural Steel
05500 Miscellaneous Metal
05650 Railroads

Table 10-1
List of Technical Specifications - *Continued*

Division 07 – Thermal & Moisture Protection

07840 Firestopping
07900 Joint Sealing

Division 08 – Doors & Windows

08110 Steel Doors and Frames
08330 Overhead Rolling Doors
08330 Steel Windows
08700 Builder's Hardware
08810 Glass and Glazing

Division 09 – Finishes

09250 Gypsum Board
09510 Acoustical Ceilings
09651 Resilient Tile Flooring
09900 Painting, General
09910 High Solids Thin Film Epoxy Flooring System
09930 Sump Interior Coating System
09950 Motar Flooring System

Division 10 – Specialties

10160 Toilet Partitions
10201 Metal Wall Louvers
10505 Steel Clothing Lockers
10800 Toilet Accessories

Division 11 – Equipment

11310 Sump Pumps

Division 13 – Special Construction

13120 Standard Metal Building Systems
13850 Fire Detection and Alarm System
13930 Wet Pipe Sprinkler System, Fire Protection
13935 Dry Pipe Sprinkler System, Fire Protection

Table 10-1
List of Technical Specifications - *Continued*

Division 15 – Mechanical

15050 Basic Mechanical Materials and Methods
15080 Thermal Insulation for Mechanical Systems
15190 Gas Piping Systems
15200 Pipelines, Liquid Process Piping
15400 Plumbing, General Purpose
15565 Heating System; Gas-Fired Heaters
15700 Unitary Heating and Cooling Equipment
15760 Terminal Heating and Cooling Units
15810 Ductwork and Ductwork Accessories
15895 Air Supply, Distribution, Ventilation, and Exhaust System
15950 Heating, Ventilating and Air Conditioning (HVAC) Control Systems
15990 Testing, Adjusting, and Balancing of HVAC Systems

Division 16 – Electrical

16050 Basic Electrical Materials and Methods
16081 Apparatus Inspection and Testing
16360 Secondary Unit Substations
16403 Motor Control Centers, Switchboards and Panelboards
16415 Electrical Work, Interior
16510 Interior Lighting
16520 Exterior Lighting
16726 Security Alarm System

Table 10-2
List of Design Drawings

G-001	Cover Sheet and Index of Drawings
G-002	Standard Symbols and Abbreviations
G-401	Project Location Plan
G-101	Area D Dewatering Building – Building General Arrangement Plan
G-201	Area D Dewatering Building – General Exterior Views (Sheet 1 of 2)
G-202	Area D Dewatering Building – General Exterior Views (Sheet 2 of 2)
C-101	Area D – Existing Conditions Plan
C-111	Area D – Property Lines and Easements
C-1	Area D Bulkhead – Site Plan
C-103	Area D – Site Plan
C-104	Area D – Site Grading Plan
C-105	Area D – Fencing Plan
C-106	Area D – Railroad Layout Plan and Profiles
C-107	Area D – Drainage Plan
C-108	Area D – Transfer Pipeline Plan
C-109	Area D – Soil Erosion and Sedimentation Control Plan
C-110	Area C – Desanding Facilities Site Plan
C-111	Area D – Property Lines and Easements
C-112	Area D – Transportation Routes
C-301	Area D – Storm Sewer Profiles (Sheet 1 of 2)
C-302	Area D – Storm Sewer Profiles (Sheet 2 of 2)
C-501	Details (Sheet 1 of 4)
C-502	Details (Sheet 2 of 4)
C-503	Details (Sheet 3 of 4)
C-504	Details (Sheet 4 of 4)
U-101	Area D – Utility Plan
U-301	Area D – Sanitary Sewer Profile
U-501	Utility Details
S-501	Concrete Foundation and Slab Layout
S-502	Structural Details (Sheet 1 of 3)
S-503	Structural Details (Sheet 2 of 3)
S-504	Structural Details (Sheet 3 of 3)
S-1	Cellular Bulkhead Structural Details
E-001	Electrical Notes, Symbols and Abbreviations
E-101	Area D – Exterior Power and Lighting Plan
E-102	Area D – Site Lighting Plan
E-501	Electrical Details
E-601	Area D – One Line Diagram
M-001	Mechanical Notes, Symbols and Abbreviations
M-601	Area D – Dewatering Building – Piping
M-602	Area D – Dewatering Building – General Ventilation Plan
M-604	HVAC Equipment Schedule
L-101	Area D – Planting Plan and Details
L-102	Area D – Irrigation Plan and Details

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Appendix A

USEPA's Draft Explanation of Significant Differences

Site: New Bedford
Break: 5.4
25344

Explanation of Significant Differences

for the

Upper and Lower Harbor Operable Unit

New Bedford Harbor Superfund Site

New Bedford, Massachusetts

September 2001

U.S. Environmental Protection Agency - New England Region

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Appendices

Appendix A - References Cited

I. Introduction

A. Site Name and Location

Site Name: New Bedford Harbor, Upper and Lower Harbor Operable Unit (o.u. #1)

Site Location: Bristol County, Massachusetts

B. Lead and Support Agencies

Lead Agency: United States Environmental Protection Agency (EPA)

Contacts: David Dickerson, Co Remedial Project Manager (617) 918-1329
Jim Brown, Co Remedial Project Manager (617) 918-1308

Support Agency: Massachusetts Department of Environmental Protection (MA DEP)

Contact: Paul Craffey, Project Manager (617) 292-5591

C. Legal Authority for Explanation of Significant Differences

Section 117(c) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and Section 300.435(c)(2)(1) of the National Contingency Plan (NCP) requires that, if any remedial or enforcement action is taken under Section 106 of CERCLA after adoption of a final remedial action plan, and such action differs in any significant respects from the final plan, the EPA shall publish an explanation of the significant differences (ESD) and the reasons such changes were made.

D. Summary of ESD

The Record of Decision (ROD) for this phase (or operable unit) of the site cleanup was issued on September 25, 1998. Since that time EPA has gathered additional site information and refined the cleanup approach for the upper and lower harbor area. This ESD describes five significant differences between the current remedial design and the cleanup plan envisioned in the 1998 ROD, and discusses how the current project cost estimate compares with the cost estimate in the ROD. The five significant differences, discussed in more detail in Section III below, are:

1. Additional intertidal cleanup areas in the upper harbor to address dermal contact risks
2. Mechanical dewatering of dredged sediments
3. Use of the pilot study confined disposal facility (CDF) at Sawyer Street as an interim TSCA (Toxic Substance Control Act) facility for PCB-contaminated sediments
4. Change in CDF D wall design
5. Use of rail at CDF D

Finally, as explained more fully in Section III.F below, the net effect of these refinements to the cleanup approach has maintained the estimated project cost within the acceptable range allowed by EPA guidance. The current, fully funded cost estimate for this cleanup of the upper and lower harbor operable unit, including the five modifications listed above, is $325 million; whereas the maximum cost allowed using applicable EPA guidance is $335 million. It should be emphasized, however, that this $325 million estimate is based on assumed "most efficient" levels of annual funding. Should annual funding rates be less than these levels, the total project cost will likely increase accordingly, due to the delays and inefficiencies that would result from a longer construction and dredging schedule.

E. Public Record

In accordance with Section 117(d) of CERCLA, this ESD will be part of the administrative record file that is available for public review at the two locations listed below.

EPA New England Records Center
1 Congress Street
Boston, MA 02114
(617) 918-1440
Monday-Friday: 9:00am - 5:00pm; (closed first Friday of every month and federal holidays)

New Bedford Free Public Library
613 Pleasant Street, 2nd floor Reference Department
New Bedford, MA 02740
(508) 961-3067
Monday-Thursday: 9:00am - 9:00pm
Friday-Saturday: 9:00am - 5:00pm

EPA is currently supplementing the administrative record with various documents generated since the 1998 ROD that support this ESD. All of the documents referenced in this ESD (see Appendix A) are either included in this supplement or are included in the original 1998 administrative record.

II. Summary of Site History, Contamination Problems and Selected Remedy

A. Site History and Enforcement Activity

Identification of PCB (polychlorinated biphenyl) contaminated sediments and seafood in and around New Bedford Harbor was first made in the mid-1970s as a result of EPA region-wide sampling programs. In 1978, the manufacture and sale of PCBs was banned by the federal Toxic Substance Control Act (TSCA). In 1979, the Massachusetts Department of Public Health promulgated regulations prohibiting fishing and lobstering throughout the site due to elevated

PCB levels in area seafood. Due to these concerns, the site was proposed for the Superfund National Priorities List (the NPL) in 1982, and finalized on the NPL in September 1983. Pursuant to 40 CFR 300.425(c)(2), the Commonwealth of Massachusetts (the Commonwealth) nominated the site as its priority site for listing on the NPL.

EPA's site-specific investigations began in 1983 and 1984. Site investigations continued throughout the rest of the 1980s and early 1990s, including a pilot dredging and disposal study in 1988 and 1989, computer modeling of the site completed in 1990, and an updated feasibility study for site cleanup also completed in 1990.

Collectively, these investigations identified the Aerovox manufacturing facility on Belleville Avenue in New Bedford as the primary source of PCBs to the site. PCB wastes were discharged from the facility's operations directly to the upper harbor through open trenches and discharge pipes, or indirectly throughout the site via CSOs (combined sewer overflows) and the City's sewage treatment plant outfall. Secondary inputs of PCBs were also made from the Cornell Dubilier Electronics, Inc. (CDE) facility just south of the hurricane barrier in New Bedford.

Based on the investigations' results, state and federal enforcement actions were initiated against both the Aerovox and CDE facilities as well as the City of New Bedford (though the City is not a Potentially Responsible Party for this site) pursuant to CERCLA, Massachusetts General Law c.21E, and other federal and state environmental statutes. For a summary of these enforcement actions and resulting settlements please see Section II of the 1998 ROD for the site (this ROD can be found as document 5.4.1 in the administrative record discussed above). The site cleanup is being managed by EPA, in partnership with the U.S. Army Corps of Engineers and the MA DEP.

In April 1990, EPA issued a ROD for the hot spot operable unit of the site (o.u. #2). The hot spot ROD called for dredging and on-site incineration of the site's most highly PCB-contaminated sediments located in the vicinity of the Aerovox facility. The ROD defined these hot spots as areas above 4,000 ppm (parts per million). Dredging of these sediments - about 14,000 cubic yards (cy) in volume and 5 acres in area - began in April 1994 and was completed in September 1995. However, due to a vehement and congressionally-supported reversal in local support for on-site incineration, EPA suspended the incineration component of the hot spot remedy. Pursuant to an October 1995 ESD the dredged hot spot sediments were temporarily stored in a shoreline confined disposal facility at Sawyer Street in New Bedford, and then, pursuant to an April 1999 amendment to the 1990 Hot Spot ROD, the sediments were dewatered and transported to an offsite landfill for permanent disposal. This final phase of the hot spot remedy was completed in May 2000.

In September 1998, EPA issued the second ROD for the site for cleanup of the upper and lower New Bedford Harbor areas (o.u. #1). The remedy selected in this 1998 ROD (also known as ROD 2) is summarized in section II.C below.

B. Contamination Problems

As noted above, the main site concern is the widespread PCB contamination in New Bedford Harbor. Although the hot spot remedy removed approximately 14,000 cy of the most contaminated sediment, elevated levels up to and, in isolated areas, above 4,000 ppm total PCBs remain in both sediments and wetlands. The highest levels are generally found in the northern reaches of the upper harbor, with PCB levels decreasing in a southerly trend. Because of this sediment contamination, PCBs are also found in elevated levels in the water column and in local seafood, and to a lesser extent in the air along certain areas of the shoreline (Foster Wheeler, 2001a). In addition to the PCB contamination, harbor sediments also contain high levels of other contaminants including heavy metals (e.g., cadmium, chromium, copper and lead).

As described more completely in sections V and VI of the 1998 ROD, EPA found the PCB contamination to result in unacceptable risks to human health and the environment. The biggest human health risk was found to be from frequent (e.g., weekly) ingestion of local seafood, although secondary risks were also found from frequent human contact with PCB-contaminated shoreline sediments or soils. Ecologically, EPA's investigations concluded that the harbor's marine ecosystem is severely damaged from the widespread PCB contamination.

C. Summary of Remedy Originally Selected in the 1998 Record of Decision

Due to this contamination and risks to human health and the environment, EPA in the 1998 ROD selected a cleanup remedy for the entire upper and lower harbor areas. The ROD calls for the dredging and containment of approximately 450,000 cubic yards of PCB-contaminated sediment spread over about 170 acres. In the upper harbor north of Coggeshall Street, sediments above 10 ppm PCBs will be dredged, while in the lower harbor and in salt marshes, sediments above 50 ppm PCBs will be dredged. To protect human health against risks due to dermal contact with PCBs, intertidal sediments or soils in areas adjacent to homes will be removed if PCB levels are above 1 ppm, while those adjacent to parks or recreational shoreline areas where people spend less time than in areas adjacent to residences will be removed if PCB levels are above 25 ppm (the "beachcombing standard").

The ROD calls for the dredged sediments to be placed in four shoreline confined disposal facilities (CDFs) and the seawater decanted from these sediments to be treated before discharge back into the harbor. The ROD also requires that institutional controls, including the continuation of a state-sanctioned fishing ban, be in place until PCB levels in seafood reach acceptable levels. Figure 1 attached shows the location of the four CDFs identified in the ROD as well as the approximate sediment areas to be dredged as part of the cleanup.

III. Description of Significant Differences and the Basis for These Differences

Set out below are explanations of how several components of the current remedial design differ from the remedy described in the 1998 ROD. Additional investigations performed since

the ROD, including field surveys, sediment sampling and a state-of-the-art dredging field test conducted in August 2000, have yielded significant new information pertaining to the harbor cleanup. The differences below reflect how this additional information has been incorporated into the remedy for sound construction and cost-effective implementation while remaining protective of human health and the environment. Documents that support these changes are referenced (see Appendix A of this ESD) and are being added to the two site repositories listed above in Section I.E.

A. Additional Intertidal Cleanup Areas in the Upper Harbor to Address Dermal Contact Risk

The 1998 ROD (see pp.42-43 and Figure 23 of the ROD) describes three specific areas in the upper harbor north of the Coggeshall Street bridge with intertidal sediment PCB levels greater than dermal health-based cleanup levels. These areas are the Coffin Avenue cove (or Riverside Park) area in New Bedford, the residential area immediately north of Wood Street in New Bedford, and the Veranda Street inlet area in Fairhaven.

In addition to these three areas, EPA is now aware, based on post-ROD sampling, of at least two other areas in the upper harbor where these intertidal, dermal-based cleanup levels are appropriate to protect human health. These two areas are the small residential area along the Acushnet River just south of Main Street in Acushnet, and the area slated for "River Road Park" directly across the river along River Road in New Bedford. See Figure 2 attached.

In this first area in Acushnet, the post-ROD sampling revealed elevated PCB levels as high as 23,000 ppm in intertidal area sediments (Foster Wheeler, 2001b). As a result this area was the first to be remediated pursuant to the 1998 ROD as part of EPA's Early Action program. Approximately 2,500 cy of contaminated shoreline soil and sediment was removed. The excavated areas were then backfilled with clean material and replanted using native wetland species in late winter and early spring 2001. EPA plans to sample this shoreline over time to ensure that recontamination does not occur.

The second dermal risk area, the proposed River Road Park, was formally a lumber yard and truss manufacturing facility. The City of New Bedford is currently in the process of acquiring this property for the purpose of developing a shoreline park (New Bedford, 2001). Consistent with section XIII.B.4 of the 1998 ROD, the vegetated intertidal area of this shoreline was originally slated for a cleanup to 50 ppm due to the (former) industrial/commercial land use. Since more frequent contact with intertidal sediments is expected under the new recreational land use, EPA will now apply the 25 ppm "beachcombing" standard instead.

The post-ROD shoreline sediment sampling in the River Road Park area has revealed PCB levels above this 25 ppm level; as high as 680 ppm in the intertidal zone (Foster Wheeler, 2001c, Foster Wheeler, 2001b). The sampling performed to date in this area also indicates that the PCB contamination is limited to certain portions of the shoreline. EPA will coordinate the cleanup of this contaminated shoreline with the City to ensure that the cleanup is completed before the shoreline area of the proposed park is opened to the public.

For the record, the Early Action program discussed above also included temporary shoreline fencing at the Coffin Avenue cove area and at the shoreline residential area immediately north of Wood Street, both in New Bedford. In both of these areas the shoreline was fenced to prevent human access to and contact with PCB-contaminated intertidal sediments. Once these shoreline areas are remediated as part of the larger dredging and excavation program, these fences will be removed.

Finally, as EPA continues with post-ROD sampling, other areas may be identified which require early action dredging or excavation. As these areas are identified, EPA will issue fact sheet(s) with more details of these activities.

B. Mechanical Dewatering of Dredged Sediments

Mechanical dewatering is a process which uses various types of mechanical equipment to squeeze or remove excess amounts of water from sediments or sludge. It is a process frequently used at wastewater treatment plants, and more recently as part of sediment cleanups.

Although evaluated as potentially useful in the 1990 Feasibility Study for the site (see documents 4.6.3-5 in the Administrative Record for this operable unit), EPA did not specifically include mechanical dewatering in the 1998 ROD's selected remedy. The main reason for this was that given EPA's pilot study and hot spot dredging experience (both of which used hydraulic dredging without mechanical dewatering), EPA believed that the remedy could be implemented without the added expense of the mechanical dewatering step. During the detailed post-ROD design process, however, it became clear that mechanical dewatering could help resolve a number of project challenges, as explained below.

The greatest benefit of using mechanical dewatering would be to minimize the CDF disposal volume required. If dewatering is not undertaken, the 473,000 cy of *in situ* sediments to be removed from the seabed would increase to 615,000 cy needing disposal due since these sediments expand during the dredging and slurry transport process. If dewatering is performed, the 473,000 cy of *in situ* sediments would be reduced to approximately 349,000 cy, a volume which could be disposed of entirely in CDF C and a reduced size CDF D. Thus, given this volume reduction due to mechanical dewatering, the proposed CDFs A and B may not be needed provided the current estimate of total *in situ* sediment volume requiring disposal (473,000 cy) is reasonable. CDFs A and B would be needed, however, if this current estimate is significantly exceeded (see Section III.E below for more discussion of this sediment volume issue).

Other advantages of mechanical dewatering are: a) it helps control air emissions since the operation would take place in an enclosed building with emissions control as necessary; b) it assists in the water treatment process since the water produced from the dewatering process gets filtered (i.e., clarified) as it is squeezed out of the dredge material before the water is sent to the water treatment plant; c) it reduces any limited potential for low-level leakage of PCBs from the CDFs over time due to the removal of sediment pore water, even though this potential leakage is

considered insignificant (see p.29 of the 1998 ROD); d) it produces a sediment "cake" which can be placed mechanically and which is dryer than the slurry from hydraulic dredging, thereby decreasing the time required for consolidation and temporary capping of sediment placed in the CDFs; and e) it allows the earlier application of heavier loads during beneficial reuse of the final CDFs. The conceptual location of the dewatering facility is shown in Figure 5 attached.

C. Use of the Pilot Study CDF at Sawyer Street as an Interim TSCA Facility for PCB-Contaminated Sediment

As part of EPA's pilot study of dredging and disposal techniques in1988-89, a six acre CDF was constructed along the shoreline immediately north of Sawyer Street in New Bedford. This CDF consisted of a primary and a secondary cell separated by a sheet pile wall, and was partially filled with PCB-contaminated sediments dredged from the cove just north of the CDF. Cleaner, deeper sediments from this cove were used to cap the contaminated sediments (USACE, 1990).

This area was further modified in 1992 to create the hot spot water treatment facility: this work entailed transforming the western portion of the pilot study CDF into the new water treatment facility, and leaving the eastern area as a Debris Disposal Area (DDA). Also in 1992, a six inch sand cap was added over the original sediments within the DDA.

As part of the original hot spot remedy, cell #1 of the water treatment facility (the former western portion of the pilot study CDF) was to receive solidified incinerator ash, and this cell was to be covered with a landfill-type cap (USACE, 1991). The final resolution of the DDA area was to be left to a later decision document. As described in the hot spot ROD Amendment, however, the incinerator component of the remedy was not implemented (see section II.A above), and the cap over cell #1 was not installed, nor was a final resolution of the DDA issued.

More recently, a portion of the remaining volume in the DDA has been used to dispose of approximately 2,500 cy of PCB-contaminated sediments excavated from the Early Action areas in Acushnet (see section III.A above), as well as for approximately 1,000 cy of sediments excavated near the discharge structure of the relocated Sawyer Street CSO for CDF C. Other than PCBs, no other potential contaminants in the sediment and debris in the DDA meet federal or state standards to be classified as hazardous waste (USACE, 1994). This use of of the DDA has allowed the cleanup to proceed in a timely and cost-effective manner. Additional "unused" volume remains in the DDA for potential disposal of other contaminated sediments excavated or dredged as part of the remedy.

Groundwater and air monitoring have been and continue to be performed in and around the DDA, all of which indicates that PCBs are not migrating from the DDA (USEPA, 2001a, USEPA, 2001b). In addition, testing of the current surface layer of the DDA shows that it does not present an unreasonable dermal exposure risk (USACE, 2001). With regard to the soil conditions underlying the DDA, Figures 3.a and 3.b attached show the most recent cross-section

of this area, taken from the CDF C design. This cross section shows a clay layer sandwiched between the DDA and the underlying sands of the area. In addition, test pit logs from the pilot study report indicate a concrete slab approximately four to six feet below the 1987 ground level in much of the western portion of the DDA (USACE, 1990).

Given these groundwater, surface soil and air monitoring results, the subsurface features in the area and the fact that the dredged sediments in the DDA are naturally very impermeable, EPA will continue to use this DDA area as an interim TSCA facility for PCB-contaminated sediment from the site. This facility must comply with TSCA regulations governing remediation waste. CERCLA § 121. Section 761.61(c) of the TSCA regulations require that the EPA Regional Administrator make a determination that the facility does not pose an unreasonable risk to health or the environment. After reviewing the information contained in the administrative record, the Regional Administrator, by his signature on this document, determines that the facility does not pose an unreasonable risk to health or the environment as long as the following conditions are maintained: (1) Groundwater and air monitoring of this area is continued as long as the PCB contaminated sediment remains in place; (2) subsurface conditions remain intact; (3) surface PCB levels in the DDA remain low or, alternatively, a clean soil cover (approximately six inches thick) is placed so that it does not pose an unreasonable risk to health or the environment and (4) a final resolution of the facility is made in a later decision document.

The groundwater and air monitoring of this area, as well as additional groundwater modeling, will continue in order to confirm the protectiveness of this DDA as a CDF. Once all of this information is in hand, and should this monitoring and modeling confirm that the DDA would be suitable for a permanent CDF, EPA will solicit public comment on any proposal to make the DDA a permanent TSCA facility. If made a permanent facility, the DDA would be filled and covered with a cap that meets all applicable federal and state standards.

D. Change in CDF D Wall Design

The 1998 ROD's conceptual design of the CDF D wall called for a single sheet pile wall around the entire CDF, along with a synthetic liner on the inside wall of this sheet pile to minimize PCB leakage. Sediment borings performed during the detailed design for CDF D, however, revealed the existence of very weak, silty sediments. When combined with the deep water depths in the area, this new information showed that the conceptual sheet pile wall design would not meet project design criteria.

A number of different wall and dike designs were thus evaluated to replace the original single sheet pile concept. The two considered to be most preferable and cost effective were: a) a cellular sheet pile wall consisting of interconnected 66-foot diameter sheet pile cells filled with structural fill, and b) an earthen and rock filled dike. Based on current estimates, EPA believes that the rock filled dike design, as shown in Figure 4, is the best choice of these two alternatives due to its cost-effectiveness and permanence. The rock filled design is considered more permanent since it should last in perpetuity, whereas a sheet pile-based design would eventually need significant maintenance or replacement.

It should be noted that, with either of these dike designs, due to the very soft and geotechnically weak sediments in the area, approximately 300,000 cy of these sediments would have to be removed and replaced with structural fill as the first construction step (USACE, 2000). These "foundation" sediments would not necessarily be contaminated with PCBs since they exist at deeper, cleaner depths than the contaminated surficial sediment.

In addition, due to the inclusion of mechanical dewatering discussed above and the volume reductions it allows, the overall footprint of CDF D has been reduced from that conceived in the 1998 ROD. Figure 5 attached shows the revised footprint with the rock filled dike design. This reduction has eliminated the need to relocate the navigational channel in this area, which would have been covered by the original CDF D footprint.

The revised wall design brings with it the need for significant amount of rock to be delivered to the site as well as the disposal of the 300,000 cy of foundation sediment discussed above. EPA has considered the reuse of the non-contaminated portion of these foundation sediments for backfilling excavated wetlands, as well as the viability of local temporary disposal facilities to store this material before reuse. No viable local area was found, however, thus offsite disposal for this foundation material is currently considered the most likely option.

E. Use of Rail at CDF D

Although not specifically envisioned in the 1998 ROD, EPA believes that extension of a rail spur to CDF D from the rail depot located across Herman Melville Boulevard from the CDF could serve a variety of uses during the harbor cleanup. Previously inactive, the City of New Bedford is currently working to redevelop this rail yard. The benefits of such a rail spur could include facilitating material delivery for construction of the CDF, and providing for the offsite disposal of any non-TSCA (Toxic Substance Control Act) material such as the foundation sediments discussed above or "clean" sand removed from the dredging process.

An additional potential advantage of a rail spur is that it could serve as an off-site disposal contingency in case the overall volume of sediments to be disposed exceeds the built capacity of the CDFs. This could be an important consideration since computer modeling of the total *in situ* sediment volume needing disposal indicates a worst case total of up to approximately 800,000 cy. This worst case estimate is based on a conservative method of estimating the PCB concentrations between actual sediment sampling locations within the approximately 1,000 acre upper and lower harbor area. Current project planning is using an *in situ* sediment volume estimate of 473,000 cy, based on a less conservative but reasonable approach to estimating these PCB levels in unsampled areas. This 473,000 cy is consistent with the 1998 ROD's estimate of 450,000 cy, especially in light of the approximately 57,000 cy of PCB- contaminated "footprint" sediments that must be removed should CDFs A and B not be needed due to the benefits of mechanical dewatering (see Section II.B). (These 57,000 cy are included in the updated 473,000 cy estimate, but were not included in the ROD's 450,000 cy estimate.)

As discussed in Section II.D, the current CDF wall design requires substantially more construction material than the ROD's conceptual sheet pile wall design, and the 300,000 cy of "foundation" sediments would likely need to be transported offsite. Use of rail for this material delivery and offsite transport would thus help alleviate community concerns about increased truck traffic during the remedy. Addition of a rail spur also aligns with the City of New Bedford and Harbor Development Commission's long term plans for a multi-modal port facility for the CDF D area, as developed in their recent harbor master plan (New Bedford, 2001; VHB, 2000). The conceptual location of this rail spur is shown in Figure 5 attached.

F. Updated Cost Estimate

The current, fully funded cost estimate to implement ROD 2 including the remedy refinements outlined above is $324.6 million, using 2001 price levels. Table 1 attached outlines the major cost components of this estimate. Note that the total project cost could become greater if actual funding levels are so low as to cause significant project delays and inefficiencies.

As explained below, this current, fully funded $325 million estimate is a different type of cost estimate than used in the 1998 ROD. The ROD's estimate - $129 million for EPA costs - is a present worth estimate, and was based on 1995 price levels. Present worth is the amount required to fund a project assuming that amount can be invested at the start of the project for a given rate of return as the project progresses. Present worth estimates help evaluate various options on an equal basis, but they do not represent the actual funding levels that will be required for a project of this type. The fully funded estimate, on the other hand, reflects the total of the actual annual funding levels required to implement the harbor cleanup project. In addition, since the ROD cost estimate is based strictly on a conceptual (rather than a detailed) project design, EPA guidance acknowledges that actual project costs could be up to 50% higher than the cost estimate developed for the ROD (USEPA, 1999).

The following table shows the comparative process used by EPA and the Corps of Engineers to evaluate whether the current, fully funded estimate of $325 million is within the initial, present worth estimate of $129 million included in the ROD.

Type of Cost Estimate	**$ - in millions**
EPA costs at 1995 price level, as presented in the ROD, **present worth**	129
EPA costs at 1995 price level, **present worth basis removed**	188
EPA costs **at 2001 price level, present worth basis removed** (increases due to inflation)	223
2001 price level, acceptable upper limit (**$223 million times 1.5** per EPA guidance)	335

Since the current, fully funded estimate of $325 million is $10 million less than this last $335 million threshold, EPA believes that the remedy with the refinements discussed herein has been maintained within the acceptable range of the original ROD cost estimate.

IV. Supporting Agency Comments

In a letter to EPA dated September 27, 2001, the MA DEP expressed its agreement with the changes documented in this ESD.

V. Statutory Determinations

As discussed above in Section III.C, this ESD documents EPA New England's Regional Administrator Robert W. Varney's regulatory finding under TSCA 40 CFR Sec. 761.61(c) that the use of the DDA to store PCB-contaminated sediments does not pose an unreasonable risk of injury to health or the environment.

EPA believes that the remedy as modified herein remains protective of human health and the environment, complies with all Federal and State requirements that are applicable or relevant and appropriate to this remedial action (and which were not waived in the 1998 ROD), and is cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site.

VI. Public Participation Activities

EPA and DEP meet regularly with site stakeholders to keep the community up to date with the site's cleanup status, including the issues described above in section III. For example, EPA and DEP meet quarterly with the facilitated New Bedford Harbor Superfund Site Community Forum, as well as monthly with the Forum's subcommittee. Additional meetings and outreach efforts with other groups occur as necessary to successfully implement the cleanup program.

Robert W. Varney, Regional Administrator
EPA New England

9-27-01
Date

Patricia Meaney, Director
Office of Site Remediation and Restoration
EPA-New England

9/27/01
Date

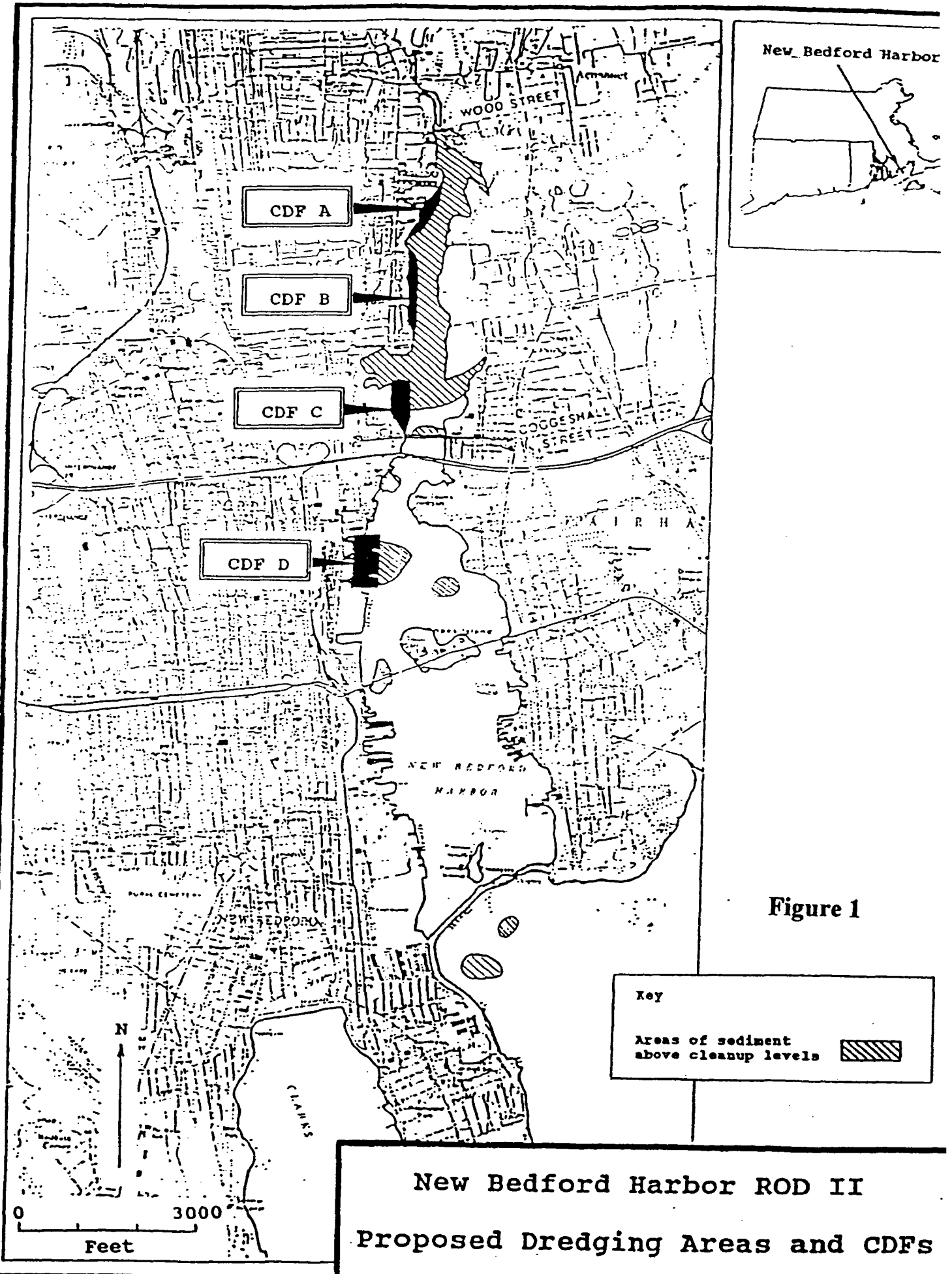


Figure 1

New Bedford Harbor ROD II

Proposed Dredging Areas and CDFs

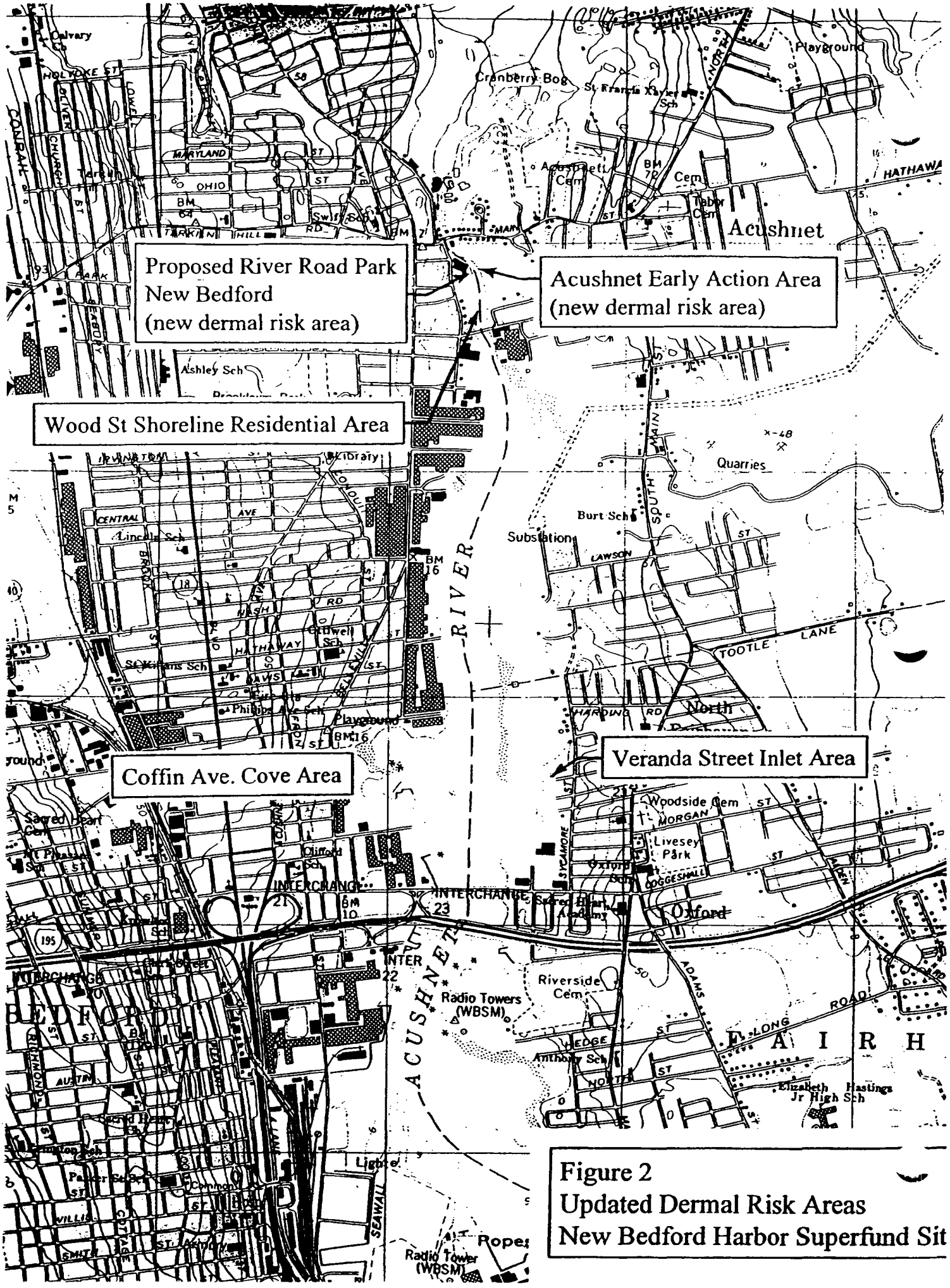


Figure 2
Updated Dermal Risk Areas
New Bedford Harbor Superfund Sit

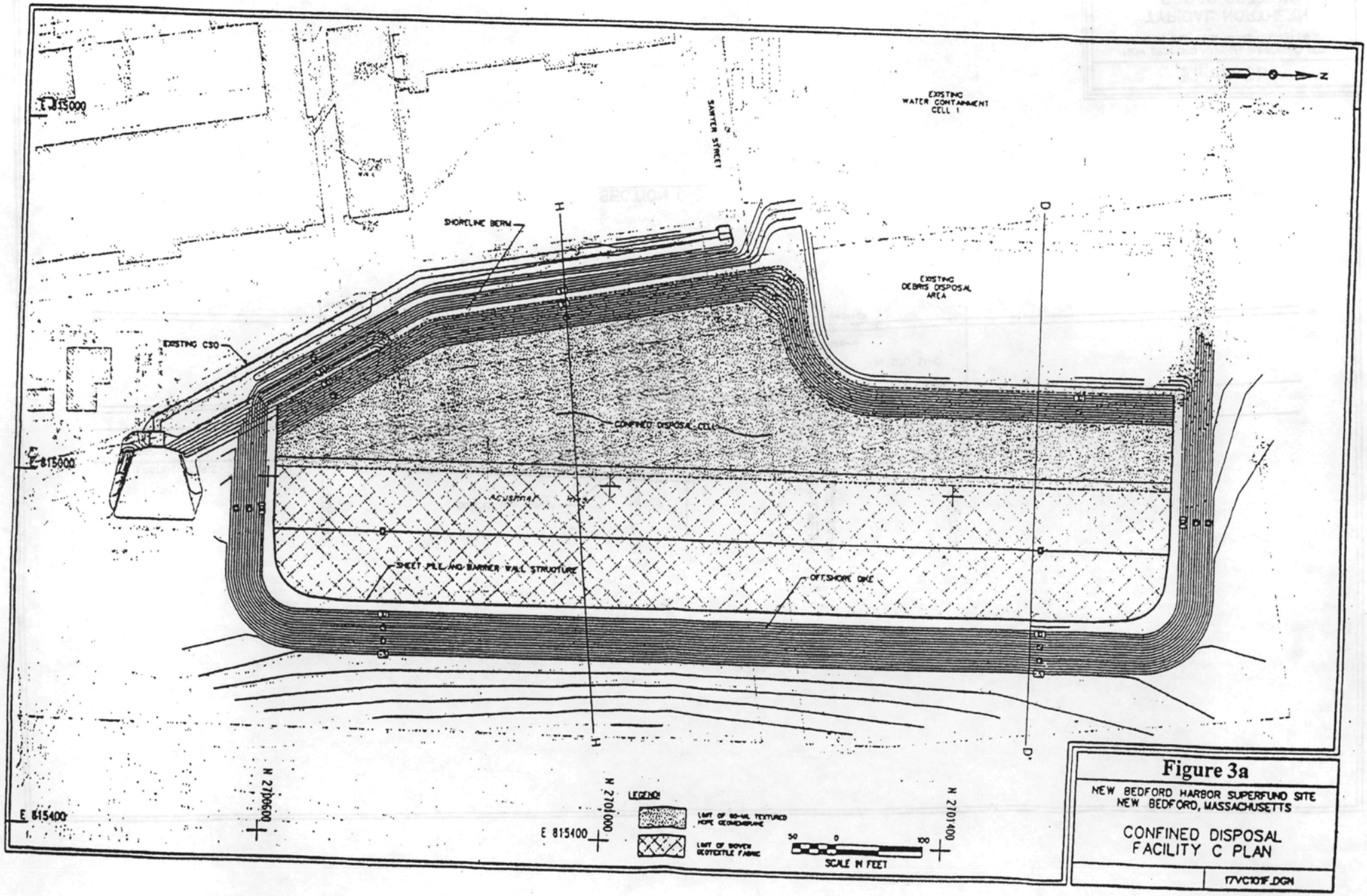
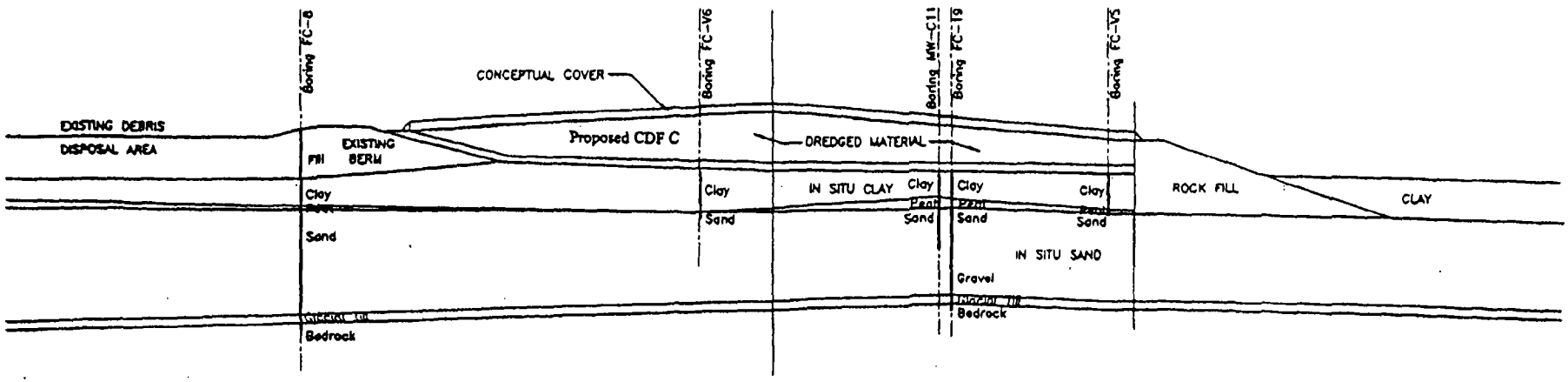


Figure 3a

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CONFINED DISPOSAL FACILITY C PLAN

17VC101F.DGN



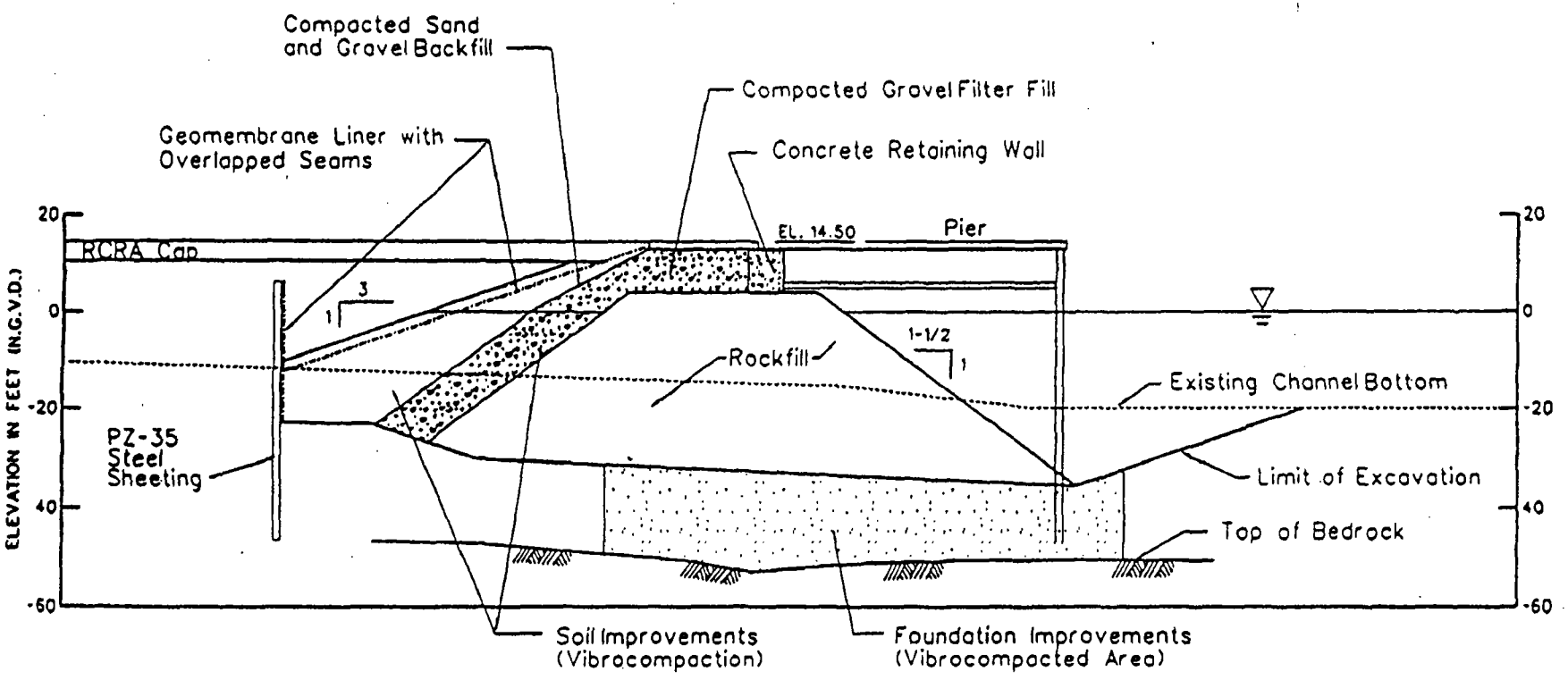
SECTION D-D'

Figure 3b

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

TYPICAL NORTHERN
CROSS SECTION

17VC30F.DWG



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

March 2001

ENVIRONMENTAL PROTECTION AGENCY
NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CONFINED DISPOSAL FACILITY "D"
ROCKFILL DIKE ALTERNATIVE
CONCEPTUAL SECTION

Figure 4

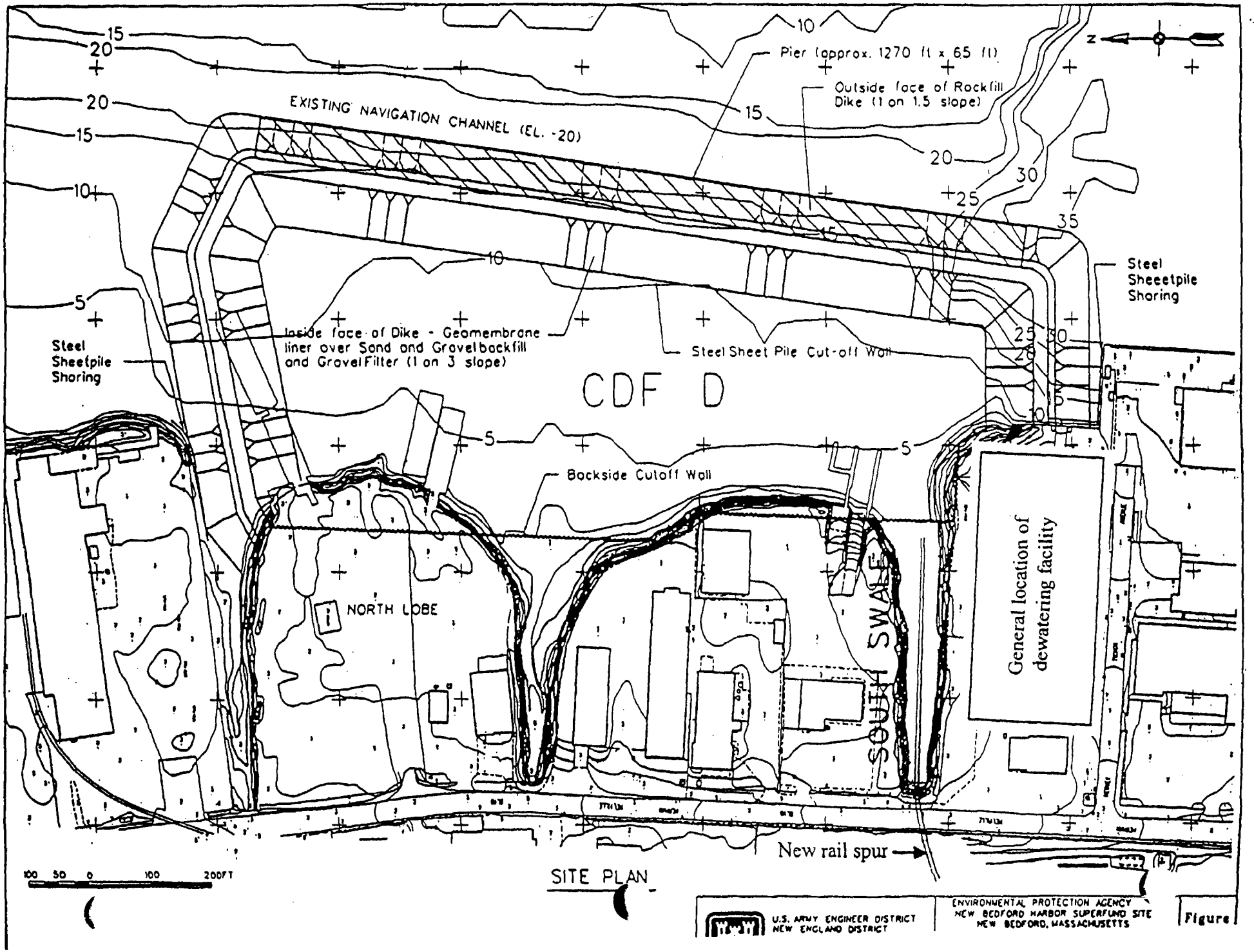

EXISTING NAVIGATION CHANNEL (EL. -20)
Pier (approx. 1270 ft x 65 ft)
Outside face of Rockfill Dike (1 on 1.5 slope)
Steel Sheetpile Shoring
Inside face of Dike - Geomembrane liner over Sand and Gravel backfill and Gravel Filter (1 on 3 slope)
Steel Sheet Pile Cut-off Wall
CDF D
Backside Cutoff Wall
NORTH LOBE
SOUTH SWALE
General location of dewatering facility
New rail spur
100 50 0 100 200FT
SITE PLAN
U.S. ARMY ENGINEER DISTRICT NEW ENGLAND DISTRICT
ENVIRONMENTAL PROTECTION AGENCY NEW BEDFORD HARBOR SUPERFUND SITE NEW BEDFORD, MASSACHUSETTS
Figure

Table 1

PLAN "Fa" : CDFs C & D (w/Stone Fill), Dewater Harbor Sediments		
Dredge/Excav: 472,700 CY Contaminated		
COST SUMMARY		
	Cost	Percent of Total
Confined Disposal Facility "D" (CDF D) w/o Cap	$ 23,258,000	7%
CDF D Wharf (Loading /Unloading Dock)	$ 6,604,000	2%
Confined Disposal Facility "C" (CDF C) w/o Cap	$ 11,084,000	3%
Combined Sewer Overflow for CDF D (CSO D) w/mark-ups	3,636,000	1%
Combined Sewer Overflow @ CDF C (CSO C) w/ mark-ups	2,233,000	1%
Fill CDFs & Emissions Control	7,753,000	2%
CDF D Surcharging & CDFs Final RCRA Caps and O&F	12,349,000	4%
Build Water Treatment Plant & Water Treatment	2,825,000	1%
Build De-Watering Bldg, So. Lobe & Sawyer St., Mobilize, Remove Vessels	12,720,000	4%
Harbor Dredging & Excavation (w/ Early Action & Confirmatory Sampling)	24,027,000	7%
De-Water Harbor Sediments	18,855,000	6%
Transport & Dispose Harbor Sediments Off-Site (T&D) incls. to Pierce Mill	3,189,000	1%
Wetland / Habitat Restoration	4,178,000	1%
Relocate Commonwealth Electric Power Cables	6,499,600	2%
Air/Water Quality, Ecological, Seafood Monitoring & Confirmatory Sampling	7,068,000	2%
Soccer Field w/ Parking Area & Fence	415,000	0.1%
Site/Home Ofc. Mgt, Eng. During Construction, SS&H,QC, Admin., Overhead, Site Operations (15% on Construc. Costs + USACE Construction Oversight)	34,383,300	11%
Project Construction Contingency (40% on Future TERC Construction Costs)	59,714,500	18%
Contract Fee (7% on TERC Construction Costs)	15,117,323	5%
Real Estate Acquisition	3,411,000	1.0%
USACE & Contract Remedial Design & Investigations	35,058,034	11%
Inflation @ 3%/Year Over Design/Construction Period	30,268,674	9%
Total (Not Rounded)	$ 324,846,430	
Total Project Fully Funded Cost	**$ 325,000,000**	**100%**
Total Fully Funded O&M through 2030	**$ 6,300,000**	
Note: CDF O&M Program would continue beyond 2030.		

APPENDIX A - REFERENCES CITED

1. Foster Wheeler, 2001a. Final Annual Report, Baseline Ambient Air Sampling and Anaylsis, 1June 1999 - 30May2000. Operable Unit #1, New Bedford Harbor Superfund Site. Foster Wheeler Environmental Corporation. March 2001. (Note: this document is included in the 2001 supplement to the administrative record for this operable unit in section 6)

2. Foster Wheeler, 2001b. Draft Sediment Sampling Report, New Bedford Harbor Superfund Site. Foster Wheeler Environmental Corporation. April 2001. (Note: this document is included in the 2001 supplement to the administrative record for this operable unit in section 6)

3. Foster Wheeler, 2001c. Sediment sampling e-mail for samples collected between May and July 2001, from Stephen Emsbo-Mattingly to Paul Craffey, MA DEP, et al.; with corresponding map of sample locations attached. August 31, 2001. (Note: this document is included in the 2001 supplement to the administrative record for this operable unit in section 6)

4. New Bedford, 2001. New Bedford, Our City Our Future - An Overview of the New Bedford Master Plan: Vision and Challenges. City of New Bedford Master Plan Committee. (Note: this document is included in the 2001 supplement to the administrative record for this operable unit in section 13)

5. USACE, 1990. New Bedford Harbor Superfund Pilot Study, Evaluation of Dredging and Dredged Material Disposal. US Army Corps of Engineers, New England Division. May 1990. (Note: this document is included in the 1998 administrative record for this operable unit as document 4.6.1)

6. USACE, 1991. Final construction drawings, New Bedford Harbor Superfund Hazardous Waste Cleanup, Hot Spot Operable Unit. US Army Corps of Engineers, Omaha District December 1991. (Note: due to the oversize nature of these drawings, this document is only available at the Boston, MA records center listed in section I.E above).

7. USACE, 1994. New Bedford Harbor Remediation. US Army Corps of Engineers, New England Division, Enviromental Laboratory (concerning TCLP analysis of the hot spot sediments). October 6, 1990. (Note: this document is included in the 1998 administrative record for this operable unit as document 7.2.2)

8. USACE, 2000. Draft Technical Information Report, Confined Disposal Facility D. US Army Corps of Engineers, New England Division. June 9, 2000. (Note: this document is included in the 2001 supplement to the administrative record for this operable unit in section 6)

9. USACE, 2001. Surficial Soil Samples, Debris Disposal Area. June 12, 2001 (Note: this document is included in the 2001 supplement to the administrative record for this operable unit in section 7)

10. USEPA, 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. USEPA Office of Solid Waste and Emergency Response. EPA 540-R-98-031, OSWER 9200.1-23P, PB98-963241. July 1999. (Note: this guidance document is available at the EPA New England Records Center at the location listed in Section I.E above.)

11. USEPA, 2001a. Compilation of groundwater monitoring results for the Debris Disposal Area, New Bedford Harbor Superfund Site. US Environmental Protection Agency, New England Region. September 06, 2001. (Note: this document is included in the 2001 supplement to the administrative record for this operable unit in section 7)

12. USEPA, 2001b. Compilation of Sawyer Street air monitoring results, October 2000 through May 2001, New Bedford Harbor Superfund Site. US Environmental Protection Agency, New England Region. September 26, 2001. (Note: this document is included in the 2001 supplement to the administrative record for this operable unit in section 7)

13. VHB, 2000. New Bedford/Fairhaven Harbor Plan, Executive Summary and Figure 1.1. Vanasse Hangen Brustlin et al. August 2000. (Note: this document is included in the 2001 supplement to the administrative record for this operable unit in section 17)

Explanation for Significant Differences #2
New Bedford Harbor Superfund Site OU#1
(February 2002)

Explanation of Significant Differences

for the

Upper and Lower Harbor Operable Unit

New Bedford Harbor Superfund Site

New Bedford, Massachusetts

Draft for Public Comment

February 2002

U.S. Environmental Protection Agency - New England Region

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Appendices

Appendix A - Draft TSCA 761.61(c) Determination
Appendix B - Reference Cited

I. Introduction

A. Site Name and Location

Site Name: New Bedford Harbor, Upper and Lower Harbor Operable Unit (o.u.) #1
Site Location: Bristol County, Massachusetts

B. Lead and Support Agencies

Lead Agency: United States Environmental Protection Agency (EPA)
Contacts: David Dickerson, Co Remedial Project Manager (617) 918-1329
Jim Brown, Co Remedial Project Manager (617) 918-1308

Support Agency: Massachusetts Department of Environmental Protection (MA DEP)
Contact: Paul Craffey, Project Manager (617) 292-5591

C. Legal Authority for Explanation of Significant Differences

Section 117(c) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and Section 300.435(c)(2)(1) of the National Contingency Plan (NCP) requires that, if any remedial or enforcement action is taken under Section 106 of CERCLA after adoption of a final remedial action plan, and such action differs in any significant respect from the final plan, the EPA shall publish an explanation of the significant differences (ESD) and the reasons such changes were made. While not required by Section 300.435(c), EPA is exercising its discretion to hold a public comment period on this proposal to ensure that all interested parties have an opportunity to provide input to EPA before it makes its final decision on this modification to the remedy.

D. Summary of Proposed ESD

The Record of Decision (ROD or ROD 2) for this phase or operable unit of the site cleanup was issued on September 25, 1998. The ROD's cleanup plan calls for approximately 450,000 cubic yards of PCB laden sediment to be dredged from the harbor bottom and surrounding wetlands, and to be disposed in perpetuity in four shoreline confined disposal facilities (CDFs A, B, C and D). See Figure 1. Since that time EPA has gathered additional site information and refined the cleanup approach for the upper and lower harbor area. A prior ESD was issued in September 2001 to address five of these refinements: additional intertidal cleanup areas; mechanical dewatering; use of the pilot study CDF as an interim TSCA (Toxic Substance Control Act) facility; change in CDF D wall design; and use of rail at CDF D.

This proposed ESD for ROD 2 seeks public comment on EPA's assessment that offsite disposal for the dredged sediments slated for CDF D is a better approach for the harbor cleanup than constructing CDF D and disposing PCB-contaminated sediments in it. At approximately 17

acres, CDF D is the largest of the ROD's four CDFs and has been sited for the north terminal port area of the harbor. As described more fully in Section III, EPA has compared the refined cleanup approach discussed in the first ESD to a modified approach that eliminates CDF D, and instead disposes the sediment slated for CDF D at a licensed offsite facility. EPA now believes that this proposed modified approach is better and more cost-effective than constructing and filling CDF D.

While this ESD proposes elimination of the 17 acre CDF D, it does not eliminate extension of the rail spur into this area discussed in the September 2001 ESD. If this proposed ESD is supported by public comment and incorporated into the remedy, a smaller shoreline facility would be constructed in the same area to support both the sediment dewatering building and the rail car (or truck or barge) loading area required for offsite disposal of the dredged sediments. See Figure 2 for the location of this smaller dewatering and loading facility. Figure 3 illustrates the larger area of fill that would be required for CDF D, based on its current conceptual design. Figure 4 provides a closer overhead view of the smaller dewatering and loading facility, as currently designed.

It should be emphasized that this proposal only addresses the elimination of CDF D, and proposes off-site disposal of only those sediments that would have been disposed in it. While the current cost-estimate (see Table 1) indicates that it would be cost-effective to dispose all site sediments at an offsite facility, thus eliminating construction of CDFs A, B and C as well as D, EPA stresses that this cost estimate will need to be reevaluated at least annually once actual offsite disposal costs are determined. Other project factors will be included in these reevaluations along with these actual disposal costs, such as the compliance status of the offsite facility(ies), potential growth of the total sediment volume requiring disposal, and annual funding levels for the harbor cleanup. If in the future construction and filling of one or more of CDFs A, B or C is deemed no longer necessary, EPA will issue an additional decision document.

Compared to the fully funded project cost of $325 million for the refined remedy discussed in the first ESD (disposal of dewatered dredged sediments in CDFs C and D), the alternative proposed in this ESD - elimination of CDF D and offsite disposal of dredged sediment - is estimated to cost $317 million (a two percent difference). As described below in Section III, cost considerations are not the only reason EPA believes the offsite disposal alternative to be the best approach.

E. Public Comment Period

EPA will solicit public comment on the proposed modification to the remedy discussed in this ESD for a period of thirty days after the publication of this draft ESD. To make it easy for the public to comment, EPA will allow oral, written and e-mailed formal comments to be entered for the record. Oral comments can be provided at the public hearing portion of a March 6, 2002 public meeting at the New Bedford Free Public Library, 613 Pleasant Street. (An informational presentation and question and answer session from 6:30 to 7:30 pm will precede the public hearing from 7:30 pm to 9 pm at the March 6, 2002 public meeting.)

Written comments post-marked by March 26, 2002 may be submitted to:

David J. Dickerson
Remedial Project Manager
U.S. EPA New England Region
1 Congress Street
Suite 1100 (HBO)
Boston, MA 02114

E-mailed comments can be sent by March 26, 2002 to the following e-mail address:

comments.nbh@epa.gov

F. Public Record

When the public comment period closes, EPA will consider all formal comments before issuing a final ESD. EPA will prepare a Responsiveness Summary that answers all formal comments received during the public comment period. The Responsiveness Summary, along with all comments, will be attached to the ESD and will become part of the official public record for the site that is available for public review at the two locations listed below.

EPA New England Records Center
1 Congress Street
Boston, MA 02114
(617) 918-1440
Monday-Friday: 9:00am - 5:00pm; (closed first Friday of every month and federal holidays)

New Bedford Free Public Library
613 Pleasant Street, 2nd floor Reference Department
New Bedford, MA 02740
(508) 961-3067
Monday-Thursday: 9:00am - 9:00pm
Friday-Saturday: 9:00am - 5:00pm

EPA supplemented the public administrative record file in October 2001 with various documents generated since the 1998 ROD, including those that supported the September 2001 ESD.

II. Summary of Site History, Contamination Problems and Selected Remedy

A. Site History and Enforcement Activity

Identification of PCB (polychlorinated biphenyl) contaminated sediments and seafood in and around New Bedford Harbor was first made in the mid-1970s as a result of EPA region-wide

sampling programs. In 1978, the manufacture and sale of PCBs was banned nationally by TSCA. In 1979, the Massachusetts Department of Public Health promulgated regulations prohibiting fishing and lobstering throughout the site due to elevated PCB levels in area seafood. Due to these concerns, the site was proposed for the Superfund National Priorities List (the NPL) in 1982, and finalized on the NPL in September 1983. Pursuant to 40 CFR 300.425(c)(2), the Commonwealth of Massachusetts (the Commonwealth) nominated the site as its priority site for listing on the NPL.

EPA's site-specific investigations began in 1983 and 1984. Site investigations continued throughout the rest of the 1980s and early 1990s, including a pilot dredging and disposal study in 1988 and 1989, computer modeling of the site completed in 1990, and an updated feasibility study for site cleanup also completed in 1990.

Collectively, these investigations identified the Aerovox manufacturing facility on Belleville Avenue in New Bedford as the primary source of PCBs to the site. PCB wastes were discharged from the facility's operations directly to the upper harbor through open trenches and discharge pipes, or indirectly throughout the site via CSOs (combined sewer overflows) and the City's sewage treatment plant outfall. Secondary inputs of PCBs were also made from the Cornell Dubilier Electronics, Inc. (CDE) facility just south of the hurricane barrier in New Bedford.

Based on the investigations' results, state and federal enforcement actions were initiated against both the Aerovox and CDE facilities as well as the City of New Bedford (though the City is not a Potentially Responsible Party for this site) pursuant to CERCLA, Massachusetts General Law c.21E, and other federal and state environmental statutes. For a summary of these enforcement actions and resulting settlements please see Section II of the 1998 ROD for the site (this ROD can be found as document 5.4.1 in the administrative record discussed above). The site cleanup is being managed by EPA, in partnership with the U.S. Army Corps of Engineers and the MA DEP.

In April 1990, EPA issued a ROD for the hot spot operable unit of the site (o.u. #2). The hot spot ROD called for dredging and on-site incineration of the site's most highly PCB-contaminated sediments located in the vicinity of the Aerovox facility. The ROD defined these hot spots as areas above 4,000 ppm (parts per million) PCBs. Dredging of these sediments - about 14,000 cubic yards (cy) in volume and 5 acres in area - began in April 1994 and was completed in September 1995. However, due to a vehement and congressionally-supported reversal in local support for on-site incineration, EPA suspended the incineration component of the hot spot remedy. Pursuant to an October 1995 ESD the dredged hot spot sediments were temporarily stored in a shoreline confined disposal facility at Sawyer Street in New Bedford, and then, pursuant to an April 1999 amendment to the 1990 Hot Spot ROD, the sediments were dewatered and transported to an offsite landfill for permanent disposal. This final phase of the hot spot remedy was completed in May 2000.

In September 1998, EPA issued the second ROD for the site for cleanup of the upper and lower New Bedford Harbor areas (o.u. #1). The remedy selected in this 1998 ROD (also known as ROD 2) is summarized in Section II.C below. As discussed above in Section I, the remedy was subsequently refined in a September 2001 ESD.

B. Contamination Problems

As noted above, the main site concern is the widespread PCB contamination in New Bedford Harbor sediments. Although the hot spot remedy removed approximately 14,000 cy of the most contaminated sediment, elevated levels up to and, in isolated areas, above 4,000 ppm total PCBs remain in both sediments and wetlands. The highest levels are generally found in the northern reaches of the upper harbor, with PCB levels decreasing in a southerly trend. Because of this sediment contamination, PCBs are also found in elevated levels in the water column and in local seafood, and to a lesser extent in the air along certain areas of the shoreline. In addition to the PCB contamination, harbor sediments also contain high levels of other contaminants including heavy metals (e.g., cadmium, chromium, copper and lead).

As described more completely in Sections V and VI of the 1998 ROD, EPA found the PCB contamination to result in unacceptable risks to human health and the environment. The biggest human health risk was found to be from frequent (e.g., weekly) ingestion of local seafood, although secondary risks were also found from frequent human contact with PCB-contaminated shoreline sediments or soils. Ecologically, EPA's investigations concluded that the harbor's marine ecosystem is severely damaged from the widespread PCB contamination.

C. Summary of Remedy Originally Selected in the 1998 Record of Decision as Modified by the September 2001 ESD

Due to this contamination and risks to human health and the environment, EPA in the 1998 ROD selected a cleanup remedy for the entire upper and lower harbor areas. The ROD calls for the dredging and containment of approximately 450,000 cubic yards of PCB-contaminated sediment spread over about 170 acres. In the upper harbor north of Coggeshall Street, sediments above 10 ppm PCBs will be dredged, while in the lower harbor and in salt marshes, sediments above 50 ppm PCBs will be dredged. To protect human health against risks due to dermal contact with PCBs, intertidal sediments or soils in areas adjacent to homes will be removed if PCB levels are above 1 ppm, while those adjacent to parks or recreational shoreline areas where people spend less time than in areas adjacent to residences will be removed if PCB levels are above 25 ppm (the "beachcombing standard").

As discussed above in Section I, the ROD originally called for the dredged sediments to be placed in four shoreline CDFs (CDFs A, B, C and D; see Figure 1). Seawater decanted from these sediments is to be treated to very stringent levels before discharge back into the harbor. The ROD also requires that institutional controls, including the continuation of a state-sanctioned fishing ban, be in place until PCB levels in seafood reach acceptable levels.

The September 2001 ESD set forth further refinements of the remedy that arose as the design phase progressed since 1998. These changes included the use of mechanical dewatering for the dredged sediments and the incorporation of a rail spur at CDF D.

III. Description of Significant Differences and the Basis for These Differences

As summarized in Section I, EPA has evaluated the benefits of eliminating CDF D and disposing its sediments offsite to those of the original remedy as modified by the September 2001 ESD. As described below, this evaluation leads EPA to believe that this ESD's proposed modification is a better approach than building and filling CDF D.

A. Use of a licensed, offsite TSCA-authorized facility (or facilities) instead of CDF D avoids filling approximately 15 acres of New Bedford Harbor

The most direct physical advantage of this ESD's proposed modification is that it reduces the required filling of intertidal and subtidal areas from the original 17 acres to only 2 acres. By expanding existing filled tidelands with an additional 2 acres of fill, both the sediment dewatering and offsite loading facilities can be located within a smaller area, with a net savings of 15 acres of tidelands that are no longer disrupted. See Figures 2 and 3 attached. This proposal to decrease the amount of filling, along with dewatering, is consistent with EPA's mandate under both state and federal laws to consider actions that are least damaging to the environment and to minimize, to the maximum extent possible, adverse environmental impacts.

B. Implementation of CDF D poses significant engineering challenges

During the course of an extensive post-ROD sediment boring program for CDF D, the Corps of Engineers identified a problematic layer of soft, fine grained sediments. From a geotechnical and structural standpoint, these soft underlying materials are an unsuitable base or foundation for any wall design for the CDF. As explained in the September 2001 ESD, a number of different CDF wall designs were examined but all required removal of these soft, weak sediments.

Even though these weak underlying sediments do not exceed ROD 2 cleanup levels, approximately 250,000 to 300,000 cubic yards of this material would need to be removed and disposed before building CDF D. This would be a large and costly sediment volume to manage which would not otherwise have been required by the harbor cleanup (i.e., the PCB levels would not be above the 50 ppm lower harbor cleanup level). It was primarily this fact, as well as market experience gained in sending the hot spot sediments to an offsite facility in 1999 and 2000, which prompted a closer evaluation of an offsite alternative in lieu of CDF D.

Elimination of CDF D would also avoid other engineering challenges, that, although less significant than managing these weak foundation sediments, could impact the harbor and surrounding communities. These include, among others, managing a complex, in-water construction and filling project within the busy harbor, dewatering the CDF prior to filling with filter cake (see Section IV) and controlling air emissions from within the large CDF footprint.

C. Given the strain on CERCLA funding nationally, eliminating CDF D and sending its sediment offsite avoids the possibility of having a partially completed and unusable CDF D linger amidst the working waterfront

To date the ROD 2 cleanup has been implemented using dedicated site-specific funds resulting from previous CERCLA litigation (see Section II.A above). During fiscal year 2002, however, these settlement funds will likely be exhausted, and the cleanup will be funded by a combination of the remainder of these funds and national Superfund program funds. Beginning in fiscal year 2003 (which begins in October 2002) the harbor cleanup will be entirely dependent on annual funding from the national Superfund program. This national funding is currently limited, and is projected to be insufficient to meet all needs across the country.

The specific affect on the harbor cleanup from a shortfall in annual funding, absent this ESD's proposed modifications, could either be a partially constructed CDF or a constructed CDF with insufficient funding to fill it. Not only would this present technical challenges in terms of managing air emissions and minimizing potential PCB leakage from an uncapped facility, it would also significantly delay the beneficial reuse of the CDF and stymie redevelopment of the working waterfront.

Instead, this proposal provides an alternative that allows both dredging and redevelopment to move forward simultaneously. Once the dewatering and water treatment facilities are in place, dredging can begin and move forward as dictated by available funding.

D. Construction of the infrastructure required for offsite disposal has less adverse impacts on abutting waterfront dependent businesses than construction of CDF D

Although the proposed modification does impact certain abutters, its decreased size would significantly lessen these impacts to abutters compared to the originally planned CDF D. Proceeding with CDF D would displace a number of water dependent businesses within the designated port area for an undetermined period until its completion. The proposed, smaller scale structure reduces the number of businesses affected. EPA has had preliminary discussions with impacted landowners and tenants about the proposed smaller structure, and through the cooperation of these affected parties, acceptable arrangements that accommodate both their needs and the project's needs appear viable.

E. The shoreline facility required for offsite disposal can be more easily reused and integrated into the working waterfront than CDF D

In terms of beneficial reuse, the proposed smaller facility presents significantly less challenges than the full scale CDF D. This is an important consideration since both facilities would be located in the state-designated port area (DPA) of the harbor (see p.32 of ROD 2).

Under the CDF D option, EPA would create a 17 acre area which would have to be capped and maintained to prevent the release of the stored PCB-contaminated sediments. Redevelopment of this new acreage would need to be carefully controlled and limited in order to preserve the integrity of the CDF. In addition, the full scale CDF D would require significant long term monitoring and maintenance (O&M) costs. These Superfund O&M costs would be eliminated with the smaller facility.

Under the offsite disposal option, the smaller scale shoreline facilities - the bulkhead, dewatering warehouse and rail spur - would be designed for future commercial marine reuse. Thus beneficial reuse of these facilities within the DPA once the cleanup is complete would be vastly streamlined and much less limited. Figure 4 shows a plan view of these features as currently designed.

F. The Proposed Remedy Change Allows for a Quicker Cleanup of Contaminated Sediments North of Wood Street

Switching to offsite disposal in lieu of CDF D would allow the "North of Wood Street" cleanup to be fast-tracked, since the excavated soils and sediments from this area could be disposed offsite rather than waiting for CDF D to be completed. Remediation of this area is important since it contains high contamination levels (up to 33,000 ppm PCBs) in a stretch of the Acushnet River with homes and two public parks along its shores.

Remediating this river stretch in 2002 also benefits the harbor cleanup by making use of property formerly occupied by a truss manufacturing facility as an important shoreline staging area. Since this property is slated to become a shoreline park in the City's Master Plan, an earlier cleanup avoids the dilemma of locating a park near the contaminated shoreline and allows the restoration and replanting process of the remediation to cost-effectively dovetail into the park design.

G. Offsite disposal in lieu of CDF D is estimated to save $8 million

As discussed above in Section I.D and below in Section III.H and Table 1, the current, fully funded cost estimate for this proposed modification to eliminate CDF D is $317 million, approximately $8 million less than the current $325 million estimate if CDF D is retained (see the September 2001 ESD). Since this represents only a two percent savings, and is likely to be within the margin of error of the estimates, EPA does not believe that this savings is an over-riding reason to implement the proposed modification. Rather, it is just one of the many reasons explained herein that point towards the elimination of CDF D and the proposed remedy modification. EPA does believe, however, because less of the cost of the proposed remedy would go towards in-water construction, that there is less potential for construction related cost growth.

H. Updated Cost Estimate

The current, fully funded cost estimate to implement ROD 2 as proposed in this ESD is $317 million, using 2001 price levels, three percent per year inflation, and full contingency. Table 1 attached outlines the major cost components of this estimate. Note that the total project cost could become greater if actual funding levels are so low as to cause significant project delays and inefficiencies, or if the assumptions the cost estimate is based upon change significantly. Alternatively, total costs could decrease to an estimated $298 million if annual funding levels are high enough to allow the project to be implemented more efficiently.

As explained below, this current, fully funded $317 million estimate is a different type of cost estimate than used in the 1998 ROD. The ROD's estimate - $129 million for EPA costs - is a present worth estimate, and was based on 1995 price levels. The ROD's cost estimate included all dredging related costs as well as the costs of CDFs A, B, C and D.

Present worth is the amount required to fund a project assuming that amount can be invested at the start of the project for a given rate of return as the project progresses. Present worth estimates help evaluate various options on an equal basis, but they do not represent the actual funding levels that will be required for a project of this type. The fully funded estimate, on the other hand, includes inflation and reflects the total of the actual annual funding levels required to implement the harbor cleanup. In addition, since the ROD cost estimate is based strictly on a conceptual (rather than a more detailed) project design, EPA guidance acknowledges that actual project costs could be up to 50% higher than the cost estimate developed for the ROD (USEPA, 1999).

The following table shows the comparative process used by EPA and the Corps of Engineers to evaluate whether the current, fully funded estimate of $317 million is within the initial, present worth estimate of $129 million included in the ROD.

Type of Cost Estimate	**$ - in millions**
EPA ROD 2 cost at 1995 price level, **present worth**	129
EPA ROD 2 cost at 1995 price level, **present worth basis removed**	188
EPA ROD 2 cost **at 2001 price level, present worth basis removed** (increases due to inflation)	223
EPA ROD 2 cost at 2001 price level, acceptable upper limit (**$223 million times 1.5** per EPA guidance)	335
Current fully funded cleanup estimate (2001 price level including inflation)	317

Since the current, fully funded estimate for offsite disposal of $317 million as explained

in this ESD is $18 million less than this last $335 million threshold, EPA believes that the remedy has been maintained within the acceptable range of the original ROD cost estimate.

IV. Offsite Disposal "ARARs" (Applicable or Relevant and Appropriate Requirements)

Consistent with ROD 2, PCB-contaminated sediment above EPA's clean up levels must be handled and disposed of in accordance with 40 CFR 761.61(c) of TSCA, which requires that the methods used will not pose an unreasonable risk of injury to health or the environment. See Table 8 of the ROD, Action Specific ARARs. This section describes the cleanup methods to be used that will be compliant with TSCA's standards.

Except for a limited amount of sediment removal discussed below, all dredged sediment over 50 ppm PCBs in situ (i.e, as measured in place) will be subject to a coarse material separation process and a dewatering process before being disposed in a CDF or, as proposed in this ESD, transported offsite for disposal at a licensed TSCA facility. After removing larger debris such as large shells and stones at the dredging platform, the dredged sediments will be first piped to a coarse material separation facility located at the debris disposal area (DDA) at Sawyer Street. A temporary soil cap will be placed on top of the DDA as well as an asphalt pad before construction of this separation facility (see Section III.C of the September 2001 ESD for more information on the DDA).

At the separation facility, the sediment will be subjected to a mechanical process to separate coarse material (sand, gravel, shells, etc.) from the finer grained organic silts. This separation process will be done in an enclosed building where point source air emissions will be collected and treated. Removal of this coarse material will improve the efficiency of the dewatering process and reduce the wear and tear on the equipment used to dewater the organic silts.

As an additional benefit, EPA believes that the separated coarse material is likely to contain much lower PCB levels than the finer grained organic silts. Additional site specific studies are being performed to confirm this. The PCBs would not be lost or diluted by this process but rather the cleaner sand and gravel would be separated from the more highly contaminated organic silts. The resulting water from this process will be sent to the site's water treatment plant at Sawyer Street, treated to applicable water quality standards, and discharged into the harbor. The air and groundwater monitoring already in place at Sawyer Street will be tailored to the separation operations to ensure that emissions are within acceptable levels. Other engineering controls such as odor control or dust suppression will be implemented as necessary.

After coarse material separation at Sawyer Street, the remaining dredged sediments will be piped approximately 5,000 feet south via double-walled underwater pipes to a dewatering facility at Hervey Tichon Avenue. Here, the dredged material will be processed through filter presses to remove excess water, resulting in a dewatered "filter cake" similar to damp soil in texture. The process will be completely enclosed within the dewatering building, and point

source air emissions within the building will be treated. If necessary, dust suppression measures will be implemented inside the building as well. Ambient air monitoring will be performed to ensure that neighboring workers and residents are not adversely impacted by the dewatering operations. As proposed in this ESD, the filter cake will be sent offsite to a licensed TSCA-authorized facility or to CDFs A, B and C; the water removed by the presses will be sent back to Sawyer Street, again via underwater pipes, for water treatment.

The separated sand and gravel from the separation facility at Sawyer Street will be sampled and, if less than 50 ppm total PCBs, will be transported offsite to a non-TSCA facility, similar to disposal practices outlined in 40 CFR 761.61(a)(5)(ii) for self-implementation. As to the larger separated debris, it will be decontaminated or washed in a controlled process so as to avoid spills or releases. This debris will then be sampled to determine if it can be disposed as TSCA or non-TSCA waste. This process will capture regulated PCBs and dispose of them properly, most likely by treating the wash water at the onsite water treatment plant.

To optimize cost-efficiency, EPA may identify harbor sediments which contain PCBs above ROD 2 cleanup levels but below 50 ppm in situ as separate dredge management units (DMUs). This material will be subjected to the same separation and dewatering processes explained above for sediment exceeding 50 ppm. However, provided confirmational sampling shows this dredged sediment to be below 50 ppm, the resulting filter cake will be sent offsite to a non-TSCA facility as allowed under 40 CRF 761.61(a)(5)(ii).

In addition to the full scale dredging process explained above, some construction related dredging will be required in the north terminal area of the harbor as part of the harbor cleanup. After removing all sediments with PCB levels at or above EPA's cleanup level of 50 ppm in this area, limited additional sediments which do not exceed this clean-up level will likely need to be removed to enable construction of the dewatering facility and associated navigational dredging (see Section III.C, above). Instead of being subjected to the active separation and dewatering processes described above, this less contaminated material may be passively dewatered on an asphalt pad constructed on nearby filled land. Levels of pollutants in the water runoff from this process may exceed allowable discharge levels set in accordance with Section 402 of the Clean Water Act and the State's surface water discharge requirements. The runoff will be captured and sent to the City of New Bedford's publicly owned treatment plant (POTW) if it meets applicable Clean Water Act standards, 40 CFR 403. (See Table 8 of the ROD, Action Specific ARARs.) If the runoff does not meet applicable standards for discharge to the POTW, it will be transported to EPA's water treatment facility at Sawyer Street, where it will be treated to applicable discharge standards before being discharged either to the POTW or the Harbor. Once sufficiently dried, this dredged material will be sampled, and, if found to have 1 ppm or less of PCB concentration (and no longer regulated under TSCA), it will meet state and federal standards for unlimited reuse or may be disposed of as Solid Waste.

Another area where sediment handling will be different than in the full scale separation and dewatering process is in the river stretch north of Wood Street. Because recent sampling has

revealed extremely high shoreline PCB levels (up to 33,000 ppm), and since residences and two public parks are located in this stretch, EPA has prioritized the cleanup of this area to start in July 2002 (see Section III.C above). Because the separation and dewatering facilities explained above will not be in place until approximately one year later, EPA will use specialized techniques such as "roll-off" containers to drain excess water from the excavated soil and sediments from this area. This removed water will be captured at the containers and sent to Sawyer Street or the POTW for water treatment, as appropriate. For excessively wet sediment, some materials (e.g., cement) may be added within the roll-off containers to dry the sediments sufficiently for offsite transport and disposal. All such activities will take place on a bermed, asphalt pad, and air monitoring will be performed to ensure that neighboring residents and workers are not adversely impacted by this cleanup effort. Similar techniques may be used in other areas of the harbor where it may not be feasible to slurry (or pump) excavated material to the dewatering facility.

In accordance with Section 761.61(c) of TSCA, the Regional Administrator must make a determination that the proposed offsite disposal discussed above does not pose an unreasonable risk of injury to human health or the environment. A draft determination is attached to this ESD as Appendix A. A final determination will be made after the close of the public comment period and will be attached to the final ESD.

V. Supporting Agency Comments

In a February 21, 2002 letter to EPA New England, the MA DEP expressed its agreement with the changes proposed in this draft ESD.

VI. Statutory Determinations

As discussed above in Section IV, this ESD includes EPA New England's Regional Administrator Robert W. Varney's draft determination under TSCA 40 CFR Sec. 761.61(c) that the dewatering and proposed offsite disposal does not pose an unreasonable risk of injury to health or the environment.

EPA believes that the proposed modification herein remains protective of human health and the environment, complies with all Federal and State requirements that are applicable or relevant and appropriate to this remedial action (and which were not waived in the 1998 ROD), and is cost-effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site.

VII. Public Participation Activities

EPA and DEP meet regularly with site stakeholders to keep the community up to date with the site's cleanup status, including the issues described above in Sections III and IV. For example, EPA and DEP meet quarterly with the facilitated New Bedford Harbor Superfund Site Community Forum, as well as monthly with the Forum's subcommittee. Additional meetings

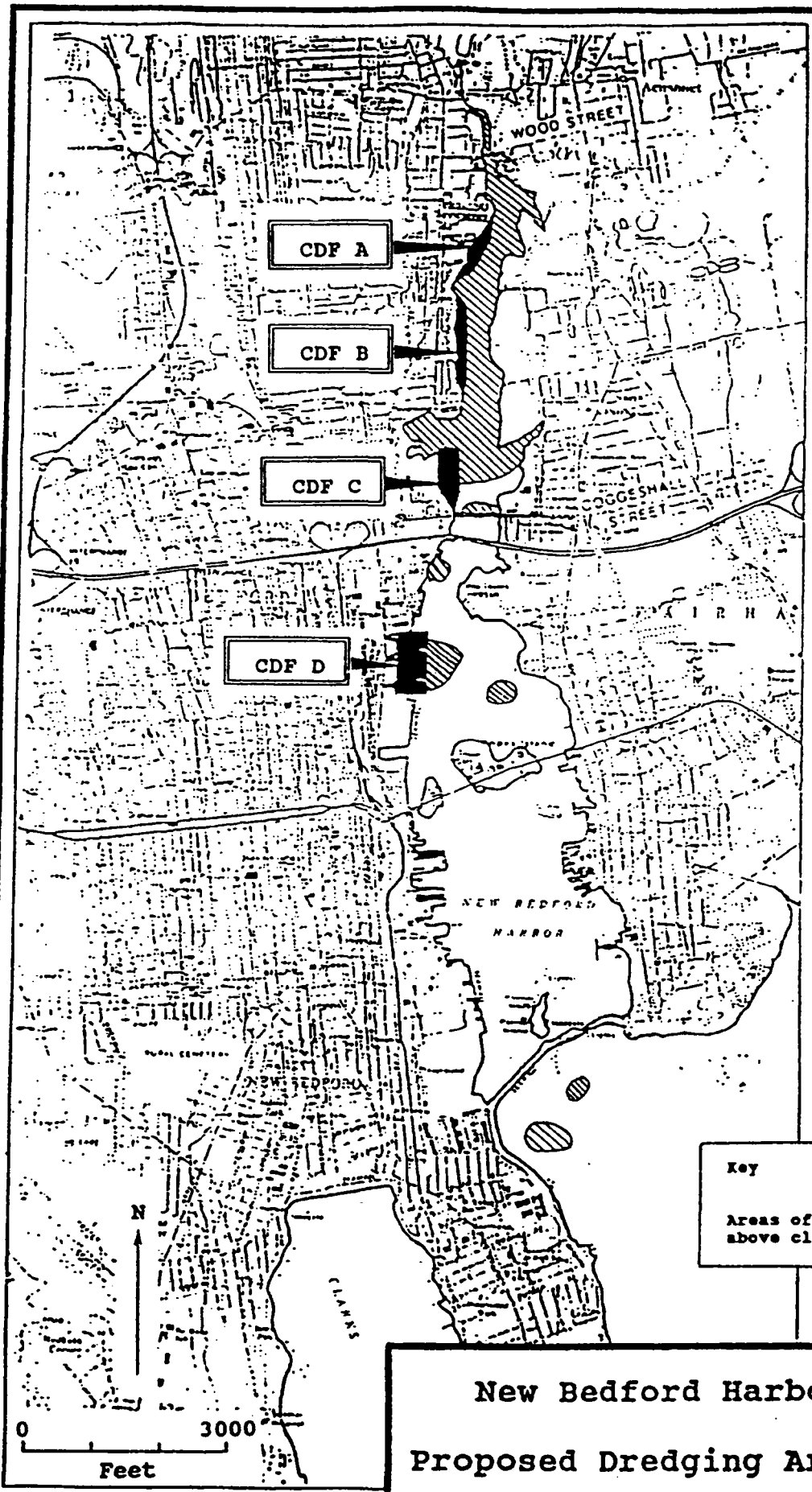
and outreach efforts with other groups occur as necessary to successfully implement the cleanup program.

Also, as explained above in Section I.E, EPA will hold a public meeting on March 6, 2002 specifically to discuss the modified remedy proposed herein, and to take formal comments on it.

_____ _____

Patricia Meaney, Director
Office of Site Remediation and Restoration
EPA New England

Date



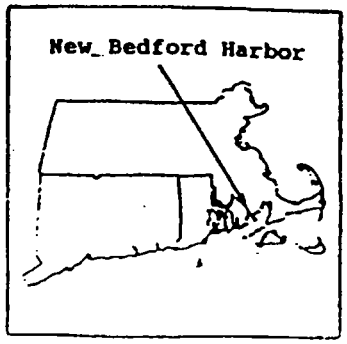


Figure 1

Key

Areas of sediment above cleanup levels

New Bedford Harbor ROD II

Proposed Dredging Areas and CDFs

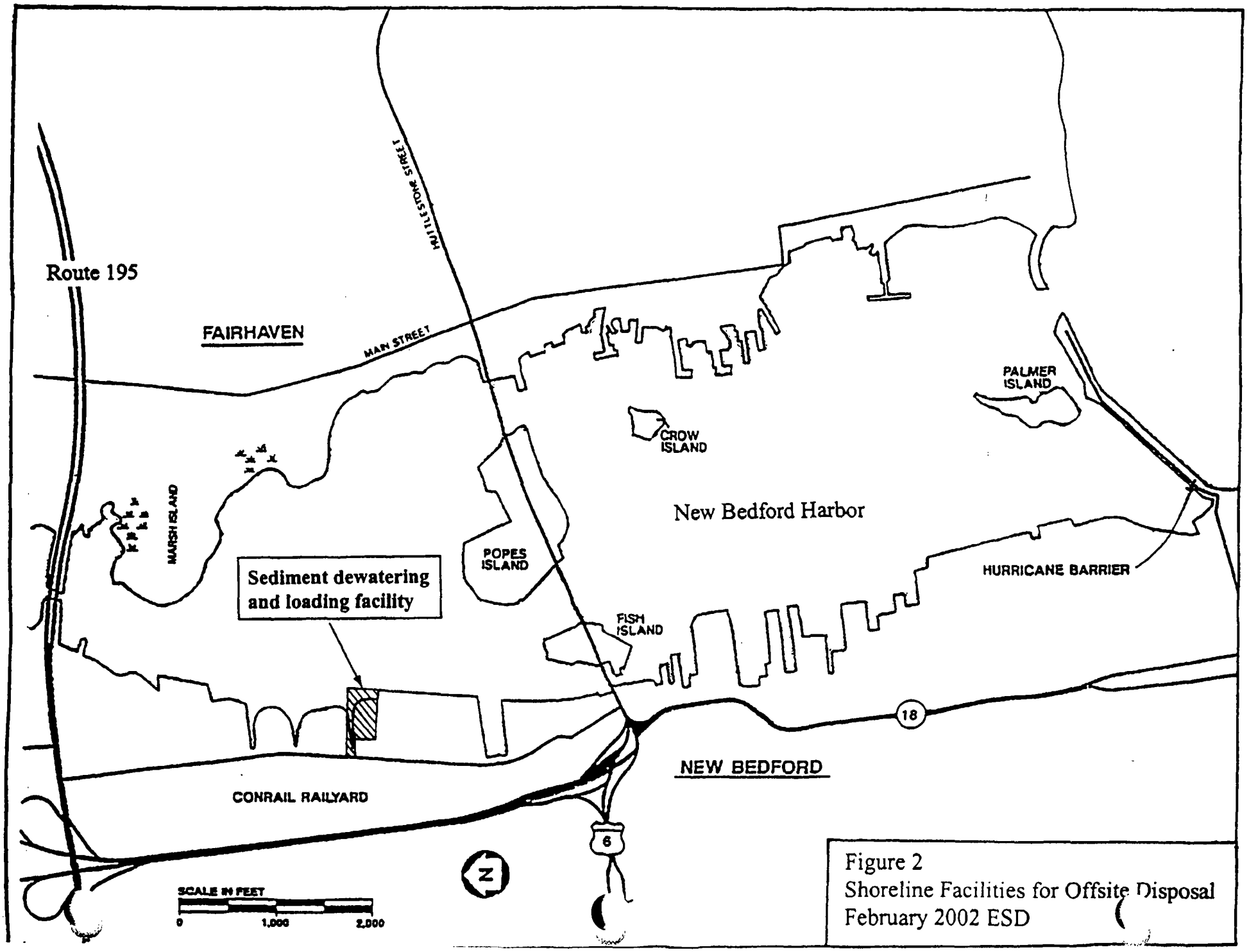


Figure 2
Shoreline Facilities for Offsite Disposal
February 2002 ESD

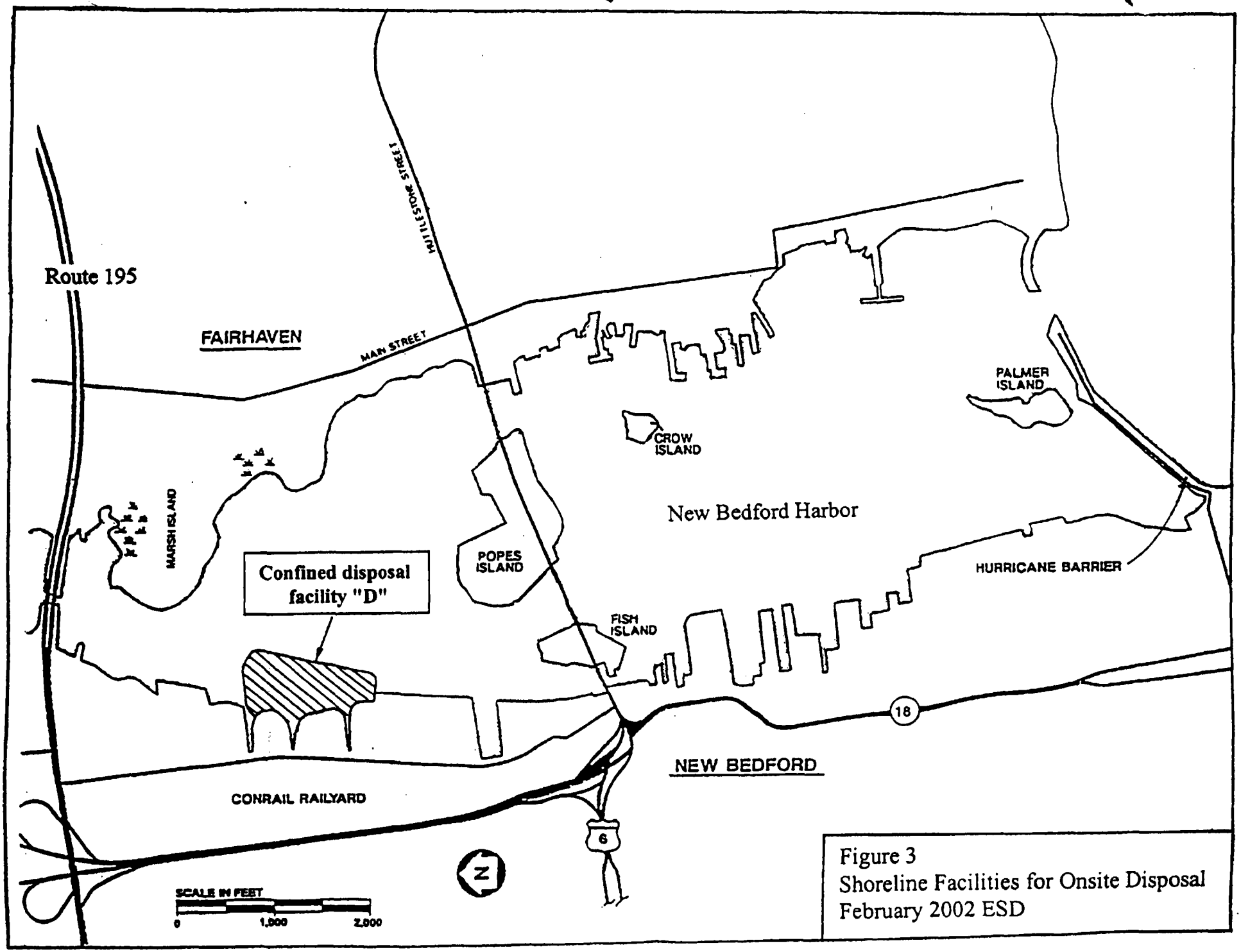


Figure 3
Shoreline Facilities for Onsite Disposal
February 2002 ESD

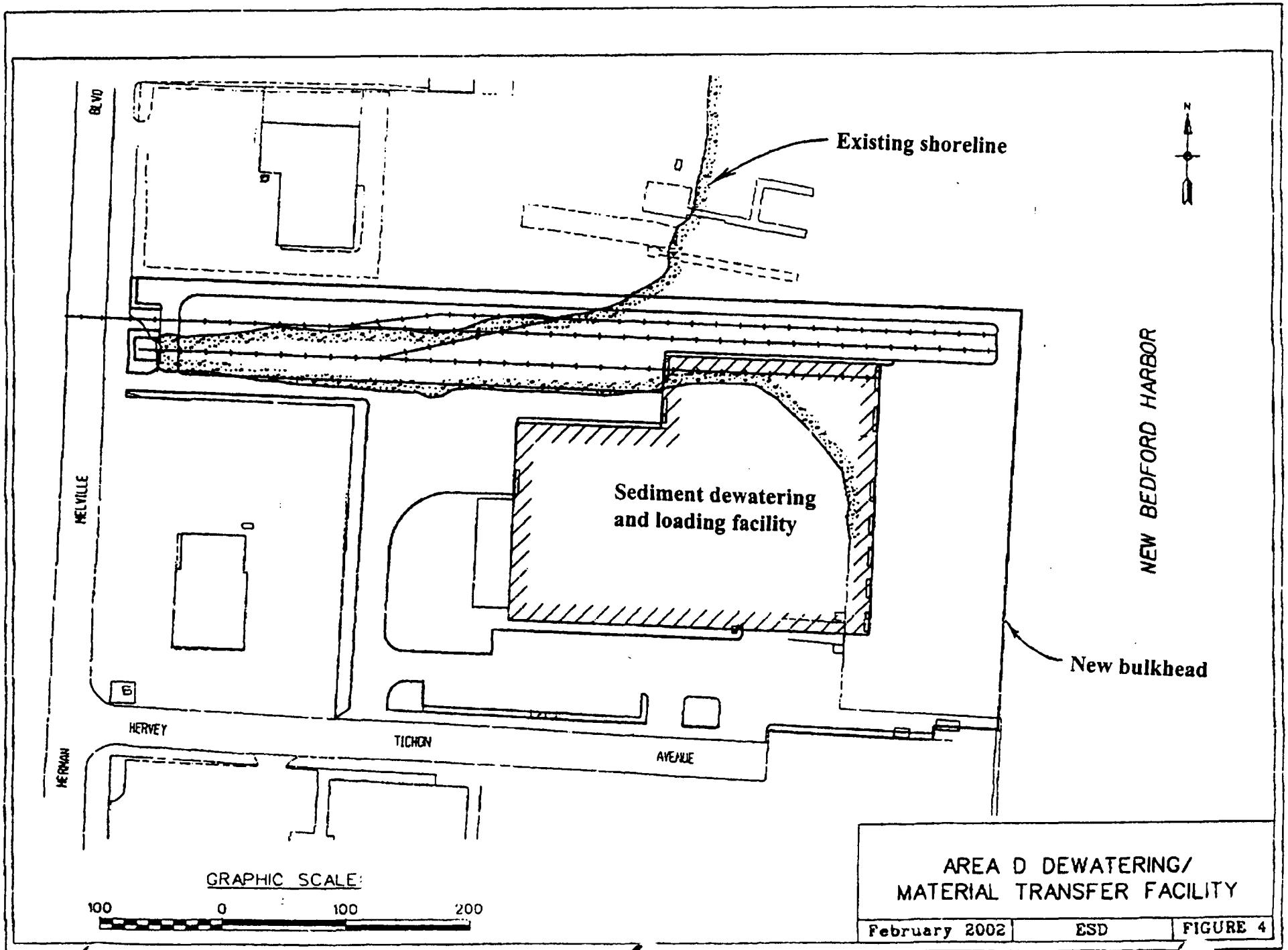

Existing shoreline
Sediment dewatering
and loading facility
New bulkhead
NEW BEDFORD HARBOR
MELVILLE
BLVD
HERVEY
TICHON
AVENUE
MERRIMAN
GRAPHIC SCALE:
100
0
100
200
AREA D DEWATERING/
MATERIAL TRANSFER FACILITY
February 2002
ESD
FIGURE 4

Table 1

PROJECT CURRENT COST & BUDGET: TRANSPORT & DISPOSE by RAIL

T&D 387k tons@ Area D; Dredge/Excav. 507,100 CY Contaminated

COST SUMMARY

Restricted Funding--PRELIMINARY ESTIMATE

14-Feb-02

		Cost	Percent of Total
Debris Disposal Area (Surcharge & Cap)	$	574,000	0.2%
Combined Sewer Overflow @ CDF C (CSO C) w/ Mods & Mark-ups		2,614,900	1%
Build Water Treatment Plant & Water Treatment		2,589,000	1%
Area D: De-Watering Bldg, Transport Facility, RR Spur & Remove Vessels		21,972,200	7%
Combined Sewer Overflow for Area "D" (CSO D) w/mark-ups		2,736,380	1%
Harbor Dredging & Excavation (w/ Early Action & Confirm. Smpg & Channel)		33,969,100	11%
De-Water Harbor Sediments		24,500,000	8%
Transport & Dispose Harbor Sediments Off-Site (T&D)		43,459,000	14%
Wetland / Habitat Restoration		4,370,000	1%
Relocate Commonwealth Electric Power Cables w/ Ctg & Air Monitoring Mod		6,855,113	2%
Air/Water Quality, and Ecological Sampling & Monitoring thru 2022		9,194,710	3%
Soccer Field w/ Parking Area and Fence		415,000	0.1%
Site/Home Ofc. Mgt, Eng. During Construction, SS&H,QC, Admin., Overhead, Site Operations (15% on Construc. Costs + USACE Construction Oversight)		36,107,600	11%
Contingency on RA Dredging, De-Watering & T&D		41,071,066	13%
Contract Fee on Future TERC RA Costs		9,091,521	3%
Real Estate Acquisition		1,043,000	0.3%
USACE & Contract Remedial Design & Investigations w/Ctg		39,090,130	12%
Inflation @ 3%/Year Over Design/Construction/RA Monitoring Period		37,169,356	12%
Total (Not Rounded)	$	316,822,076	
Total Project Fully Funded Cost	**$**	**317,000,000**	100%
Total Fully Funded O&M through 2030	**$**	**2,000,000**	

Appendix A - Draft TSCA 761.61(c) Determination

Consistent with Section 761.61(c) of the Toxic Substances Control Act (TSCA) I have reviewed the Administrative Record for the site and considered the proposal for offsite disposal of PCB contaminated sediment set out in the Explanation of Significant Differences (ESD) dated _____ for the first operable unit of the New Bedford Harbor Superfund Site. As required by this section of TSCA, I have determined that the ESD proposal to transport dredged PCB contaminated sediment offsite for disposal instead of containing the sediment in Confined Disposal Facility D does not pose an unreasonable risk to health or the environment as long as the following conditions are met:

1. All dredged sediment is disposed of in accordance with TSCA based on in situ PCB levels and not subject to dilution.

2. Protocols, developed in accordance with TSCA, will be developed and maintained for the following activities:

A. Sampling of all dredged material (including separated sand and gravel) before it is transported offsite; and

B. Best efforts are used to rinse desanding and dewatering equipment when handling TSCA and non-TSCA material to avoid mixing.

3. Stockpiled material shall be bermed while awaiting transport to capture runoff. Runoff shall be collected and treated to applicable water quality standards.

4. Groundwater and air monitoring and dust suppression measures as described in the ESD are maintained until the desanding, dewatering and transporting of PCB-contaminated sediment ceases.

(EPA will consider all public comments received during the public comment period prior to issuing a final determination.)

_____ _____

Robert W. Varney, Regional Administrator Date
EPA New England

Appendix B - Reference Cited

1. USEPA, 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. USEPA Office of Solid Waste and Emergency Response. EPA 540-R-98-031, OSWER 9200.1-23P, PB98-963241. July 1999. (Note: this guidance document is available at the EPA New England Records Center at the location listed in Section I.E above.)

B

Appendix B

Development of Public Health Related Design Criteria

The information presented within Appendix B was developed based on the project information available in April 2002. Following development of the Public Health Related Design Criteria, the Bench Scale Dewatering Report was issued and the design of the dewatering facilities was revised. These changes as they relate to the information presented within Appendix B are:

- Analytical data presented within the Bench Scale Dewatering Report indicated negligible concentrations of PCBs and particulate within the filter press blowdown.
- At the maximum dewatering production capacity (816 yd^3/day), approximately 34 yd^3 rather than 17 yd^3 of filter cake may be present in the loadout facility at any one time.
- The building height will be approximately 40 feet rather than the assumed 30 feet.

Each of these changes does not significantly change the results of the report and do not change the conclusions presented. Therefore, the Development of Public Health Related Design Criteria was not revised.

Development of Public Health Related Design Criteria

This section presents the estimation of emissions and development of public health-related design criteria for the dewatering process. While the final design of the dewatering process will take place at a later date, a conceptual process design has been developed to facilitate the development of these criteria. In this design, the process will occur in two locations with some processing at the Sawyer St. area (Area C) and the rest at the area previously proposed for CDF D (Area D). The facilities for the initial desanding operations will be located at Area C, while the dewatering and loading operations will be at Area D. The process assumptions used to estimate emissions are further described in Section 1.0 below. Using this design, air emissions were evaluated to determine their potential to impact public health and safety and performance criteria were developed. The findings of this evaluation relative to public exposure are presented in this section.

1.0 PROCESS DESCRIPTION/ASSUMPTIONS

The conceptual dewatering process begins with the transport of dredged material to the de-sanding operations at Area C via a floating pipeline. The dredged sediment will flow directly into one of several de-sanding units that can operate in parallel that utilize coarse screening and hydrocyclones to separate sand and large debris from the dredged sediment. The dredged material first enters a weir box and flows over the weir into a shaker screen to remove debris larger than 3/8 inch in diameter. The material then drops into a V-tank with a screw auger at the bottom. The auger moves the material to hydrocyclones and linear shakers that remove finer material. The removed coarse and sand solids are then spray-washed and stored prior to disposal. For purposes of estimating emissions, it was assumed that there would be 4 desanding units that could all operate at the same time. The size of each of these units is 30 ft long by 8 ft wide. Sediment and water (i.e., the de-sanded sediment slurry) overflow from these units is then pumped into collection tanks to await hydraulic transport to the dewatering facility at Area D. It was assumed that there would be six 20,000 gal storage tanks. Each tank would be 30 ft long by 8 ft wide and be equipped with mixers to prevent any settling of the solids in the slurry.

The de-sanded sediment slurry will be pumped to a covered storage or equalization tank at the dewatering facilities at Area D. The slurry storage tank at this location will be equipped with jets to continually mix the slurry hydraulically within the tank to prevent the settling of the solids. I was assumed that there would be two equalization tanks, each 30 ft by 80 ft in dimension. From the Area D equalization tanks, the slurry will be pumped to mixing/conditioning tanks. At this point in the process, polymer will be added to the sediment slurry either through in-line additions or in the mixing tanks. It was assumed that there would be twelve 20,000 gal conditioning tanks, each 30 feet long by 8 ft wide. The conditioned slurry will then be fed to one of several filter presses operating in parallel. Each filter press operates as a batch operation as opposed to a continuous operation. The sediment slurry is pumped into the space between the filter chambers then the plates are squeezed together hydraulically and pressurized. The liquid filtrate is separated from the particulate sediments and forced through the filters into a discharge line and collection area. For purposes of conservatively estimating emissions, it was assumed that there would be 6 presses, each with 150 chambers mounted on 2 meter by 2 meter plates, that could all operate at the same time. The filtrate from the presses then goes to a water treatment facility for treatment prior to discharge to the harbor. After a predetermined time, the pressure to the filter press is relieved and the plates are separated. During this separation, the feed lines are pressurized to remove unprocessed slurry. The air or blowdown drawn through the press effectively removes any vapors that may have built up between the plates. It was then assumed that the filter cake would automatically drops from the filters onto a drag flight conveyor belt system located beneath the press. For purposes of estimating emissions, it was assumed that each conveyor would be 70 ft long by 4 ft wide.

The conveyor system transports the filter cake material to the loadout area of the dewatering building where it is deposited into cake bins. It was assumed that it would take ~ 20 minutes for each batch of material to reach the loadout area and that one batch could be dumped from a press every 2 hours. Diesel powered front end loaders will then remove the solid cake from the cake bins and transfer it into either rail cars or trucks for off-site disposal. It is important to note that the loaders will be continually removing the solid cake from the bins such that there will be little stored cake in the loadout area at any given time. However, for purposes of estimating emissions, it was assumed that one batch of material (15 CY) would be in the loadout area at all times. Figure 1 presents a flow diagram summarizing the conceptual process described above.

2.0 ESTIMATION OF EMISSIONS

The process described above was used as the basis of an evaluation of the potential for air emissions from de-sanding and dewatering operations. This emissions evaluation was used to develop design criteria that will ensure the protection of the public. Based upon previous experience with dewatering of contaminated sediment, it was determined that the main releases of potential concern to the public include emissions of PCBs, and the generation of odors and fugitive dust.

2.1 Emissions of Potential Concern

While PCBs are generally not considered volatile compounds, there is the potential for modest releases from the processing of highly contaminated sediment whenever they are in contact with open air. This section presents the methods that have been used to evaluate the potential for PCB emissions from desanding and dewatering operations. The potential for release of PCBs from other remediation activities has been evaluated in a previously submitted document entitled *Draft Final Development of PCB Air Action Levels for the Protection of the Public* (Ref. 1).

There also is the potential for odor generation during the de-sanding and dewatering of contaminated sediment. It is currently believed that the primary source of odors is the release of hydrogen sulfide (H_2S) from the dredged sediment as it is agitated. H_2S normally exists as a gas, so it is easily and quickly released from water in which it is dissolved when it is vigorously mixed or agitated. Consequently, release of odor causing H_2S is expected to be limited to locations where agitated dredged material first contacts the open air. This would be at the weir box and coarse shaker screens at the de-sanding units at Area C. To check this assertion, the potential for release of H_2S release was theoretically modeled as presented in this section.

Lastly, there is the potential for fugitive dust generation from the handling of dewatered or dried cake. The dewatering facilities are being designed so that the entire process will be enclosed in a building. For this reason, dust releases to ambient air (and therefore exposures to the public) are expected to be negligible, as any fugitive dust will likely remain within the building. The doors to the facility will generally be closed. They would only be opened to allow trucks or railroad cars to enter or exit the material loading area, and material handling operations will only occur when the doors are closed. In addition, operational management practices will be in place to minimize the generation of dust within the dewatering buildings. As described previously, the sediment remains in a slurry form for most of the dewatering process. In this wet form, generation of dust is not expected. Consequently, the potential for dust generation is limited to material handling and processing after the filter presses (i.e., the conveyor belt and the loadout area).

2.2 Estimated Emissions

The potential for air emissions from the dewatering process was evaluated using a combination of test data and USEPA-approved air emission rate models. In order to estimate emissions, the process was considered as a series of individual sources:

- flow over a weir at the de-sanding unit;
- drop from a coarse screen into a V-tank at the de-sanding unit;
- surface of V-tank at the de-sanding unit (the hydrocyclones are enclosed units and thus have minimal emissions);
- surface of collection tanks at the de-sanding operations;
- surface of slurry storage tank in the dewatering building;
- surface of mixing/conditioning tanks in the dewatering building;
- air blowdown from the filter presses; and
- surface of the dewatered cake.

Emissions of both PCBs and hydrogen sulfide were estimated for these sources. The methodology used for these estimates is presented below.

2.2.1 PCB Emissions

The individual sources identified above have the potential to release some amount of PCB to the air due to sediment slurry or cake being exposed to air. As such, the magnitude of emissions is strongly dependent upon the surface area of exposed sediment or sediment slurry. Testing for PCBs has been performed to measure the emission fluxes (emissions per unit area) of PCBs from contaminated sediment slurry and dewatered cake.

A Pre-Design Field Test (PDFT) was conducted to evaluate dredging technology for use in designing the dredge and disposal plan for the full-scale clean-up. The results of the PDFT are presented in a document entitled *Pre-Design Field Test Evaluation Report New Bedford Harbor Superfund Site* (Ref. 2). As a part of the PDFT, flux measurements for PCBs were taken over recently dredged slurry. At the time of this testing, dewatered sediment samples were also collected and sent to the USACE Waterways Experiment Station (WES) for flux testing. This testing is described in greater detail in the PDFT document and the *Draft Final Development of PCB Air Action Levels for the Protection of the Public* document. The results of the flux testing were used to evaluate emissions from the surface of exposed sediment slurry and dewatered cake.

The high end of the range of measured PDFT test results (2500 ng/m^2 per minute) was used to estimate emissions from the surface of sediment slurry in the V-tanks, collection tanks, slurry storage tank, and mixing tanks. As mentioned above, the slurry in these tanks will be continually agitated or mixed. However, the flux testing that was done was for a sediment slurry surface that was calm or quiescent. An agitated or turbulent surface would be expected to have a relatively larger release of constituent than a quiescent surface. For this reason the flux test data was scaled-up to account for turbulence in order to estimate emissions from these tanks. The scale-up factor was estimated as the ratio of the calculated turbulent and the quiescent mass transfer coefficients. Mass transfer coefficient correlations as presented in the USEPA document *Air Emissions Models for Waste and Wastewater* (Equation 5.2 and Table 5-1) were used to develop this ratio (Ref. 3). The scale-up factor was calculated to be approximately 220 for PCBs. This means that PCB emission rates from a turbulent surface were estimated to be approximately

220 times greater than from a smooth quiet liquid surface. The supporting calculations used to estimate this scale-up factor are provided at the end of this section.

The highest measured results of the WES flux testing of the dewatered sediment (36,400 ng/m^2 per minute) were used to estimate emissions from the dewatered cake. The points in the process where cake was assumed to be exposed to the open air in the building were:

- the filter press (after the plates are opened)
- the conveyor beneath the press
- the cake bins in the loadout area.

The WES results are believed to accurately reflect emissions of PCBs from dewatered cake, consequently these results were not adjusted for the evaluation.

There are several points in the process where the flux testing data are not considered appropriate for estimating emissions. These include the water flow over the weir, the water drop into the V-tank after the coarse screen and the filter press air blowdown step. Volatile emissions from water flowing over a weir or dropping into a tank can be larger than from a standing water surface because air is entrained in the water as it flows and separates. This can cause some aeration of the water stream, which would increase emissions. For this reason, the flux test results were not used to evaluate emissions from the water flowing over the weir and dropping into the V-tank. Instead, a USEPA model that specifically estimates emission rates from water flowing over weirs was used. This model is presented in the USEPA document *Air Emissions Models for Waste and Wastewater* (Section 4.3.18) (Ref. 2).

Air emissions from the filter press blowdown are still in the process of being evaluated. A pilot test for the dewatering process was conducted in Fall 2001. As part of this pilot program, tests were performed to determine the level of volatile PCBs in the filter press blowdown. The results of this testing are still pending.

The overall results of this air emissions evaluation are summarized in the supporting calculations and indicate that potential uncontrolled emissions of PCBs from the de-sanding and dewatering processes average less than approximately 2.1 pounds per day or ~0.4 tons per year (~25% from Area C and 75% from Area D). In efforts to protect the public, several very conservative assumptions were built into these estimates:

- There will be a consistently high concentration of 1000 ppm_w of PCBs in sediment. In practice the concentration of PCBs in sediment will vary widely, and will most often be considerably less than 1000 ppm_w.
- The tanks will not be covered and will have agitated slurry exposed to the air at all times. In practice, the tanks would have full or partial covers.
- All of the de-sanding equipment, storage tanks and filter presses will be used at the same time. The conceptual design of the process has several screens, tanks and filter presses that can be operated in parallel. However, in practice, this equipment may not all be operating at the same time.
- A fresh load of dewatered cake would be in the loadout area at all times. In practice, a batch of freshly dewatered cake would likely remain in the loadout for less than an hour.

It is important to note that these estimates were developed to provide a very conservative estimate of what may be emitted from the process. Because the design of the dewatering process has not been completely

finalized, these estimates will likely change when the design is completed. However, there are several fundamental conclusions that can be drawn from this evaluation that are not likely to change with more refined process parameters. First, the results of this evaluation indicate that the bulk of the volatile PCBs would be emitted from the slurry storage tank and the mixing/conditioning tanks in the dewatering building (~75%). Secondly, the dewatered cake, while characterized to have a higher emissions flux than slurry, has relatively lower overall emissions (less than 1.25% of total PCB emissions) than the wet slurry operations. It is important to note, however, that the cake will be managed such that it is exposed for only short periods of time to reduce the potential for occupational exposures inside the building. Finally, even though there are weirs in the de-sanding units, which could lead to higher emission rates (the hydrocyclones are enclosed and contribute minimally to emissions), the volatile PCB emissions from the de-sanding operation are relatively lower than those from the dewatering process. This is due to the fact that less surface is exposed to open air in the de-sanding units when compared to the Area D tanks.

2.2.2 Hydrogen Sulfide

Estimates were also developed to evaluate the potential for H_2S emissions from the dewatering process. Unlike for PCBs, there are no quantitative measurements of the emissions of H_2S from contaminated sediment under varying conditions. Consequently, H_2S releases were evaluated theoretically using USEPA-approved models as presented in *Air Emissions Models for Waste and Wastewater*. Similar to the PCB methodology presented above, the model for weirs (Section 4.3.18) was used to estimate H_2S emissions from the weir and the drop to the V-tank in the de-sanding units. Also, turbulent mass transfer coefficients for H_2S were developed using the same correlations as those used for PCBs. These mass transfer coefficients were used to estimate emissions from the turbulent tank surfaces.

There is no analytical data to indicate how much hydrogen sulfide may be present initially in the sediment to be dewatered. It is expected that the amount of H_2S in the harbor sediment would not be uniform, but instead would exhibit considerable variability. As such, emission rate estimates would also be expected to be highly variable. However, emissions modeling was performed using a range of H_2S concentrations in the dredged sediment to estimate the range of anticipated H_2S emission rates. There were several fundamental conclusions developed from this modeling. First, even at relatively low concentrations, H_2S emissions would likely result in odor-causing concentrations. Second, because H_2S is so volatile (it exists as a gas at standard conditions), modeling indicates that it will be completely released from the dredged sediment during the de-sanding operations, even at relatively high initial H_2S concentrations. This conclusion is supported by observations during the recent dewatering pilot study. During the pilot testing, odors were only detected during the initial agitation and exposure of the sediment to the air. Thereafter, the odor rapidly subsided, indicating that the H_2S was quickly depleted in the sediment. For these reasons, the greatest potential for odor is assumed to be at the de-sanding operations at Area C.

Concentrations of hydrogen sulfide in the head space over sediment slurry was measured during the bench-scale testing study. These concentrations ranged from zero to ~ 50 ppm_v. Assuming equilibrium at the air/water interface, the concentration of H_2S in water that would result in 50 ppm_v in air is 2×10^{-4} kg/m^3. This is approximately 1/10,000th of the solubility of H_2S in water. Annual emission of hydrogen sulfide from the de-sanding process were estimated assuming a concentration in water equal to 1/10,000th of the solubility (or 4×10^{-4} kg/m^3). Supporting calculations are attached.

2.2.3 Fugitive Dust

As mentioned previously, the release of fugitive dust to ambient air from material handling operations within the dewatering facility are expected to be negligible. However, the generation of dust inside the building as relates to occupational exposures is being evaluated for the on-site worker protection program.

3.0 DEVELOPMENT OF PERFORMANCE CRITERIA FOR PROTECTION OF THE PUBLIC

This section presents evaluations that have been completed to determine what may be needed in the design of the dewatering process to ensure that all regulatory and health-based requirements are met. This section also summarizes the air monitoring program that will be implemented when the process is operating to confirm that the public is being protected.

3.1 Regulatory Requirements

Section 2.0 of this document presents all of the regulatory requirements for the dewatering operations at New Bedford Harbor. This section briefly summarizes the Federal and State regulatory requirements that govern new sources of air emissions and evaluates their applicability to the proposed de-sanding and dewatering facilities based upon the conceptual design of the dewatering process. The final process design will be required to comply with these requirements.

The USEPA and the Massachusetts Department of Environmental Protection (MADEP) have promulgated air quality regulations that establish ambient air quality standards and emission limits. The Federal standards require a Prevention of Significant Deterioration (PSD) evaluation and an evaluation of the impact on ambient air quality for major sources. Based upon the conservatively projected magnitude of the emissions estimates presented above, the dewatering process would not be considered a major source under Federal regulations.

310 CMR 7.02 of the Massachusetts Air Pollution Control regulations require that any new stationary source of air contaminants with potential emissions of any pollutant greater than one ton per year obtain an air permit. This includes criteria pollutants (e.g., volatile organic compounds, nitrogen oxides, particulate etc.) and non-criteria pollutants. Using the conservative emissions estimates presented above, and assuming 365 days of operation per year, the predicted uncontrolled emission rate Areas C and D combined would be ~0.4 tons of airborne PCBs per year. Based upon this emissions evaluation, it does not appear that the emissions of airborne PCBs from these sources will exceed the one ton per year threshold. Consequently, the requirements associated with an air permit, such as installation of Best Available Control Technology (BACT), would not be required to comply with this regulation.

310 CMR 7.09 requires that construction or demolition activities do not contribute to a condition of air pollution, which includes generation of excessive odors or fugitive dust. As presented above, odors may be generated during the de-sanding operations. The regulations require that these odors be controlled. The release of fugitive dust to the ambient air is not anticipated from the dewatering process because of the enclosed nature of the loadout area.

Lastly, while not a regulation, MADEP has established air quality guidelines for toxic air pollutants that were developed to be protective of public health. These guidelines provide short term and long term exposure point concentrations for air contaminants. Foster Wheeler Environmental has developed health-based allowable ambient limits at the point of inhalation exposure for possible residential and commercial receptors. The health-based allowable ambient limits for child residential and commercial receptors are 409 ng/m^3 and 894 ng/m^3, respectively. These concentrations are annual averages and have been developed assuming a 10 year project exposure. The development of these levels have been presented in a previously submitted document entitled *Draft Final Development of PCB Air Action Levels for the Protection of the Public.* An ambient air monitoring program will ensure that concentrations at off-site receptors cannot exceed these levels. The health-based allowable ambient limits are more stringent than the MADEP policy guidance such that compliance with these levels will ensure compliance with the policy.

3.2 Estimation of Emission Rate to Meet Health Based Standard

An evaluation was performed to confirm that the health-based allowable ambient limits would be able to be met at off-site receptors using available control technology. For this evaluation, conservative dispersion modeling was used to estimate an emission rate of PCBs from a stack on the dewatering building that would result in concentrations at off-site receptors equal to the health-based allowable ambient limits.

SCREEN3 was used to conduct the dispersion modeling. SCREEN3 is an EPA-recommended model that estimates short-term ground level concentrations for point, area and volume sources. It is a very conservative dispersion model and is traditionally used to measure short term concentrations (i.e., one-hour averages), because the model assumes that the wind is blowing in only one direction, directly at the receptor. In addition, the model chooses the wind speed and stability class combination from their set of standard conditions that results in the highest ground level concentration. The predicted one-hour concentrations were converted to annual averages using an accepted scaling factor of 0.08.

In order to model point sources, SCREEN3 requires some standard source parameters including exhaust rate, temperature, stack height and stack diameter. Stack parameters for the dewatering building were developed using the conceptual process model. The exhaust rate was estimated to be 130 cfm assuming that all of the process tanks would be vented at ambient temperature. The stack was assumed to have a diameter of 6 inches and a stack height ten feet above the building, for a total height of 40 ft. The building downwash option was used for this modeling. This option accounts for the influence of a nearby building on the dispersion of emissions from a stack. It was assumed that the dewatering building would be the controlling building with dimensions of 165 ft x 300 ft x 30 ft.

The dispersion model was run to provide two concentrations. The first concentration is the maximum concentration at the point of maximum impact. Due to the close proximity of nearby commercial buildings, for purposes of evaluating health effects, it was assumed that a commercial worker would be at the point of maximum impact. The allowable limit for commercial workers is 894 ng/m^3 of PCBs (annual average). The dispersion model was also run to provide a concentration at 250m. This was assumed to be the location of the closest resident. The allowable limit for a child resident is 409 ng/m^3 of PCBs (annual average). Based upon this modeling, it was determined that modeling of the commercial worker provided the lowest emission rate. It was estimated that an emission rate of ~0.06 lb/hr would result in a maximum concentration equal to the health-based limit. Using estimates of process emissions presented above, this would require a PCB control system with a 40 to 50 percent efficiency. The supporting calculations and the screen outputs for this modeling are attached.

A sensitivity analysis was conducted to determine the effect of changing source parameters on predicted concentrations. The dispersion model was run for different source parameters including exhaust flow, stack diameter and stack height. These runs indicate that changing the stack height has the most impact on predicted concentrations. Specifically, lowering the stack height increases the predicted maximum concentration significantly. Supporting calculations and the screen outputs for these runs are attached.

In summary, this analysis illustrated several important considerations. Firstly, based upon conservatively estimated emissions, controls will be necessary to ensure protection of public health. Secondly, readily available control equipment will likely reduce emission enough to provide protection. Lastly, while dispersion in influenced by all source parameters, in this case, stack height is the most influential and lowering the stack height will increase off-site concentrations.

3.3 Ambient Air Monitoring

As described above, all efforts are being undertaken to proactively ensure protection of the public from any airborne releases of contaminants during the clean-up. Pursuant to this objective, an ambient air monitoring program has been developed to ensure the protection of public health. The health basis of the monitoring program has been presented in a previously submitted document entitled *Draft Final Development of PCB Air Action Levels for the Protection of the Public.* In summary, this document describes a series of steps used to establish the methodology for cumulative exposure budgeting. First, health-based allowable ambient limits at the point of inhalation exposure were determined for possible residential and commercial receptors. These ambient limits were used in conjunction with measured background concentrations and dispersion modeling to develop air action levels for monitoring stations to be located near the principal sources of emissions. Air action levels define the ambient air concentrations near the emissions sources associated with a specified level of acceptable risk to the most sensitive receptors at their respective points of potential exposure. The air action levels were then used to develop cumulative exposure budgets to be proactively tracked at the monitoring stations.

An exposure budget is a target ambient air concentration trend over time at a monitoring station near an emission source of potential concern that is designed to keep total public exposures to airborne PCBs below acceptable health-based levels. Because the documented adverse health effects associated with PCB inhalation are associated with long-term or chronic exposure, the most appropriate exposure budgets for public protection from volatilized PCBs at the Harbor also focus on chronic exposure. As such, the exposure budget is referred to as a "cumulative" exposure budget because the projected exposures are tracked, summed, and managed over time as the remediation operations are performed. Clean-up operations will be managed to ensure that actual ambient PCB levels and potential exposures to the public are kept below this pre-determined exposure budget.

A simple cumulative exposure budget is a straight, upward sloping line on a graph where the x-axis marks time (e.g., duration of exposure or time since the beginning of dredging) and the y-axis marks cumulative exposure (measured in "concentration-days" or the multiplicative product of a health-based target PCB air concentration and the period of time over which public exposure may occur at that level). The slope of the budget line is the allowable ambient PCB concentration at that monitoring point that is protective of the most sensitive target receptors in the vicinity.

Two different monitoring points may have different exposure budgets, depending on their locations. The linkage between the airborne concentration of PCBs at the monitoring location and at the location of the most sensitive public receptor is established using air dispersion modeling. In the Draft Final *Development of PCB Air Action Levels for the Protection of the Public*, cumulative exposure budgets were established for eight monitoring stations located around the two previously proposed Confined Disposal Facilities (CDFs) (C and D). In each case, the cumulative exposure budget was developed to protect the most sensitive public receptor.

It must be noted that the referenced document evaluated a remediation scenario that proposed the use of CDFs for the disposal of dredged sediment. Since that time, other operational alternatives have been proposed, including sediment dewatering and off-site disposal. The choice of a specific remediation alternative will affect location and characteristics of the emission sources, and consequently the dispersion modeling results. While these results are used to determine the placement of the monitors for budget tracking and the numerical exposure budget, the basic principals used to establish a cumulative exposure budget will not change.

Cumulative exposure budgets for PCBs will be integrated into an ambient air monitoring program. The main elements of this program will involve ambient air monitoring for volatile PCBs and tracking of

these ambient concentrations for the duration of the project to ensure that exposure to PCBs does not exceed the cumulative exposure budgets, and thus remains protective of public health. The approach for implementing air monitoring program and tracking conditions relative to these cumulative exposure budgets are described in the *Draft Final Implementation Plan* which is included as Appendix M to the *Draft Final Development of PCB Air Action Levels for the Protection of the Public.*

4.0 AIR POLLUTION CONTROL

As presented above, the project will be required to be protective of the public by ensuring that off-site impacts are less than the health-based allowable ambient exposure limits at commercial and residential receptors. While final design of the process has not been completed the evaluations presented in this section indicate that air pollution control equipment, as described below, will likely be required.

The greatest potential for odor is at the de-sanding operations at Area C. As a result, air emissions controls will likely be required to capture and remove hydrogen sulfide at the de-sanding equipment. There are several methods available to control H_2S including wet scrubbing and absorption onto solid media.

The emissions evaluation has indicated that the greatest potential for volatile PCB emissions is from the slurry storage tank and the mixing/conditioning tanks in the dewatering building at Area D (and likely from the filter press blowdown). The estimated emissions of PCBs from the Area C operations are relatively smaller. The evaluation has also indicated that, even using conservative assumptions, potential emissions of PCBs from the dewatering process would be less than regulatory thresholds and would not be subject to MADEP permitting requirements. However, in efforts to ensure public protection, air emissions controls for the largest potential PCB sources at the dewatering building should be considered. Because of the relatively smaller estimated emissions at Area C, air emissions control of PCBs will likely not be necessary. One option for controlling the Area D emissions is to keep the Area D tanks covered and under a negative pressure to capture any released vapors. The exhaust from these tanks can then be piped to air emissions control equipment to remove volatile PCBs. The level of PCBs released with the filter press blowdown is currently being studied, but this stream could also be vented to control equipment. Use of activated carbon absorption is an option for this control system.

As presented previously, the potential for fugitive dust release to ambient air from the de-sanding and dewatering processes is considered negligible. Consequently, no equipment is considered necessary to control fugitive dust releases to the ambient air.

Summary of Parameters for NBH Dewatering Building Screening Analysis

	ft	m
stack height	40	12.192
building height	30	9.144
exhaust flow rate	130 cfm	N/A
stack diameter	0.5	0.1524
min building dimension	165	50.292
max building dimension	300	91.44
dist to fenceline	120	36.576
dist to wharf tavern	142	43.2816
dist to marine hydraulics	176	53.6448
dist to PPC packaging	285	86.868
dist to eastern fisheries	285	86.868
dist to N.B. welding supplies	285	86.868

Summary of Results	*one-hour X/Q ug/m3/g/s*	*annual avg X/Q ug/m3/g/s*	*target conc. ng/m3*	*emit rate g/s*	*emit rate lb/hr*	*emit rate tpy*	*exhaust flow cfm*	*stack conc. ng/m3*	*pre control emissions tpy*	*control eff. %*
design par. to max conc.(43 m)	1410	112.8	894	7.93E-03	6.28E-02	2.75E-01	130	1.29E+08	0.5	44.9%
design par. to near res (250m)	503.7	40.296	409	1.01E-02	8.05E-02	3.53E-01	130	1.65E+08	0.5	29.5%
increase cfm to max conc. (44 m)	1328	106.24	894	8.41E-03	6.67E-02	2.92E-01	500	3.57E+07	0.5	41.5%
increase cfm to near res (250m)	503.6	40.288	409	1.02E-02	8.05E-02	3.53E-01	500	4.30E+07	0.5	29.5%
dec stack hght to max conc(28 m)	2572	205.76	894	4.34E-03	3.45E-02	1.51E-01	130	7.08E+07	0.5	69.8%
dec stack hght to near res(250 m)	535.1	42.808	409	9.55E-03	7.58E-02	3.32E-01	130	1.56E+08	0.5	33.6%
increase diam to max conc (59m)	1427	114.16	894	7.83E-03	6.21E-02	2.72E-01	130	1.28E+08	0.5	45.6%
increase diam to near res (250m)	497.6	39.808	409	1.03E-02	8.15E-02	3.57E-01	130	1.67E+08	0.5	28.6%

01/25/02
15:12:03

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

design parameters

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE            =        POINT
   EMISSION RATE (G/S)    =      1.00000
   STACK HEIGHT (M)       =      12.1000
   STK INSIDE DIAM (M)    =        .1500
   STK EXIT VELOCITY (M/S)=       3.4719
   STK GAS EXIT TEMP (K)  =     293.0000
   AMBIENT AIR TEMP (K)   =     293.0000
   RECEPTOR HEIGHT (M)    =        .0000
   URBAN/RURAL OPTION     =        URBAN
   BUILDING HEIGHT (M)    =       9.1440
   MIN HORIZ BLDG DIM (M) =      50.2000
   MAX HORIZ BLDG DIM (M) =      91.4400

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   STACK EXIT VELOCITY WAS CALCULATED FROM
   VOLUME FLOW RATE =   130.00000     (ACFM)

BUOY. FLUX =      .000 M**4/S**3;  MOM. FLUX =      .068 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC              U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)   STAB   (M/S)  (M/S)    (M)    HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
     1.    .0000       0      .0     .0      .0     .00     .00     .00    NA
   100.    1241.       5     1.0    1.1 10000.0   12.11   10.79    8.90    SS
   200.    678.3       5     1.0    1.1 10000.0   12.11   21.17   15.32    SS
   300.    387.6       5     1.0    1.1 10000.0   12.11   31.18   21.09    SS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
    43.    1410.       3     1.0    1.0   320.0   12.11    9.60    8.80    SS

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

**********************************
*** SCREEN DISCRETE DISTANCES ***
**********************************
```

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
250.	503.7	5	1.0	1.1	10000.0	12.11	26.22	18.27	SS

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** REGULATORY (Default) ***
PERFORMING CAVITY CALCULATIONS
WITH ORIGINAL SCREEN CAVITY MODEL
(BRODE, 1988)
****

*** CAVITY CALCULATION - 1 ***			*** CAVITY CALCULATION - 2 ***		
CONC (UG/M**3)	=	.0000	CONC (UG/M**3)	=	.0000
CRIT WS @10M (M/S)	=	99.99	CRIT WS @10M (M/S)	=	99.99
CRIT WS @ HS (M/S)	=	99.99	CRIT WS @ HS (M/S)	=	99.99
DILUTION WS (M/S)	=	99.99	DILUTION WS (M/S)	=	99.99
CAVITY HT (M)	=	9.14	CAVITY HT (M)	=	9.14
CAVITY LENGTH (M)	=	45.72	CAVITY LENGTH (M)	=	37.03
ALONGWIND DIM (M)	=	50.20	ALONGWIND DIM (M)	=	91.44

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S. CONC SET = 0.0

****
END OF CAVITY CALCULATIONS
****

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	1410.	43.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

01/25/02
15:59:00

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

increase stack diameter

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE              =        POINT
   EMISSION RATE (G/S)      =      1.00000
   STACK HEIGHT (M)         =      12.1000
   STK INSIDE DIAM (M)      =        .3048
   STK EXIT VELOCITY (M/S)=          .8408
   STK GAS EXIT TEMP (K)    =     293.0000
   AMBIENT AIR TEMP (K)     =     293.0000
   RECEPTOR HEIGHT (M)      =        .0000
   URBAN/RURAL OPTION       =        URBAN
   BUILDING HEIGHT (M)      =       9.1440
   MIN HORIZ BLDG DIM (M) =        50.2000
   MAX HORIZ BLDG DIM (M) =        91.4400

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   STACK EXIT VELOCITY WAS CALCULATED FROM
   VOLUME FLOW RATE =   130.00000     (ACFM)

BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .016 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC              U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)   STAB   (M/S)  (M/S)    (M)    HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
     1.    .0000       0      .0     .0      .0     .00     .00     .00    NA
   100.    1293.       6     1.0    1.1 10000.0   12.10   10.79    9.38    SS
   200.    671.3       5     1.0    1.1 10000.0   12.10   21.17   15.74    SS
   300.    383.0       5     1.0    1.1 10000.0   12.10   31.18   21.48    SS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
    59.    1427.       6     1.0    1.1 10000.0   12.10    6.52    6.88    SS

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

**********************************
*** SCREEN DISCRETE DISTANCES ***
**********************************
```

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
250.	497.6	5	1.0	1.1	10000.0	12.10	26.22	18.68	SS

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

```
****************************************
     *** REGULATORY (Default) ***
    PERFORMING CAVITY CALCULATIONS
  WITH ORIGINAL SCREEN CAVITY MODEL
          (BRODE, 1988)
****************************************
```

*** CAVITY CALCULATION - 1 ***			*** CAVITY CALCULATION - 2 ***		
CONC (UG/M**3)	=	.0000	CONC (UG/M**3)	=	.0000
CRIT WS @10M (M/S)	=	99.99	CRIT WS @10M (M/S)	=	99.99
CRIT WS @ HS (M/S)	=	99.99	CRIT WS @ HS (M/S)	=	99.99
DILUTION WS (M/S)	=	99.99	DILUTION WS (M/S)	=	99.99
CAVITY HT (M)	=	9.14	CAVITY HT (M)	=	9.14
CAVITY LENGTH (M)	=	45.72	CAVITY LENGTH (M)	=	37.03
ALONGWIND DIM (M)	=	50.20	ALONGWIND DIM (M)	=	91.44

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S. CONC SET = 0.0

```
****************************************
      END OF CAVITY CALCULATIONS
****************************************
```

```
     ****************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ****************************************
```

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	1427.	59.	0.

```
**************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
**************************************************
```

01/25/02
16:01:10

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

decrease stack height

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE            =        POINT
   EMISSION RATE (G/S)    =      1.00000
   STACK HEIGHT (M)       =      10.7000
   STK INSIDE DIAM (M)    =        .1500
   STK EXIT VELOCITY (M/S)=       3.4719
   STK GAS EXIT TEMP (K)  =     293.0000
   AMBIENT AIR TEMP (K)   =     293.0000
   RECEPTOR HEIGHT (M)    =        .0000
   URBAN/RURAL OPTION     =        URBAN
   BUILDING HEIGHT (M)    =       9.1440
   MIN HORIZ BLDG DIM (M) =      50.2000
   MAX HORIZ BLDG DIM (M) =      91.4400

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   STACK EXIT VELOCITY WAS CALCULATED FROM
   VOLUME FLOW RATE =   130.00000     (ACFM)

BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .068 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC              U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)   STAB   (M/S)  (M/S)    (M)    HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
     1.    .0000       0      .0     .0      .0     .00     .00     .00    NA
   100.    1621.       5     1.0    1.0 10000.0   10.71   10.79    9.70    SS
   200.    735.4       5     1.0    1.0 10000.0   10.71   21.17   16.03    SS
   300.    407.6       5     1.0    1.0 10000.0   10.71   31.18   21.74    SS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
    28.    2572.       5     1.0    1.0 10000.0   10.71    3.17    5.41    SS

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

**********************************
*** SCREEN DISCRETE DISTANCES ***
**********************************
```

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
250.	535.1	5	1.0	1.0	10000.0	10.71	26.22	18.95	SS

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** REGULATORY (Default) ***
PERFORMING CAVITY CALCULATIONS
WITH ORIGINAL SCREEN CAVITY MODEL
(BRODE, 1988)
****

*** CAVITY CALCULATION - 1 ***			*** CAVITY CALCULATION - 2 ***		
CONC (UG/M**3)	=	.0000	CONC (UG/M**3)	=	.0000
CRIT WS @10M (M/S)	=	99.99	CRIT WS @10M (M/S)	=	99.99
CRIT WS @ HS (M/S)	=	99.99	CRIT WS @ HS (M/S)	=	99.99
DILUTION WS (M/S)	=	99.99	DILUTION WS (M/S)	=	99.99
CAVITY HT (M)	=	9.14	CAVITY HT (M)	=	9.14
CAVITY LENGTH (M)	=	45.72	CAVITY LENGTH (M)	=	37.03
ALONGWIND DIM (M)	=	50.20	ALONGWIND DIM (M)	=	91.44

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S. CONC SET = 0.0

****
END OF CAVITY CALCULATIONS
****

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	2572.	28.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

01/25/02
16:02:54

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

increase cfm

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE            =        POINT
   EMISSION RATE (G/S)    =      1.00000
   STACK HEIGHT (M)       =      12.1000
   STK INSIDE DIAM (M)    =        .1500
   STK EXIT VELOCITY (M/S)=      13.3534
   STK GAS EXIT TEMP (K)  =     293.0000
   AMBIENT AIR TEMP (K)   =     293.0000
   RECEPTOR HEIGHT (M)    =        .0000
   URBAN/RURAL OPTION     =        URBAN
   BUILDING HEIGHT (M)    =       9.1440
   MIN HORIZ BLDG DIM (M) =      50.2000
   MAX HORIZ BLDG DIM (M) =      91.4400

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   STACK EXIT VELOCITY WAS CALCULATED FROM
   VOLUME FLOW RATE =   500.00000     (ACFM)

BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =    1.003 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC              U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)   STAB   (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
     1.    .0000       0      .0     .0      .0     .00     .00     .00    NA
   100.    910.9       4     1.0    1.0   320.0   12.81   15.69   13.79    SS
   200.    660.5       5     1.0    1.1 10000.0   12.96   21.17   14.03    SS
   300.    391.5       5     1.0    1.1 10000.0   12.96   31.18   19.93    SS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
    44.    1328.       3     1.0    1.0   320.0   12.47    9.81    9.00    SS

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*********************************
*** SCREEN DISCRETE DISTANCES ***
*********************************
```

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
250.	503.6	5	1.0	1.1	10000.0	12.96	26.22	17.06	SS

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

```
****************************************
     *** REGULATORY (Default) ***
    PERFORMING CAVITY CALCULATIONS
  WITH ORIGINAL SCREEN CAVITY MODEL
          (BRODE, 1988)
****************************************
```

*** CAVITY CALCULATION - 1 ***			*** CAVITY CALCULATION - 2 ***		
CONC (UG/M**3)	=	.0000	CONC (UG/M**3)	=	.0000
CRIT WS @10M (M/S)	=	99.99	CRIT WS @10M (M/S)	=	99.99
CRIT WS @ HS (M/S)	=	99.99	CRIT WS @ HS (M/S)	=	99.99
DILUTION WS (M/S)	=	99.99	DILUTION WS (M/S)	=	99.99
CAVITY HT (M)	=	9.14	CAVITY HT (M)	=	9.14
CAVITY LENGTH (M)	=	45.72	CAVITY LENGTH (M)	=	37.03
ALONGWIND DIM (M)	=	50.20	ALONGWIND DIM (M)	=	91.44

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S. CONC SET = 0.0

```
****************************************
      END OF CAVITY CALCULATIONS
****************************************
```

```
     ****************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ****************************************
```

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	1328.	44.	0.

```
****************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****************************************************
```

Air Emissions Calculations

New Bedford Harbor Superfund Site - Dewatering Building
Summary of PCB Emissions

Equipment	(g/s or ng/m2 min) unit emissions or measured flux	coefficient scale-up factor	# units	(ft) length or diameter	(ft) width	(ft2) surface area	(m2) surface area	(g/s) estimated emissions	(tpy) estimated emissions	max (lb/hr) estimated emissions
weir at coarse screens	1.70E-08	-	4	-	-	-	-	6.80E-08	2.36E-06	5.39E-07
drop to V-tank	1.40E-07	-	4	-	-	-	-	5.60E-07	1.94E-05	4.44E-06
V-tanks	2500	219.69	4	30	8	240	22.3	8.16E-04	2.84E-02	6.47E-03
20k gal storage tanks	2500	219.69	6	30	8	240	22.3	1.22E-03	4.25E-02	9.71E-03
equalization tank	2500	219.69	2	30	80	2400	223.0	4.08E-03	1.42E-01	3.24E-02
20k gal storage tanks	2500	219.69	12	30	8	240	22.3	2.45E-03	8.51E-02	1.94E-02
filter press blowdown										
								8.57E-03	0.30	0.07

Filter Cake - PCBs

Equipment	(g/s or ng/m2 min) unit emissions or measured flux	coefficient scale-up factor	# units	(ft) length or diameter	(ft) width	(ft2) surface area	(m2) surface area	(g/s) estimated emissions	(tpy) estimated emissions	max (lb/hr) estimated emissions
filter cake in press	36400	1	6				600	2.18E-03	3.16E-03	1.44E-03
drag flight conveyor	36400	1	6	70	4	280	26.0	9.47E-05	4.11E-04	1.88E-04
load out area	36400	1	1			303.75	28.2	1.71E-05	5.95E-04	1.36E-04
								2.30E-03	4.17E-03	1.77E-03

	g/s	lb/hr	tpy	lb/yr
total	**0.010869**	**0.07**	**0.30**	603.8

New Bedford Harbor Superfund Site - Dewatering Building
Summary of H2S Emissions

Liquids - H2S (uses AP-42 model for weirs)

Equipment	(g/s or ng/m2 min) unit emissions or measured flux	(kg/m3) initial Conc.	Fraction Volatilized	(m/s) overall trans. coefficient	# units	(ft) length or diameter	(ft) width	(ft2) surface area	(m2) surface area	all units (g/s) estimated emissions	(g/s) inlet mass rate	frac. volatilized check
weir at coarse screens	1.998E-03	4.00E-04	21.1%	0.02452	4	-	-	-	-	7.99E-03	9.46E-03	21%
drop to V-tank	2.235E-03	3.16E-04	29.9%	0.02452	4	-	-	-	-	8.94E-03	7.47E-03	30%
V-tanks	1.209E-01	2.21E-04	**100%**	0.02452	4	30	8	240	22.3	2.09E-02	5.23E-03	2311%
equalization tank	1.209E-01	0.00E+00		0.02452	1	40		1256.63706	116.7	0.00E+00		
20k gal storage tanks	1.209E-01	0.00E+00		0.02452	12	30	8	240	22.3	0.00E+00		
20k gal filtrate frac tanks	1.209E-01	0.00E+00		0.02452	6	30	8	240	22.3	0.00E+00		
										3.79E-02		

	g/s	lb/hr	tpy	lb/yr
total	**0.037854**	**0.30**	**1.31**	**2629.44**

New Bedford Harbor Superfund Site - Dewatering Building

Estimation of Emissions from Flow over the Weir in Coarse Screening
based on general weir model (Section 4.3.18 - EPA-453/R-94-080A)

Case Conditions
Case 1: Total PCBs,15% slurry, 1000 ppmw sed. cont., 1500 gpm, 2 ft waterfall
Case5: calculations for H2S, assume 1/100 of solubility in water
Case 6: calculations for H2S at 1/1000000 of solubility in water
Case 7: calculations for H2S at 1/10000 of solubility in water

Estimation of Emissions Over a Weir

Variable Description	Variable	Units	case 1 total PCB	case 5 H2S	case 6 H2S	case 7 H2S
concentration of total PCBs in sediment	w	ppm	1000			
concentration of total PCBs in sediment	w	kg/kg	0.001			
partitioning coefficient between sed and wat	Kd	m3/kg	188			
solids content by weight		%	15%			
specific gravity of slurry mixture		-	1.21			
concentration of suspended solids	ps	kg/m3	181.50			
concentration in water	Cw	kg/m3	5.32E-06	4.00E-02	4.00E-06	4.00E-04
fraction emitted to air	fair	-	1.35E-04	6.50E-02	6.50E-02	6.50E-02
flowrate through weir	Q	gpm	375	375	375	375
flowrate through weir	Q	m3/hr	85.1715	85.1715	85.1715	85.1715
emissions from a weir	**E**	**lb/yr**	**1.18E-03**	**4.27E+03**	**4.27E-01**	**4.27E+01**
emissions from a weir	**E**	**g/s**	**1.70E-08**	**6.15E-02**	**6.15E-06**	**6.15E-04**
emissions from a weir	**E**	**tpy**		**2.14**	**0.00021**	**0.0214**

Calculation of Deficit Ratio (ln(r))

Variable Description	Variable	Units	case 1 total PCB	case 5 H2S	case 6 H2S	case 7 H2S
depth from crest of wier to water level	z	ft	2	2	2	2
depth from crest of wier to water level	z	m	0.6096	0.6096	0.6096	0.6096
length across of weir	L	ft	4	4	4	4
length across of weir	L	m	1.2192	1.2192	1.2192	1.2192
flowrate through weir	Q	gpm	375	375	375	375
flowrate through weir	Q	ft3/sec	0.8355	0.8355	0.8355	0.8355
flowrate through weir	Q	m3/hr	85.1715	85.1715	85.1715	85.1715
critical depth across rect. channel	Dc	ft	0.110892335	0.110892	0.110892	0.110892
critical depth across rect. channel	Dc	m	0.033799984	0.0338	0.0338	0.0338
drop height of waterfall (includes 1.5 x Dc)	Z	m	0.660299976	0.6603	0.6603	0.6603
tailwater depth	h	ft	0.083333333	0.083333	0.083333	0.083333
tailwater depth	h	m	0.0254	0.0254	0.0254	0.0254
flowrate per unit length	q	m3/hr m	69.85851378	69.85851	69.85851	69.85851
constant for equation	-	-	0.0785	0.0785	0.0785	0.0785
exponential for Z	-	-	1.31	1.31	1.31	1.31
exponential for q	-	-	0.428	0.428	0.428	0.428
natural log of deficit ratio	ln(r)	-	0.089857652	0.089858	0.089858	0.089858

Calculation of Liquid Mass Transfer Coefficient (Kl)

Variable Description	Variable	Units	case 1 total PCB	case 5 H2S	case 6 H2S	case 7 H2S
Diffusivity of constituent in water	Dlv	cm2/hr	4.60E-06			

Diffusivity of constituent in water	Dlv	cm2/sec	1.28E-09	1.61E-05	1.61E-05	1.61E-05
Diffusivity of air/oxygen in water	Dlo	cm2/sec	2.40E-05	2.40E-05	2.40E-05	2.40E-05
flowrate per unit length	q	m3/hr m	69.85851378	69.85851	69.85851	69.8585
drop height of waterfall (includes 1.5 x Dc)	Z	m	0.660299976	0.6603	0.6603	0.6603
natural log of deficit ratio	ln(r)	-	0.089857652	0.089858	0.089858	0.089858
liquid phase mass transfer coefficient	Kl	m/s	3.99E-06	2.03E-03	2.03E-03	2.03E-03

Calculation of Gas Phase Mass Transfer Coefficient(Kg)

			case 1	case 5	case 6	case 7
Variable Description	**Variable**	**Units**	**total PCB**	**H2S**	**H2S**	**H2S**
Diffusivity of constituent in gas	Dgv	m2/sec	3.60E-06			
Diffusivity of constituent in gas	Dgv	cm2/sec	3.60E-02	1.76E-01	1.76E-01	1.76E-01
Diffusivity of air/oxygen in vapor	Dvo	cm2/sec	0.088	0.088	0.088	0.088
gas phase mass transfer coefficient	Kg	m/s	2.77E-02	7.90E-02	7.90E-02	7.90E-02

Calculation of Partitioning Coefficient (K)

			case 1	case 5	case 6	case 7
Variable Description	**Variable**	**Units**	**total PCB**	**H2S**	**H2S**	**H2S**
Henry's Law Constant for constituent	Hc	-	0.0249			
universal gas constant	R	atm m3/gmol K	8.21E-05			
temperature	T	K	298			
Partitioning Coefficient	K	atm m3/gmol	6.09E-04	2.30E-02	2.30E-02	2.30E-02

Calculation of Overall Mass Transfer Coefficient (Ko)

			case 1	case 5	case 6	case 7
Variable Description	**Variable**	**Units**	**total PCB**	**H2S**	**H2S**	**H2S**
liquid phase mass transfer coefficient	Kl	m/s	3.99E-06	2.03E-03	2.03E-03	2.03E-03
gas phase mass transfer coefficient	Kg	m/s	2.77E-02	7.90E-02	7.90E-02	7.90E-02
Partitioning Coefficient	K	atm m3/gmol	6.09E-04	2.30E-02	2.30E-02	2.30E-02
overall mass transfer coefficient	Ko	m/s	3.97E-06	1.98E-03	1.98E-03	1.98E-03

Calculation of Fraction Emitted (fair)

			case 1	case 5	case 6	case 7
Variable Description	**Variable**	**Units**	**total PCB**	**H2S**	**H2S**	**H2S**
overall mass transfer coefficient	Ko	m/s	3.97E-06	1.98E-03	1.98E-03	1.98E-03
drop height of waterfall (includes 1.5 x Dc)	Z	m	0.660299976	0.6603	0.6603	0.6603
flowrate per unit length	q	m3/hr m	69.85851378	69.85851	69.85851	69.85851
fraction emitted to air	fair	-	1.35E-04	6.50E-02	6.50E-02	6.50E-02

New Bedford Harbor Superfund Site - Dewatering Building

Estimation of Emissions from Drop to V-Tank after Coarse Screening
based on general weir model (Section 4.3.18 - EPA-453/R-94-080A)

Case Conditions
Case 1: Total PCBs,15% slurry, 1000 ppmw sed. cont., 1500 gpm, 3 ft waterfall
Case5: calculations for H2S, assume 1/100 of solubility in water
Case 6: calculations for H2S at 1/1000000 of solubility in water
Case 7: calculations for H2S at 1/10000 of solubility in water

Estimation of Emissions Over a Weir

Variable Description	Variable	Units	case 1 total PCB	case 5 H2S	case 6 H2S	case 7 H2S
concentration of total PCBs in sediment	w	ppm	1000			
concentration of total PCBs in sediment	w	kg/kg	0.001			
partitioning coefficient between sed and wat	Kd	m3/kg	188			
solids content by weight		%	15%			
specific gravity of slurry mixture		-	1.21			
concentration of suspended solids	ps	kg/m3	181.50			
concentration in water	Cw	kg/m3	5.32E-06	4.00E-02	4.00E-06	4.00E-04
fraction emitted to air	fair	-	1.11E-03	3.52E-01	3.52E-01	3.52E-01
flowrate through weir	Q	gpm	375	375	375	375
flowrate through weir	Q	m3/hr	85.1715	85.1715	85.1715	85.1715
emissions from a weir	**E**	**lb/yr**	**9.72E-03**	**2.31E+04**	**2.31E+00**	**2.31E+02**
emissions from a weir	**E**	**g/s**	**1.40E-07**	**3.33E-01**	**3.33E-05**	**3.33E-03**
emissions from a weir	**E**	**tpy**		**11.56**	**0.00116**	**0.1156**

Calculation of Deficit Ratio (ln(r))

Variable Description	Variable	Units	case 1 total PCB	case 5 H2S	case 6 H2S	case 7 H2S
depth from crest of wier to water level	z	ft	3	3	3	3
depth from crest of wier to water level	z	m	0.9144	0.9144	0.9144	0.9144
length across of weir	L	ft	1.666666667	1.666667	1.666667	1.666667
length across of weir	L	m	0.508	0.508	0.508	0.508
flowrate through weir	Q	gpm	375	375	375	375
flowrate through weir	Q	ft3/sec	0.8355	0.8355	0.8355	0.8355
flowrate through weir	Q	m3/hr	85.1715	85.1715	85.1715	85.1715
critical depth across rect. channel	Dc	ft	0	0	0	0
critical depth across rect. channel	Dc	m	0	0	0	0
drop height of waterfall (includes 1.5 x Dc)	Z	m	0.9144	0.9144	0.9144	0.9144
tailwater depth	h	ft	8	8	8	8
tailwater depth	h	m	2.4384	2.4384	2.4384	2.4384
flowrate per unit length	q	m3/hr m	167.6604331	167.6604	167.6604	167.6604
constant for equation	-	-	0.0785	0.0785	0.0785	0.0785
exponential for Z	-	-	1.31	1.31	1.31	1.31
exponential for q	-	-	0.428	0.428	0.428	0.428
natural log of deficit ratio	ln(r)	-	0.824170235	0.82417	0.82417	0.82417

Calculation of Liquid Mass Transfer Coefficient (Kl)

Variable Description	Variable	Units	case 1 total PCB	case 5 H2S	case 6 H2S	case 7 H2S
Diffusivity of constituent in water	Dlv	cm2/hr	4.60E-06			
Diffusivity of constituent in water	Dlv	cm2/sec	1.28E-09	1.61E-05	1.61E-05	1.61E-05

Diffusivity of air/oxygen in water	Dlo	cm2/sec	2.50E-05	2.50E-05	2.50E-05	2.50E-05
flowrate per unit length	q	m3/hr m	167.6604331	167.6604	167.6604	167.660
drop height of waterfall (includes 1.5 x Dc)	Z	m	0.9144	0.9144	0.9144	0.9144
natural log of deficit ratio	ln(r)	-	0.824170235	0.82417	0.82417	0.82417
liquid phase mass transfer coefficient	Kl	m/s	6.17E-05	3.14E-02	3.14E-02	3.14E-02

Calculation of Gas Phase Mass Transfer Coefficient(Kg)

			case 1	case 5	case 6	case 7
Variable Description	**Variable**	**Units**	**total PCB**	**H2S**	**H2S**	**H2S**
Diffusivity of constituent in gas	Dgv	m2/sec	3.60E-06			
Diffusivity of constituent in gas	Dgv	cm2/sec	3.60E-02	1.76E-01	1.76E-01	1.76E-01
Diffusivity of air/oxygen in vapor	Dvo	cm2/sec	0.088	0.088	0.088	0.088
gas phase mass transfer coefficient	Kg	m/s	2.77E-02	7.90E-02	7.90E-02	7.90E-02

Calculation of Partitioning Coefficient (K)

			case 1	case 5	case 6	case 7
Variable Description	**Variable**	**Units**	**total PCB**	**H2S**	**H2S**	**H2S**
Henry's Law Constant for total PCBs	Hc	-	0.0249			
universal gas constant	R	atm m3/gmol K	8.21E-05			
temperature	T	K	298			
Partitioning Coefficient	K	atm m3/gmol	6.09E-04	2.30E-02	2.30E-02	2.30E-02

Calculation of Overall Mass Transfer Coefficient (Ko)

			case 1	case 5	case 6	case 7
Variable Description	**Variable**	**Units**	**total PCB**	**H2S**	**H2S**	**H2S**
liquid phase mass transfer coefficient	Kl	m/s	6.17E-05	3.14E-02	3.14E-02	3.14E-02
gas phase mass transfer coefficient	Kg	m/s	2.77E-02	7.90E-02	7.90E-02	7.90E-02
Partitioning Coefficient	K	atm m3/gmol	6.09E-04	2.30E-02	2.30E-02	2.30E-02
overall mass transfer coefficient	Ko	m/s	5.67E-05	2.21E-02	2.21E-02	2.21E-02

Calculation of Fraction Emitted (fair)

			case 1	case 5	case 6	case 7
Variable Description	**Variable**	**Units**	**total PCB**	**H2S**	**H2S**	**H2S**
overall mass transfer coefficient	Ko	m/s	5.67E-05	2.21E-02	2.21E-02	2.21E-02
drop height of waterfall (includes 1.5 x Dc)	Z	m	0.9144	0.9144	0.9144	0.9144
flowrate per unit length	q	m3/hr m	167.6604331	167.6604	167.6604	167.6604
fraction emitted to air	fair	-	1.11E-03	3.52E-01	3.52E-01	3.52E-01

New Bedford Harbor Superfund Site - Dewatering Building

Comparison of Mass Transfer Coefficients - Gas Phase Transfer Coefficient
based on correlations provided in EPA-453/R-94-080A and AP-42

case1: transfer coefficient for PCBs

kg for turbulent surfaces - aeration assumptions based on default parameters as provided in AP-42

Variable Description	**Variable**	**Units**	**case 1**
Reynolds Number	Re	-	3.10E+06
Power Number	P	-	0.000282
Schmidt Number on gas side	Scg	-	4.19E+00
Froude Number	Fr	-	987.0065
Diffusivity of consituent in gas	Da	cm2/s	3.60E-02
molecular weight of air	Mwa	g/gmol	29
impeller diameter	d	cm	60.96
mass transfer coeff. - gas phase turbulent	kg	m/s	7.00E-02

Reynolds Number

Variable Description	**Variable**	**Units**	**case 1**
impeller diameter	d*	ft	2
impeller diameter	d	cm	60.96
rotational speed of impeller	w	rad/s	126
density of air	pa	g/cm3	1.20E-03
viscosity of air	ua	g/cm s	1.81E-04
Reynolds Number	Re	-	3.10E+06

Power Number

Variable Description	**Variable**	**Units**	**case 1**
total power to aerators	POWR	hp	75
gravitation constant	gc	lbm ft/s3 lbf	32.17
number of aerators	Ni		1
density of water	pl	lb/ft3	62.4
impeller diameter	d*	ft	2
rotational speed of impeller	w	rad/s	126
Power Number	P	-	0.000282

Schmidt Number

Variable Description	**Variable**	**Units**	**case 1**
viscosity of air	ua	g/cm s	1.81E-04
density of air	pa	g/cm3	1.20E-03
Diffusivity of consituent in gas	Da	cm2/s	3.60E-02
Schmidt Number on gas side	Scg	-	4.19E+00

Froude Number

Variable Description	**Variable**	**Units**	**case 1**
impeller diameter	d*	ft	2

rotational speed of impeller	w	rad/s	126
gravitation constant	gc	lbm ft/s3 lbf	32.17
Froude Number	Fr	-	987.0065

kg for quiescent surfaces - assumptions based on default parameters as provided in AP-42

Variable Description	Variable	Units	case 1
windspeed at 10 meters	U10	m/s	4
length of exposed surface	le	m	9.144
width of exposed surface	wi	m	2.4384
area of exposed surface	A	m2	22.29673
effective diameter	de	m	5.32814
viscosity of air	ua	g/cm s	1.81E-04
density of air	pa	g/cm3	1.20E-03
Diffusivity of consituent in gas	Da	cm2/s	3.60E-02
Schmidt Number on gas side	Scg	-	4.19E+00
mass transfer coeff. - gas phase for quiescen	kg	m/s	4.53E-03

New Bedford Harbor Superfund Site - Dewatering Building

Comparison of Mass Transfer Coefficients - Liquid Phase Transfer Coefficients

based on correlations provided in EPA-453/R-94-080A and AP-42

case1: transfer coefficient for PCBs

kl for turbulent surfaces - aeration assumptions based on default parameters as provided in AP-42

Variable Description	Variable	Units	case 1
total power to aerators	POWR	hp	25.00
oxygen transfer rating of surface aerator	J	lb O2/hp hr	3.00
temperature of water	T	C	25.00
oxygen transfer correction factor	Ot	-	0.83
molecular weight of water	MWl	g/gmol	18.00
turbulent surface area	Vav	ft2	288
density of water	pl	g/cm3	1
diffusivity of constituent in water	Dw	cm2/sec	1.28E-09
diffusivity of oxygen in water	D o2,w	cm2/sec	2.40E-05
liquid phase mass transfer coefficient	kl	m/s	2.63E-04

kl for quiescent surfaces - assumptions based on default parameters as provided in AP-42

Variable Description	Variable	Units	case 1
windspeed at 10 meters	U10	m/s	4
friction velocity	U*	m/s	0.117439346
Schmidt Number on liquid side	Scl	-	6.99E+06
diffusivity of constituent in water	Dw	cm2/sec	1.28E-09
diffusivity of ether in water	De	cm2/sec	8.50E-06
mass transfer coeff. - liquid phase for quiescent	kl	m/s	1.05E-06

Schmidt Number - liquid side

Variable Description	Variable	Units	case 1
viscosity of water	ul	g/cm s	8.93E-03
density of water	pa	g/cm3	1.00E+00
Diffusivity of consituent in water	Dw	cm2/s	1.28E-09
Schmidt Number on gas side	Scg	-	6.99E+06

New Bedford Harbor Superfund Site - Dewatering Building

Comparison of Mass Transfer Coefficients - Overall Transfer Coefficient
based on correlations provided in EPA-453/R-94-080A and AP-42

case1: transfer coefficient for PCBs

Kov for turbulent surfaces - aeration assumptions based on default parameters as provided in AP-42

Variable Description	Variable	Units	case 1
mass transfer coeff. - gas phase turbulent	kg	m/s	7.00E-02
liquid phase mass transfer coefficient	kl	m/s	2.63E-04
Henry's Law Constant of constituent	H	atm m3/gmol	6.09E-04
universal gas constant	R	atm m3/gmol K	8.21E-05
temperature	T	K	298
equilibrium coefficient	Keq	-	2.49E-02
overall transfer coefficient	Kov	m/s	2.28E-04

Kov for quiescent surfaces - assumptions based on default parameters as provided in AP-42

Variable Description	Variable	Units	case 1
mass transfer coeff. - gas phase turbulent	kg	m/s	4.53E-03
liquid phase mass transfer coefficient	kl	m/s	1.05E-06
Henry's Law Constant of constituent	H	atm m3/gmol	6.09E-04
universal gas constant	R	atm m3/gmol K	8.21E-05
temperature	T	K	2.98E+02
equilibrium coefficient	Keq	-	2.49E-02
overall transfer coefficient	Kov	m/s	1.04E-06

D

Appendix D

Geotechnical Investigation Report

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

FINAL
GEOTECHNICAL REPORT INVESTIGATION FOR REMEDIAL DESIGN OF OPERABLE UNIT 01 NEW BEDFORD HARBOR SUPERFUND SITE

New Bedford Harbor, Massachusetts

May 2002

Prepared for

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

2002-017-0129_App_D
5/17/02

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1.0 INTRODUCTION

1.1 Purpose of Report

This report presents geotechnical information required for the design and construction of the proposed foundation for the dewatering facility/rail access for the off-site disposal option. The data obtained from the new geotechnical borings is supplemented with previous site data, and used to evaluate the engineering parameters of the subsurface conditions required for the facility design.

1.2 Description of Project

1.2.1 Location

The New Bedford Harbor Superfund Site, located within the jurisdiction of Bristol County, is situated between the city of New Bedford and the Towns of Fairhaven and Acushnet on the west and east, respectively. The proposed dewatering facility and rail access site, shown on Figure 1-1, is located along the western shoreline of the Acushnet River, just south of Interstate Highway I-195 and west of Route 18.

1.2.2 Site Description

The site limits are bounded by water on the northern and eastern boundaries, and Herman Melville Boulevard on the west, and Hervey Tichon Avenue on the south. The property is owned by the city of New Bedford which has leased the western portion to Wharf Tavern and the eastern portion to Packer Marine Inc., shown on Figure 1-2. Part of the proposed rail access will include use of the Conrail Property located west of the site. Conditions and limits are mentioned briefly below. The majority of the site is founded on reclaimed land from harbor development, which extended the existing shoreline from approximately Herman Melville Boulevard to its present shoreline position. Site topography generally grades from Herman Melville Boulevard (approximately 9.5 feet NGVD) towards the northeast corner of the site (approximately 7.5 feet NGVD).

Wharf's Tavern Lease Area

A small, steel framed restaurant building is located centrally on the Wharf Tavern Property. The majority of the Wharf Tavern property is paved with asphalt, with the exception of a small eastern portion of the property, which consist of a crushed gravel base parking area used for tractor trailer storage. During preliminary site survey, various underground utilities were located along the western and eastern boundaries following the property lines along the roads.

Packer Marine Lease Area

The Packer Marine lease area is located east of the Wharf Tavern property; the area is generally used for material storage, and the majority is covered by a gravel base overlay. At the time of the most recent field investigation, the property was used as a barge transfer area, for shipping earthen fill, modular homes, and miscellaneous items via large barges. Large piles of earthen fill (gravel and sand) are temporarily located around the site awaiting barge transport. The western portion of the property is overgrown with vegetation and is used for storage of large miscellaneous materials (creosote treated timber piles, steel pipe, old trailers, and satellite dishes). A small sheet pile bulkhead and dock loading area line the eastern boundary along the Acushnet River. The remaining shoreline consists of a riprap placed approximately 5 feet above the typical grade. Various underground utilities are located along the southern boundaries following the property line along the road. Previous construction permits indicate that a large portion of

the area was used as a dredge spoil disposal pit and covered with fill. Additional detail about the previous construction is given later in Section 2.5.

Conrail Yard Property

The Conrail Rail Yard is located on the western side of Herman Melville Boulevard. At one time, the rail yard was used for the transfer, loading, and storage of raw materials, manufactured goods, rail relics, and miscellaneous refuse (e.g., used paper and plastic products, abandon cars, used machinery parts, etc.) and are scattered on-site.

1.3 Proposed Construction

The proposed construction consists of the extension of the shoreline along the northern and eastern boundaries and the construction of a dewatering treatment building and rail spur. The proposed layout is shown on Figure 1-3.

1.3.1 USACE Cellular Sheet Pile Bulkhead

Part of the proposed construction will include a cellular sheet pile bulkhead, which will be constructed along the shoreline by the USACE to extend the shoreline. Bulkheads will be constructed offshore along the western boundary and along approximately half of the northern boundary of the site, as shown on Figure 1-3. The proposed design calls for the dredging of the soft organic soils beneath the footprint of the bulkheads. Preliminary dredge design indicates that the dredge cut will extend back to the shoreline, and remove all organic material behind the bulkheads. After construction of the bulkheads, the area between the bulkheads and existing shoreline will be backfilled with a structural fill to an elevation of approximately 10 feet NGVD. The remaining area along the northern boundary will consist of engineered fill overlying existing organic soils with the final grade tying in with the top of the cellular bulkheads.

1.3.2 Dewatering Building

The dewatering building will be constructed on the Packer Marine lease area extending to the eastern boundary of the Wharf Tavern lease area. The plan view of the building footprint is shown on Figure 1-3. A large portion of the building will be founded upon existing fill with a small portion of the building constructed over the USACE backfill behind the bulkheads. Initial site preparation and grading will be required before the construction of the dewatering building foundation.

Primary structural framing for the proposed building will make use of prefabricated steel systems, and utilizing clear spans, where economically feasible, and minimizing interior columns to facilitate flexibility for dewatering operations.

The proposed building will consist of three main functional areas: central dewatering area, sediment transfer area, and rail loading area. The entire dewatering building will include fabrication of buildings with a total footprint of approximately 56,000 square feet and a height of up to 40 feet.

The central dewatering area will primarily house the process equipment, pumps, and other associated material required for the separation and dewatering of the dredged sediment. A multi-span steel frame structure is proposed for housing the central dewatering area, with possibly a clear span if economically beneficial when considering the entire structure.

The sediment transfer area will house the rolloff bins and be used for transfer of the dewatered cake to and from the rail and/or trucks. The building structure will require clear span steel framing to accommodate a 25 ton overhead crane and facilitate mobility of the loading vehicles. Large access doors will be located on the eastern wall.

The rail loading area will be use to hold and clean rail cars while transferring dewatered cake from the central dewatering area. Lean-to steel framing will be used to house the rail loading area.

1.3.3 Rail Access

The rail access will extend from the Conrail area across Belleville Avenue along the northern boundary of the site limits, partially over new fill and the northern portions of the bulkheads (see Figure 1-3). The proposed rail access facility will be founded on portions of the bulkhead and the remaining on engineered fill behind the bulkheads along the shore.

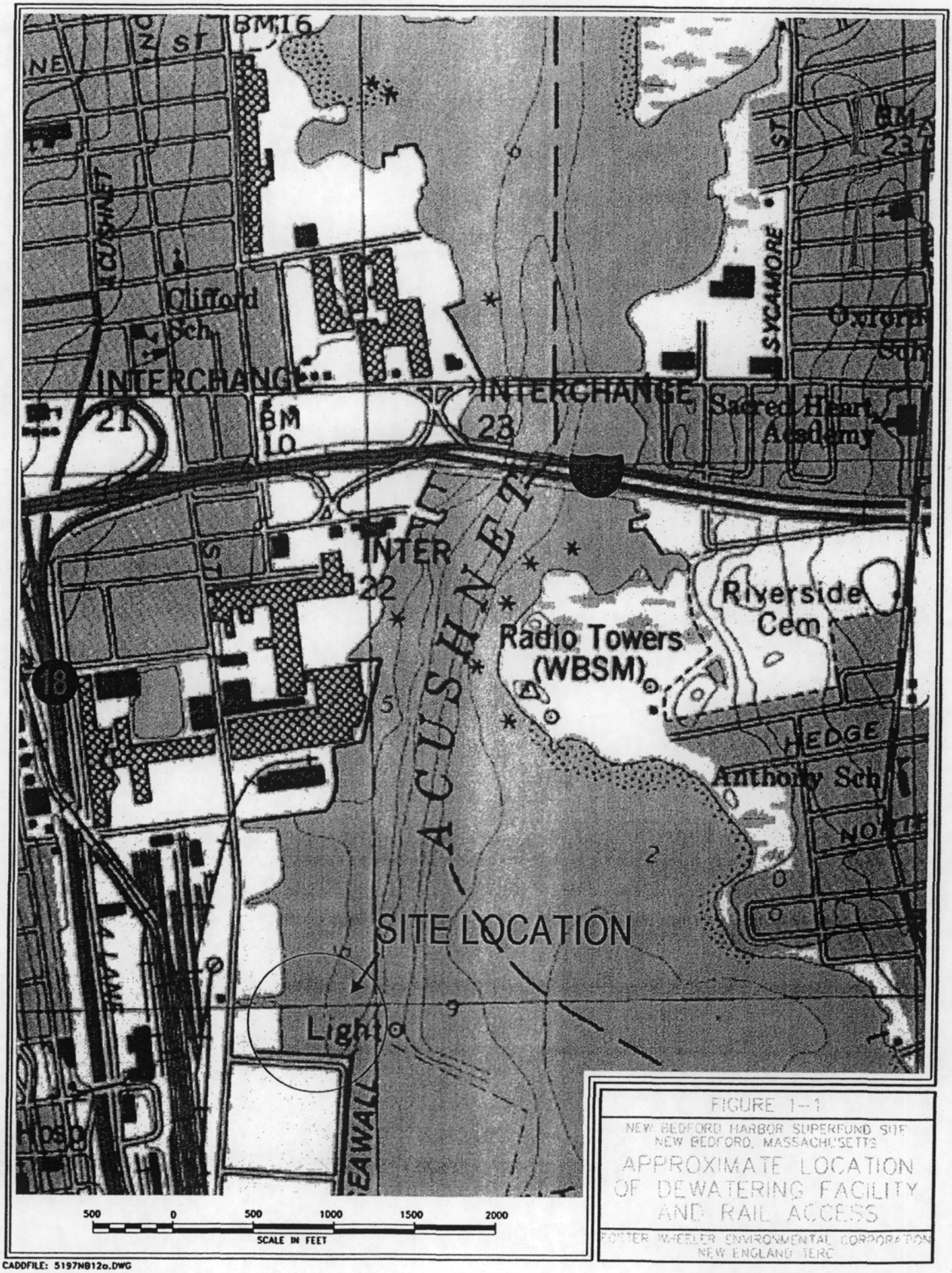


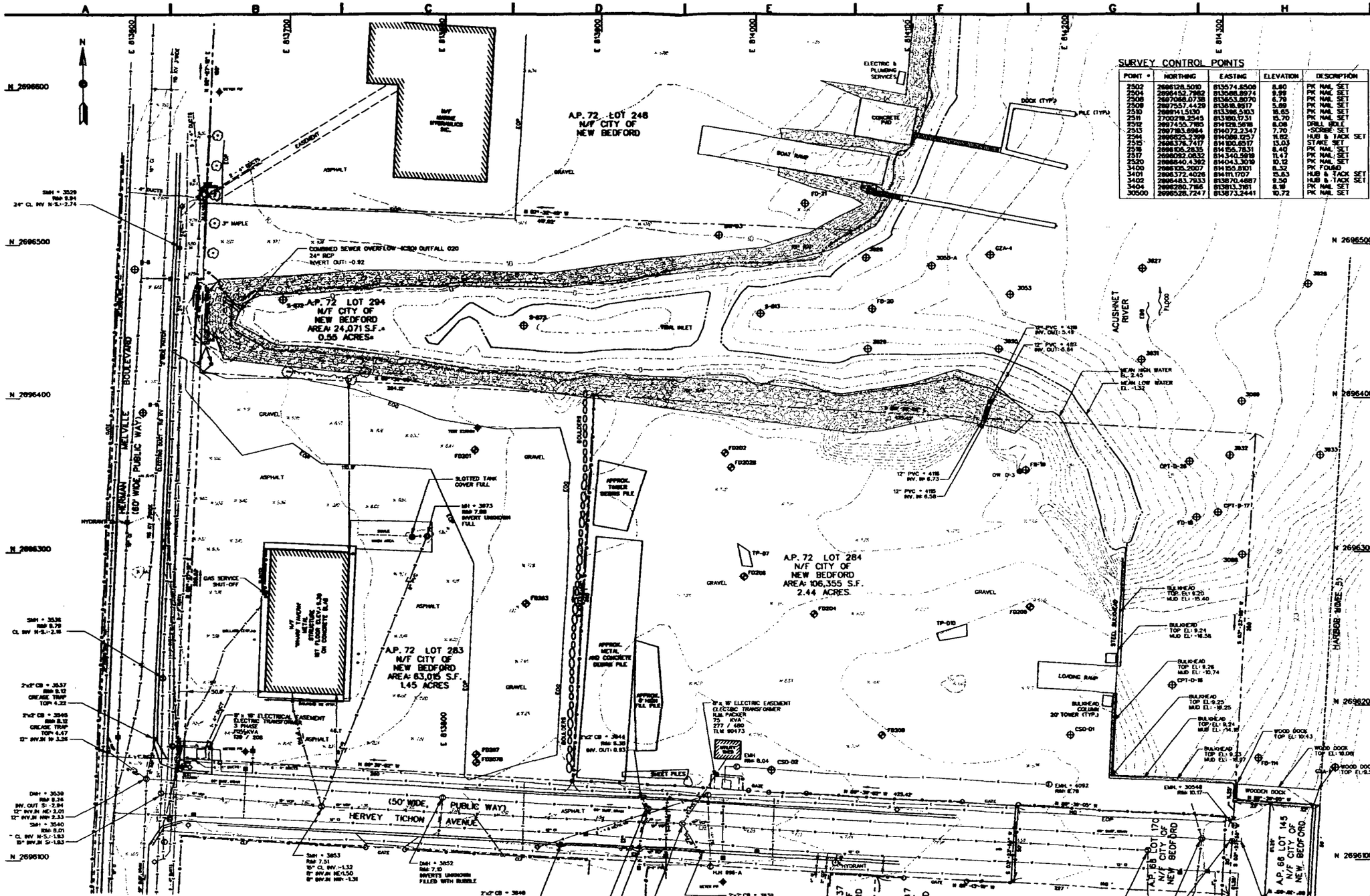
FIGURE 1-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

APPROXIMATE LOCATION OF DEWATERING FACILITY AND RAIL ACCESS

FOSTER WHEELER ENVIRONMENTAL CORPORATION
NEW ENGLAND TERC

CADDFILE: 5197NB12o.DWG



SURVEY CONTROL POINTS

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
2502	2696128.5010	813574.6509	8.80	PK NAIL SET
2504	2696452.7982	813588.8974	9.99	PK NAIL SET
2508	2697068.0738	813633.8070	6.79	PK NAIL SET
2509	2697537.4429	813618.8917	5.89	PK NAIL SET
2510	2698114.5130	813398.3103	18.63	PK NAIL SET
2511	2700278.2545	813180.1731	15.70	PK NAIL SET
2512	2697435.7185	814128.5618	8.08	DRILL HOLE
2513	2697183.6964	814072.2347	7.70	+SCRIBE SET
2514	2696625.2309	814089.1257	11.02	HUB & TACK SET
2515	2696374.7417	814100.8517	13.03	STAKE SET
2516	2696106.2835	814155.7831	8.40	PK NAIL SET
2517	2696062.0832	814340.5918	11.47	PK NAIL SET
2520	2696640.4392	814043.3019	10.12	PK NAIL SET
3400	2696135.2007	814155.8101	8.32	PK FOUND
3401	2696372.4026	814111.1707	15.83	HUB & TACK SET
3402	2696483.7933	813870.4887	9.50	HUB & TACK SET
3404	2696280.7186	813813.3161	8.18	PK NAIL SET
30500	2696528.7247	813873.2441	10.72	PK NAIL SET

GENERAL NOTES

1. SITE SURVEY INFORMATION, GROUND SURFACE ELEVATIONS AND MUD ELEVATIONS IN THE TIDAL INLET AND AT THE BULKHEAD AS NOTED TAKEN FROM PLAN ENTITLED, "TOPOGRAPHIC SURVEY A.P. 72 LOT 283, 284, AND 294, HERMAN MELVILLE BLVD., NEW BEDFORD, MASSACHUSETTS FOR FOSTER WHEELER ENVIRONMENTAL CORP." DATED DECEMBER 08, 2001 BY SAI SURVEYING CORPORATION OF JAMESTOWN, RHODE ISLAND.
2. BATHYMETRY IS BASED ON HYDROGRAPHIC SURVEY CONDUCTED BY THE U.S. ARMY CORPS OF ENGINEERS IN FEBRUARY AND MARCH 1999.
3. LOCATION OF ALL UTILITIES SHOWN HEREON ARE APPROXIMATE AND ARE BASED ON FIELD LOCATION OF VISIBLE STRUCTURES, SUCH AS: CATCH BASINS, MANHOLES, WATER GATES, FIRE HYDRANTS, ETC. SIZES AND TYPES OF MATERIALS ARE BASED ON AVAILABLE UTILITY RECORDS. CONTRACTORS SHOULD NOTIFY COMPANIES PRIOR TO CONSTRUCTION AND/OR CALL DIG SAFE AT 1-800-DIG-SAFE.
4. THE SUBJECT PREMISES ARE LOCATED IN FLOOD ZONE "A" BEING ELEVATION 6.0 NGVD29 COMMUNITY NUMBER 255216 0009 B, REVISED JANUARY 05, 1984.
5. HARBOR LINE- U.S. HARBORLINES, NEW BEDFORD AND FAIRHAVEN HARBOR- U.S. ENGINEERS OFFICE, PROVIDENCE, RI, MARCH 30, 1926.
6. FOR LEGEND, NOTES AND ABBREVIATIONS SEE SHEET G-002.

UTILITY INFORMATION: THE CONTACT DATA LISTED BELOW IS CORRECT AS OF OCTOBER 15, 2001.
SANITARY SEWER & STORM DRAINAGE:
CITY OF NEW BEDFORD, ENGINEERING DEPT. 1-508-979-1527.
WATER:
CITY OF NEW BEDFORD, WATER DEPT. 1-508-979-1558.
GAS:
NATIAN (GAS), 1-888-372-9300.
ELECTRIC:
NSTAR ELECTRICS, 1-800-291-0850.
TELEPHONE:
VERIZON, 1-800-289-8780

LEGEND:

- ⊕ TEST BORING
- ⊕ MONITORING WELL
- ⊙ OBSERVATION WELL

90% DESIGN

HORIZONTAL SCALE IN FEET
1 INCH = 30 FEET
HORIZONTAL DATUM IS NAD83 MASSACHUSETTS STATE PLANE
VERTICAL DATUM IS NGVD29

SCALE IN FEET

US Army Corps of Engineers
New England District

Symbol	Description	Date	Appr.	Revised
D	ISSUED FOR 90% DESIGN SUBMITTAL	06/24/02	M.G.	
A	ISSUED FOR LAUNCH REVIEW	03/07/02		

Symbol	Description	Date	Appr.	Revised

Rev. 0
Scale
06/24/02
Date
Design File / File no.
Drawing scale
Drawing title
Designed by/ E. MARSH
Drawn by/ E. CYPHER, M. MARCE
Reviewed by/ M. MARCE
Submitted by/ SUBMITTED BY
FILE name
FILE name
FILE name

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

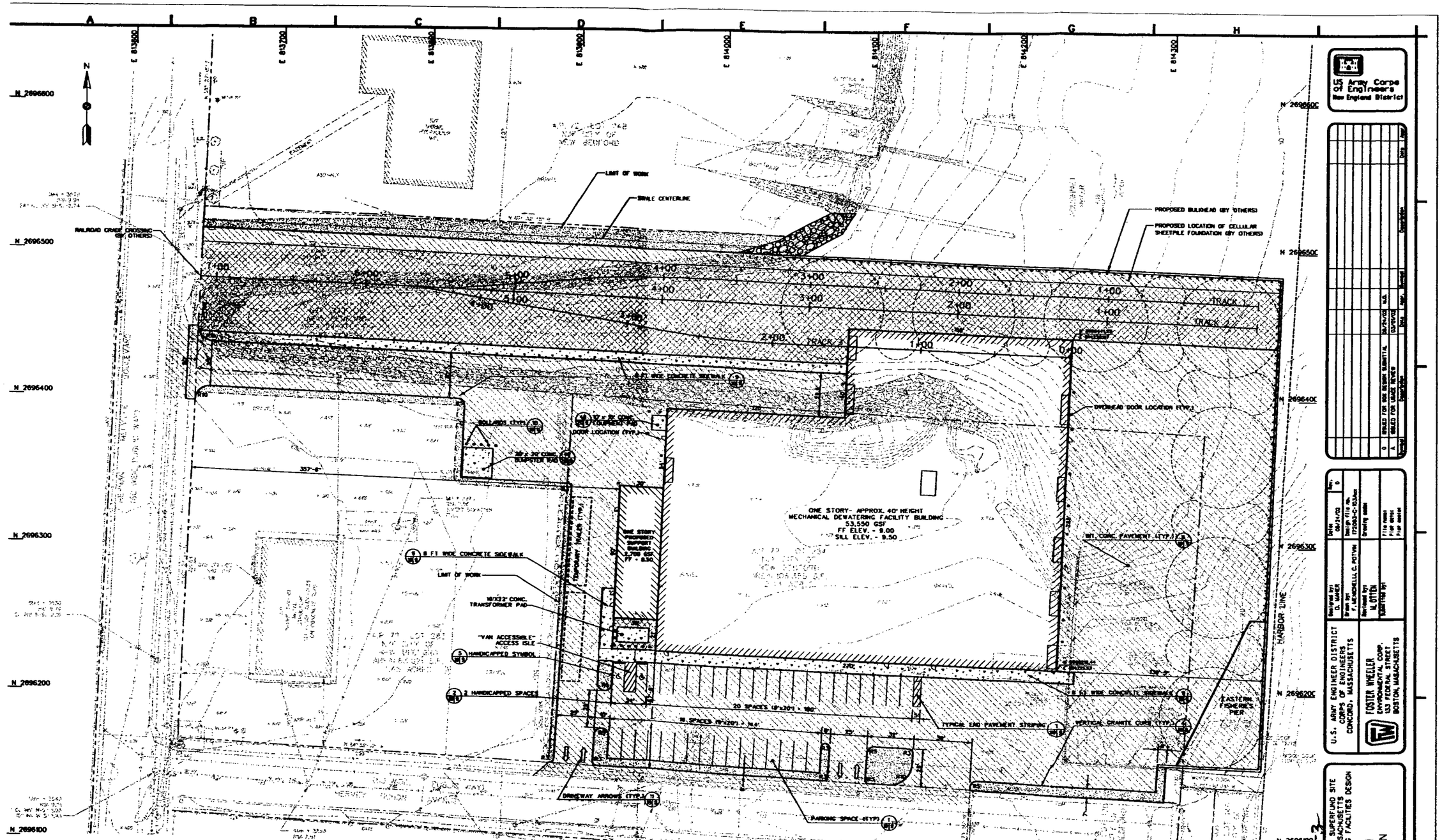
FOSTER WHEELER
ENVIRONMENTAL CORP.
133 FEDERAL STREET
BOSTON, MASSACHUSETTS

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS
DESANDING AND DEWATERING FACILITIES DESIGN

AREA D
EXISTING CONDITIONS PLAN

FIGURE D1-2

Reference number:
C-101
Sheet 7 of 40



GENERAL NOTES

1. SEE SHEET C-101 FOR VERTICAL AND HORIZONTAL CONTROL DATA.
2. EXISTING UTILITY LOCATIONS DEPICTED AND NOTED HEREON ARE TO BE CONSIDERED APPROXIMATE. (SEE NOTE 3, SHEET C-101.)
3. THE LOCATIONS, ELEVATIONS AND DIMENSIONS OF ALL EXISTING UTILITIES, STRUCTURES AND FEATURES AFFECTING THIS WORK SHALL BE VERIFIED PRIOR TO CONSTRUCTION.
4. BUILDING DIMENSIONS GIVEN TO LIMITS OF FOUNDATION. SEE SHEET S-501 FOR FOUNDATION DIMENSIONS.
5. SEE SHEET C-105 FOR FENCING LOCATIONS.
6. SEE SHEET C-106 FOR RAILROAD LAYOUT.
7. SEE SHEET L-101 FOR LANDSCAPE PLAN.
8. INCREASE IN TOTAL LOT AREA DUE TO BULKHEAD CONSTRUCTION.

LEGEND:

- BITUMINOUS CONC. PAVEMENT
- CONCRETE
- GRAVEL
- LANDSCAPE

AREA CALCULATIONS:

EXISTING LOTS	
A.P. 72 LOT 283 -	63,015 SF
A.P. 72 LOT 284 -	106,355 SF
A.P. 72 LOT 294 -	24,071 SF
TOTAL LOT AREA -	193,441 SF
IMPROVED AREA	
EXISTING BUILDINGS (WHARF TAVERN) -	4,841 GSF
NEW BUILDINGS	57,690 GSF
TOTAL BUILDINGS -	62,331 GSF (32% LOT OCCUPANCY)
NEW BITUMINOUS CONC. PAVEMENT -	93,728 SF
NEW CONCRETE SURFACES -	3,472 SF
NEW GRAVEL -	39,844 SF
NEW LANDSCAPED AREAS -	8,613 SF
TOTAL IMPROVED AREA -	207,313 SF
TOTAL UNIMPROVED AREA -	55,835 SF
TOTAL AREA -	263,148 SF *SEE NOTE 8

HORIZONTAL SCALE IN FEET
1 INCH = 30 FEET
HORIZONTAL DATUM IS NAD83 MASSACHUSETTS STATE PLANE
VERTICAL DATUM IS NGVD29

SCALE IN FEET

90% DESIGN

FIGURE 2.3

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS
DESANDING AND DEWATERING FACILITIES DESIGN

AREA D
SITE PLAN

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

FOSTER WHEELER ENVIRONMENTAL CORP.
133 FEDERAL STREET
BOSTON, MASSACHUSETTS

Reference number:
C-103
Sheet 9 of 40

2.0 EXISTING GEOTECHNICAL INFORMATION

Geotechnical information has been generated throughout the development of remedial alternatives for the New Bedford Superfund Site. The following sections highlight previous geotechnical and site information pertinent to the proposed construction of the dewatering and rail access facility.

2.1 Previous Geophysics

Foster Wheeler conducted a multi-phase geophysical survey in and around the proposed CDF D cell, including Packer Marine lease area. Two geophysical instruments were used: an Electromagnetic Induction (EMI) system and a Ground Penetrating Radar (GPR) system. Both systems were deployed in an attempt to detect and characterize potential underground storage tanks, metallic pipes, buried debris, buried former foundations, voids, and other potential subsurface obstructions and hazards within the survey area that may affect future construction activities. The details of the investigation are summarized in the Foster Wheeler (2001c) "Final Report of On-land Geophysical Surveys: Electromagnetics and Ground Penetrating Radar - Area D," dated April 2001.

EMI techniques can be used to locate ferrous and non-ferrous metals as well as lateral changes in ground conductivity. Conductivity contrasts in the earth can be caused by natural phenomena such as lithologic changes, or by man-made phenomena such as disturbed ground, buried materials, or contaminants in the soil or groundwater. Generally, man-made materials that are metallic produce anomalies that contrast significantly with the surrounding natural geologic material. The primary factors that affect the detectability of objects or features (with the EMI methods) include their volumetric size and orientation, their distance from the sensor, and the conductivity contrast between the object/feature and the surrounding materials.

GPR was used in conjunction with the EMI data at the Area D site to further characterize specific EMI anomalies, as well as provide information on potential non-metallic utilities and/or other subsurface features. The GPR data were used in order to gain additional information on the shape of objects or features detected using EMI techniques, and in doing so, provided additional information for interpretation.

A number of features were identified from the geophysical data gathered at the Packer Marine lease area are shown on Figure 2-1 and are summarized as follows:

1. A steel bulkhead, a metal mat, a 55-gallon drum, and scrap pipes were readily identifiable.
2. A metallic pier and dock is evident.
3. A linear metallic anomaly, which is interpreted as potential pipeline conduit, was identified in the data. Subsurface conduit/electric lines were also identified.
4. Several areas were identified that contained numerous individual buried objects. These areas were filled with construction debris or rubble that contain a high percentage of metallic objects (concrete with rebar, cabling, steel beams, etc.).
5. Numerous individual smaller isolated targets were identified and thought to be due to the presence of individual, or a few pieces of, debris containing metal that are located in the subsurface.

2.2 Previous Test Pits

Two test pits (TP-D7 and TP-D10) located on the Packer Marine lease area were previously completed by Foster Wheeler from September 5th through 8th and September 11th through 13th, 2000, and the geology

logged by a Nobis Geotechnical Engineer. The locations of the two test pits are given in Table 2-1 and shown on Figure 2-2. Test pit logs are contained in Attachment A. Additional details of the test pit program are reported in Foster Wheeler (2001b) "Final Phase II Test Pit Data Report".

Test pit TP-D7 reported approximately 13 feet of fill, consisting of a mixture of sand and gravel with miscellaneous construction debris, with a fill/organic clay interface noted at the bottom of the test pit. Test pit TP-D10 reported 15 feet of fill consisting of a mixture of silty sand with gravel, terminating at a layer of asphalt. Groundwater levels for test pits TP-D7 and TP-D10 were noted at 7 feet and 9 feet below grade.

Evidence of olfactory soil contamination were noted on the test pit logs. Olfactory evidence of hydrocarbon odors were noted in test pit TP-D7. Headspace readings taken in test pit TP-D10 were non-detect, except for a reading of 20 ppmv at 7.0 to 7.5 feet. Analytical results from samples taken at the two locations reveal some soil contamination, 11.5 to 12 feet depth for TP-D7 and 9 to 10 feet depth for TP-D10. Additional details regarding soil contaminants are reported later in Section 2.7.

2.3 Previous Soil Borings and Rock Cores

Previous borings located onshore and offshore situated in the area of the proposed facility are listed in Table 2-1 and the logs contained in Attachment A. Additional information regarding the previous boring investigations are contained in the Nobis (2000) and Woodward-Clyde (1987) reports. The previous borings were conducted by several different drilling companies using typical rotary wash and rock coring methods. Additional information regarding the drilling methodology and equipment are noted in the references cited above and noted on the logs contained in Attachment A. The location of the previous soil boring in relation to the site is shown on Figure 2-2. Monthly groundwater levels from wells MW-D3 and OW-D3, recorded from October 1, 1999 to December 1, 1999, are reported in Table 2-2.

2.4 Previous Laboratory Testing

Laboratory testing was conducted on some samples from the previous field investigations. Laboratories testing for samples FD-18 and BL-106 were conducted by Geotesting Express of Boxborough, MA and E.C. Jordan Co., respectively. Table 2-3 reports previous laboratory test data available from the previous borings listed in Table 2-1. Index parameters were evaluated, along with one-dimensional consolidation and undrained unconsolidated triaxial compression testing. Laboratory data sheets for the previous testing are contained in Attachment A.

2.5 Previous Cone Penetrometer Testing

Applied Research Associates (ARA) conducted 29 offshore electrical piezo-cone penetration tests (CPTu) under contract with Warren George Inc. (WGI). The locations of the CPTu tests are given in Table 2-1 and shown on Figure 2-2. CPTu tests were conducted from spud barges and the penetrometer advanced using conventional drilling equipment mounted to the barges. Testing was conducted using 15 cm^2 penetrometer probe (1.75 in diameter, 60° conical tip, and 1.75-inch by 6.5-inch long friction sleeve). Water pressures were measured using a pressure transducer connected to a porous filter located behind the tip of the sensor. Computer data acquisition systems were used to record cone resistance, sleeve friction, and pore pressure. All testing was performed in accordance with ASTM D5778. Pore pressure dissipation tests were also conducted at select depths to aid in the determination of lateral consolidation coefficients and soil permeabilities. CPTu logs for tests cited in Table 2-1 are contained in Attachment A. Additional information regarding the previous cone penetrometer testing is contained in Warren George (2001) "Cone Penetrometer Testing at the New Bedford Harbor Superfund Site."

Table 2-1
Previous Borehole and Test Pit Locations and Elevations

Boring ID	Northing (NAD 83)	Easting (NAD 83)	Elevation (ft NGVD)
TP-D7 P1	2696290.55	813996.61	---
TP-D7 P2	2696291.24	813989.87	---
TP-D7 P3	2696300.65	813994.26	---
TP-D7 P4	2696305.74	813987.12	---
TP-D10 P1	2696245.39	814134.52	---
TP-D10 P2	2696253.24	814134.43	---
TP-D10 P3	2696247.42	814115.20	---
TP-D10 P4	2696242.58	814117.01	---
BL-106	227339.80 [A]	760160.50 [A]	-3.0 [B]
B-8	2696484.00 [C]	813599.00 [C]	6.4 [D]
B-9	2696391.00 [C]	813604.00 [C]	7.2 [D]
GZA-1	2696160.00 [C]	814369.94 [C]	-10.5 [C]
GZA-4	2696493.00 [C]	814149.58 [C]	-4 [C]
CSO-D1	2696181.20	814200.30	8.9
CSO-D2	2696159.20	814008.20	7.5
OW-D3	2696352.50	814168.10	68
MW-D3	2696505.70	813975.40	10.1
FD-18	2696322.50	814282.00	-7.9
FD-19	2696353.50	814172.20	7.0
FD-20	2696458.00	814041.80	-4.1
FD-21	2696526.50	814030.90	10.9
FD-22	2696654.20	814049.70	11.3
FD-108	2696632.00	814464.00	-12.9
FD-109	2696361.00	814482.00	-33.5
FD-113	2696239.00	814464.00	-33.8
FD-114	2696166.00	814321.00	-20.7
CPT-D-15	2696202.90	814392.50	---
CPT-D-16	2696213.20	814266.10	---
CPT-D-17	2696326.10	814295.70	---
CPT-D-25	2696356.40	814424.60	---
CPT-D-26	2696359.00	814277.50	---
S-813	2626455.00	814002.00	---
S-872	2696464.00	813695.00	---
S-873	2696447.00	813850.00	---
3053-A	2696485.82	814121.63	---
3088	2696298.23	814310.79	---
3089	2696397.89	814310.00	---
3926	2696491	814070	---
3929	2696432	814071	---
3930	2696432	814155	---
3931	2696425	814247	---
3927	2696484	814248	---
3928	2696474	814354	---
3932	2696363	814303	---
3933	2696363	814361	---
3934	2696264	814356	---
3935	2696192	814296	---

A - Lambert grid coordinates
B - Surface elevation referenced to mean sea level, feet
C - Approximate locations
D - City of New Bedford Datum CNBD

Table 2-2
Previously Recorded Groundwater Levels

MW-D3			
Top of PVC Elev.	9.766	ft	
Date (mm/dd/yy)	Time (hrs)	Water Level (ft)	Water Table Elev. (ft, NGVD)
10/1/99	11:00	8.62	1.146
10/14/99	8:45	8.62	1.146
10/28/99	7:35	8.8	0.966
11/11/99	10:42	7.12	2.646
12/1/99	16:27	7.01	2.756
		Average:	1.732
OW-D3			
Top of PVC Elev.	9.706	ft	
Date (mm/dd/yy)	Time (hrs)	Water Level (ft)	Water Table Elev. (ft, NGVD)
10/1/99	11:10	8.27	1.436
10/14/99	10:20	7.75	1.956
10/28/99	8:32	8.38	1.326
11/11/99	10:37	8.31	1.396
12/1/99	15:40	8.44	1.266
		Average:	1.476

Table 2-3
Previous Geotechnical Laboratory Test Data

Boring ID	Sample ID	Depth (ft)	Class. ASTM	Water Content (%)	Compaction		Organic Content (%)	Particle Size				Specific Gravity	Atterberg Limits	
					Optimum Moisture Content (%)	Maximum Dry Density (pcf)		%Gravel	%Sand	%Silt	%Clay		Liquid Limit	Plasticity Index
FD-18	UO-1	1-3	OH	72.8			5.1	3	32	38	27	2.67	53	26.8
	UO-2	4-6	SC	31.0			0.6	3	51	32	14	2.68	32.2	12.9
	UO-3	7-9	ML	24.3										
BL-106	S3	6-8	SM	39.0				31	40	29				
	S7	14-16	SP	34.1				1	97	2				
3929	T	0.2-1.2	OH	76.2	13.5	115	4	3	18	65	14		67.8	37.1
	B	1.2-2.2	OH	90.4			5.2	0	4	64.5	31.5		76.8	45.2
3930	T	3.3-4.3	OH	96.9			5.3	1	13	65	21		89.5	32.6
	B	4.3-5.3	OH	78.7			4.8	4	28	46	22		79.1	32.7

Boring ID	Sample ID	Depth (ft)	Consolidation						Triaxial Test (UU)					
			Water content (%)	Dry Density (pcf)	Void Ratio	Saturation (%)	CR	RR	Water content (%)	Dry Density (pcf)	Void Ratio	Saturation (%)	Minor Principle Stress (psf)	Shear Strength (psf)
FD-18	UO-1	1-3	63.52	58.9	1.83	92.7	0.205	0.008	50.1	55.6	1.996	67.1	90.7	76.1
	UO-2	4-6	31.3	89.0	0.88	95.3	0.085	0.004	30.3	80.5	1.079	75.4	360.0	160.2

2.6 Previous Vibracoring

CR Environmental conducted sixteen offshore vibracores near the boundaries of the site located along the USACE proposed sheet pile cofferdam alignment. Locations of the vibracores are presented in Figure 2-2 and Table 2-1; the field logs are contained in Attachment A. Vibracore testing was conducted from a low draft vessel using typical vibracore equipment. Coring was conducted using 3-inch diameter stainless steel vibracores lined with polyethylene sleeves. The total barrel length from the base of the pneumatic hammer to the core tip measured 12 feet in length. The vibracores were advanced using the self-weight of the device until tip resistance impeded penetration, upon which the barrel was advanced using the vibratory hammer. Typically, the increased tip resistance coincided when encountering the sand layer underlying the top sediments.

2.7 Previous Borehole Permeability and Packer Tests

Nobis Engineering conducted borehole permeability and Packer tests during previous field investigations. Three borehole permeability tests were conducted in offshore borings located near the site. Constant head testing was conducted in the boring FD-18 in the bedrock, and falling head tests were conducted in borings FD-109 and FD-114 in the marine sands and silts, and the glaciofluvial deposits. The results of the borehole permeability tests are contained in Attachment A.

Packer tests were conducted in the bedrock in three offshore borings (FD-109, FD-113 and FD-114) located near the site. The results of the borehole permeability tests are contained in Attachment A.

2.8 Miscellaneous Construction Records

Review of site permitting documents (New Bedford Harbor Development Commission License Plan #1023) revealed that a portion of the Packer Marine lease area was used as a dredge spoil disposal pit, assumedly to dispose of dredged sediment during the construction of the steel bulkhead and docking area for the barge activities. Cross sections contained in the permit documents suggest a maximum dredged sediment thickness of 2.5 feet. Attachment B provides the permit documents, along with the proposed plan and cross sectional drawings. Some evidence of the disposal pits (traces of geosynthetics) were encountered during the previous test pitting and the Phase III drilling.

2.9 Phase III Site Subsurface Exploration

The Phase III geotechnical investigation program was developed by Foster Wheeler, in coordination with the USACE, and included advancement of onshore soil borings to supplement the existing site data for the design and construction of the dewatering building and rail access facility. Samples were collected for index testing, and standard penetration testing was conducted to provide an estimation of in situ engineering parameters.

2.9.1 Phase III Drilling and Sampling

Additional upland soil borings were carried out as part of the planned Phase III Sampling. The onshore boring program consisted of advancement of eight test borings (FD-201 through FD-208). All drilling work was performed by Geologic Inc., of Hopkington, MA, between September 12, 2001 and October 1, 2001, using a Mobile B-57 truck mounted drill rig. Borings were advanced using conventional rotary wash and rock coring methods. Continuous split-spoon samples were taken in the upper strata and at standard 5-foot intervals in denser material. In selected borings, shelby tube samples were attempted from the silty layers. A Foster Wheeler geologist oversaw all drilling and sampling activities.

The borehole location, coordinates, and elevations were determined by Foster Wheeler GPS survey and referenced to NGVD. These coordinates are presented in Table 2-4. The locations of the borings are also shown on Figure 2-1, along with the location of previous test pits and borings.

Table 2-4
Phase III Borehole Locations and Elevations

Boring ID	Northing	Easting	Elevations
FD 201	2 696 366.63	813 818.27	7.8
FD 202	2 696 364.56	813 979.00	7.1
FD 203	2 696 266.72	813 851.01	7.4
FD 204	2 696 260.10	814 036.08	8.3
FD 205	2 696 264.31	814 174.86	9.1
FD 206	2 696 288.00	814 990.50	7.4
FD 207	2 696 164.28	813 818.58	7.1
FD 208	2 696 181.81	814 079.53	8.1

Boring logs prepared by Foster Wheeler are provided in Attachment C. Classifications on the boring logs are consistent with ASTM D 2488 – Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Soil classifications which were edited based on particle size analysis results and Atterberg limits determinations are consistent with ASTM D 2487 – Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

2.9.2 Phase III Geotechnical Laboratory Testing

The Phase III geotechnical laboratory testing program was performed to assist in classification of soils and estimation of engineering parameters necessary for the facility design. Index testing, including moisture content, specific gravity, particle size, and Atterberg limits determinations, was conducted on samples of fill, organic clay, sandy silts, and interbedded sands. Laboratory testing was performed by Geotesting Express, Inc. (GTX) of Boxborough, Massachusetts. Laboratory results are contained in Geotesting Express (2001) "New Bedford Harbor Geotechnical Laboratory Report."

2.9.3 Moisture Content

Thirteen moisture, or water, contents were determined in accordance with ASTM D 2216. The results are contained in Table 2-5 and Attachment C. Natural water contents determined in conjunction with Atterberg limits testing (see Section 3.1.5) are contained in Attachment C.

2.9.4 Specific Gravity

Nine specific gravity tests were conducted on the clays, sandy silts, and interbedded sands in accordance with ASTM D 854, and the results are contained in Table 2-5 and Attachment C. The specific gravity of the solid substance of most inorganic soils varies between 2.60 and 2.80. Reported values less than 2.60 could likely be influenced by the presence of organic matter.

2.9.5 Particle Size Analysis

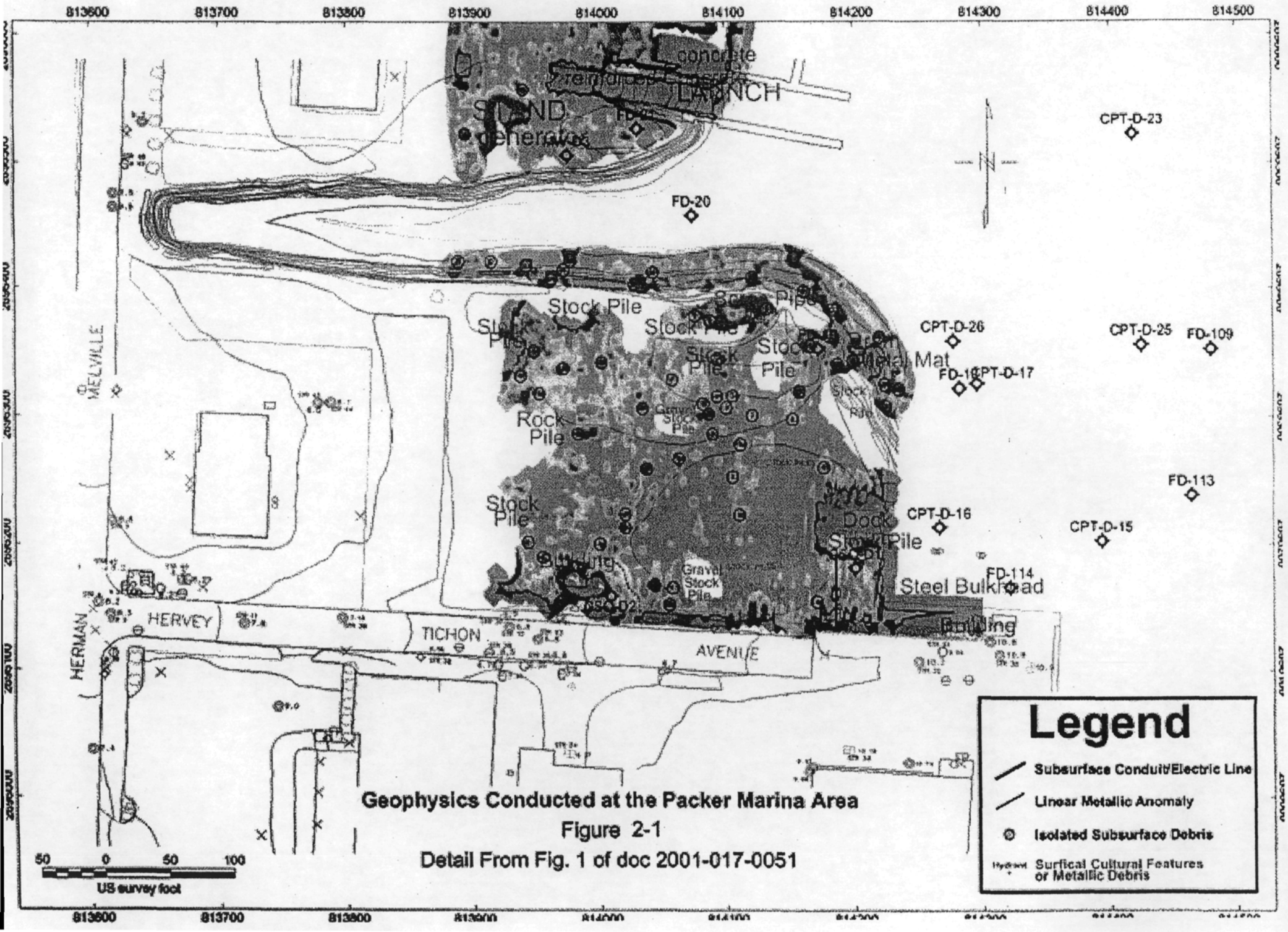
A total of twenty-one particle size analyses were performed on representative samples of subsurface materials. Twelve of the particle size analyses were performed using both sieve and hydrometer tests. Nine of the analyses were conducted using only sieve tests. All analyses were conducted in accordance with ASTM D 421 and D 422. Soil classifications are contained in Table 2-5. Results of the particle size analyses (both sieve and hydrometer) are also contained in Attachment C.

2.9.6 Atterberg Limits

Atterberg limits were conducted on six soil samples in accordance with ASTM D 4318 and the results reported in Table 2-5 and in Attachment C. The fines contained in five of the samples were found to be nonplastic, and one sample was determined to be a low plasticity organic soil.

Table 2-5
Phase III Geotechnical Laboratory Tests Data

Boring ID	Sample ID	Depth (ft)	Class. ASTM	Water Content (%)	Organic Content (%)	Particle Size				Specific Gravity	Atterberg Limits	
						%Gravel	% Sand	%Silt	%Clay		Liquid Limit	Plasticity Index
FD 201	S-2	2-4	SM	4.6		32	47	17	4			NP
FD 201	S-6	14-16	SW-SM	10.9		19	74	7	0	2.61		NP
FD 201	S-9	29-31	SP	9.1		39	59	2	0	2.61		
FD 202	S-4	6-8	SM	16.4	2.03	9	78	10	3			
FD 202	S-8	24-26	ML	24.3		0	35	49	16			NP
FD 204	S-6	14-16	SM	19.2	0.80	2	83	12	3			NP
FD 204	S-7	19-21	ML	28.1		0	4	85	11	2.70		NP
FD 205	S-4	6-8	GP	7.3		69	28	3	0	2.51		
FD 205	S-9	29-31	ML	22.7		0	11	83	6	2.67		
FD 205	S-13	49-51	SP			1	95	4	0			
FD 206	S-5	9-11	GW-GM	9.4		55	36	9	0	2.48		
FD 206	S-8	15-17	ML	20.1		2	39	54	5	2.61		
FD 206	S-10	24-26	ML			1	12	87	0			
FD 207	S-3	4-6	GM			46	38	16	0			
FD 207	S-6	14-16	SM	22.1		0	53	37	10	2.65		
FD 207	S-8	24-26	SW			0	37	63	0			
FD 208	S-2	4-6	GW			64	33	3	0			
FD 208	S-4	8-10	SM			21	58	21	0			
FD 208	S-7	14-16	OL	33.1	1.81	3	37	47	13	2.63	36.6	14.0
FD 208	S-8	16-18	SM			5	83	11	1			
FD 208	S-11	29-31	SM			9	55	36	0			



Geophysics Conducted at the Packer Marina Area

Figure 2-1

Detail From Fig. 1 of doc 2001-017-0051

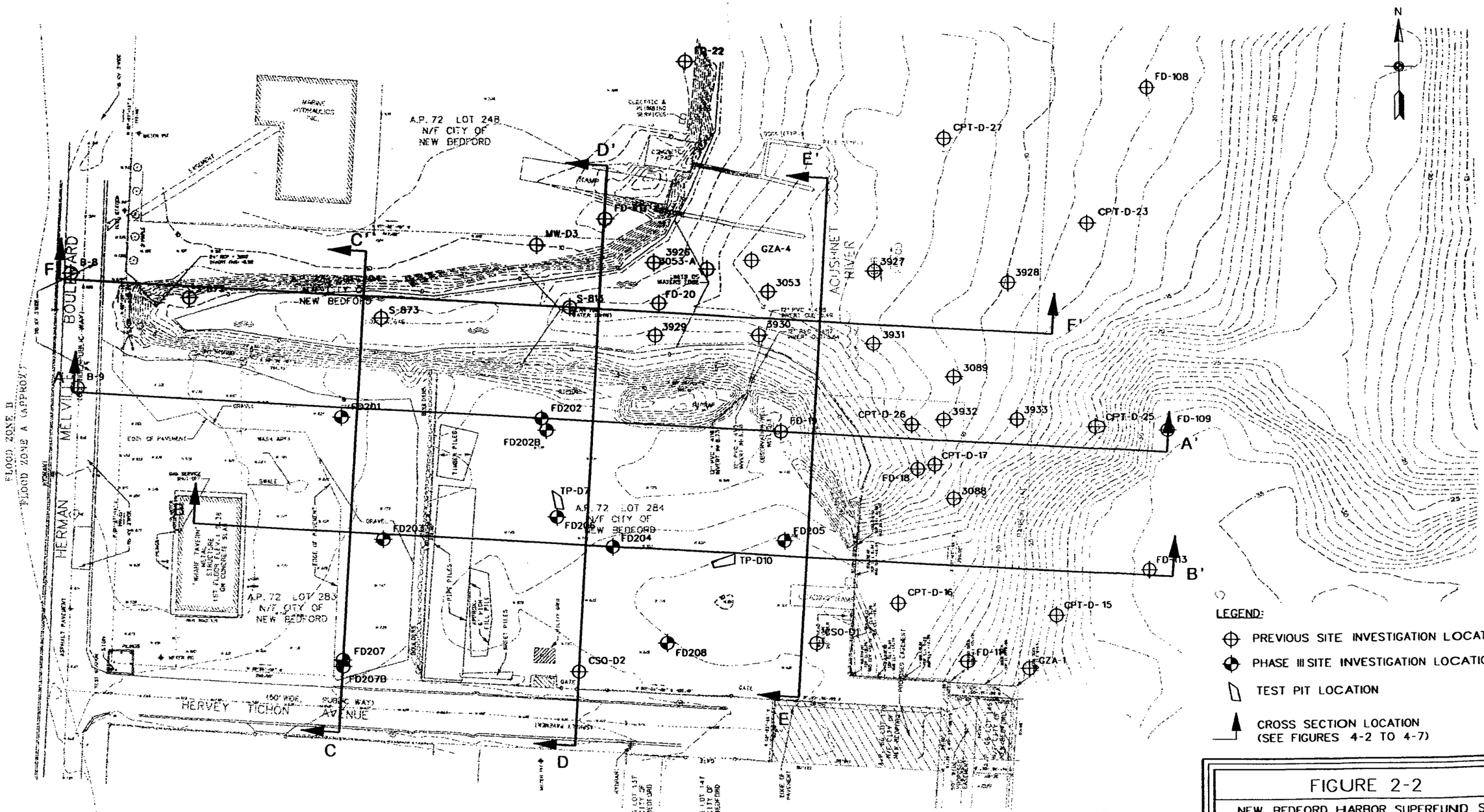


FIGURE 2-2

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS
DEWATERING FACILITIES

LOCATION PLAN
SUBSURFACE EXPLORATION

SCALE: NOTED	110291-B-701XXX.DGN

3.0 SUMMARY OF ANALYTICAL CHEMISTRY RESULTS

3.1 Analytical Results from Phase III Drilling and Sampling

Chemical analysis was performed on fifteen soil samples collected from seven borings at area D at the New Bedford Harbor Superfund site during September of 2001. Samples were analyzed for volatile organics (VOCs), semivolatile organics (SVOCs), PCB congeners, total organic carbon (TOC), and priority pollutant metals including mercury and cyanide. The analytical methods used were listed as follows:

- VOCs: Method 8260B
- SVOCs: Method 8270C
- PCB Congeners: Method 8082
- TOC: Method 9060.
- Priority Pollutant Metals: Methods 6010A and 7471A
- Cyanide: Method 9012A

A brief data review was performed on the data from the samples based on the following parameters:

- Sample Preservation and Holding Times
- Method Blank Analysis
- Field/Equipment Blank Analysis
- Surrogate Recovery
- Matrix Spike/Matrix Spike Duplicate Results
- Field and/or Laboratory Duplicates
- Laboratory Control Sample

Overall, the majority of data are valid and useable to meet project objectives. VOC, SVOC and cyanide non-detect results for two samples (see below) were rejected as unusable due to exceedance of holding time criteria.

Tabulated data and validation memos may be found in Attachment D. Samples FD203 S-2 and FD203 S-4 were received by the laboratory after holding times had expired for the cyanide and organic analyses. As a result, the non-detects (U) for the VOC, SVOC, PCB congener and cyanide analyses for both samples were considered unusable (R). In addition, the positive results from these two samples may have a low bias. No other qualifications were applied to the data as a result of the data review. Three trip blanks for volatile organics were taken, and methylene chloride and naphthalene were found in some of the trip blanks. Low levels of methylene chloride and naphthalene detected in the samples may be attributed to laboratory or field cross-contamination. Other blanks (lab and field) did not indicate detectable contamination. No other analyte specific problems were noted with regard to the samples.

For reference, sample results were compared with the Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML). The MOHML provides criteria for soil categories S1 and S2 which are classified based on the potential for human exposure to the soils. S1 soils are associated with the highest potential for exposure, and S2 soils have the less potential for exposure.

Naphthalene was detected in FD202 S-6, FD205 S-4, and FD206 S-5, and naphthalene in FD205 S-4 exceeded the S1 criteria but not the S2 criteria. Many polycyclic aromatic hydrocarbons (PAHs) were detected in FD201 S-2, FD201 S-3, FD202 S-4, FD202 S-6, FD203 S-2, FD204 S-1, FD204 S-4, FD205 S-4, and FD206 S-5. Results from FD201 S-2, FD201 S-3, FD202 S-4, FD202 S-6, FD203 S-2,

FD205 S-4, and FD206 S-5 exceeded both MOHML S1 and S2 criteria for one or more of the following compounds: benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and dibenzo(a,h)anthracene.

PCB congeners were detected in FD201 S-2, FD201 S-3, FD202 S-2, FD202 S-4, FD202 S-6, FD204 S-1, FD204 S-4, FD205 S-4, FD206 S-5, FD206 S-6, and FD207 S-4, with total PCB concentrations ranging from 0.1 mg/kg to 1.06 mg/kg. No samples were found to exceed the S1 and S2 criteria for total PCBs (2 mg/kg). Metal analyses indicated that lead for sample FD206 S-5 (416 mg/kg) exceeded the S1 criteria of 300 mg/kg, but did not exceed the S2 criteria. Cyanide was not detected in the samples. In some of these samples and in those from earlier test pit investigations, several PAHs were detected at concentrations greater than S1 and S2 standards. Additional discussion of the individual sample results is given below.

3.2 Previous Analytical Results from Test Pitting

Analytical results from test pit samples including TP-D7-(0-0.5), TP-D7-(8.5-9), TP-D7-(11.5-12), TP-D10-(0-0.5), TP-D10-(7-7.5) and TP-D10-(9-10) reported from a previous test pitting investigation (see Foster Wheeler (2001b)) "Final Phase II Test Pit Data Report." For VOC, acetone was detected in the six samples and naphthalene was found in three samples. For SVOC, many PAHs were detected in TP-D7-(8.5-9), TP-D7-(11.5-12), and TP-D10-(9-10), with the results of benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene exceeding the MOHML S1 and S2 criteria in each of the three samples, and indeno(1,2,3-cd)pyrene exceeding S1 criteria in TP-D7-(8.5-9). Aroclor 1254 (comparable to total PCBs) was found in TP-D7-(0-0.5), TP-D7-(8.5-9), TP-D7-(11.5-12), and TP-D10-(9-10) with concentrations ranging from 0.0619 mg/Kg to 0.426 mg/Kg. No pesticides were detected in these test pit samples. For metals, lead was detected in each of the samples at concentrations ranging from 7.5 mg/kg to 183 mg/kg. None of the lead concentrations exceed MOHML S1 and S2 criteria. Cyanide was not detected in the samples.

It should be noted that the sampling event was not designed to meet the detection and reporting requirements of the MOHML S1 and S2 criteria. These criteria were used as a reference only. Consequently, some of the laboratory reporting limits are higher than the criteria.

4.0 SITE CHARACTERIZATION

The following sections present the interpretation of site conditions based upon the Phase III and previous field investigation conducted at the site.

4.1 Subsurface Strata

The subsurface conditions at the site vary both onshore and offshore. The onshore portion of the site is, in general, characterized by fill overlying dense inorganic sandy silts and dense poor to well graded sand, with the exception of two borings where a thin organic soil layer was encountered between the fill and the sandy silts. The offshore portion of the site is generally characterized by organic soil overlying the inorganic sandy silts and dense sand. The subsurface conditions for the onshore and offshore portions of the site are described in detail below.

Subsurface profiles across the site are presented as Figures 4-2 through 4-7, respectively. The general notes and legend for the subsurface profiles are included on Figure 4-1. Subsurface conditions were observed only at the boring locations. The strata boundary lines on the profiles are based on interpolation between borings and are shown only to provide visual continuity. The actual strata boundaries between borings may vary from the lines shown on the profiles.

4.1.1 Soil and Rock Conditions

4.1.1.1 Onshore Portion of Site

FILL: Where fully penetrated, the fill encountered in the onshore borings and test pits ranges from approximately 6 to 23 feet in depth, with the average thickness being approximately 16 feet. The fill is mostly granular in nature and consists of poorly graded sands with varying amounts of silt and gravel. Other components include boulders, brick, concrete, wood, asphalt, and polypropylene plastic. The fill layer was typically dense to very dense, with frequent obstructions which often prevented casing advancement during the borehole installation. Upper portions of the fill were denoted by a moist brown matrix, where as lower portions of the fill strata were typically wet gray to black matrix. This lower discoloration is likely attributed to the mixing of the dark gray organic soils and the fill during historic backfilling of the shoreline. A very strong petroleum odor was observed in boring FD-206 which coincide with a large return of wood chips entrained within the wash return. This may be attributed to creosote timber encountered within the fill layer at a depth of 6 to 9 feet.

ORGANIC DEPOSITS: A thin organic clay layer was encountered directly beneath the fill layer in three of the onshore borings (FD-208, FD-21, and CSO-D1) and at one test pit location (TP-D7). Where fully penetrated, this stratum ranges from approximately 1 to 2 feet on the Packer Marine lease area, to 7.5 feet in thickness north of the site near Marine Hydraulics. The borings indicate that the stratum consists of stiff organic clay or organic silt containing varying amounts of sand. The color was found to range from dark gray to black, and in one instance an organic odor was noted. Grain size analyses from FD-208 classified the organic deposits as a sandy organic soil (OL), composed of 32% sand, 47% silt, and 13% clay. Atterberg limits conducted on the fine portions reported a liquid limit of 36.6 and a plasticity index of 14.0 (slightly plastic). Organic content was approximately 2% with the reported water content of 33%.

MARINE SANDS AND SILTS: An inorganic sandy silt or silty sand stratum was typically encountered below the fill and organic deposits. Samples of the marine sands and silts taken during the soil borings indicated varying amounts of fine sand and silt with some infrequent, isolated seams of clayey silt and clay. The sand content varied between depths and borings, but a consistent olive brown color was distinct throughout the layer. In some instances the samples were mostly fine sand and others conversely silt.

Based on standard penetration tests, the marine sands and silts were generally medium dense to dense, although some loose and very dense sands and silts were encountered. Where the marine sands and silts stratum was encountered and fully penetrated, the thickness ranges from approximately 1.5 to 30 feet, with the average thickness being approximately 14 feet.

GLACIOFLUVIAL DEPOSITS: Well and poorly graded sands were encountered below the marine sands and silts. The stratum was distinguished largely by distinct reddish brown color attributed to a significant presence of granitic sand grains. Based on standard penetration tests, the glaciofluvial deposits were generally medium dense to dense, although some loose and very dense sands were encountered. Where stratum was fully penetrated, the thickness ranges from approximately 11.5 to 25.5 feet, with the average thickness being approximately 20 feet. A significant amount of boulders and cobbler were present in the lower 5 to 10 feet of the deposit, overlying the bedrock, which may imply a mix of highly weathered bedrock and glaciofluvial deposit.

BEDROCK: Bedrock was cored in seven of the onshore borings. The rock consists of fresh to weathered aphanitic gneiss. The rock quality designation (RQD) noted on the boring logs ranged from poor to very good, but was generally fair to good. A significant amount of water loss occurred during rock coring, which may imply moderately open fractures and moderately permeable bedrock.

4.1.1.2 Offshore Portion of Site

ORGANIC DEPOSITS: Organic deposits, encountered at all six offshore borings and three vibracore locations, ranged in thickness from 4 to 12 feet where fully penetrated. The stratum consists of generally very soft to soft organic clay or organic silt containing varying amounts of fine to medium sand (approximately 5% to 35% by weight) and shell fragments. Included in the organic deposits stratum is 3 feet of clayey sand (46% clay and 54% sand) in FD-18, an estimated 4 feet of clayey sand (20% clay and 80% sand and shell fragments) in FD-114, and an estimated 4.5 feet of brown clayey silt (up to 35% sand) in GZA-4. The color of the organic deposits was generally recorded as dark gray to black, and a strong organic odor was often noted.

MARINE SANDS AND SILTS: Marine sands and silts were encountered in four offshore borings. The stratum, which ranges from 6 inches to 33 feet in thickness, consists of loose to dense sandy silt and silty sand with varying amounts of sand, silt, and gravel. As with the onshore borings, samples were largely fine sand and silt. Colors ranged from gray to brown, with a distinct olive brown silt being encountered in FD-18. A sandy clay seam was also encountered in FD-18.

GLACIOFLUVIAL DEPOSITS: Well and poorly graded brown sands and gravels with varying amounts of silt were encountered below the organic deposits and marine sands and silts. Based on standard penetration tests, the glaciofluvial deposits were generally medium dense to dense, although some loose and very dense sands and gravels were encountered. Where stratum was fully penetrated, the thickness ranges from approximately 10 to 44 feet, with the average thickness being approximately 22 feet.

GLACIAL TILL: Glacial till was encountered in one offshore boring (FD-113). The thickness of the stratum was approximately 2 feet and the material was classified as a poorly graded sand with gravel with varying amounts of silt. Based on standard penetration tests, the material was dense.

BEDROCK: Bedrock was cored in four offshore borings. The rock consists of fresh to weathered aphanitic gneiss. The rock quality designation (RQD) noted on the boring logs generally ranged from very poor to excellent.

4.1.2 Seismicity

The dewatering building and rail access site is located within seismic zone 2A according to the seismic zone map of the United States. Peak ground acceleration for the site is 0.035g with 10% probability of exceedance in 50 years from the United States Geological Survey National Earthquake Hazard Reduction Program. As per the Massachusetts State Building Code CMR 1612.2.3, the effective peak velocity related acceleration (A_v) and the effective peak acceleration (A_a) shall be taken as 0.12g throughout Massachusetts for purposes of seismic design.

4.1.2.1 Assessment of Seismic Hazards

Soil liquefaction is a process by which loose, saturated, granular deposits lose a significant portion of their shear strength due to pore pressure buildup resulting from cyclic loading, such as that caused by an earthquake. Soil liquefaction can lead to foundation bearing failures and excessive settlements. Preliminary liquefaction potential of the site was assessed based upon the Massachusetts State Building Code CMR 1805.3 Figure 1805.3 requirements. The preliminary results indicated that the foundation materials present at the site were not susceptible to liquefaction or excessive deformation in the event of a significant earthquake.

4.1.3 Groundwater Elevations

One previously installed monitoring well (MW-D3) was used to determine the groundwater levels for the site. Groundwater elevations fluctuate with the tide and range from 1.0 to 2.8 feet NGVD. Groundwater levels for test pits TP-D7 and TP-D10 were noted at 7 feet and 9 feet below grade, which translates to approximately to 0 to 0.5 NGVD, based upon survey data of ground surface elevations interpolated within the locations of the test pits. Variations are largely associated with seasonal variations and existing shoreline groundwater elevations are likely influenced by tidal fluctuations. Changes in the groundwater levels may occur after construction of the bulkhead.

GENERAL NOTES:

1. ELEVATIONS ARE IN FEET AND REFER TO NATIONAL GEODETIC VERTICAL DATUM (NGVD).
2. BORING LOCATIONS AND SUFACE ELEVATIONS AT TEST BORINGS WERE DETERMINED BY GLOBAL POSITIONING SYSTEM (GPS) SURVEY PERFORMED BY FOSTER WHEELER ENVIRONMENTAL CORPORATION.
3. GROUND SURFACE ELEVATION PROFILE IS BASED ON PHOTOGRAMMETRIC SURVEY CONDUCTED BY JAMES W. SEWALL COMPANY ON DECEMBER 2, 1998. MUDLINE ELEVATION PROFILE IS BASED ON HYDROGRAPHIC SURVEY CONDUCTED BY THE U.S. ARMY CORPS OF ENGINEERS IN FEBRUARY AND MARCH 1999.
4. STRATIFICATIONS SHOWN DEPICT INTERPOLATIONS BETWEEN BORINGS AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS. PROJECT BORINGS HAVE BEEN GIVEN PRECEDENCE OVER PREVIOUS BORINGS WITH REGARD TO STRATIFICATION.
5. BORING LOCATIONS ARE SHOWN IN PLAN VIEW ON FIGURE 2-2.
6. PROJECT BORING LOGS ARE CONTAINED IN APPENDIX A.

BORING LEGEND:

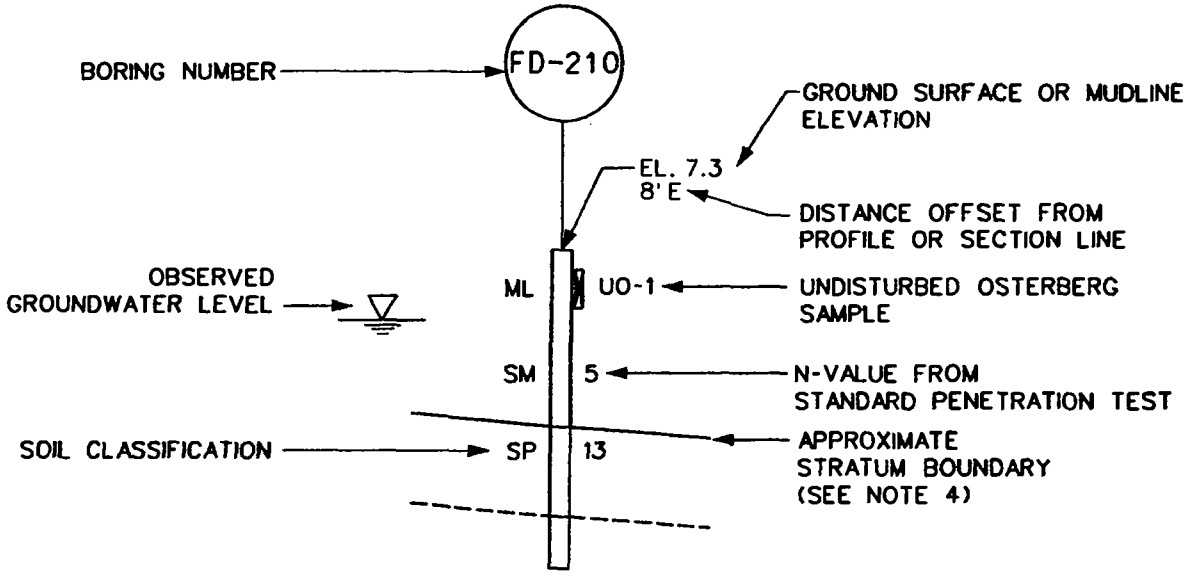


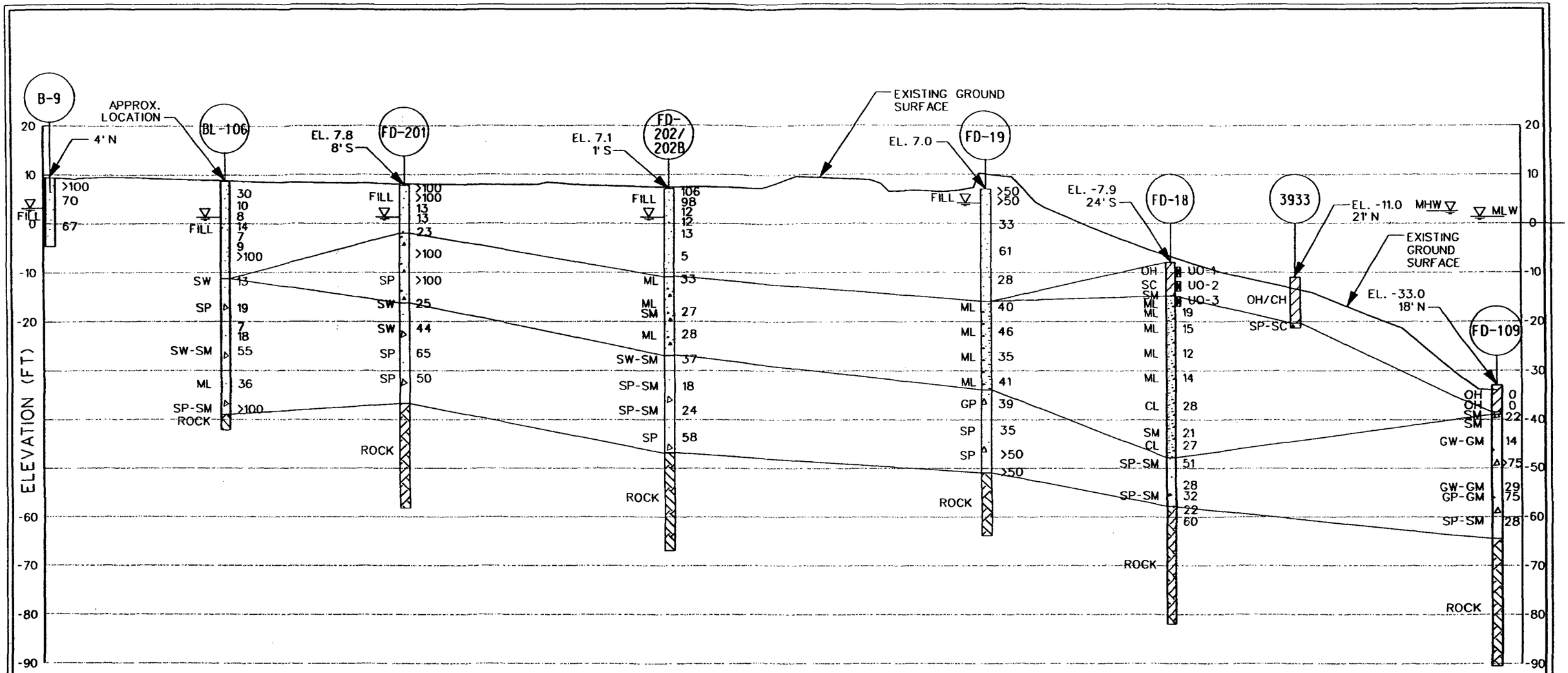
FIGURE 4.1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

GENERAL NOTES AND LEGEND FOR SUBSURFACE PROFILES AND SECTIONS

NOT TO SCALE

110291LG702Axx.dgn



NOTES:

1. SEE FIGURE 4-1 FOR GENERAL NOTES AND LEGEND.
2. SEE FIGURE 2-2 FOR PLAN VIEW OF SUBSURFACE SECTION AND BORING LOCATIONS.

GEOLOGIC LEGEND (STRATUM DESCRIPTION)

- FILL
- ORGANIC DEPOSITS
- MARINE SANDS AND SILTS
- GLACIOFLUVIAL DEPOSITS
- GLACIAL TILL
- BEDROCK

HORIZONTAL SCALE 1"=60'

30 0 60 120 180 FEET

10 0 20 40 60

VERTICAL SCALE 1"=20'

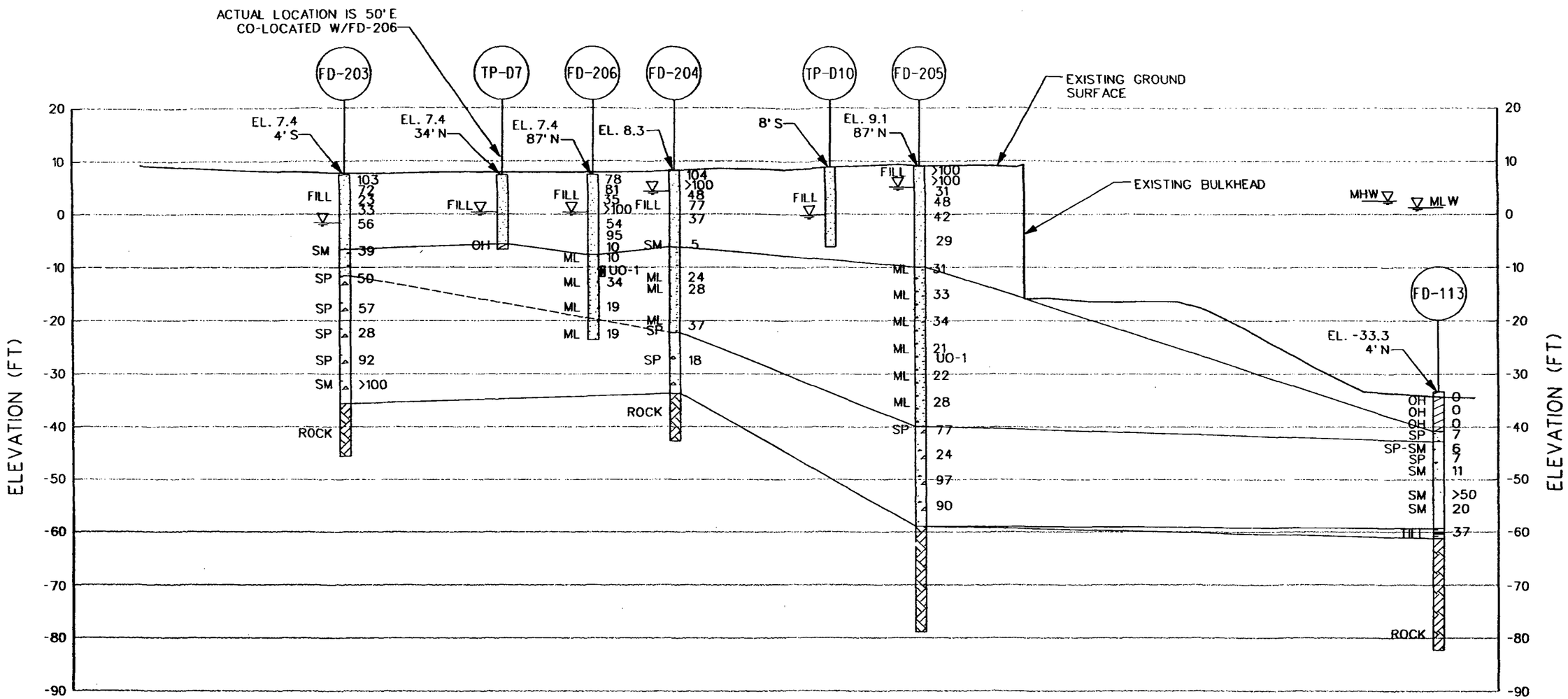
FIGURE 4-2

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SUBSURFACE SECTION
A – A'

SCALE: NOTED

110291LB703Axx.dgn



GEOLOGIC LEGEND (STRATUM DESCRIPTION)

- FILL
- ORGANIC DEPOSITS
- MARINE SANDS AND SILTS
- GLACIOFLUVIAL DEPOSITS
- GLACIAL TILL
- BEDROCK

NOTES:

1. SEE FIGURE 4-1 FOR GENERAL NOTES AND LEGEND.
2. SEE FIGURE 2-2 FOR PLAN VIEW OF SUBSURFACE SECTION AND BORING LOCATIONS.

HORIZONTAL SCALE 1"=60'

30 0 60 120 180 FT

10 0 20 40 80

VERTICAL SCALE 1"=20'

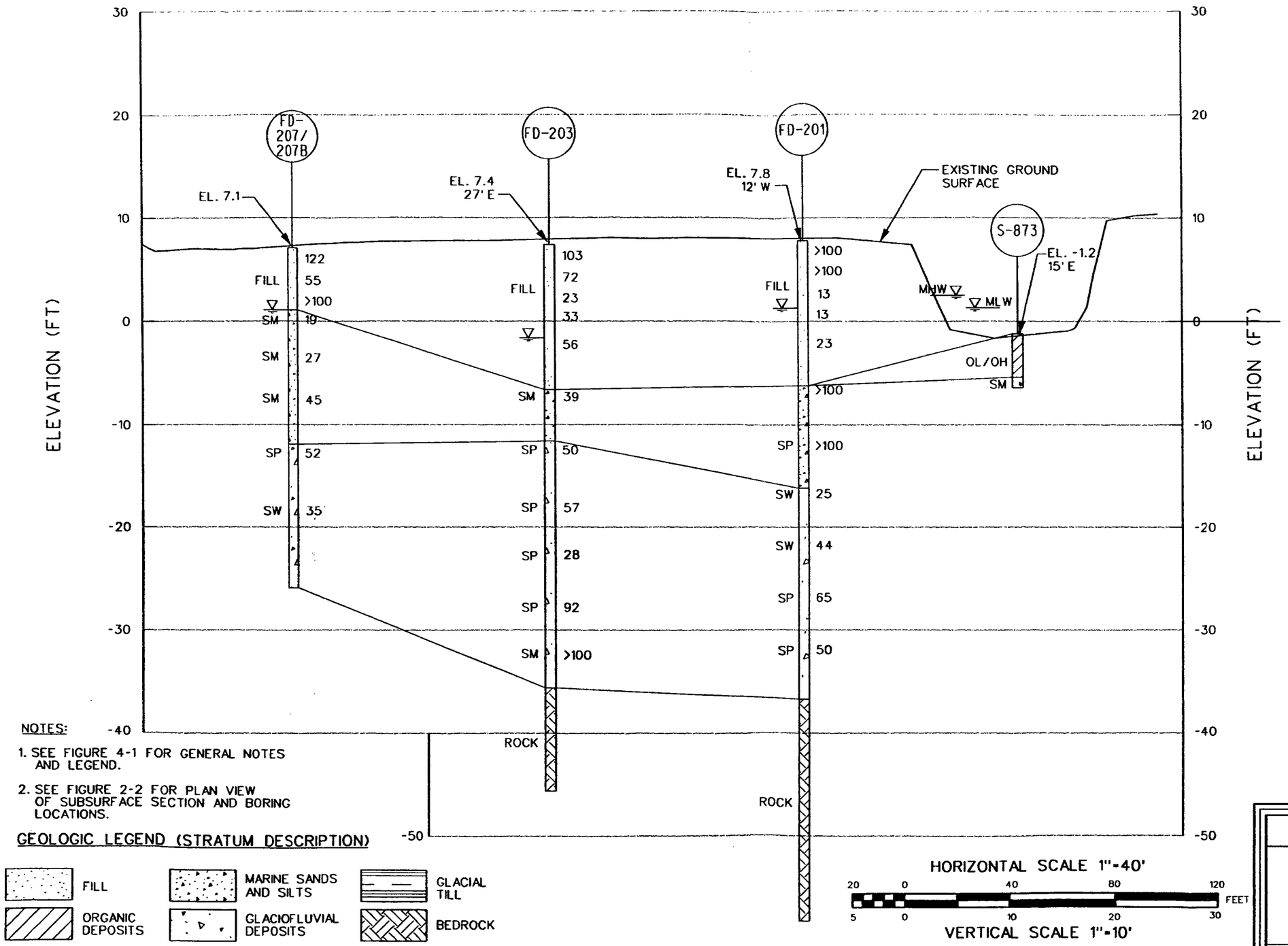
FIGURE 4-3

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SUBSURFACE SECTION
B-B'

SCALE: NOTED

11029ILB704Axx.dgn



NOTES:

1. SEE FIGURE 4-1 FOR GENERAL NOTES AND LEGEND.
2. SEE FIGURE 2-2 FOR PLAN VIEW OF SUBSURFACE SECTION AND BORING LOCATIONS.

GEOLOGIC LEGEND (STRATUM DESCRIPTION)

- FILL
- ORGANIC DEPOSITS
- MARINE SANDS AND SILTS
- GLACIOFLUVIAL DEPOSITS
- GLACIAL TILL
- BEDROCK

FIGURE 4-4

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SUBSURFACE SECTION
C-C'

SCALE: NOTED

110291LB705Axx.dgn

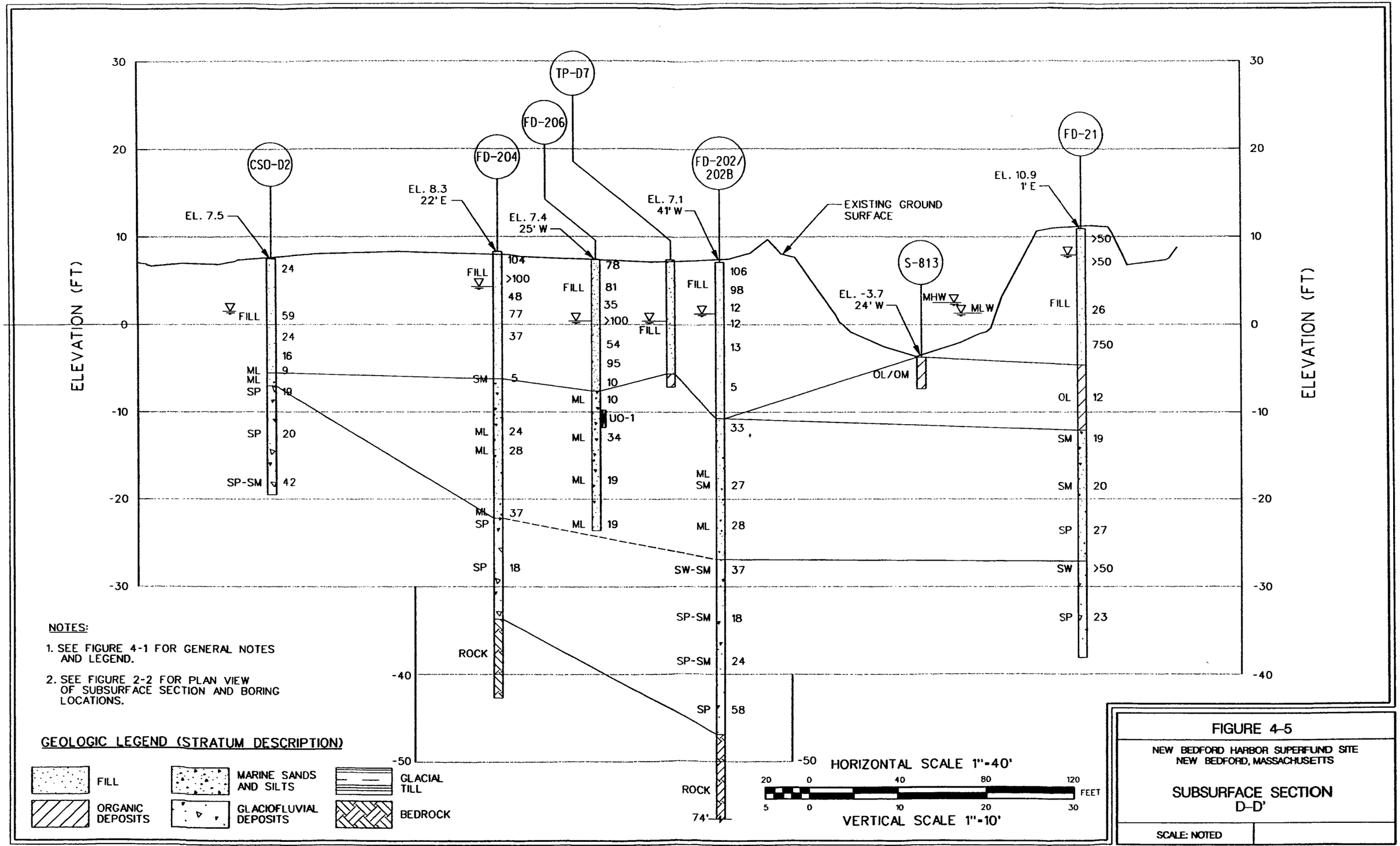


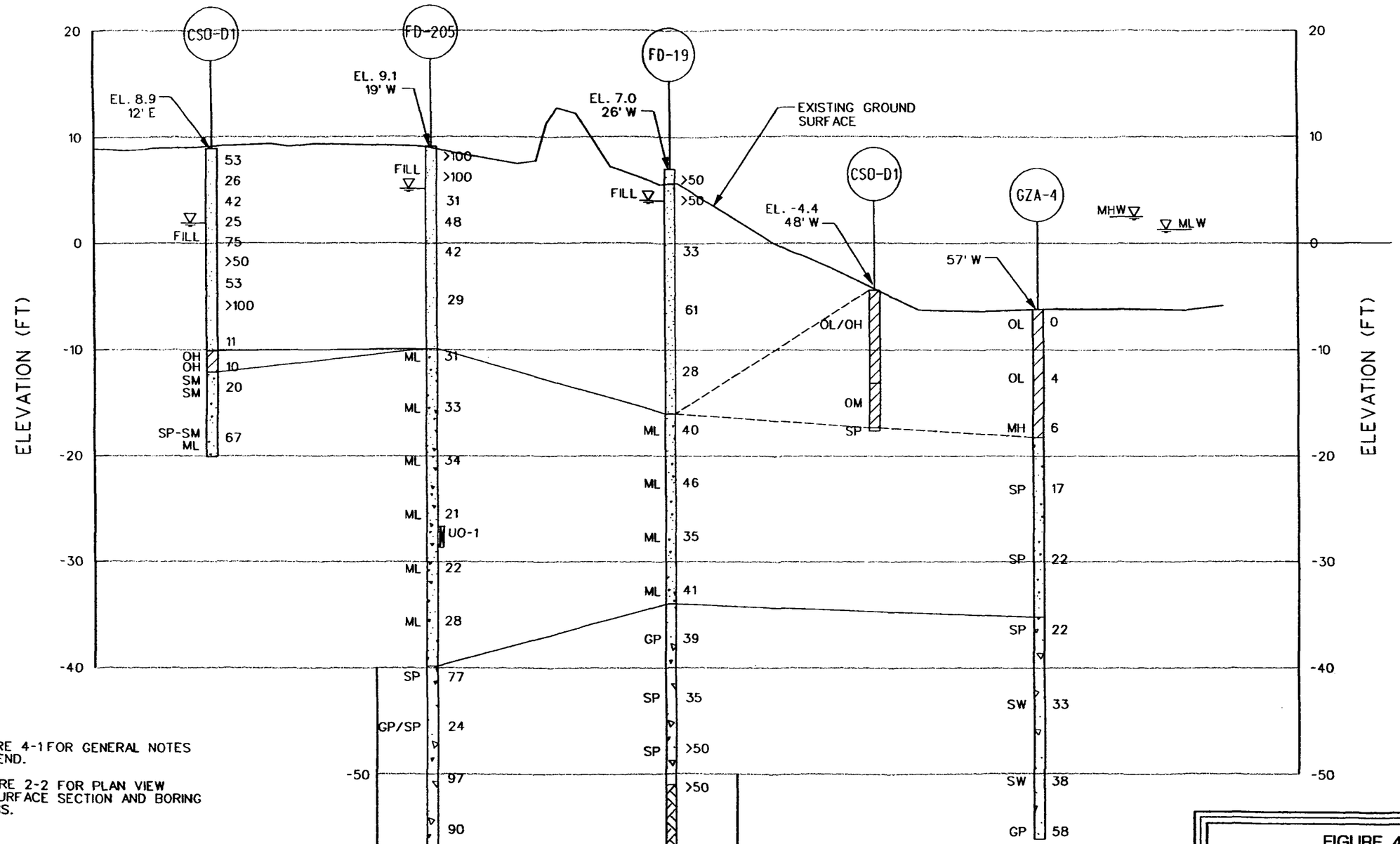
FIGURE 4-5

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SUBSURFACE SECTION
D-D'

SCALE: NOTED

110291LB706Axx.dgn



NOTES:

1. SEE FIGURE 4-1 FOR GENERAL NOTES AND LEGEND.
2. SEE FIGURE 2-2 FOR PLAN VIEW OF SUBSURFACE SECTION AND BORING LOCATIONS.

GEOLOGIC LEGEND (STRATUM DESCRIPTION)

- FILL
- MARINE SANDS AND SILTS
- GLACIAL TILL
- ORGANIC DEPOSITS
- GLACIOFLUVIAL DEPOSITS
- BEDROCK

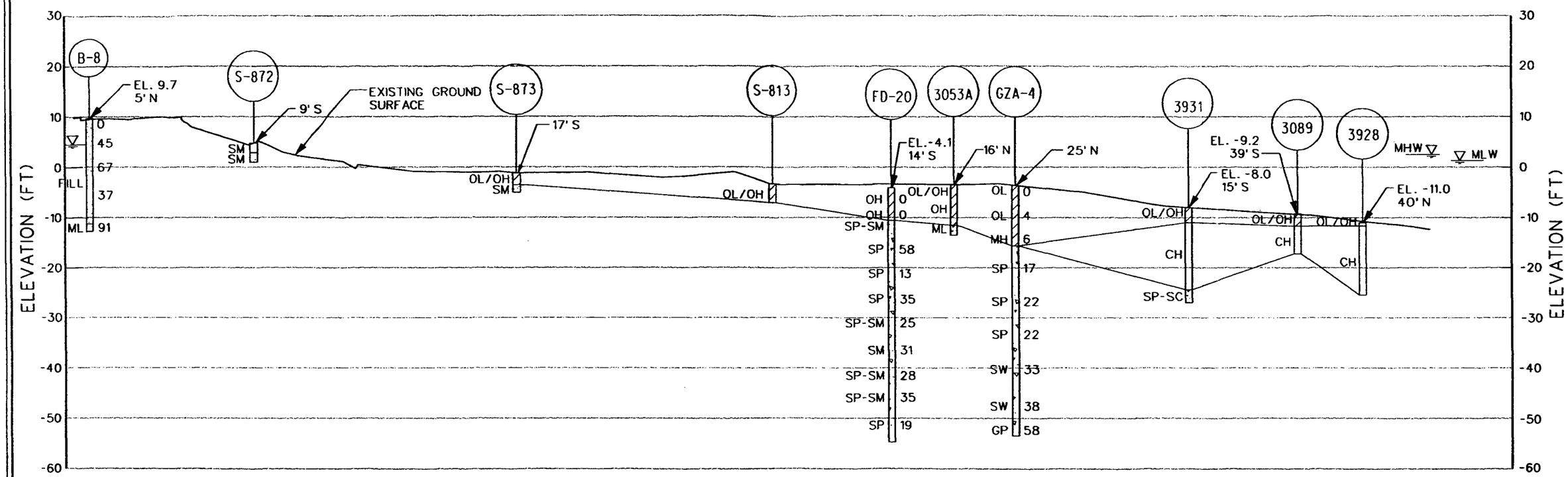
FIGURE 4-6

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SUBSURFACE SECTION
E-E'

SCALE: NOTED

110291LB707Axx.dgn



NOTES:

1. SEE FIGURE 4-1 FOR GENERAL NOTES AND LEGEND.
2. SEE FIGURE 2-2 FOR PLAN VIEW OF SUBSURFACE SECTION AND BORING LOCATIONS.

GEOLOGIC LEGEND (STRATUM DESCRIPTION)

- FILL
- ORGANIC DEPOSITS
- MARINE SANDS AND SILTS
- GLACIOFLUVIAL DEPOSITS
- GLACIAL TILL
- BEDROCK

HORIZONTAL SCALE 1"=60'

30 0 60 120 180 FEET

10 0 20 40 60

VERTICAL SCALE 1"=20'

FIGURE 4-7

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SUBSURFACE SECTION
F-F'

SCALE: NOTED

110291LB708Axx.dgn

5.0 FOUNDATION DESIGN

For the satisfactory performance, the foundation of any structure must satisfy two independent design criteria. First, it must have an acceptable factor of safety against bearing failure in the foundation soils under maximum design load. Second, settlements during the life of the structure must not be a magnitude that will cause structural damage, endanger piping connections, or impair the operational efficiency of the facility. Selection of the foundation type to satisfy these criteria depends on the nature and magnitude of dead and live loads, the base of the area of the structure, and tolerable settlements. When more than one foundation type satisfies these criteria, then cost, scheduling, material availability, and local practice will probably influence or determine the final selection of the type of foundation.

5.1 Engineered Fill

The proposed construction as outlined in Section 1.3, call for site preparation and placement of engineered fill to the specified grades. The following section presents foundation and earthwork recommendations for the design and construction of the dewatering building/rail access facility for the proposed offsite disposal option.

Subgrade preparation in the footprint of the proposed foundations should include the complete removal of all existing foundations, vegetation, debris, asphalt, and base coarse. Demolition of existing foundations/timber piling will be removed from site and disposed of in accordance with local and state regulatory requirements. It is anticipated that a controlled, compacted fill will be required to achieve the final grades specified in Section 1.3.

5.1.1 Backfill Requirements

It is recommended that the engineered fill consist of sand and gravel from the potential excavations or other local sources. The characteristics of borrow material, and particularly the coarseness of its particle-size distribution, will determine the modalities of fill control during construction and affect the construction specifications.

If the engineered fill material is mainly sand and fine gravel, fill control can be by relative compaction using ASTM D1557. Then, the fill should be compacted to 95% of its maximum dry unit weight based on ASTM D1557. As this material often has a fines content less than 15%, pre-construction tests should be performed to evaluate both the relative compaction and the relative density methods of fill control.

If a substantial fraction of the fill material consists of particles that would be retained on the ¾-inch sieve, compaction test methods that use molds larger than a 6-inch diameter should be evaluated. Such methods include ASTM D4254 and USBR 5515. If the material is coarser still, it may be appropriate to control fill placement by a method specification, that is, by a specified number of passes of a roller with specified characteristics, and with the material being within a specified range of water content. In this case, a test fill should be constructed prior to finalizing earthwork specifications. Initially, structural fill should be placed in lifts not exceeding eight inches uncompacted thickness. Thicker lifts may be used pursuant to approval based upon results of field compaction performance. The moisture content for all compacted fill should be within -3 to 3% of the optimum moisture content measured by ASTM 1557.

5.2 Foundation Systems

Based upon the layout of the dewatering building and rail access facility, spread footing foundations are recommended to support buildings. Rail access will be founded partially over new fill and the northern portions of the bulkheads.

5.2.1 Spread Footings

Spread footings will be used for the column support of the dewatering building. It is anticipated that all new structures will bear on compacted fill material overlying existing conditions. Local building codes recommend an allowable bearing pressure of 2 to 4 ton/ft^3 (4,000 to 8,000 psf) for the foundation materials located at the site (CMR Table 1804.4). Proposed planning for the building structure calls for flexibility of column spacing and open clear spans. To accommodate a flexible layout, and aid in the structural design, a footing design chart was developed considering both bearing capacity and settlement as part of the spread footing requirements and is presented in Figure 5.1. The design chart allows the structural engineer to select design values for the total and differential settlement of the building. The footing design chart is a compilation of many bearing capacity and settlement analyses expressed as a plot of an allowable column load versus footing width. The chart clearly demonstrates how the bearing capacity governs the design of narrow footings, whereas settlement governs the design of wider ones.

For footing design, the maximum allowable bearing pressures shown on the figure should be used for allowable maximum pressure under "factored" loads. For calculating footing size based on "service load," the maximum axial load on footing should be limited to 4,000 pounds per square foot (psf).

Settlement of footings was checked using the service loads (dead load plus live load) provided by the structural engineer. Interior column footings are 6 feet by 6 feet and have a service load of 76.4 kips. Interior column footings are 5 feet by 5 feet and have a service load of 43.6 kips. Settlements of the granular soil was calculated using three methods – Schmertmann's, Meyerhoff's, and Temoshenko and Goodier. The calculated settlements are shown below:

Footing Location and Size	Service Load in Kips	Settlement in Inches		
		Schmertmann	Meyerhoff	Timoshenko and Goodier
Interior 5 ft by 5 ft	76.4	1.2	2.1	0.7
Exterior 6 ft by 6 ft	44.6	0.7	1.3	0.5

Settlement estimated by the Meyerhoff method are typically conservative and over-estimate settlement by a factor of 2. Total settlement by the Schmertmann and Timoshenko are less than the recommended maximum for steel-frame structures in Engineering Manual EM 1110-1-1904.

Shallow foundation construction will require the earthwork measures discussed in Section 5.1 to improve the subgrade soils and prevent moisture infiltration. The minimum recommended width is 2 feet for spread footings and 1.5 feet for strip footings. Frost depth is expected to be 4 feet below ground surface. As per the Massachusetts State Building Code CMR 1806, exterior footings or footings in unheated areas for the WWTB shall extend a minimum of four feet (1.2 meters) below finished grade. Deviations from the minimum foundation grade should be approved by a professional engineer, or a code official. Interior footings should have a minimum embedment of 2.0 feet below finished grade to develop the bearing value of the soils. If shallow footings are located in close proximity to utility trenches or any other type of excavation, no portion of the footing should be within a 1:1 plane projected upward from the closest bottom corner of an excavation, and in accordance with local, state and federal OSHA regulations.

5.2.2 Building Floor Slabs

Based on the current information, heavy floor slabs will be used for the dewatering building to accommodate heavy equipment and machinery. It is expected that some areas will be subject to heavy equipment loads and others lightly loaded. The following are recommendations for the floor slab design.

As recommended in Section 5.1, any poor fill must first be removed, and the subgrade properly prepared prior to placement of structural fill and floor slabs. Performance of a slab on ground depends on the integrity of both the soil support system and the slab, so specific attention should be given to the site preparation requirements, including proof-rolling. In most cases, proof-rolling results are far more indicative of the ability of the soil support system to withstand loading than are the results from in-place tests of moisture content or density. A thin layer of graded, granular, compactible material is recommended to better control the thickness of the concrete and to minimize friction between the base material and the slab.

Proper moisture protection (vapor barrier) is recommended for any slab on ground where the floor will be covered by tile, wood, carpet, impermeable floor coatings (urethane, epoxy, or acrylic terrazzo), or where the floor will be in contact with any moisture sensitive equipment or products.

5.2.2.1 Building Floor Slabs: Modulus of Subgrade Reaction

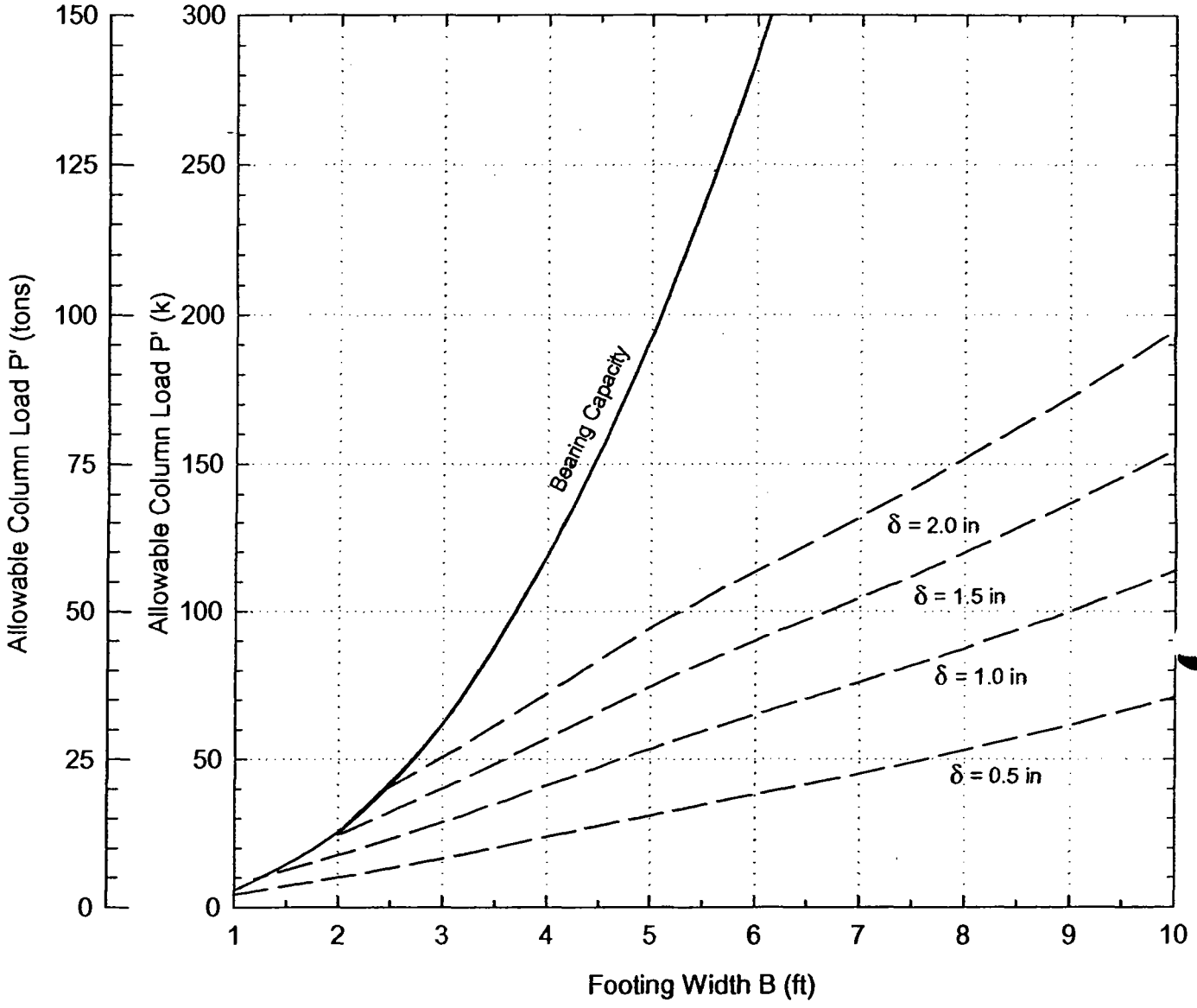
Settlements of lightly loaded floor slabs will be negligible. In more heavily loaded floor slab areas, average uniform load of 750 to 1,000 pounds per square foot maximum, long-term settlements should be accounted for. Evaluation will require coordination between the structural engineer and geotechnical engineer. It is recommended that floor slabs be independent of foundations. If heavier average floor loads are anticipated, it may be appropriate to adjust the foundation design to account for the effects of confinement on modulus if the range of influence is large; therefore, interaction between the structural engineer and geotechnical engineer is recommended.

The slab on grade was designed using a computer program that requires "soil subgrade modules". The design was done using values of 51 kips per square foot (k/ft^2) in the process area, 51 k/ft^2 in the filter cake loading area and 51 k/ft^2 in the rail track area. These values are based on the dimension of the footings and the soil type. The geotechnical engineer concurs with these values, which are based on published values for the types of soils present at this site.

5.2.3 Depth of Frost Penetration

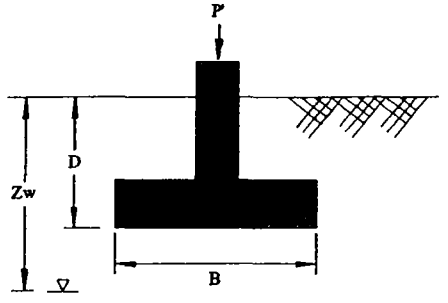
As per the Massachusetts State Building Code CMR 1806, exterior footings or footings in unheated areas for the dewatering building shall extend a minimum of four feet (1.2 meters) below finished grade, except when erected on sound bedrock, or when protected from frost. Deviations from the minimum foundation grade should be approved by a professional engineer or a code official. Interior footings should have a minimum embedment of 2.0 feet below finished grade to develop the bearing value of the soils.

Figure 5-1 : New Bedford Harbor - Dewatering Building Foundation
Footing Design Chart for Allowable Column Loads



Design Parameters

Footing Depth (D) = 4.00 ft
Soil Friction Angle (ϕ) = 32 deg
Soil Unit Weight (γ) = 115.0 lb/ft^3
Soil Modulus = 146,000 (lb/ft^2)
Depth to Groundwater (Z_w) = 8.5 ft
Factor of Safety = 2.50
Standard Penetration Value (N) = 14



6.0 REFERENCES

Foster Wheeler (2001b), "Final Phase II Test Pit Data Report", New Bedford Harbor Superfund Site, 2001-017-9147, May 9, 2001.

Foster Wheeler (2001c), "Final Report of On-land Geophysical Surveys: Electromagnetics and Ground Penetrating Radar - Area D", dated April 2001.

Geotesting Express (2001), "New Bedford Harbor Geotechnical Laboratory Report, GTX-3695," dated November 19, 2001.

Nobis Engineering (2000), CDF D Geotechnical Data Reports Phase I and II.

Warren George and ARA (2001), "Cone Penetrometer Testing at the New Bedford Harbor Superfund Site", Prepared by Applied Research Associates Inc. for Warren George Inc., ARA Report No. 0437, Foster Wheeler Doc. 2001-017-0060, dated March 30, 2001.

Woodward-Clyde (1987), "Field Investigation and Analytical Testing", New Bedford Harbor Superfund Site, New Bedford, Massachusetts, 86C8554B/86C8554B1, January 6, 1987.

Attachment A

Test Pit Logs
Previous Boring Logs
Previous Cone Penetration Testing Logs
Previous Laboratory Data

Geo Logic, INC.
EARTH EXPLORATION SERVICES
74 ACTON STREET WATERTOWN, MASSACHUSETTS 02172
(617) 923-4420

CLIENT: Haley & Aldrich, Inc.
PROJECT: H&A File No. 10682-00
LOCATION: New Bedford, Mass.

Boring #: B-8
Page 1 of 1

	CASING	SAMPLER	CORE BARREL
TYPE	HW	SS	
SIZE	4"	1-3/8"	
HAMMER	300#	140#	--
FALL	24"	30"	--

Surface El: 6.4 CNBD
Station:

Ground water Date	Depth
2/8/91	4.5'

GLI File #: 91011
Driller: D. Green
Consultant: B. Miller
Date Start/Finish: 2/8/91

Depth	Casbl/ft	Sample No.	Depth	Pen.	Rec.	Blows/5"	Strata Change	Sample Description
		S1	0.5'-2.5'	24"	12"	32-47	0.5'	Blacktop
						68-90	3.0'	S1 Tan/dark brown silty f-m SAND, trace coarse gravel, fill
5'		S2	4'-6'	24"	12"	28-23	8.5'	S2 Black ash, cinders, trace fine sand, brick, fill
						22-16		
10'		S3	9'-11'	24"	3"	33-37	13.5'	S3 Black fine SAND, little silt, trace f-c gravel, brick
						30-21		
15'		S4	14'-16'	24"	8"	10-16	21.0'	S4 Grey f-m SAND, trace fine gravel, silt
						21-24		
20'		S5	20.5'-22.5'	24"	10"	17-37	22.5'	S5 Olive brown silty f-m SAND, trace coarse sand, fine gravel Bottom of exploration at 22.5'
						54-60		
25'								

Proportions Used:	
Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35 to 50%

Cohesive Consistency (Blows/Ft)			
0-2	Very Soft	9-15	Stiff
3-4	Soft	16-30	V-Stiff
5-8	M-Stiff	31+	Hard

Cohesionless Density	
0-10	Loose
10-30	M-Dense
30-50	Dense
50+	V-Dense

Notes:
1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual.
2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.

Remarks:

Geo Logic, INC.
EARTH EXPLORATION SERVICES
74 ACTON STREET WATERTOWN, MASSACHUSETTS 02172
(617) 923-4420

CLIENT: Haley & Aldrich, Inc.
PROJECT: H&A File No. 10682-00
LOCATION: New Bedford, Mass.

Boring #: B-9
Page 1 of 1

	CASING	SAMPLER	CORE BARREL
TYPE	HW/NW	SS	NVII
SIZE	4"/3"	1-3/8"	2"
HAMMER	300#	140#	--
FALL	24"	30"	--

Surface El: 7.2 CNBD
Station:

Ground water Date	Depth
2/8/91	6.4'

GLI File #: 91011
Driller: D. Green
Consultant: B. Miller
Date Start/Finish: 2/7-2/8/91

Depth	Casbl/ft	Sample No.	Depth	Pen.	Rec.	Blows/6"	Strata Change	Sample Description
		S1	0.5'-2.5'	24"	20"	70-8.[illegible]	0.3'	Blacktop
						40-*27		S1 Tan/black f-m Sandy SILT, trace gravel, ash, brick, fill
								*Drove spoon with 300# weight
5'		S2	4'-6'	24"	14"	26-37		S2 Similar to S1
						33-59		
							7.5'	
10'		S3	9'-11'	24"	10"	28-40		S3 Brown f-c sandy GRAVEL, little silt, fine sand
						27-73		
							12.3'	Possible Rock or Boulder
							12.6'	Sand seam
								Ran rollerbit to 14.0'
15'		C1	14'-19'	60"	59"	Rock Core		C1 ROCK
								MPF - 2, 2, 2, 2, 2
							19.0'	Bottom of exploration at 19.0'
20'								

Proportions Used:

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35 to 50%

Cohesive Consistency (Blows/Ft)

0-2	Very Soft	9-15	Stiff
3-4	Soft	16-30	V-Stiff
5-8	M-Stiff	31+	Hard

Cohesionless Density

0-10	Loose
10-30	M-Dense
30-50	Dense
50+	V-Dense

Notes:
1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual.
2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.

Remarks:

DEPTH (FT)	CASING BLOWS/FT	SAMPLE NO. PENETRATION/RECOVERY	SAMPLE	LAB TEST	WATER CONTENT (%)	SHEAR STRENGTH, SU PEAK/RESIDUAL (psf) ROD PROBE (BLOWS/FT)	SOIL DESCRIPTION	SOIL CLASS	STANDARD PENETRATION RESISTANCE BLOWS/FT (0 10 20 30 40 50 60)	PIEZOMETER DATA	ELEV. (FT)
0	Hollow Stem Auger						GRAVEL — Gravel Parking Area				
1–5		S-1 2.0 0.8; S-2 2.0 0.85; S-3 2.0 0.6; S-4 2.0 0.7		C	39.0		SAND (Fill) — Brown fine to medium sand, little gravel, little to trace silt, trace coarse sand, trace cobble, trace brick and ashes, medium dense, moist. Some to little gravel, loose, wet. Some gravel. Dark brown gravelly sand, trace organics, medium dense.		30; 10; 8; 14		
10		S-5 2.0 1.0; S-6 2.0 1.8					Trace ash and cinders, loose.		7; 9		
12.0							SAND (Native) — Layer, 1.0', black silty fine to medium sand, trace coarse sand and gravel. SM				
15		S-7 2.0 1.8		C	34.1		Gray fine to coarse sand, trace gravel, trace silt, medium dense, wet. SW; #Split spoon binding against auger.		170#		
20	10, 11, 14, 20	S-8 2.0 0.6					Brown fine to coarse sand, trace silt, trace gravel, medium dense, wet, well graded. SW		13		
25	24, 8, 13, 15	S-9 1.5 0.8					Brown fine to medium sand, trace coarse sand, trace gravel, medium dense, wet. SP		19		25
30	31, 43, 18, 24, 15, 14	S-10 2.0 0.2; S-11 2.0 0.8							7; 18		30
35.0	44, 20, 63, 47, 32, 53	S-12 2.0 0.5					GRAVELLY SAND — Brown gravelly fine to coarse sand, little silt, trace cobble, very dense, wet. SW-SM		55		35
40											

U: 3" or 3½" thin wall tube S: split spoon R: rock C: 2" thin wall tube

PRELIMINARY GEOTECHNICAL INVESTIGATION
OF ENGINEERING PROPERTIES
NEW BEDFORD HARBOR SUPERFUND SITE
BRISTOL COUNTY, MASSACHUSETTS

E.C. JORDAN CO.
CONSULTING ENGINEERS

Engineering Log of: BL-106		Page 1/2
Project No. 4939-19	Date Drilled 1/7-1/11/88	Sheet A-30

DEPTH (FT)	CASING BLOWS/FT	SAMPLE NO. PENETRATION/RECOVERY	SAMPLE	LAB TEST	WATER CONTENT (%)	SHEAR STRENGTH, Su PEAK/RESIDUAL (psf) ROD PROBE (BLOWS/FT)	SOIL DESCRIPTION	SOIL CLASS	STANDARD PENETRATION RESISTANCE BLOWS/FT (0 10 20 30 40 50 60)	PIEZOMETER DATA	ELEV (FT)
40											
41	11	S-13 2.0 0.8					Layers, 0.25', brown fine sandy silt layers. ML		36		
42	30										
43	60						*No penetration after 100 blows.				
44	33										
45	43										
	62r	S-14					SAND Brown fine to medium sand, little gravel, little silt.	SP-SM		130+	
		*R-1 5.2 5.0					45.7 BEDROCK AT 45.7 FEET			(100)#	
							Gray to light pink gneissic granite, some muscovite, massive.				
							RQD = 96.2%				
50							50.9				
							BOTTOM OF EXPLORATION AT 50.9 FEET				
							*Rock core obtained with a double barrel N core and NWX core bit.				
55											
60											
65											
70											
75											
80											

U: 3" or 3½" thin wall tube S: split spoon R: rock C: 2" thin wall tube

PRELIMINARY GEOTECHNICAL INVESTIGATION
OF ENGINEERING PROPERTIES
NEW BEDFORD HARBOR SUPERFUND SITE
BRISTOL COUNTY, MASSACHUSETTS

E.C. JORDAN CO.
CONSULTING ENGINEERS

Engineering Log of: BL-106 Page 2/2

Project No. 4959-19 | Date Drilled 1/7-1/11/88 | Sheet A-31

GZA DRILLING INC.
246 BAILEY ST., CANTON, MA. 02021
(A DIVISION OF GOLDBERG-ZOINO & ASSOC., INC.)

PROJECT
Proposed North Terminal
New Bedford Harbor, MA.

REPORT OF BORING No. 2
SHEET 1 OF 2
FILE No. 9213/C-5436
CHKD. BY: DH

FOREMAN: C. Lenling
CLASSIFIED BY: R. Kubiak
INSPECTOR: None

BORING LOCATION: As on Plan
GROUND SURFACE ELEVATION: 83.1 DATUM: BM #1
DATE START: 3/1/85 DATE END: 3/1/85

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300lb. HAMMER FALLING 24 in.
CASING SIZE: BW-2½" I.D. OTHER:

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (ft)	CASING (blows)	SAMPLE No.	PEN./REC. (in)	DEPTH (ft)	BLOWS/6"	SAMPLE DESCRIPTION (Burmister CLASSIFICATION)	REMARKS	DEPTH OF STRATUM CHANGE
0		1	24/24	0-2	Push	Very soft, dark grey, Organic SILT, trace Shells		
5		2	24/24	5-7	Push	Very soft, dark grey, Organic SILT, trace Shells		ORGANIC SILT
10		3	24/18	10-12	1-1-1-1	Very soft, dark grey, Organic SILT, trace Shells		
15		4	24/20	15-17	1-1-1-2	Very soft, dark grey, Organic SILT		17.0
20		5	24/18	20-22	4-4-5-5	Loose, grey, fine SAND, little Silt		Fine, Silty SAND
25		6	24/20	25-27	4-6-5-5	Medium dense, grey, fine SAND, trace Silt		
30		7	24/16	30-32	4-6-6-6	Medium dense, grey, fine to medium SAND, trace Silt		30.0
								Fine to medium SAND

GRANULAR SOILS BLOWS/FT.	DENSITY	COHESIVE SOILS BLOWS/FT.	DENSITY
0-4	V. LOOSE	<2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
>50	V. DENSE	15-30	V. STIFF
		>30	HARD

REMARKS:

GZA

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. 2

GZA DRILLING INC.
246 BAILEY ST., CANTON, MA. 02021
(A DIVISION OF GOLDBERG-ZOINO & ASSOC., INC.)

PROJECT
Proposed North Terminal
New Bedford Harbor, MA.

REPORT OF BORING No. 1
SHEET 1 OF 1
FILE No. 9213/C-5436
CHKD. BY DH

FOREMAN: C. Lenling
CLASSIFIED BY: R. Kubiak
INSPECTOR: None

BORING LOCATION: As on Plan
GROUND SURFACE ELEVATION: 82.2 DATUM: BM #1
DATE START: 3/4/85 DATE END: 3/4/85

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300 lb. HAMMER FALLING 24 in.
CASING SIZE: BW-2⅝" I.D. OTHER:

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (ft)	CASING (blows/ft)	SAMPLE No.	PEN./REC.	DEPTH (ft)	BLOWS/6"	SAMPLE DESCRIPTION (Burmister CLASSIFICATION)	REMARKS	DEPTH OF STRATUM CHANGE
0		1	24/13	0-2	Push	Very soft, black, Organic SILT, trace Shells		ORGANIC SILT
5		2	24/15	5-7	1-1-1-1	Very soft, dark grey, Organic SILT		5.0
10		3	24/18	10-12	1-1-1-2	Very soft, dark grey, Organic SILT, little Shells		
		4	24/10	12.5-14.5	8-6-6-7	Medium dense, dark grey, Organic SILT, some Gravel		12.5 ORGANIC SILT with Gravel
15								15.0
20		5	24/12	19-21	18-15-12-14	Medium dense, brown, fine to coarse SAND, some Gravel, trace Silt		SAND and GRAVEL
25		6	6/6	25-25.5	100	Very dense, brown, fine to coarse SAND, and Gravel, trace Silt	1	Refusal at 25.5'
30								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT.	DENSITY	BLOWS/FT.	DENSITY
0-4	V. LOOSE	<2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
>50	V. DENSE	15-30	V. STIFF
		>30	HARD

REMARKS: 1) Refusal defined as 100 blows with 300# hammer on open end as rod for zero penetration
2) All elevations measured from reference benchmark on dock, assumed elevation 100.00

GZA NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. 1

GZA DRILLING INC.
246 BAILEY ST., CANTON, MA. 02021
(A DIVISION OF GOLDBERG-ZOINO & ASSOC., INC.)

PROJECT
Proposed North Terminal
New Bedford Harbor, MA.

REPORT OF BORING No. 4
SHEET 1 OF 2
FILE No. 9213/C-5436
CHKD. BY DH

FOREMAN: C. Lenling
CLASSIFIED BY: R. Kubiak
INSPECTOR: None

BORING LOCATION: As on Plan
GROUND SURFACE ELEVATION: 85.0 DATUM: BM #1
DATE START: 2/28/85 DATE END: 2/28/85

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300lb. HAMMER FALLING 24 in.

CASING SIZE: BW- 2½" I.D. OTHER:

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME

DEPTH (ft)	CASING (blows/ft)	SAMPLE No.	PEN. (in.)/REC.	DEPTH (ft)	BLOWS/6"	SAMPLE DESCRIPTION Burmister CLASSIFICATION	REMARKS	DEPTH OF STRATUM CHANGE
0		1	24/16	0-2	Push	Very soft, dark grey, Organic SILT OL		Organic SILT
5		2	24/15	5-7	1-2-2-3	Soft, dark grey, Organic SILT, little fine Sand OL		7.5
10		3	24/18	10-12	4-3-3-3	Loose, brown, Clayey SILT, some fine Sand MH		Clayey SILT
15		4	24/20	15-17	5-7-10-10	Medium dense, brown, fine to medium SAND, trace Silt SP		12.0
20		5	24/16	20-22	9-11-11-13	Medium dense, brown, fine to medium SAND, trace Silt SP		Fine to medium SAND
25		6	24/18	25-27	10-10-12-10	Medium dense, brown, fine to medium SAND, trace Silt SP		
30		7	24/20	30-32	14-17-16-17	Dense, brown, fine to coarse SAND, some Gravel, trace Silt SW		29.0 Gravelly SAND

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT.	DENSITY	BLOWS/FT.	DENSITY
0-4	V. LOOSE	< 2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
>50	V. DENSE	15-30	V. STIFF
		>30	HARD

REMARKS:

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. 4

GZA DRILLING INC.
246 BAILEY ST., CANTON, MA. 02021
(A DIVISION OF GOLDBERG-ZOINO & ASSOC., INC.)

PROJECT
Proposed North Terminal
New Bedford Harbor, MA.

REPORT OF BORING No. 4
SHEET 2 OF 2
FILE No. 9213/C-5436
CHKD. BY DH

DEPTH (ft)	CASING (b/ft)	SAMPLE No.	PEN. (in)/REC.	DEPTH (ft)	BLOWS/6"	SAMPLE DESCRIPTION Burmister CLASSIFICATION	REMARKS	DEPTH OF STRATUM CHANGE
35		8	24/21	35-37	13-20-18-18	Dense, brown, fine to coarse SAND, some Gravel, trace Silt SW		SAND and GRAVEL
		9	24/19	38-40	24-30-28-30	Very dense, brown, GRAVEL, some fine to coarse Sand, trace Silt GP		
40								Bottom of Boring at 40.0'

REMARKS:

GZA

BORING No. 4
SHEET A-43

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3053	PENETRATION:	8.5'
		RECOVERY:	6.8'
AS-BUILT NORTHING:	2696467.220		
AS-BUILT EASTING:	814162.363	WATER DEPTH:	5.7'
MUDLINE ELEVATION:	-5.3'		
	0.496	DATE:	8/3/01
	-5.7		

STRATIGRAPHY | **SAMPLES**

Soil Type	Depth		Depth	Time	Analysis
			0-1		CONG
		OL/OH	0-2		TCL/TAL
	2		1-2		HOLD
			2-3		HOLD
TRANSITIONAL	3	3.3			
			3.3-6		HOLD
	4				
OLIVE GREY			3.3-6	TCL/TAL	TCL/TAL
FAT CLAY				HOLD	
SANDY OR SANDY IN	5	CH			
HORIZONS					
	6				
	7				
OLIVE-					
GREY SANDY		SC			
CLAY	8				
	9				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3053-A	PENETRATION:	10.0'
		RECOVERY:	7.8'
AS-BUILT NORTHING:	2696485.819		
AS-BUILT EASTING:	814121.629	WATER DEPTH:	6.1'
MUDLINE ELEVATION:	-1.0 (+/-2')		
	-5.08 (+/-2')	DATE:	8/3/01
	-6.1		

STRATIGRAPHY | **SAMPLES**

Soil Type	Depth		Depth	Time	Analysis
	0				
BL ORGANIC SOIL					
5% SAND					
SHELL LAYER	1	OL/OH			
MARKS CONTACT					
	2				
	3	3.5'			
		GRAD			
	4				
OLIVE-GRAY		CH			
FAT CLAY HI-PLASTIC, SLOW DILAT.	5				
15%-25% SAND					
	6				
	7				
LT BR INTERBEDDED	8	SP/ML			
FINE SILT		8.5			
YELLOW SILT	9	ML			
	10				

(*) NOT A SAMPLE LOCATION. SAMPLE REQUEST BY USACE

T' FIND CONTACT w/HARD SOFT MATERIAL

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	308B	PENETRATION:	7.0'
		RECOVERY:	5.0'
AS-BUILT NORTHING:	2696298.233		
AS-BUILT EASTING:	914310.788	WATER DEPTH:	11.8'
MUDLINE ELEVATION:	-11.3		
	-0.458	DATE:	8/3/01

STRATIGRAPHY

Soil Type	Depth
OLIVE GREY Organic Sandy Clay/SILT	1
	2
	3
	4
LT BROWN WELL GRADED SANDY w/ 10% GRAVEL	5
	6
	7

4.7	
SW	
5.6	
Yellow Brown SILT ML	

SAMPLES

Depth	Time	Analysis
0-1		CONG
0.2	TCL/TAL	
1-2		CONG
2-3		HOLD
3-4	TCL/TAL	
4.7-5.7		HOLD

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3089	PENETRATION:	8.4
		RECOVERY:	6.8
AS-BUILT NORTHING:	2696397.887		
AS-BUILT EASTING:	814310	WATER DEPTH:	8.0
MUDLINE ELEVATION:	-9.2		
	-0.429	DATE:	8/3/01
	-8.0		

STRATIGRAPHY

Soil Type	Depth	
	0	
BL OLG SOIL		
40% SHELLS	1	OL/OH
	2	
SHELLS MARK		2.4
CONTACT	3	
	4	
OLIVE GREY		
~5% SHELLS		
		CH
FAT CLAY	5	
5-15% SAND		
	6	
	7	
	8	

SAMPLES

Depth	Time	Analysis
0-1		GRG
0-2	TCL/TAL	
1-2.4		GRG
2.4-3.4		HOLD
3.4-4.4		TCL/TAL

HOLD 2-3

FORM 6906-5

FOSTER WHEELER

w/ Depth Hull line } missing from all

S-872 11-09-00

N: 2626464
E: 813695

per. ~~yes~~ ?
ecc. ~~yes~~ ?

0-24" br-blk f-cr sand 20% gravel 20% silt
SM- silty sand w/ gravel

24"

24-36" br f-cr sand 20% silt 10% gravel
SM- silty sand

36"

S-873 11-7-00

N: 2696447
E: 813850

0-26" blk organic silt 30% clay 20% sand
OL/OH- organic soil w/ sand

26"

26-42" blk f-cr sand 30% organic soil
SM- f sand w/ organic soil

42"

S-813 11-7-00

N: 2696455
E: 814002

0-43" blk organic soil
OL/OH

43"

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3926		PENETRATION:	9.0
			RECOVERY:	6.2
AS-BUILT NORTHING:	2696488.240			
AS-BUILT EASTING:	814086.986		WATER DEPTH:	5.0
MUDLINE ELEVATION:	-3.4			
			DATE:	1/14/02
			SAMPLER:	KW,MG

STRATIGRAPHY / **SAMPLES**

Soil Type	Depth		Depth	Time	Analysis
Organic soil (OH); trace fine	0				
sand, black.					
	1				
	2				
	3	OL/OH			
	4				
				LOG ONLY	
	5				
	6	6.2			
Sandy lean clay (CL); 65%					
fine sand, 25% medium sand,					
10% coarse sand, trace shells,	7	CL			
olive gray.					
Well graded sand with gravel	8	7.9			
(SW); 10% subrounded cobble,					
olive gray.		SW			
	9	9.0			
BOB 9.0 ft.					

NOTE: Off proposed location by approx. 20 ft. due to close proximity to shoreline

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3929
AS-BUILT NORTHING:	2696450.466
AS-BUILT EASTING:	814083.851
MUDLINE ELEVATION:	-3.5

PENETRATION:	10.0
RECOVERY:	9.8
WATER DEPTH:	6.5
DATE:	1/15/02
SAMPLER:	KW,MG

STRATIGRAPHY

Soil Type	Depth	
Organic soil (OH); trace fine	0	
sand, dark gray.		OL/OH
	1	1.2
Lean clay (CL); trace fine sand,		
olive gray.		CL
	2	1.8
		OL/OH
		2.4
	3	CL
		3.3
		OL/OH
	4	3.7
*trace shells 4.0'- 4.4'		
		CL
Lean clay with sand (CL); 70%	5	
fine sand, 20% medium sand,		
10% coarse sand, olive gray		
from 4.8'- 6.5'	6	
		6.5
Very fine sand with clay (SP-SC)		
very compact, light gray.	7	
*Light brown from 7.0'- 10.0'		
	8	SP-SC
	9	
BOB 10.0 ft.	10	10.0

SAMPLES

Depth	Time	Analysis
0.2-1.2	0845	Geotech
1.2-2.2	0847	Geotech

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3930	PENETRATION:	8.8
		RECOVERY:	7.3
AS-BUILT NORTHING:	2696443.677		
AS-BUILT EASTING:	814174.021	WATER DEPTH:	6.2
MUDLINE ELEVATION:	-4.4		
		DATE:	1/14/02
		SAMPLER:	KW,MG

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil (OH); trace fine	0				
sand, trace shells, dark gray.					
	1				
		OL/OH			
	2				
Lean clay (CL); trace fine sand,	3	3.1			
olive gray.		CL	3.3-4.3	0850	Geotech
		3.6			
Organic soil (OH); black (same	4	OL/OH			
as above)		4.3			
			4.3-5.3	0852	Geotech
Fat clay with sand (CH); 80% fine	5				
sand, 20% medium sand, trace					
shells, olive gray.					
	6				
		CH			
*Sandier grading downward					
	7				
	8				
		8.5			
Very fine sand (SP); trace clay,		SP			
very compact, light brown.	9	8.8			
BOB 8.8 ft.					
	10				

NOTE: off proposed location by approx. 25 ft. due to close proximity to shoreline

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3931
AS-BUILT NORTHING:	269433.426
AS-BUILT EASTING:	814251.002
MUDLINE ELEVATION:	-8.057

PENETRATION:	11.0
RECOVERY:	9.6
WATER DEPTH:	8.9
DATE:	1/10/02
SAMPLER:	KW

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil (OH); trace fine	0				
sand, black.					
	1				
		OL/OH			
	2				
*70% shell assemblage from 2.6'-					
3.0'					
	3	3.0			
Sandy fat clay (CH); 65% fine			3.0-5.0	1545	PCBs/SVOCs/
sand, 35% medium sand, trace					Metals
shells, olive gray.	4				
	5		5.0-7.0	1550	PCBs/SVOCs/
					Metals
		CH			
	6				
	7				
	8				
*Sharp contact		8.4			
Very fine sand with clay (SP-SC)	9				
; very compact, light gray/light		SP-SC			
brown.					
	10				
BOB 11.0 ft.	11				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3927
AS-BUILT NORTHING:	2696489.670
AS-BUILT EASTING:	814248.773
MUDLINE ELEVATION:	-7.43

PENETRATION:	12.5
RECOVERY:	10.0
WATER DEPTH:	7.5
DATE:	1/10/02
SAMPLER:	KW

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil (OH); trace fine	0				
sand, trace shells, black.					
	1				
		OL/OH			
	2				
	3				
*Gradational Contact	4	4.1			
Fat clay with sand (CH); 80%					
fine sand, 20% medium sand,	5				
trace shells, olive gray.			5.0-7.0	1500	PCBs/SVOCs/
					Metals
*Shell assemblage (75% shells)	6				
from 4.7'- 5.0'					
	7				
		CH	7.0-9.0	1505	PCBs/SVOCs/
					Metals
	8				
*Sandier grading downward					
	9				
	10				
	11	11.0			

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3927
AS-BUILT NORTHING:	2696489.670
AS-BUILT EASTING:	814248.773
MUDLINE ELEVATION:	-7.43

PENETRATION:	12.5
RECOVERY:	10.0
WATER DEPTH:	7.5
DATE:	1/10/02
SAMPLER:	KW

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Fine sand with clay (SP-SC);		SP-SC			
very compact, light gray.					
	12				
*light brown from 11.2'- 11.5'		12.5			
BOB 12.5 ft.	13				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3928	PENETRATION:	14.5
		RECOVERY:	10.5
AS-BUILT NORTHING:	2696472.336		
AS-BUILT EASTING:	814365.539	WATER DEPTH:	10.5
MUDLINE ELEVATION:	-11.04		
		DATE:	1/10/02
		SAMPLER:	KW,MG

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil (OH); trace sand	0				
(100% fine sand), 25-30% shells,		OL/OH			
black.		0.7			
	1				
Fat clay (CH); trace fine sand,			1.3-3.3	1135	PCBs/SVOCs/
65% shells, olive gray/black.					Metals
	2				
*Gradational contact					
Fat clay with sand (CH); (100%	3				
fine sand), trace shells, olive			3.3-5.3	1140	PCBs/SVOCs/
gray from 1.3'- 14.5'.					Metals
	4				
	5				
		CH			
	6				
	7				
	8				
	9				
	10				
	11				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3928
AS-BUILT NORTHING:	2696472.336
AS-BUILT EASTING:	814365.539
MUDLINE ELEVATION:	-11.04

PENETRATION:	14.5
RECOVERY:	10.5
WATER DEPTH:	10.5
DATE:	1/10/02
SAMPLER:	KW,MG

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
	12				
		CH			
	13				
	14				
BOB 14.5 ft.		14.5			
	15				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3916
AS-BUILT NORTHING:	2697467.606
AS-BUILT EASTING:	814276.617
MUDLINE ELEVATION:	-8.0

PENETRATION:	5.0 (refusal)
RECOVERY:	4.8
WATER DEPTH:	7.5
DATE:	1/11/02
SAMPLER:	KW

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil with sand (OH); 90%	0				
fine sand, 10% medium sand,					
trace shells, black.		OL/OH			
	1		0.8-1.8	1415	Geotech
		1.8			
	2				
Sandy lean clay (CL); 65% fine			1.8-2.8	1420	Geotech
sand, 20% medium sand, 15%		CL			
coarse sand, some shells, olive	3				
gray.		3.4			
		CH			
Sandy fat clay (CH); 80% fine	4	4.1			
sand, 20% medium sand, olive					
gray.		SW			
	5	5.0			
Well graded sand with					
subangular gravel (SW); light					
gray.	6				
	7				
	8				
	9				
	10				
	11				

NOTE: Took as-built location approx. 50 ft. off on proposed easting due to wooden ship wrecks and barges in ship graveyard

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3918
AS-BUILT NORTHING:	2697405.595
AS-BUILT EASTING:	814251.573
MUDLINE ELEVATION:	-7.7

PENETRATION:	8.5
RECOVERY:	8.0
WATER DEPTH:	8.5
DATE:	1/14/02
SAMPLER:	KW, MG

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic Soil (OH); trace fine	0				
sand, black.					
	1	OL/OH			
	2	2.2			
Fat clay with sand (CH); 85%			2.2-4.2	1050	PCBs/SVOCs/
fine sand, 15% medium sand,	3				Metals
trace subangular gravel, trace					
shells, olive gray.					
	4				
			4.2-6.2	1055	PCBs/SVOCs/
		CH			Metals
	5				
	6				
	7				
		7.3			
Poorly graded fine sand (SP);					
fairly compact, light gray.	8	SP			
		8.5			
BOB 8.5 ft.					
	9				
	10				
	11				

NOTE: off proposed location by approx 40 ft. due to wooden boat wrecks in ship graveyard

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3919
AS-BUILT NORTHING:	2697437.226
AS-BUILT EASTING:	814308.937
MUDLINE ELEVATION:	-9.6

PENETRATION:	7.8
RECOVERY:	6.9
WATER DEPTH:	9.5
DATE:	1/14/02
SAMPLER:	KW, MG

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil (OH); trace fine	0				
sand, black.					
	1				
		OL/OH			
	2				
*40% subangular gravel, 5%	3				
cobble from 3.1'- 3.9'					
	4	3.9			
Sandy fat clay (CH); 70% fine			3.9-5.9	1150	PCBs/SVOCs/
sand, 20% medium sand, 10%					Metals
coarse sand, olive gray.	5				
		CH			
	6		5.9-6.5	1155	PCBs/SVOCs/
		6.5			Metals
Poorly graded sand (SP); 5%					
subangular cobble, light gray.	7	SP			
		7.8			
BOB 7.8 ft.	8				
	9				
	10				
	11				

NOTE: off proposed location by approx 15 ft. due to a wooden boat located on top of station (ship graveyard)

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3920	PENETRATION:	9.5
		RECOVERY:	7.3
AS-BUILT NORTHING:	2697427.134		
AS-BUILT EASTING:	814455.196	WATER DEPTH:	10.0
MUDLINE ELEVATION:	-11.7		
		DATE:	1/14/02
		SAMPLER:	KW, MG

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil (OH); trace sand	0				
(90% fine sand, 10% medium					
sand), dark gray.					
	1				
		OL/OH			
	2				
	3	3.0			
Sandy lean clay (CL); 70% fine			3.0-5.0	1435	PCBs/SVOCs/
sand, 25% medium sand, 5%					Metals
coarse sand, trace shells, olive	4				
gray.					
	5		5.0-7.0	1437	PCBs/SVOCs/
					Metals
	6	CL			
	7				
	8				
*Dark brown organic material in	9				
core tip (at 9.0')		9.5			
BOB 9.5 ft.	10				
	11				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3921	PENETRATION:	9.5
		RECOVERY:	9.2
AS-BUILT NORTHING:	2697356.469		
AS-BUILT EASTING:	814248.005	WATER DEPTH:	6.0
MUDLINE ELEVATION:	-5.5		
		DATE:	1/11/02
		SAMPLER:	KW

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil (OH); trace fine sand	0				
trace shells, black.					
	1	OL/OH			
	2	2.3	1.3-2.3	1050	Geotech
Fat clay with sand (CH); 65%					
fine sand, 25% medium sand,	3		2.3-3.3	1055	Geotech
10% coarse sand, trace shells,					
olive gray.					
	4				
	5				
*Sandier grading downward					
		CH			
	6				
	7				
	8				
	9				
BOB 9.5 ft.		9.5			
	10				
	11				

NOTE: took as-built location 68 ft. east and 23 ft. north of proposed location due to a wooden boat wreck in ship graveyard

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3922
AS-BUILT NORTHING:	2697359.008
AS-BUILT EASTING:	814310.320
MUDLINE ELEVATION:	-6.8

PENETRATION:	11.2
RECOVERY:	10.2
WATER DEPTH:	8.0
DATE:	1/11/02
SAMPLER:	KW

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil with sand (OH); 80%	0				
fine sand, 20% medium sand,					
30% shells, dark gray.					
	1				
		OL/OH			
	2				
	3	3.0			
Fat clay with sand (CH); 65%			3.0-5.0	0950	PCBs/SVOCs/
fine sand, 25% medium sand,					Metals
10% coarse sand, olive gray.	4				
	5		5.0-7.0	0955	PCBs/SVOCs/
					Metals
*Sandier grading downward					
	6				
		CH			
	7				
	8				
	9				
		9.7			
Poorly graded sand (SP); 50%	10				
fine sand, 50% medium sand,					
light gray.		SP			
	11				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3922	PENETRATION:	11.2
		RECOVERY:	10.2
AS-BUILT NORTHING:	2697359.008		
AS-BUILT EASTING:	814310.320	WATER DEPTH:	8.0
MUDLINE ELEVATION:	-6.8		
		DATE:	1/11/02
		SAMPLER:	KW

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
		SP			
BOB 11.2 ft.					
	12	11.2			
	13				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3923	PENETRATION:	12.5
		RECOVERY:	8.1
AS-BUILT NORTHING:	2697402.799		
AS-BUILT EASTING:	814389.018	WATER DEPTH:	7.6
MUDLINE ELEVATION:	-7.4		
		DATE:	1/11/02
		SAMPLER:	KW

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil (OH); trace fine sand	0				
and shells, black.					
	1				
	2				
		OL/OH			
	3				
	4				
	5		5.0-6.0	1515	Geotech
	6	6.0			
*Sandier grading downward			6.0-7.0	1518	Geotech
Sandy fat clay with shells (CH);	7				
85% fine sand, 15% medium					
sand, olive gray.					
	8				
		CH			
	9				
	10				
	11				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3923
AS-BUILT NORTHING:	2697402.799
AS-BUILT EASTING:	814389.018
MUDLINE ELEVATION:	-7.4

PENETRATION:	12.5
RECOVERY:	8.1
WATER DEPTH:	7.6
DATE:	1/11/02
SAMPLER:	KW

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
		CH			
	12				
BOB 12.5 ft.		12.5			
	13				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3924	PENETRATION:	10.5
		RECOVERY:	6.1
AS-BUILT NORTHING:	2697340.472		
AS-BUILT EASTING:	814456.460	WATER DEPTH:	8.0
MUDLINE ELEVATION:	-9.5		
		DATE:	1/14/02
		SAMPLER:	KW, MG

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil with sand (OH); 80%	0				
fine sand, 15% medium sand, 5%					
coarse sand, some shells, dark					
gray.	1				
	2				
	3	OL/OH			
	4				
	5				
	6	6.2			
Lean clay with sand (CL); 80%			6.2-8.2	1555	PCBs/SVOCs/
fine sand, 15% medium sand, 5%	7				Metals
coarse sand, trace shells, olive					
gray.					
	8				
		CL	8.2-10.2	1557	PCBs/SVOCs/
					Metals
	9				
	10				
BOB 10.5 ft.		10.5			
	11				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3925	PENETRATION:	10.2
		RECOVERY:	7.9
AS-BUILT NORTHING:	2697369.205		
AS-BUILT EASTING:	814518.882	WATER DEPTH:	10.0
MUDLINE ELEVATION:	-7.5		
		DATE:	1/14/02
		SAMPLER:	KW

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Sandy organic soil (OH); 80%	0				
fine sand, 20% medium sand,					
some shells, black.					
	1				
		OL/OH			
	2				
	3	3.0			
Lean clay with sand (CL); 80%			3.0-5.0	1515	PCBs/SVOCs/
fine sand, 20% medium sand,					Metals
trace shells, olive gray.	4				
	5		5.0-7.0	1520	PCBs/SVOCs/
					Metals
	6				
		CL			
	7				
	8				
	9				
	10	10.2			
BOB 10.2 ft.					
	11				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3932	PENETRATION:	9.6
		RECOVERY:	8.9
AS-BUILT NORTHING:	2696367.380		
AS-BUILT EASTING:	814311.185	WATER DEPTH:	12.0
MUDLINE ELEVATION:	-9.2		
		DATE:	1/11/02
		SAMPLER:	KW

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil (OH); trace sand	0				
(80% fine sand, 20% medium					
sand), 40% shells, black.					
	1				
		OL/OH			
	2				
	3	3.1			
Sandy fat clay (CH); 60% fine			3.1-5.1	0855	PCBs/SVOCs/
sand, 30% medium sand, 10%					Metals
coarse sand, 10-20% shells,	4				
olive gray.					
	5	CH	5.1-7.1	0900	PCBs/SVOCs/
					Metals
	6				
	7	7.0			
Very fine sand (SP); trace clay,					
very compact, light gray/light					
brown.	8				
		SP			
	9				
		9.6			
BOB 9.6 ft.					
	10				
	11				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3933	PENETRATION:	10.3
		RECOVERY:	8.0
AS-BUILT NORTHING:	2696365.984		
AS-BUILT EASTING:	814357.574	WATER DEPTH:	11.5
MUDLINE ELEVATION:	-11.0		
		DATE:	1/10/02
		SAMPLER:	KW, MG

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic soil (OH)	0				
	1	OL/OH			
	2				
*Gradational contact		2.4			
Organic soil with clay (OH); trace	3		2.9-4.9	1350	PCBs/SVOCs/
fine sand, 25% shells, dark gray/					Metals
olive gray from 2.4'- 2.9.					
	4				
Sandy fat clay (CH); 80% fine					
sand, 20% medium sand, trace					
shells, trace subangular gravel,	5		4.9-6.9	1355	PCBs/SVOCs/
olive gray.					Metals
		CH			
	6				
*Sandier grading downward					
	7				
	8				
	9	9.3			
Very fine sand with clay (SP-SC)					
very compact, light gray.		SP-SC			
	10				
		10.3			
BOB 10.3 ft.					
	11				

NOTE: unable to recover organic layer (0-2.4 ft) due to liquidfication

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3053	PENETRATION:	8.5'
		RECOVERY:	6.8'
AS-BUILT NORTHING:	2696467.220		
AS-BUILT EASTING:	814162.363	WATER DEPTH:	5.7'
MUDLINE ELEVATION:	-5.3'		
		DATE:	8/3/01

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic Soil (OH)	0		0-1 ft.		Congener
	1		0-2 ft.		TCL/TAL
		OL/OH	1-2 ft.		Hold
	2				
			2-3 ft.		Hold
	3				
*Transitional Contact		- - - - -			
			3.3-6.0 ft.		Hold
	4				
			3.3-6.0 ft.		TCL/TAL
Fat Clay (CH); sandy or shelly					
in horizons, olive gray.	5				
		CH			
	6				
	7	- - - - -			
Sandy Clay (SC); olive gray.					
		SC			
	8				
		~~			
	9				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3088	PENETRATION:	7.0'
		RECOVERY:	5.0'
AS-BUILT NORTHING:	2696298.233		
AS-BUILT EASTING:	814310.788	WATER DEPTH:	11.8'
MUDLINE ELEVATION:	-11.3'		
		DATE:	8/3/01

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic Sandy Silt (ML); olive	0		0-1 ft.		Congener
gray.					
	1		0-2 ft.		TCL/TAL
		ML	1-2 ft.		Congener
	2				
			2-3 ft.		Hold
	3				
			3-4 ft.		TCL/TAL
	4				
Well Graded Sand with 10%	5		4.7-5.7 ft.		Hold
Gravel (SW); light brown.		SW			
	6				
Silt (ML); yellow brown					
		ML			
	7				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	3089	**PENETRATION:**	8.4'
		RECOVERY:	6.8'
AS-BUILT NORTHING:	2696397.887		
AS-BUILT EASTING:	814310	**WATER DEPTH:**	8.8
MUDLINE ELEVATION:	-9.2'		
		DATE:	8/3/01

STRATIGRAPHY			SAMPLES		
Soil Type	**Depth**		**Depth**	**Time**	**Analysis**
Organic Soil (OH); 40%	0		0-1 ft.		Congener
shells, black.					
	1	OL/OH	0-2 ft.		TCL/TAL
			1-2.4 ft.		Congener
	2				
*Shells mark contact.			2-3 ft.		Hold
			2.4-3.4 ft.		Hold
Fat Clay (CH); 5-15% sand, ~ 5%	3				
shells, olive gray.			2.4-4.4 ft.		TCL/TAL
	4				
		CH			
	5				
	6				
	7				
	8				

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	S-813	PENETRATION:	43"
		RECOVERY:	30"
AS-BUILT NORTHING:	2696455		
AS-BUILT EASTING:	814002	WATER DEPTH:	NR
MUDLINE ELEVATION:	NR		
		DATE:	11/7/00

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Organic Soil (OH); black.	0	OL/OH	0-1 ft.		Congeners
	1				
			1-2 ft.		Congeners
	2				
			2-3 ft.		Congeners
	3				
	4				

NR = not recorded

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

STATION ID:	S-872	PENETRATION:	NR
		RECOVERY:	NR
AS-BUILT NORTHING:	2696464		
AS-BUILT EASTING:	813695	WATER DEPTH:	NR
MUDLINE ELEVATION:	NR		
		DATE:	11/9/00

STRATIGRAPHY			SAMPLES		
Soil Type	Depth		Depth	Time	Analysis
Silty Sand with Gravel (SM);	0		0-1 ft.		Congeners
fine-coarse sand, 20% gravel,					
20% silt, brown-black.					
	1	SM			
			1-2 ft.		Congeners
	2				
			2-3 ft.		Congeners
Silty Sand (SM); fine-coarse		SM			
sand, 20% gravel, 20% silt,	3				
brown.					
	4				

NR = not recorded

NEW BEDFORD HARBOR
SEDIMENT SAMPLING DATA SHEET

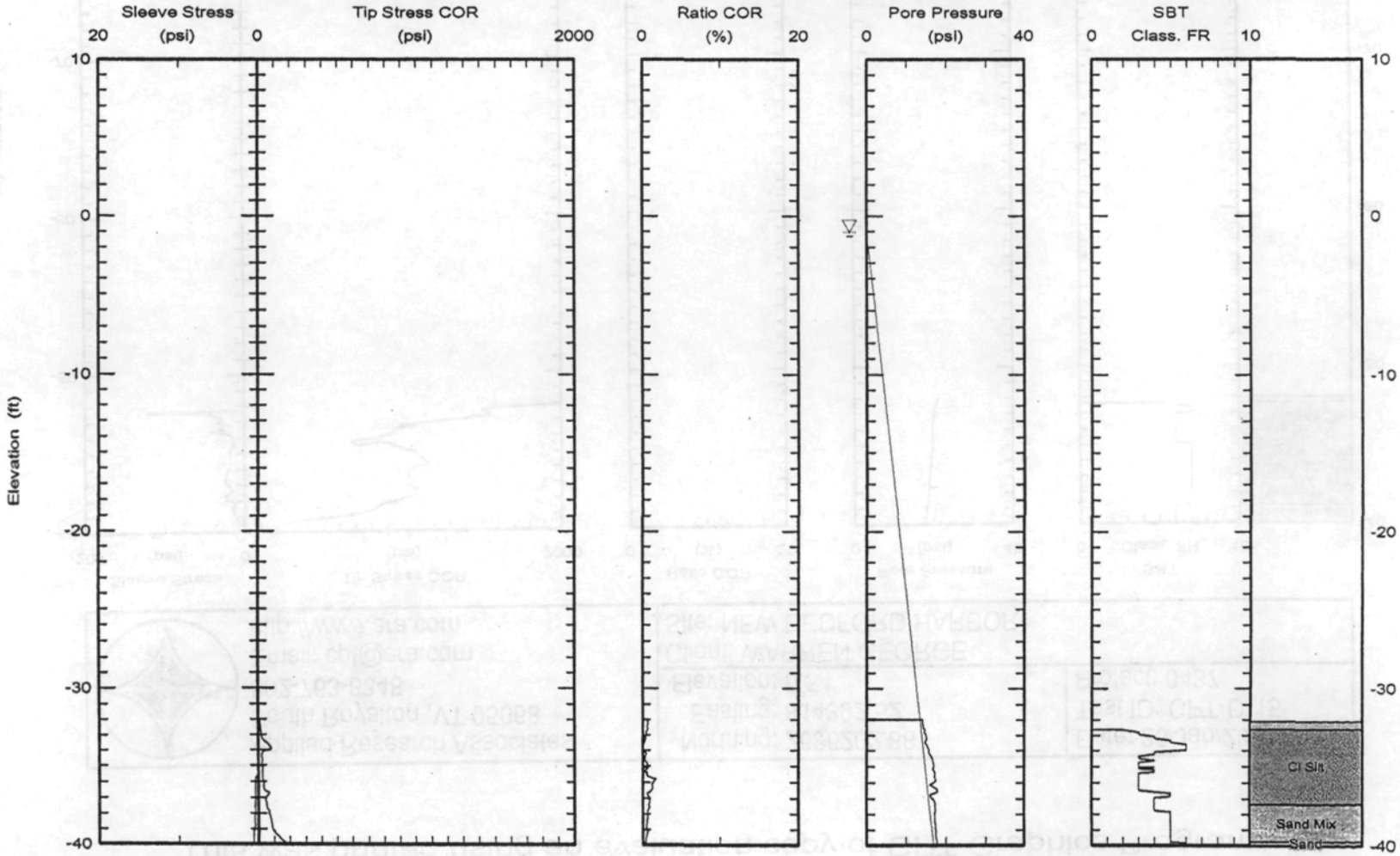
STATION ID:	S-873	**PENETRATION:**	48"
		RECOVERY:	32"
AS-BUILT NORTHING:	2696447		
AS-BUILT EASTING:	813850	**WATER DEPTH:**	NR
MUDLINE ELEVATION:	NR		
		DATE:	11/7/01

STRATIGRAPHY			SAMPLES		
Soil Type	**Depth**		**Depth**	**Time**	**Analysis**
Organic Soil with Sand (OL/OH);	0		0-1 ft.		Congeners
organic silt, 30% clay, 20% sand,					
black.					
	1	OL/OH			
			1-2 ft.		Congeners
	2				
			2-3 ft.		Congeners
Fine Sand with Organic Soil (SM);					
fine-coarse sand, 30% organic	3				
soil, black.		SM			
	4				

NR = not recorded

This was printed using an evaluation copy of CPT Graphics Program.

Applied Research Associates South Royalton ,VT 05068 802-763-8348 Email: cpt@ara.com http://www.ara.com	Northing: 2696202.88 Easting: 814392.52 Elevation: 5.54	Date: 23/Jan/2001 Test ID: CPT-D-15 Project: 0437
	Client: WARREN GEORGE Site: NEW BEDFORD HARBOR	



Maximum depth: 53.51 (ft)

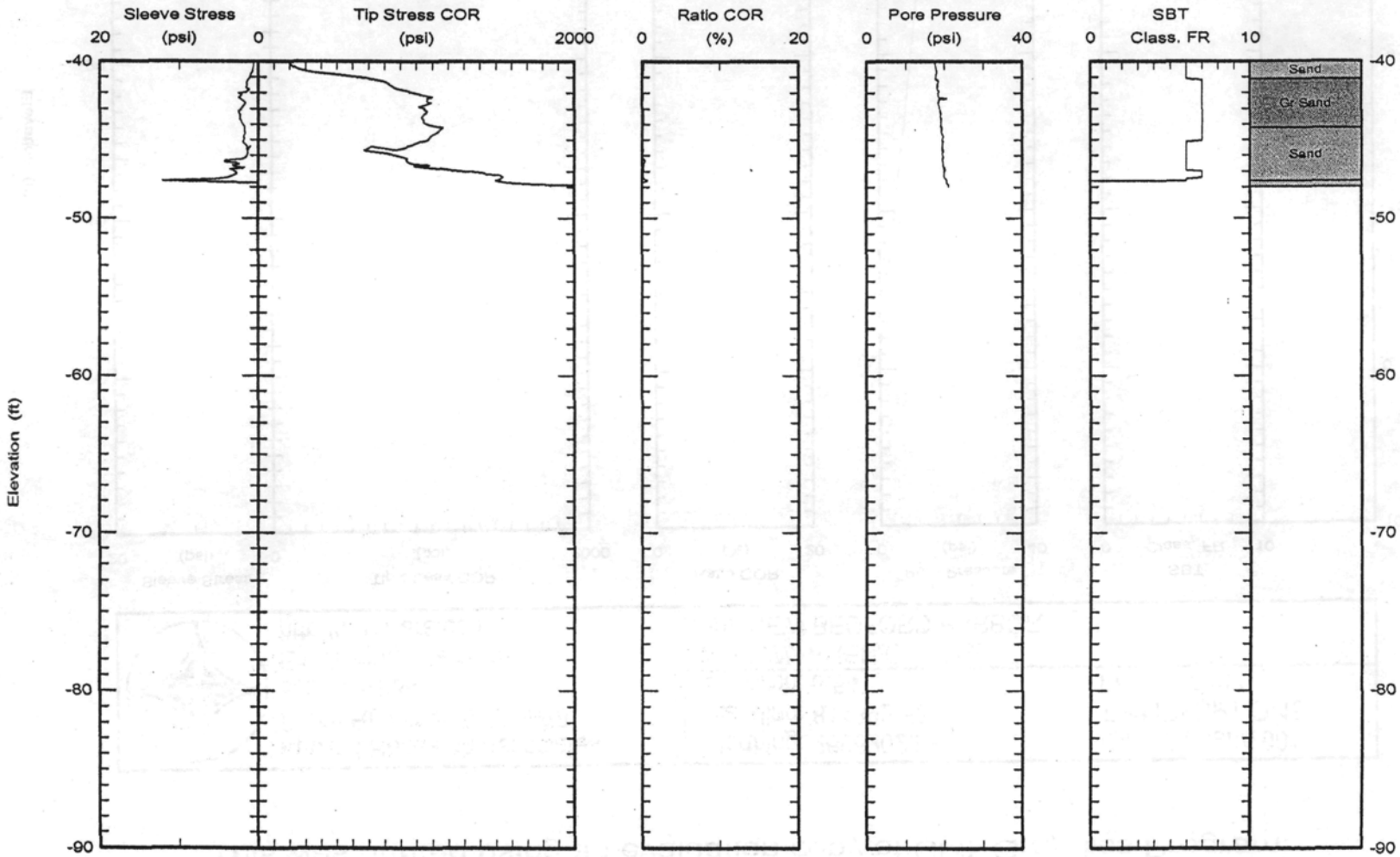
Class FR: Friction Ratio Classification (Ref: Robertson 1990)

▽ Estimated Phreatic Surface

Test ID: CPT-D-15
File: CPT_D_15.ECP

This was printed using an evaluation copy of CPT Graphics Program.

Applied Research Associates South Royalton ,VT 05068 802-763-8348 Email: cpt@ara.com http://www.ara.com	Northing: 2696202.88 Easting: 814392.52 Elevation: 5.54	Date: 23/Jan/2001 Test ID: CPT-D-15 Project: 0437
	Client: WARREN GEORGE Site: NEW BEDFORD HARBOR	

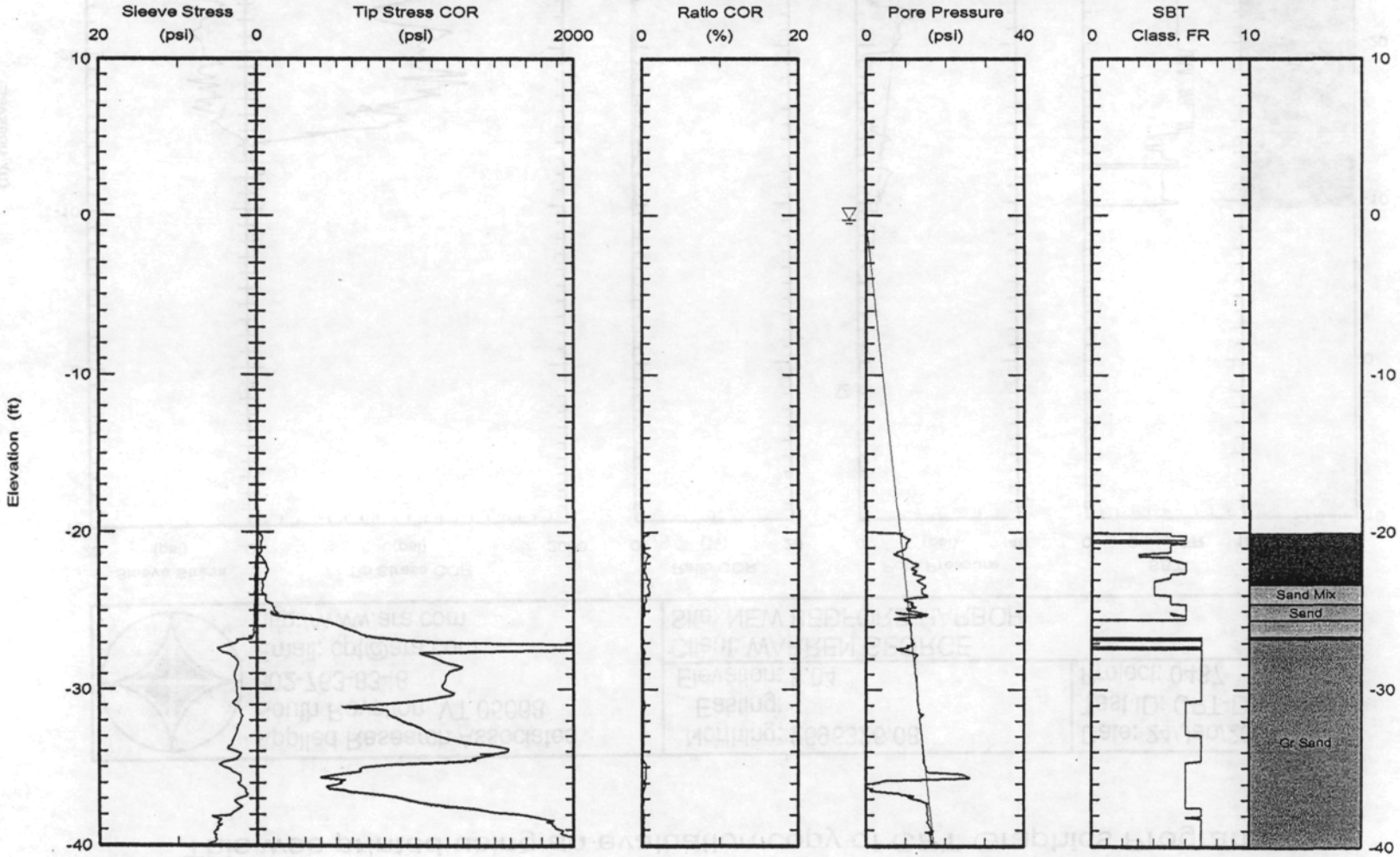


Maximum depth: 53.51 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

This was printed using an evaluation copy of CPT Graphics Program.

Applied Research Associates South Royalton ,VT 05068 802-763-8348 Email: cpt@ara.com http://www.ara.com	Northing: 2696356.45 Easting: 814424.56 Elevation: 6.29	Date: 19/Jan/2001 Test ID: CPT-D-25 Project: 0437
	Client: WARREN GEORGE Site: NEW BEDFORD HARBOR	



Maximum depth: 50.65 (ft)

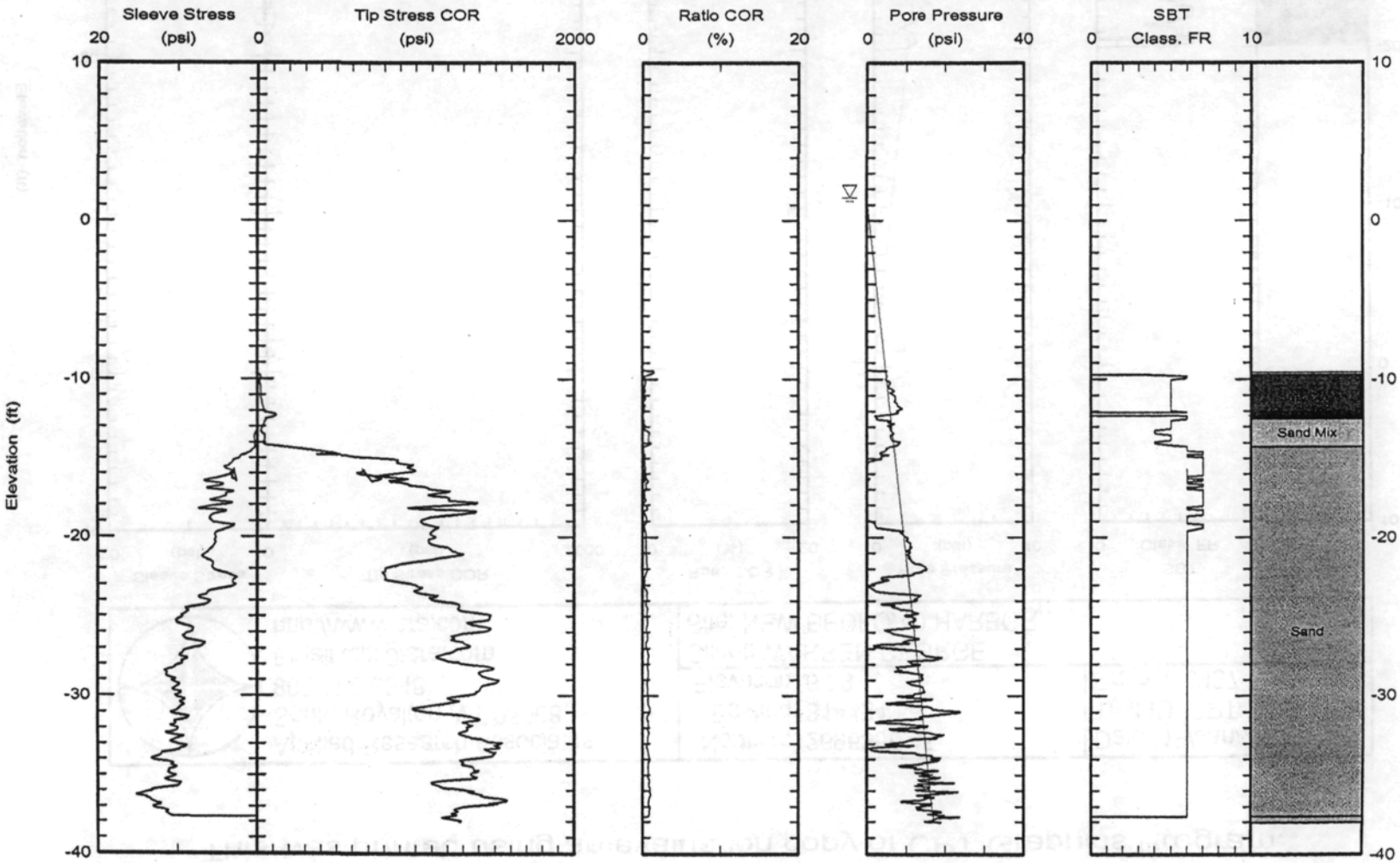
Class FR: Friction Ratio Classification (Ref: Robertson 1990)

Estimated Phreatic Surface

Test ID: CPT-D-25
File: CPT_D_25.ECP

This was printed using an evaluation copy of CPT Graphics Program.

Applied Research Associates South Royalton ,VT 05068 802-763-8348 Email: cpt@ara.com http://www.ara.com	Northing: 2696326.08 Easting: Elevation: 8.04	Date: 24/Jan/2001 Test ID: CPT-D-17 Project: 0437
	Client: WARREN GEORGE Site: NEW BEDFORD HARBOR	



Maximum depth: 46.07 (ft)

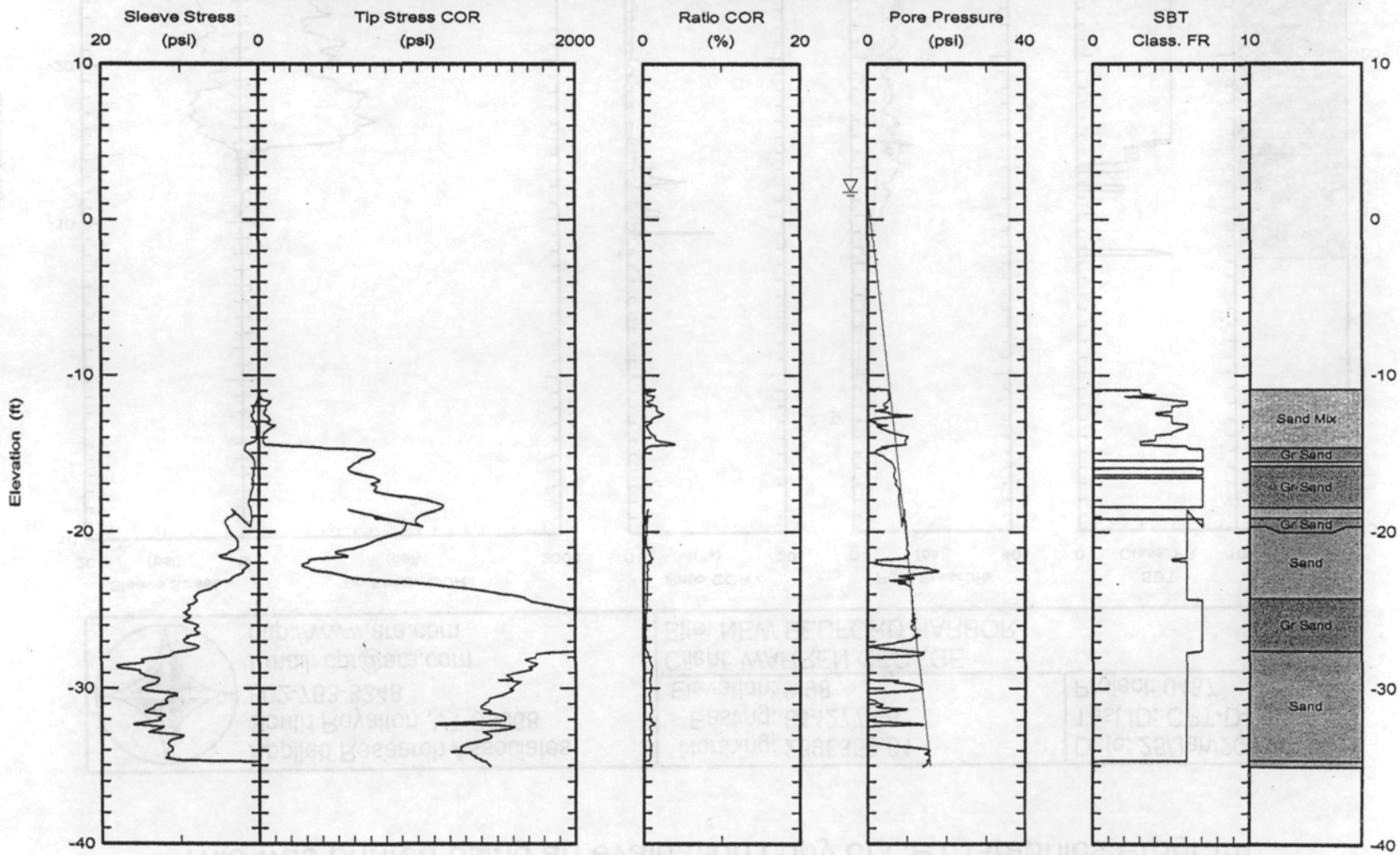
Class FR: Friction Ratio Classification (Ref: Robertson 1990)

Estimated Phreatic Surface

D: CPT-D-17
_D_17.ECP

This was printed using an evaluation copy of CPT Graphics Program.

Applied Research Associates South Royalton ,VT 05068 802-763-8348 Email: cpt@ara.com http://www.ara.com	Northing: 2696213.20 Easting: 814266.05 Elevation: 8.32	Date: 23/Jan/2001 Test ID: CPT-D-16 Project: 0437
	Client: WARREN GEORGE Site: NEW BEDFORD HARBOR	



Maximum depth: 43.38 (ft)

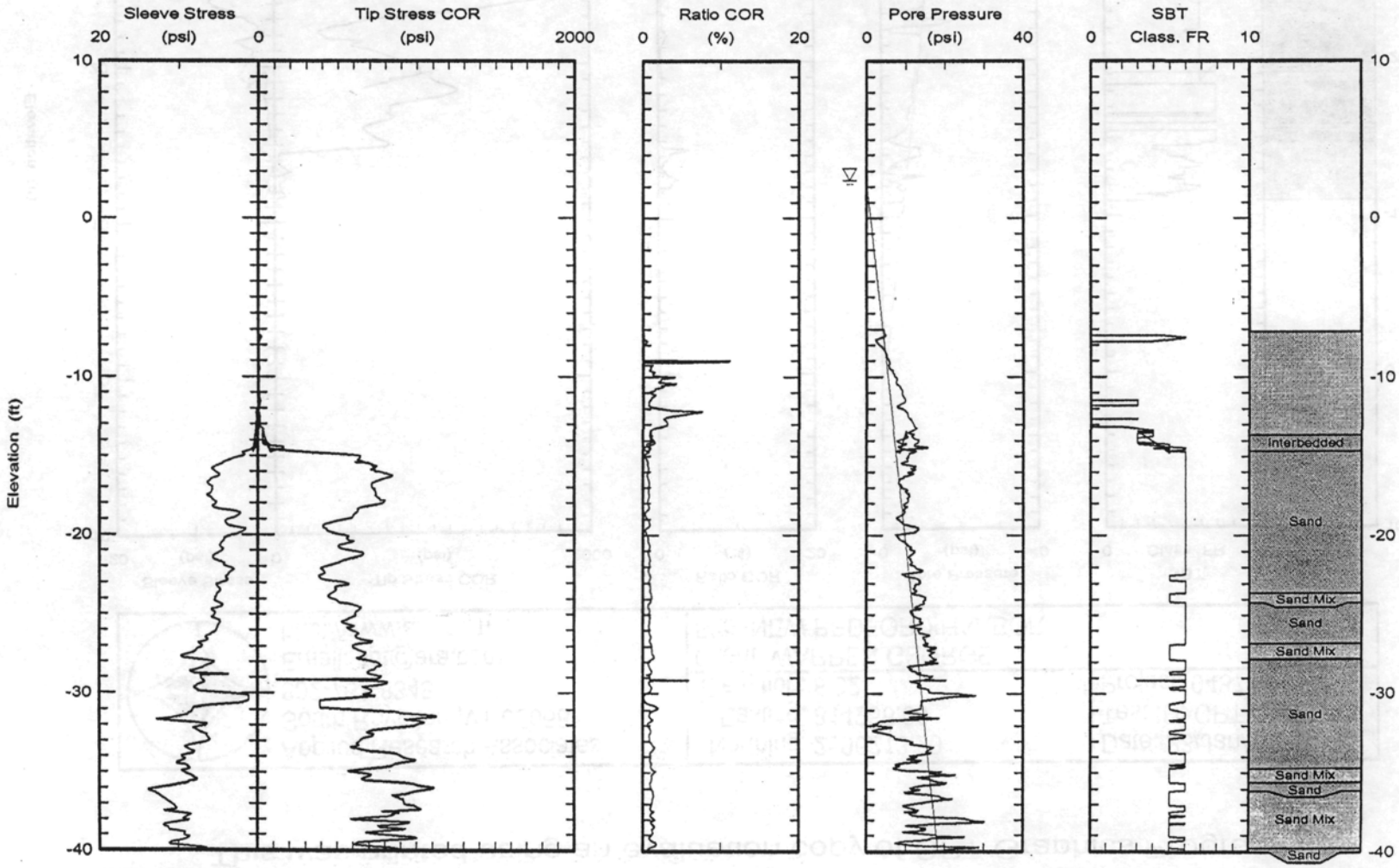
Class FR: Friction Ratio Classification (Ref: Robertson 1990)

Estimated Phreatic Surface

Test ID: CPT-D-16
File: CPT_D_16.ECP

This was printed using an evaluation copy of CPT Graphics Program.

Applied Research Associates South Royalton ,VT 05068 802-763-8348 Email: cpt@ara.com http://www.ara.com	Northing: 2696359.01 Easting: 814277.48 Elevation: 8.98	Date: 25/Jan/2001 Test ID: CPT-D-26 Project: 0437
	Client: WARREN GEORGE Site: NEW BEDFORD HARBOR	



Maximum depth: 49.52 (ft)
Page 1 of 2

Class FR: Friction Ratio Classification (Ref: Robertson 1990)
Estimated Phreatic Surface

ID: CPT-D-26
D_26.ECP

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. CSO - D1 SHEET 1 of 2 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696181.2	easting 814200.3	
Driller	R. Pryce	Ground Surface El.	8.9	Datum	NGVD
Logged By	E. Thibodeau	Date Start	11/18/99	Date End	11/18/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing. Spin and wash & mud rotary.

Groundwater Readings (from ground surface)				
Date	Time	Depth	Elev.	Stabilization Time
No water levels recorded				

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
1	Spin	S-1	24/24	0-2	11-25-28-23	53	Poorly graded sand with silt and gravel (SP-SM); dry, very dense, 30% fine sand, 20% medium sand, 10% coarse sand, 25% gravel, 10% silt, 5% asphalt, brown. (FILL)	SP-SM (FILL)	
2	Spin						Advance HW drill casing to 3 ft. Approximately 4 in. of material in bottom of drill casing; advance 3-7/8 in. button bit to remove material.		
3	Spin								
4	Spin	S-2	24/6	3-5	16-14-12-12	26	Poorly graded sand with silt and gravel (SP-SM); moist, medium dense, 30% fine sand, 25% medium sand, 10% coarse sand, 15% gravel, 10% silt, 10% asphalt, brown. (FILL)	SP-SM (FILL)	
5	Spin								
6	Spin	S-3	24/16	5-7	19-22-20-14	42	Poorly graded sand with silt and gravel (SP-SM); moist, dense, 25% fine sand, 10% coarse sand, 10% medium sand, 40% gravel, 10% silt, 5% asphalt, brown. (FILL)	SP-SM (FILL)	
7	Spin						Advance HW drill casing to 7 ft. Approximately 6 in. of material in bottom of drill casing; advance 3-7/8 in button bit to remove material.		
8	Spin	S-4	24/6	7-9	15-12-13-24	25	Silty sand with gravel (SM); wet, medium dense, 30% fine sand, 15% medium sand, 5% coarse sand, 30% gravel, 20% silt, brown. (FILL)	SM (FILL)	
9	Spin								
10	Spin	S-5	24/15	9-11	38-25-50-52	75	Poorly graded sand with silt and gravel (SP-SM); wet, very dense, 20% medium sand, 20% fine sand, 10% coarse sand, 40% gravel, 10% silt, gray to brown. Noticeable petroleum odor. (FILL)	SP-SM (FILL)	
11	Spin						Advance HW drill casing to 11 ft. Increase in drilling resistance noted. Approximately 12 in of material in bottom of casing; advance 3-7/8 in. button bit to remove material.		
12	Spin	S-6	7/6	11-11.6	26-10/1"- 50/0"	—	S-6: Silty gravel with sand (GM); wet, 40% gravel, 20% fine sand, 10% coarse sand, 5% medium sand, 25% silt, moderate organic odor, black to dark gray. (FILL)	GM (FILL)	
13	Open Hole						Advance HW drill casing to 11.7 ft. Very difficult drilling.	Possible Cobble/Boulder	
14	Open Hole	S-7	24/6	13-15	21-19-34-31	53	Advance 3-7/8 in. button bit from 11 to 13 ft. Very difficult drilling from 11.5 to 12.9 ft.; possible cobble/boulder.	GM (FILL)	
15	Open Hole						S-7: Silty gravel with sand (GM); wet, very dense, 45% gravel, 20% fine sand, 10% coarse sand, 5% medium sand, 20% silt, slight organic odor, black. Piece of gravel lodged in tip of sampler. (FILL)		
16	Open Hole	S-8	15/11	15-16.3	20-35-100/3"	—	S-8: Silty gravel with sand (GM); wet, 55% gravel, 10% coarse sand, 10% fine sand, 5% medium sand, 20% silt, slight organic odor, black to dark gray. (FILL)	GM (FILL)	
17	Open Hole						Switch to open hole mud rotary drilling techniques with bentonite drilling mud at 13 ft.		
18	Open Hole						Advance 3-7/8 in. button bit from 13 to 18 ft. Change in drilling resistance at 17 ft.		
19	Open Hole	S-9	24/12	18-20	9-6-5-3	11	S-9A: Silty sand with gravel (SM); wet, medium dense, 35% fine sand, 10% coarse sand, 10% medium sand, 20% gravel, 25% silt, drak gray to black. (6 in.)	SM	
20	Open Hole						S-9B: Organic soil with sand (OH); wet, 75% organic clay/silt, 25% fine sand, slight organic odor, dark gray. (6 in.)	OH	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1)
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3)
4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. CSO - D1 SHEET 2 of 2 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696181.2	easting 814200.3	
Driller	R. Pryce	Ground Surface El.	8.9	Datum	NGVD
Logged By	E. Thibodeau	Date Start	11/18/99	Date End	11/18/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 4-Inch I.D. (HW) flush-joint casing. Spin and wash & mud rotary.

Groundwater Readings (from ground surface)				
Date	Time	Depth	Elev.	Stabilization Time
No water levels recorded				

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
	Open	S-10	24/18	20-22	4-3-7-7	10	S-10A: Sandy organic soil (OH); wet, stiff, 60% organic clay/silt, 40% fine sand, silght	OH	
21	Hole						organic odor, dark gray. (12 in.)		
	Open						S-10B: Silty sand (SM); wet, 40% fine sand, 20% medium sand, 5% coarse sand, 5%	SM	
22	Hole						gravel, 30% silt, gray to brown. (6 in.)		
	Open	S-11	24/15	22-24	8-8-12-15	20	Advance 3-7/8 in. button bit from 18 to 22 ft.	SM	
23	Hole						S-11: Silty sand (SM); wet, medium dense, 55% fine sand, 10% medium sand, 5%		
	Open						coarse sand, 30% silt, gray to brown.		
24	Hole						Advance 3-7/8 in. button bit from 22 to 27 ft.		
	Open								
25	Hole								
	Open								
26	Hole								
	Open								
27	Hole								
		S-12	24/14	27-29	21-34-35-39	67	S-12A: Poorly graded sand with silt (SP-SM); wet, 55% fine sand, 30% medium sand,	SP-SM	
28							5% coarse sand, <5% gravel, 10% silt, brown. (6 in.)		
							S-12B: Sandy silt (ML); moist, hard, 60% silt, 40% fine sand, reddish brown. (8 in.)	ML	
29							Noticeable iron staining.		
							Bottom of exploration at 29 ft.; no refusal.		
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1)
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Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. CSO - D2 SHEET 1 of 2 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696159.2	easting 814008.2	
Driller	R. Pryce	Ground Surface El.	7.5	Datum	NGVD
Logged By	E. Thibodeau	Date Start	11/17/99	Date End	11/17/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing. Spin and wash & mud rotary.

Groundwater Readings (from ground surface)

Date	Time	Depth	Elev.	Stabilization Time
No water levels recorded				

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
		S-1	24/13	0-2	11-12-12-10	24	Topsoil and organic matter. (0.3 ft.)	TSOM	
1	Spin						S-1: Poorly graded sand with silt and gravel (SP-SM); dry, medium dense, 45% fine sand, 20% medium sand, 5% coarse and, 20% gravel, 10% silt, brown. (FILL)	SP-SM (FILL)	
2	Spin						Advance HW drill casing to 3 ft.		
							Very difficult drilling at 3 ft.		
3	Spin						Advance 3-7/8 in. button bit from 0 to 6 ft. No water return noted.		
							Very difficult drilling from 3.0 to 5.8 ft.; probable boulder.		
4	Spin								
5	Spin							Probable Boulder	
6	Spin								
		S-2	21/7	6-7.8	9-13-46-50/3"	59	Silty sand (SM); wet, very dense, 50% fine sand, 5% medium sand, 5% coarse sand, 10% gravel, 30% silt, brown to dark gray. Traces of organics noted in sample. (FILL)	SM (FILL)	
7	Spin						Advance HW drill casing to 7.7 ft.		
8	Spin						Very difficult drilling; no water return noted.	Probable Cobble	
		S-3	24/11	8-10	14-12-12-24	24	Advance 3-7/8 in. button bit to 8 ft. Probable cobble from 7.7 to 8 ft.	SM (FILL)	
9	Spin						S-3: Silty sand with gravel (SM); wet, medium dense, 25% fine sand, 10% medium sand, 5% coarse sand, 30% gravel, 30% silt, brown. (FILL)		
10	Spin								
		S-4	24/11	10-12	11-8-8-7	16	Silty sand with gravel (SM); wet, medium dense, 20% fine sand, 10% medium sand, 5% coarse sand, 35% gravel, 30% silt, brown. (FILL)	SM (FILL)	
11	Spin						Advance HW drill casing to 12 ft. Approximately 6 in. of material in bottom of drill casing; advance 3-7/8 in. button bit to remove material.		
12	Spin								
	Open	S-5	24/9	12-14	10-7-2-2	9	S-5A: Silty sand (SM); wet, loose, 40% fine sand, 10% coarse sand, 10% medium sand, 5% gravel, 35% silt, brown. (3 in.) (FILL)	SM (FILL)	
13	Hole								
	Open						S-5B: Sandy silt (ML); wet, 45% silt, 10% clay, 40% fine sand, 5% medium sand, olive brown. (6 in.)	ML	
14	Hole								
	Open	S-6	24/18	14-16	4-9-10-12	19	S-6A: Sandy silt (ML); wet, 50% silt, 5% clay, 45% fine sand, trace gravel, slight organic odor, olive brown to black. Traces of organic matter noted in sample. (6 in.)	ML	
15	Hole							SP	
	Open						S-6B: Poorly graded sand (SP); wet, medium dense, 60% fine sand, 30% medium sand, 5% coarse sand, 5% silt, brown. (12 in.)		
16	Hole								
	Open						Switch to open hole mud rotary drilling techniques with bentonite drilling mud at 12 ft.		
17	Hole						Advance 3-7/8 in. button bit from 12 to 20 ft.		
	Open						Loss of bentonite drilling mud noted during the advancement of the button bit; no return observed.		
18	Hole								
	Open								
19	Hole								
	Open								
20	Hole								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	18 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1)
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4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. CSO - D2 SHEET 2 of 2 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696159.2	easting 814008.2	
Driller	R. Pryce	Ground Surface El.	7.5	Datum	NGVD
Logged By	E. Thibodeau	Date Start	11/17/99	Date End	11/17/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 4-Inch I.D. (HW) flush-joint casing. Spin and wash & mud rotary.

Groundwater Readings (from ground surface)

Date	Time	Depth	Elev.	Stabilization Time
No water levels recorded				

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
21	Open Hole	S-7	24/12	20-22	8-9-11-14	20	Poorly graded sand (SP): wet, medium dense, 70% fine sand, 25% medium sand, 5% silt, brown.	SP	
22	Open Hole						Mix more bentonite drilling mud. Advance 3-7/8 in. button bit from 20 to 25 ft.		
23	Open Hole						Loss of bentonite drilling mud noted during the advancement of the button bit; no return observed.		
24	Open Hole								
25	Open Hole								
26		S-8	24/15	25-27	18-19-23-23	42	Poorly graded sand with silt (SP-SM); wet, dense, 65% fine sand, 10% medium sand, 10% coarse sand, 5% gravel, 10% silt, brown.	SP-SM	
27									
28							Bottom of exploration at 27 ft.; no refusal.		
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD - 18 SHEET 1 of 7 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696322.5	easting 814282.0	
Driller	A. Carter	Mudline El.	-7.85	Datum	NGVD
Logged By	E. Thibodeau	Date Start	10/13/99	Date End	10/15/99

Sampler: 2-inch O.D split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches
Drill Rig: Acker AD2 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
	Hyd.						Advance HW drill casing to 1 ft. (hydraulic push)		
1	Push						Advance 3-7/8 in. button bit from 0 to 1 ft.		
	Hyd.	UO-1	24/24	1-3	———	—	Sandy organic clay (OH); 65% organic clay, 23% fine sand, 7% medium sand, 2%	OH	1
2	Push						coarse sand, 3% gravel, strong organic odor, dark gray. Traces of shell fragments		
	Hyd.						noted.		
3	Push						Advance HW drill casing to 4 ft. (hydraulic push)		
	Hyd.						Advance 3-7/8 in. button bit from 1 to 4 ft.		
4	Push								2
	Hyd.	UO-2	24/24	4-6	———	—	Clayey sand (SC); 33% fine sand, 14% medium sand, 4% coarse sand, 3% gravel,	SC	1
5	Push						46% inorganic clay, strong organic odor, dark gray. Traces of shell fragments noted.		
	Hyd.						Advance HW drill casing to 7 ft. (hydraulic push)		
6	Push						Advance 3-7/8 in. button bit from 4 to 7 ft.		
	Hyd.								
7	Push								
	Hyd.	UO-3	24/24	7-9	———	—	Top: Silty sand (SM); 55% fine sand, 10% medium sand, 30% silt, 5% shell fragments,	SM	
8	Push						gray.		
	Hyd.						Bottom: Sandy silt (ML); 70% silt/clay, 30% fine sand, light gray.	ML	
9	Push						Advance HW drill casing to 9 ft. (hydraulic push)		
		S-1	24/12	9-11	2-7-12-12	19	Advance 3-7/8 in. button bit from 7 to 9 ft.	ML	
10	Spin						S-1: Silt with sand (ML); very stiff, 80% silt/clay, 20% fine sand, light gray. Traces of		
							iron staining.		
11	Spin						Advance HW drill casing to15 ft.		
12	Spin								
13	Spin								
14	Spin								
15	Spin								
		S-2	24/18	15-17	7-7-8-6	15	Sandy silt (ML); stiff, 65% silt/clay, 35% fine sand, olive brown.	ML	
16	Spin						Advance HW drill casing to 20 ft.		
17	Spin								
18	Spin								
19	Spin								
20	Spin								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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2) Strata break changed from 7 ft. (shown on the field log) to 4 ft. based on the laboratory test data.
3) Fractured rock/gravel noted in top of recovered sample; therefore, N-value may be biased high.
4) Button bit cuttings samples obtained utilizing an 8 in. diameter #100 U.S. sieve.

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD - 18 SHEET 2 of 7 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696322.5 easting 814282.0
Driller	A. Carter	Mudline El.	-7.85 Datum NGVD
Logged By	E. Thibodeau	Date Start	10/13/99 Date End 10/15/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: Acker AD2 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
		S-3	24/20	20-22	6-6-6-8	12	Sandy silt (ML); stiff, 55% silt/clay, 45% fine sand, olive brown.	ML	
21	Spin						Advance HW drill casing to 25 ft.		
22	Spin								
23	Spin								
24	Spin								
25	Spin								
		S-4	24/16	25-27	6-6-8-10	14	Silt with sand (ML); stiff, 75% silt/clay, 25% fine sand, olive brown.	ML	
26	Spin						Advance HW drill casing to 30 ft.		
27	Spin								
28	Spin								
29	Spin								
30	Spin								
		S-5	24/20	30-32	7-16-12-16	28	Sandy lean clay (CL); very stiff, 65% clay/silt, 35% fine sand, olive brown.	CL	
31	Spin						Approximately 1 in. thick medium to fine sand seam noted in sample, reddish-brown. Traces of black also noted in sample.		
32	Spin						Advance HW drill casing to 35 ft.		
33	Spin								
34	Spin						Change in drilling resistance at approximately 33 ft.		
35	Spin								
		S-6	24/6	35-37	22-13-8-10	21	Silty sand with gravel (SM): medium dense, 30% fine sand, 20% medium sand, 10% coarse sand, 20% gravel, 20% silt, brown.	SM	3
36	Spin						Advance HW drill casing to 37 ft.		
37	Spin								
		S-7	24/10	37-39	21-13-14-20	27	Lean clay with sand (CL); very stiff, 85% clay/silt, 15% fine sand, olive brown.	CL	
38	Spin						Approximate 1/4 in. thick medium to fine sand seam noted in bottom of sample, brown.		
39	Spin						Advance HW drill casing to 40 ft.		
40	Spin								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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3) Fractured rock/gravel noted in top of recovered sample; therefore, N-value may be biased high.
4) Button bit cuttings samples obtained utilizing an 8 in. diameter #100 U.S. sieve.

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD - 18 SHEET 3 of 7 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696322.5	easting 814282.0	
Driller	A. Carter	Mudline El.	-7.85	Datum	NGVD
Logged By	E. Thibodeau	Date Start	10/13/99	Date End	10/15/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: Acker AD2 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
		S-8	24/8	40-42	19-24-27-15	51	Poorly graded sand with silt and gravel (SP-SM); very dense, 40% fine sand, 20%	SP-SM	
41	Spin						medium sand, 5% coarse sand, 25% gravel, 10% silt, brown.		
							Advance HW drill casing to 45 ft.		
42	Spin						Very difficult drilling at 44 ft.		
43	Spin								
44	Spin								
45	Spin								
		S-9	24/0	45-47	59-16-12-15	28	No recovery.		
46	Spin						Advance HW drill casing to 47 ft.		
47	Spin								
		S-10	24/6	47-49	27-12-20-16	32	Poorly graded sand with silt and gravel (SP-SM); dense, 40% fine sand, 15% medium	SP-SM	3
48	Spin						sand, 10% coarse sand, 25% gravel, 10% silt, brown.		
							Advance HW drill casing to 50 ft.		
49	Spin								
50	Spin								
		S-11	24/2	50-52	19-11-11-15	22	Poor recovery. Piece of fractured rock lodged in tip of sampler. Possible		
51	Spin						weathered/fractured bedrock.		
							Advance HW drill casing to 52 ft.	POSSIBLE BEDROCK	
52	Spin								
		S-12	24/0	52-54	16-30-30-29	60	Poor recovery. Fractured rock. Possible weathered/fractured bedrock.		
53	Spin						Advance 3-7/8 in. button bit from 52 to 54 ft. (open hole)		
							Button bit cuttings preserved in three sample jars. Cuttings appear to be bedrock.		4
54	Spin								
		S-13	2/1	54-54.2	75/2"	—	Fractured bedrock. Appears to be less weathered/more competent than samples		
							obtained in S-11 and S-12.		
							Advance HW drill casing to 54.7 ft. for coring. (spin)		
							Fill casing with water to check casing seal; water level dropped slowly.		
							Begin HV rock core at 54.2 ft.		
							(boring log continued on next page)		

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD - 18 SHEET 4 of 7 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696322.5	easting 814282.0	
Driller	A. Carter	Mudline El.	-7.85	Datum	NGVD
Logged By	E. Thibodeau	Date Start	10/13/99	Date End	10/15/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: Acker AD2 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
54.5		R1	54.2 - 55.2	4 mins.	Begin R1 at 54.2 ft. (3rd gear) Water return color: milky white. Fresh to slightly weathered, moderately hard, gray, fine grained GNEISS. Appears to be high angle to vertical foliation. REC = 83%; RQD = 70% (fair) 54.2 to 54.3 ft: fractured piece of bedrock. Slightly discolored and weathered. 54.9 to 55.7 ft: core barrel dropped. Probable void. Recovered a few pieces of fractured bedrock and what appears to be fine gravel. Probably soil filled.	
55.0						
55.5			55.2 - 56.2	1.5 mins.	55.7 ft: change in foliation from high angle/vertical to low angle; approximately 10 degrees. 55.7 ft: water return color: light brown. Water return still possible after coring through void.	
56.0					56.2 ft: water return color: milky white.	
56.5			56.2 - 57.2	3.5 mins.	56.3 ft: mechanical break in rock core.	
57.0					57.2, 57.3, 57.4, and 57.5 ft: Primary joints: low angle, extremely close to moderately spaced, rough, planar, discolored, and partly open.	
57.5			57.2 - 58.2	4 mins.		
58.0					58.7 ft: Primary joint: low angle, extremely close to moderately spaced , rough, planar, discolored, and tight.	
58.5			58.2 - 59.2	5 mins.	58.9 ft: Primary joint: low angle, extremely close to moderately spaced, smooth, planar, discolored, and open. Sound corehole after completion of core run; approximately 4 ft. of material in corehole. Attempt split-barrel sample. Drive sampler from 56 to 59 ft. REC = 24 in. S-14A: Mostly core bit cuttings; piece of fractured bedrock noted. (top) S-14B: Mixture of medium to fine sand and gravel; could be void material. Advance HW drill casing from 54.7 to 56.2 ft. to seal off void. End R1 at 59.2 ft.	
59.0						

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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2) Strata break changed from 7 ft. (shown on the field log) to 4 ft. based on the laboratory test data.
3) Fractured rock/gravel noted in top of recovered sample; therefore, N-value may be biased high.
4) Button bit cuttings samples obtained utilizing an 8 in. diameter #100 U.S. sieve.

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD - 18 SHEET 5 of 7 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696322.5	easting 814282.0	
Driller	A. Carter	Mudline El.	-7.85	Datum	NGVD
Logged By	E. Thibodeau	Date Start	10/13/99	Date End	10/15/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: Acker AD2 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMARKS
59.5		R2	59.2 - 60.2	5 mins.	Advance 3 7/8 in. button bit from 56 to 59.2 ft to remove cuttings. Fill casing with water to check casing seal; water level dropped slowly. Begin R2 at 59.2 ft. (3rd gear) Water return color: milky white. Fresh to weathered, hard to medium hard, gray, fine grained GNEISS. Low angle foliation; approximately 10 to 20 degrees. REC = 98%; RQD = 87% (good)	
60.0						
60.5			60.2 - 61.2	4.5 mins.	60.4 to 60.5 ft: Primary joint: low angle, extremely close to moderately spaced, rough, stepped, discolored, and partly open. 60.5 to 60.6 ft: Primary joint: low angle, extremely close to moderately spaced, rough, planar, discolored, and tight.	
61.0						
61.5			61.2 - 62.2	3 mins.	61.7 to 62.8 ft: weathered zone; discolored. 61.7 to 61.9 ft: Primary joints: low angle to horizontal, extremely close to moderately spaced, rough, planar, discolored, slightly decomposed, and partly open. Joints spaced approximately 0.1 to 0.3 in. apart. 62.1 ft: mechanical break in rock core.	
62.0						
62.5			62.2 - 63.2	3 mins.	62.3 ft: mechanical break in rock core. 62.5 ft: Primary joint: horizontal, extremely close to moderately spaced, rough, planar, discolored, and open. 62.6 to 62.8 ft: Primary joints: horizontal, extremely close to moderately spaced, rough, planar, discolored to slightly decomposed, and open. Decomposed to disintegrated (friable) zone noted from 62.6 to 62.7 ft. Traces of mud filling noted in this zone. 63.0 ft: water return color: light brown to milky white.	
63.0						
63.5			63.2 - 64.2	4 mins.	63.5 ft: Primary joint: low angle, extremely close to moderately spaced, smooth, planar, discolored, slightly decomposed, and partly open.	
64.0					64.0 ft: mechanical break in rock core. End R2 at 64.2 ft.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
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11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD - 18 SHEET 6 of 7 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696322.5	easting 814282.0	
Driller	A. Carter	Mudline El.	-7.85	Datum	NGVD
Logged By	E. Thibodeau	Date Start	10/13/99	Date End	10/15/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: Acker AD2 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
64.5		R3	64.2 - 65.2	5 mins.	Fill casing with water to check casing seal; water level dropped more rapidly. Begin R3 at 64.2 ft. (3rd gear) Water return color: light brown to milky white. Fresh, hard, gray, fine grained GNEISS. Low angle foliation; approximately 15 degrees. REC = 100%; RQD = 97% (excellent)	
65.0					65.1 ft: mechanical break in rock core.	
65.5			65.2 - 66.2	4 mins.		
66.0					66.1 ft: mechanical break in rock core.	
66.5			66.2 - 67.2	4 mins.	66.5 ft: Primary joint: low angle, extremely close to widely spaced, smooth, planar, slightly discolored, and open. Minor core grinding noted on fracture surface.	
67.0						
67.5			67.2 - 68.2	4.5 mins.		
68.0					67.7 ft: mechanical break in rock core.	
68.5			68.2 - 69.2	4.5 mins.	68.3 ft: Primary joint: low angle, extremely close to widely spaced, smooth, planar, slightly discolored, and open. Some core grinding noted on fracture surface.	
69.0					68.9 ft: mechanical break in rock core.	
					End R3 at 69.2 ft.	

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11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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4) Button bit cuttings samples obtained utilizing an 8 in. diameter #100 U.S. sieve.

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD - 18 SHEET 7 of 7 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696322.5	easting 814282.0	
Driller	A. Carter	Mudline El.	-7.85	Datum	NGVD
Logged By	E. Thibodeau	Date Start	10/13/99	Date End	10/15/99

Sampler: 2-inch O.D split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: Acker AD2 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMARKS
69.5		R4	69.2 - 70.2	5.5 mins.	Begin R4 at 69.2 ft (3rd gear) Water return color: milky white. Fresh, hard, gray, fine grained GNEISS. Low angle foliation; approximately 10 degrees. REC = 98%; RQD = 98% (excellent)	
70.0					70.1 ft: mechanical break in rock core.	
70.5			70.2 - 71.2	7.5 mins.		
71.0					70.9 ft: mechanical break in rock core. 71.2 ft: mechanical break in rock core.	
71.5			71.2 - 72.2	5.5 mins.		
72.0					72.1 ft: mechanical breaks in rock core.	
72.5			72.2 - 73.2	5.5 mins.		
73.0					72.8 to 72.9 ft: Quartz/feldspar inclusion; pink in color. 73.0 ft: mechanical break in rock core.	
73.5			73.2 - 74.2	4.5 mins.		
74.0					73.9 ft: mechanical break in rock core. Perform constant head permeability test from 56.2 to 74.2 ft. End R4 at 74.2 ft. Bottom of exploration at 74.2 ft.; boring terminated in bedrock. Grouted completed borehole with approximately 57 gallons of bentonite grout. (9.2 lbs/gal.)	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory test data and ASTM D2487. Refer to Test Report No. 6, prepared by GeoTesing Express, dated December 23, 1999.
2) Strata break changed from 7 ft. (shown on the field log) to 4 ft. based on the laboratory test data.
3) Fractured rock/gravel noted in top of recovered sample; therefore, N-value may be biased high.
4) Button bit cuttings samples obtained utilizing an 8 in. diameter #100 U.S. sieve.

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. MW-D3 SHEET 1 of 1 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696505.7	easting 813975.4	
Driller	R. Pryce	Ground Surface El.	10.06	Datum	NGVD
Logged By	R. Chase	Date Start	8/31/99	Date End	8/31/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 6-Inch I.D. (SW) flush-joint casing; spin and wash.

Groundwater Readings (from ground surface)

Date	Time	Depth	Elev.	Stabilization Time
8/31	12:00 PM	7.4	2.7	Upon completion of drilling

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
		S-1	24/11	0-2	9-14-11-12	25	Poorly graded sand with silt (SP-SM); dry, medium dense, 80% fine sand, <5% coarse sand,	SP-SM	
1	Spin						<5% medium sand, 10% silt, brown. Topsoil noted in sample. (FILL)	(FILL)	
2	Spin								
3	Spin								
		S-2	24/4	3-5	21-23-27-26	50	Poorly graded sand with silt and gravel (SP-SM); wet, dense, 25% coarse sand, 15% medium	SP-SM	
4	Spin						sand, 10% fine sand, 45% fine gravel, 5% silt, brown. (FILL)	(FILL)	
							Advance SW drill casing to 9 ft.		
5	Spin								
6	Spin								
7	Spin								
							Probable nested boulders from 7 to 8.5 ft.	Probable Nested Boulders	
8	Spin								
9	Spin								
		S-3	24/6	9-11	20-46-16-11	62	Poorly graded sand with gravel (SP); wet, very dense, 50% fine sand, 25% medium sand, 5%	SP	
10	Spin						coarse sand, 15% gravel, 5% silt, gray. Traces of brick noted in sample. (FILL)	(FILL)	
							Advance SW drill casing to 12 ft.		
11	Spin						Advance 5-3/8 in. roller bit to 13 ft.		
12	Spin						Probable boulder from 11.5 to 12.5 ft.	Probable Boulder	
13	Spin						Inferred strata change at 13 ft.		
		S-4	24/4	13-15	15-22-11-6	33	Poorly graded sand with gravel (SP); wet, dense, 60% fine sand, 5% medium sand, <5% coarse	SP	
14	Spin						sand, 25% fine gravel, 5% silt, gray.		
							Advance SW drill casing to 19 ft.		
15	Spin								
16	Spin								
17	Spin								
18	Spin								1
19	Spin								
20							Bottom of exploration at 19 ft.		

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Installed 2-inch PVC monitoring well at 18 ft.; see Monitoring Well Construction Log for more details.
2)
3)
4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-21 SHEET 1 of 3 FILE NO. 48138.07 CHKD. BY J.Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696526.5	easting 814030.9	
Driller	R. Pryce	Ground Surface El.	10.9	Datum	NGVD
Logged By	R. Chase	Date Start	8/31/99	Date End	9/1/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings (from ground surface)				
Date	Time	Depth	Elev.	Stabilization Time
No water levels recorded				

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
		S-1	17/11	0-1.4	14-38-50/5"	>50	Poorly graded sand (SP); dry, very dense, 80% fine sand, 5% coarse sand, 5% medium	SP	
1	Spin						sand, 5% fine gravel, 5% silt, brown. (FILL)	(FILL)	
							Advance HW drill casing to 3 ft.		
2	Spin								
3	Spin								
		S-2	5/5	3-3.4	50/5"	>50	Similar to S-1, except wet.	SP	
4	Spin						Advance HW drill casing to 8 ft.	(FILL)	
5	Spin								
6	Spin								
7	Spin								
8	Spin								
		S-3	24/6	8-10	27-20-6-5	26	Similar to S-2, except medium dense.	SP	
9	Spin						Advance HW drill casing to 13 ft.	(FILL)	
10	Spin								
11	Spin								
12	Spin								
13	Spin								
		S-4	3/3	13-13.3	50/3"	>50	Poorly graded sand (SP); wet, 40% coarse sand, 40% medium sand, <5% fine sand, 10%	SP (FILL)	
14	Spin						fine gravel, <5% silt, red-brown. Traces of brick noted in sample. (FILL)		
							Advance HW drill casing to 18 ft.	Probable	
15	Spin						Probable boulder from 13.3 to 14.3 ft.	Boulders	
							Probable boulder from 14.3 to 15.5 ft.		
16	Spin								
17	Spin								
18	Spin								
		S-5	24/14	18-20	9-6-6-6	12	Organic soil (OL); wet, stiff, 100% organic silt, black.	OL	
19	Spin						Advance HW drill casing to 23 ft.		
20	Spin								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Grout the completed borehole from 0 to 49 ft.
2)
3)
4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-21 SHEET 2 of 3 FILE NO. 48138.07 CHKD. BY J.Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696526.5	easting 814030.9	
Driller	R. Pryce	Ground Surface El.	10.9	Datum	NGVD
Logged By	R. Chase	Date Start	8/31/99	Date End	9/1/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings (from ground surface)				
Date	Time	Depth	Elev.	Stabilization Time
No water levels recorded				

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
21	Spin								
22	Spin								
23	Spin						Inferred strata change at 23 ft.		
24	Spin	S-6	24/10	23-25	14-9-10-14	19	Silty sand (SM); wet, medium dense, 85% fine sand, 15% silt, gray. Advance HW drill casing to 28 ft.	SM	
25	Spin								
26	Spin								
27	Spin								
28	Spin								
29	Spin	S-7	24/10	28-30	8-9-11-10	20	Similar to S-6. Advance HW drill casing to 33 ft.	SM	
30	Spin								
31	Spin								
32	Spin								
33	Spin								
34	Spin	S-8	24/6	33-35	11-14-13-13	27	Poorly graded sand (SP); wet, medium dense, 95% fine sand, 5% silt, gray. Advance HW drill casing to 38 ft.	SP	
35	Spin								
36	Spin								
37	Spin								
38	Spin								
39	Spin	S-9	10/6	38-38.9	18-50/4"	>50	Well-graded sand with gravel (SW); wet, 35% coarse sand, 30% medium sand, 15% fine sand, 15% fine gravel, 5% silt. Advance HW drill casing to 43 ft.	SW	
40	Spin								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Grout the completed borehole from 0 to 49 ft.
2)
3)
4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-21 SHEET 3 of 3 FILE NO. 48138.07 CHKD. BY J.Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696526.5	easting 814030.9	
Driller	R. Pryce	Ground Surface El.	10.9	Datum	NGVD
Logged By	R. Chase	Date Start	8/31/99	Date End	9/1/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 4-inch I.D. (HW)-flush-joint casing, spin and wash.

Groundwater Readings (from ground surface)				
Date	Time	Depth	Elev.	Stabilization Time
No water levels recorded				

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
41	Spin								
42	Spin								
43	Spin								
44	Spin	S-10	24/4	43-45	14-11-12-25	23	Poorly graded sand (SP); wet, medium dense, 50% coarse sand, 35% medium sand, 5% fine sand, <5% fine gravel, <5% silt, gray.	SP	
45	Spin						Advance HW drill casing to 46.5 ft.		
46	Spin						Top of bedrock at 46.5 ft.		
47							Advance 3-7/8 in. roller bit to 49.0 ft. to confirm bedrock.		
48								BEDROCK	
49									1
50							Bottom of exploration at 49 ft.; boring terminated in probable bedrock.		
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Grout the completed borehole from 0 to 49 ft.
2)
3)
4)

M:/Reports/Active/48138.07/Logs/CDFD/Fd-21/FD-21(3)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-20 SHEET 1 of 3 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696458.0	easting 814073.9	
Driller	A. Carter	Mudline El.	-4.08	Datum	NGVD
Logged By	E. Thibodeau	Date Start	9/7/99	Date End	9/8/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. safety hammer free falling from a height of 30 inches.
Drill Rig: Acker AD2 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; wash and drive.
All casing driven with a 300 lb center hole hammer free falling from a height of 30-inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
1	Hyd. Push						Advance HW drill casing to 3 ft. (hydraulic push) Advance 3-7/8 in. button bit from 0 to 3 ft.		
2	Hyd. Push								
3	Hyd. Push								
4	Hyd. Push	S-1	24/8	3-5	WOR/24"	0	Organic soil with sand (OH); very soft, 60% organic clay, 20% organic silt, 15% fine sand, 5% medium sand, strong organic odor, slight sheen, dark gray to black.	OH	
5	Hyd. Push						Advance HW drill casing to 5 ft. (hydraulic push) Advance 3-7/8 in. button bit from 3 to 5 ft.		
6	Hyd. Push	S-2	24/18	5-7	WOR/15"-1/3"-3	0	S-2A: Sandy organic soil (OH); very soft, 40% organic clay, 25% organic silt, 30% fine sand, 5% shell fragments, strong organic odor, dark gray. (12 in.)	OH	
7	Hyd. Push						S-2B: Poorly graded sand with silt (SP-SM); 50% fine sand, 40% medium sand, 10% silt, gray to brown. (6 in.)	SP-SM	
8	19						Advance HW drill casing to10 ft. (hydraulic push) Very difficult push at 7 ft.; drive casing.		
9	16						Advance 3-7/8 in. button bit from 5 to 10 ft.		
10	21								
11	7/ 6"	S-3	24/19	10-12	17-29-29-26	58	Poorly graded sand (SP); very dense, 50% medium sand, 35% fine sand, 5% coarse sand, 5% gravel, 5% silt, brown.	SP	1
12	18						Advance HW drill casing to 15 ft. Advance 3-7/8 in. button bit from 10 to 15 ft.		
13	26								
14	37								
15	43								
16	14	S-4	24/12	15-17	6-6-7-7	13	Poorly graded sand (SP); medium dense, 40% medium sand, 25% fine sand, 20% coarse sand, 10% gravel, 5% silt, brown.	SP	
17	26						Advance HW drill casing to 20 ft. Add bentonite to drilling fluid.		
18	41						Advance 3-7/8 in. button bit from 15 to 20 ft.		
19	46								
20	49								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) HW drill casing advanced approximately 6 in. during standard penetration test; therefore, N-value may be biased high.
2) Slight loss of drilling fluid noted during advancement of button bit.
3)
4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-20 SHEET 2 of 3 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696458.0	easting 814073.9	
Driller	A. Carter	Mudline El.	-4.08	Datum	NGVD
Logged By	E. Thibodeau	Date Start	9/7/99	Date End	9/8/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. safety hammer free falling from a height of 30 inches.
Drill Rig: Acker AD2 truck mount
Drilling Method: 4-inch I.D. (HW)-flush-joint casing; wash and drive.
All casing driven with a 300 lb center hole hammer free falling from a height of 30-inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
		S-5	24/19	20-22	11-14-21-31	35	Poorly graded sand with gravel (SP); dense, 30% medium sand, 30% fine sand, 15%	SP	
21	36						coarse sand, 20% gravel, 5% silt, brown.		
							Advance HW drill casing to 25 ft.		
22	37						Advance 3-7/8 in. button bit from 20 to 25 ft.		
23	30								
24	36								
25	60								
		S-6	24/8	25-27	10-14-11-13	25	Poorly graded sand with silt and gravel (SP-SM); medium dense, 30% medium sand,	SP-SM	
26	81						15% coarse sand, 15% fine sand, 30% gravel,10% silt, brown.		
							Advance HW drill casing to 30 ft.		
27	120						Advance 3-7/8 in. button bit from 25 to 30 ft.		
28	191								
29	123								
30	115								
		S-7	24/10	30-32	25-17-14-14	31	Silty sand with gravel (SM); dense, 20% medium sand, 15% coarse sand, 15% fine	SM	
31	78						sand, 35% gravel, 15% silt, brown.		
							Advance HW drill casing to 35 ft.		
32	73						Advance 3-7/8 in. button bit from 30 to 35 ft.		
33	85								
34	113								
35	115								
		S-8	24/6	35-37	39-18-10-10	28	Poorly graded sand with silt and gravel (SP-SM); medium dense, 30% coarse sand,	SP-SM	
36	76						20% fine sand, 10% medium sand, 30% gravel, 10% silt, brown. Piece of gravel		
							lodged in tip of sampler.		
37	70						Advance HW drill casing to 40 ft.		
							Advance 3-7/8 in. button bit from 35 to 40 ft.		
38	130								
39	128								
40	81								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) HW drill casing advanced approximately 6 in. during standard penetration test; therefore, N-value may be biased high.
2) Slight loss of drilling fluid noted during advancement of button bit.
3)
4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-20 SHEET 3 of 3 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696458.0	easting 814073.9	
Driller	A. Carter	Mudline El.	-4.08	Datum	NGVD
Logged By	E. Thibodeau	Date Start	9/7/99	Date End	9/8/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. safety hammer free falling from a height of 30 inches.
Drill Rig: Acker AD2 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; wash and drive.
All casing driven with a 300 lb center hole hammer free falling from a height of 30-inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
		S-9	24/6	40-42	30-24-11-9	35	Poorly graded sand with silt (SP-SM); dense, 40% medium sand, 30% fine sand, 10% coarse sand, 10% gravel, 10% silt, brown.	SP-SM	
41	78						Advance HW drill casing to 46 ft.		
42	100						Advance 3-7/8 in. button bit from 40 to 46 ft.		
43	196								
44	89								
45	63								
46	79								
		S-10	24/18	46-48	19-12-7-5	19	Poorly graded sand with gravel (SP); medium dense, 40% medium sand, 20% coarse sand, 20% fine sand, 15% gravel, 5% silt, brown. Traces of weathered bedrock noted in sample.	SP	
47	56						Advance HW drill casing to 48.8 ft.		
48	65						Top of bedrock at 48.8 ft.		
49	218/9"						Advance 3-7/8 in. button bit from 46 feet to 50.8 ft.		
50								BEDROCK	
51									
52							Bottom of exploration at 50.8 feet; boring terminated in probable bedrock.		
53							Note: Pumped approximately 59 gallons of grout to grout completed borehole to top of HW drill casing.		
54									
55									
56									
57									
58									
59									
60									

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) HW drill casing advanced approximately 6 in. during standard penetration test; therefore, N-value may be biased high.
2) Slight loss of drilling fluid noted during advancement of button bit.
3)
4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-19 SHEET 1 of 4 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696353.5	easting 814172.2	
Driller	R. Pryce	Ground Surface El.	6.98	Datum	NGVD
Logged By	R. Chase	Date Start	9/8/99	Date End	9/9/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings (from ground surface)				
Date	Time	Depth	Elev.	Stabilization Time
9/9	7:00 AM	4.1 ft.	2.88	12 hours

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
		S-1	15/9	0-2	6-50-50/3"	>50	Poorly graded sand (SP); dry, very dense, 50% fine sand, 30% medium sand, <5%	SP	
1	Spin						coarse sand, 5% fine gravel, 5% silt, <5% brick, brown. (FILL)	(FILL)	
							Advance HW drill casing to 3 ft.		
2	Spin								
3	Spin								
		S-2	8/3	3-3.6	8-50/2"	>50	Poorly graded sand (SP); wet, very dense, 50% medium sand, 30% coarse sand, 5%	SP (FILL)	
4	Spin						fine sand, 10% fine gravel, <5% silt, brown. (FILL)		
							Advance HW drill casing to 5 ft.		
5	Spin						Advance 3-7/8 in. roller bit to 8.5 ft.		
							Probable nested boulders from 3.6 to 8.5 ft.	Probable	
6	Spin							Nested	
7	Spin							Boulders	
8	Spin								
9	Spin	S-3	24/9	8.5-10.5	33-20-13-20	33	Poorly graded sand (SP); wet, dense, 80% fine sand, 5% medium sand, <5% coarse	SP	
							sand, <5% fine gravel, 5% silt, oily odor, black.		
10	Spin						Advance HW drill casing to 13 ft.		
11	Spin								
12	Spin								
13	Spin								
		S-4	24/14	13-15	44-36-25-37	61	Similar to S-3 except very dense. Oily odor noted.	SP	
14	Spin						Advance 3-7/8 in. roller bit to 18 ft. (open hole)		
15	Spin								
16	Spin								
17	Spin								
18	Spin								
		S-5	24/8	18-20	12-6-22-35	28	Poorly graded sand (SP); wet, medium dense, 55% fine sand, 5% medium sand, <5%	SP	
19	Spin						coarse sand, 30% fine gravel, 5% silt, gray.		
							Advance HW drill casing to 23 ft.		
20	Spin								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Grout the completed borehole from 0 to 71 ft.
2)
3)
4)

M:/Reports/Active/48138.07/Logs/CDFC/Fd-19/FD-19

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-19 SHEET 2 of 4 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696353.5 easting 814172.2
Driller	R. Pryce	Ground Surface El.	6.98 Datum NGVD
Logged By	R. Chase	Date Start	9/8/99 Date End 9/9/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings (from ground surface)

Date	Time	Depth	Elev.	Stabilization Time
9/9	7:00 AM	4.1 ft.	2.88	12 hours

DEPTH	Casing Blows (ft)	Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
21	Spin								
22	Spin								
23	Spin								
		S-6	24/9	23-25	25-20-20-20	40	Silt (ML); wet, hard, 100% silt, gray.	ML	
24	Spin						Advance HW drill casing to 28 ft.		
25	Spin								
26	Spin								
27	Spin								
28	Spin								
		S-7	24/17	28-30	20-19-27-34	46	Similar to S-6, except several lenses of fine sand noted in sample.	ML	
29	Spin						Advance HW drill casing to 33 ft.		
30	Spin								
31	Spin								
32	Spin								
33	Spin								
		S-8	24/22	33-35	15-15-20-22	35	Similar to S-7.	ML	
34	Spin						Advance HW drill casing to 38 ft.		
35	Spin								
36	Spin								
37	Spin								
38	Spin								
		S-9	24/12	38-40	10-19-22-20	41	Silt (ML); wet, hard, 95% silt, 5% fine gravel.	ML	
39	Spin						Advance HW drill casing to 43 ft.		
40	Spin								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Grout the completed borehole from 0 to 71 ft.
2)
3)
4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-19 SHEET 3 of 4 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696353.5	easting 814172.2	
Driller	R. Pryce	Ground Surface El.	6.98	Datum	NGVD
Logged By	R. Chase	Date Start	9/8/99	Date End	9/9/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings (from ground surface)				
Date	Time	Depth	Elev.	Stabilization Time
9/9	7:00 AM	4.1 ft.	2.88	12 hours

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
41	Spin								
42	Spin								
43	Spin								
44	Spin	S-10	24/4	43-45	23-19-20-21	39	Poorly graded gravel (GP); wet, dense, 95% fine gravel, 5% coarse sand, gray. Advance HW drill casing to 48 ft.	GP	
45	Spin								
46	Spin								
47	Spin								
48	Spin								
49	Spin	S-11	24/7	48-50	32-15-20-24	35	Poorly graded sand (SP); wet, dense, 50% fine sand, 30% medium sand, 10% coarse sand, <5% fine gravel, 5% silt, brown. Advance HW drill to 53 ft.	SP	
50	Spin								
51	Spin								
52	Spin								
53	Spin								
54	Spin	S-12	5/3	53-53.4	50/5"	>50	Poorly graded sand (SP); wet, dense, 55% medium sand, 40% coarse sand, 5% fine sand, brown. Advance HW drill casing to 58 ft. Possible cobble from 53.4 to 53.8 ft.	SP	
55	Spin								
56	Spin								
57	Spin								
58	Spin								
59		S-13	0/0	58-58	50/0"	>50	Refusal. Top of bedrock at 58 ft.	BEDROCK	
60							Advance 3-7/8 in. roller bit to 60.8 ft. Advance HW drill casing from 58 to 60.7 ft.		

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Grout the completed borehole from 0 to 71 ft.
2)
3)
4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-19 SHEET 4 of 4 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696353.5	easting 814172.2	
Driller	R. Pryce	Ground Surface El.	6.98	Datum	NGVD
Logged By	R. Chase	Date Start	9/8/99	Date End	9/9/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 4-inch I.D. (HW) flush-joint casing; spin and wash.

Groundwater Readings (from ground surface)				
Date	Time	Depth	Elev.	Stabilization Time
9/9	7:00 AM	4.1 ft.	2.88	12 hours

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
61							Advance 3-7/8 in. roller bit to 61 ft. Begin NX rock core at 61 ft.		
62		R1	61-62		7.75 mins.		R1: 61 to 66 ft. Fresh, medium hard, gray, aphanitic GNEISS with very low angle, very closely spaced,		
63			62-63		8 mins.		rough, planar, fresh, open joints. REC = 80%; RQD = 78%		
64			63-64		7.8 mins.		90% of rock core breaks are mechanical.		
65			64-65		7 mins.				
66			65-66		11.4 mins.				
67		R2	66-67		10.9 mins.		R2: 66 to 71 ft. Similar to R1	BEDROCK	
68			67-68		9.5 mins.		REC =98%; RQD = 98%		
69			68-69		9.1 mins.				
70			69-70		9.6 mins.				
71			70-71		11.1 mins.				1
72							Bottom of exploration at 71 ft.; boring terminated in bedrock.		
73									
74									
75									
76									
77									
78									
79									
80									

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Grout the completed borehole from 0 to 71 ft.
2)
3)
4)

Nobis Engineering PO Box 2890 Concord, New Hampshire 03302	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. OW-D3 SHEET 1 of 1 FILE NO. 48138.07 CHKD. BY J. Trottier

Boring Co.	Atlantic Testing Laboratories, Limited	Boring Location	northing 2696352.5	easting 814168.1	
Driller	R. Pryce	Ground Surface El.	6.79	Datum	NGVD
Logged By	R. Chase	Date Start	9/10/99	Date End	9/10/99

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb safety hammer free falling from a height of 30 inches.
Drill Rig: CME 75 truck mount
Drilling Method: 6-Inch I.D. (SW) flush-joint casing; spin and wash.

Groundwater Readings (from ground surface)				
Date	Time	Depth	Elev.	Stabilization Time
9/10	3:45 PM	5.4	1.4	Upon completion of drilling

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
							Advance SW drill casing to 19 ft.		1
1	Spin						No samples obtained.		
2	Spin								
3	Spin								
4	Spin							SP (FILL)	
5	Spin								
6	Spin								
7	Spin								
8	Spin								
9	Spin								
10	Spin								
11	Spin								
12	Spin								
13	Spin								
14	Spin							SP	
15	Spin								
16	Spin								
17	Spin								
18	Spin								2
19	Spin								
20							Bottom of exploration at 19 ft.		

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Stratum descriptions shown here are based on information from adjacent boring FD-19; please refer to FD-19 for more specific information.
2) Installed 2-inch PVC observation well at 18 ft.; see Observation Well Construction Log for more details.
3)
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 1 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
1	WOC								
2	WOC								
		UO-1	24/17	2-4	———	—	Organic soil (OH); 10% fine sand, 90% organic clay/silt, shells, strong organic odor, dark olive gray/black.		
							Pocket penetrometer: undrained shear strength = 0.02 kips/sf		
3	WOC						Advance PW drill casing to 5 ft.		
							Advance 3-7/8 in. roller bit to 5 ft.		
4	WOC								
								ORGANIC CLAY	
5	WOC								
		UO-2	24/23	5-7	———	—	Organic soil (OH); similar to UO-1		
							Pocket penetrometer: undrained shear strength = 0.05 kips/sf		
6	WOC						Advance PW drill casing to 8 ft.		
							Advance 3-7/8 in. roller bit to 8 ft.		
7	WOC								
8	WOC								
		UO-3	24/20	8-10	———	—	Sandy organic soil (OH); 40% fine sand, 60% organic clay/silt, shells, organic odor, dark olive gray.		
							Pocket penetrometer: undrained shear strength = 0.05 kips/sf		
9	WOC						Advance PW drill casing to 11 ft.		
							Advance 3-7/8 in. roller bit to 11 ft.		
10	WOC								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 2 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
11	WOC								
		UO-4	24/13	11-13	----------	---	Sandy organic soil (OH); 5% medium sand, 35% fine sand, 60% organic clay/silt, shells, strong organic odor, dark olive gray.		
							Pocket penetrometer: undrained shear strength = 0.19 kips/sf		
12	WOC						Advance PW drill casing to14 ft.		
							Advance 3-7/8 in. roller bit to 14 ft.	ORGANIC CLAY	
13	WOC								
14	WOC								
		UO-5	18/18	14-15.5	----------	---	Sandy organic soil (OH); 5% medium sand, 45% fine sand, 50% organic clay/silt, organic odor, dark olive gray.		
							Sampler did not fully extend.		
15	WOC						Pocket penetrometer: undrained shear strength = 0.22 kips/sf		
								15.5 ft.	
		S-1	24/11	15.5-17.5	2-4-6-7	10	S-1A: Silty sand (SM); loose, 5% medium sand, 70% fine sand, 20% silt, 5% clay, organic odor, dark olive brown. (4 in.)		
16	WOC						S-1B: Poorly graded sand (SP); 10% coarse sand, 35% medium sand, 50% fine sand, 5% gravel, gray. (7 in.)		
	10						Advance PW drill casing to 17.5 ft.		
17							End A. Juneau log; 12-21-00	MARINE SAND	
							12-26-00 Rig inspector C. Thunberg		
	22						Advance PW drill casing to 20.5 ft.		
18							Advance 3-7/8 in. roller bit to 20.5 ft.		
	30								
19									
	37								
20									

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 3 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
	42								
21		S-2	24/11	20.5-22.5	13-12-15-20	27	**Sandy silt (ML); 40% fine sand, 2% medium sand, 58% silt, brown.**		1
							Thinly stratified.		
							Advance PW drill casing to 25.5 ft.		
	68						Advance 3-7/8 in. roller bit to 25.5 ft.		
22							Fine gravel noted in wash water return.		
	61							MARINE SAND	
23									
	58								
24									
	63								
25									
	62							25.5 ft.	
26		S-3	24/5	25.5-27.5	33-19-16-15	35	**Poorly graded gravel with silt and sand (GP-GM); 12% fine sand, 18% medium sand, 11% coarse sand, 52% gravel, 7% silt, reddish brown.**		1
							Advance PW drill casing to 27.5 ft.		
	70						Mix drilling mud, specific gravity = 1.09.		
27							Advance 3-7/8 in. roller bit to 27.5 ft.	GLACIO FLUVIAL	
	85								
28		S-4	24/3	27.5-29.5	13-10-8-6	18*	2-1/2 in. piece of gravel with small amount of medium to coarse sand. Insufficient volume of sand to classify, reddish brown.		2
							Advance PW drill casing to 29.5 ft.		
	44						Advance 3-7/8 in. roller bit to 29.5 ft.		
29									
	47								
30		S-5	24/11	29.5-31.5	10-6-4-5	10*	**Silty sand with gravel (SM); 21% fine sand, 21% medium sand, 10% coarse sand, 18% silt, 30% gravel, light brown.** Subangular gravel.		1,2

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 4 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
							Advance PW drill casing to refusal at 34 ft.		
	35						Advance 3-7/8 in. roller bit to 34.5 ft. Rock fragments noted in drilling mud.		
31									
	44								
32									
	60								
33									
	77								
34	100/4"								
35							Telescope HW casing to 34.5 ft. Begin HQ rock core at 34.5 ft. (boring log continued on next page)		
36									
37									
38									
39									
40									

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 5 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
	34.7 ft	R1	34.5-35.5	11 min.	Begin R1 at 34.5 ft. Fresh, moderately hard, pinkish gray, medium grained GRANITE, with horizontal (approx. 0 to 5 degrees) joints, moderately spaced and rough. Several joints filled with fine sand. REC = 100%; RQD = 87% (good) No water return noted.	
35.0						
35.5			35.5-36.5	11.5 min.		
36.0						
36.5			36.5-37.5	13.5 min.		
	36.6 ft				36.6 ft.: Break at horizontal joint.	
37.0						
37.5	37.3 ft		37.5-38.5	8 min.	37.3 ft.: Break at horizontal joint, sand seam.	
					38.75 ft.: Break with two pieces of broken gravel, sand seam.	
38.0	38 ft				38.0 ft.: Break at horizontal joint, sand seam.	
38.5			38.5-39.5	8.5 min.		
39.0	38.9 ft				38.9 ft.: Mechanical break in rock core.	
					39.2 ft.: Mechanical break in rock core. 39.3 ft.: Mechanical break in rock core.	
39.5					End R1 at 39.5 ft.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 6 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R2	39.5-40.5	11 min.	Begin R2 at 39.5 ft. Fresh, moderately hard, pinkish gray, medium grained GRANITE, with horizontal (approx. 0 to 5 degrees) joints, moderately spaced and rough. Several joints filled with fine sand. 12 in. of 36 in. rock core recovered, remainder of barrel filled with washed gravel. REC = 22%; RQD = 22% (very poor) Water return color: clear to gray, change to milky white at 40.5 ft., change to brown from 41.5 to 42.5 ft. Attempted to clear hole with roller bit and light drilling mud, attempted to spin casing; no success.	
40.0						
40.5			40.5-41.5	4.5 min.	Telescope NW casing to 46.0 ft. 39.5 to 43.4 ft.: Semi-angular/rounded gravel recovered in core barrel. Sample preserved in sample jar.	
41.0						
41.5			41.5-42.5	2.5 min.		
42.0						
42.5			42.5-43.5	NR		
43.0						
43.5			43.5-44.5	NR	43.5 ft.: Mechanical break in rock core. Broken rock fragments. Core grinding noted on break surfaces.	
44.0					43.8 ft.: Mechanical break in rock core.	
44.5					End R2 at 44.5 ft.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 7 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
			44.5-45.5	—	44.5 to 46.0 ft.: Telescope NW drill casing. Not cored.	
45.0						
45.5						
			45.5-46.0	—		
46.0						
		R3	46.0-47.0	6 min.	Begin NX rock core at 46.0 ft. Begin R3 at 46.0 ft. Fresh, hard, gray, fine to medium grained GNEISS. Low angle foliation (approx. 20 to 30 degrees).	
46.5					No joints noted.	
					REC = 97%; RQD = 97% (excellent) Water return color: milky white. 46.0 to 46.3 ft.: Discoloration noted.	3
47.0					47.1 to 47.4 ft.: Healed joint: high angle, sand infilled.	
			47.0-48.0	3.5 min.		
47.5						
48.0					47.8 ft.: Healed joint: low angle, sand infilled.	
			48.0-49.0	6 min.	48.0 ft.: Mechanical break in rock core.	
48.5					48.3 ft.: Mechanical break in rock core.	
49.0						
			49.0-50.0	4.5 min.		
49.5						

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 8 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
50.0		R3 (cont.)	50.0-51.0	5 min.		
50.5						
51.0		R4	51.0-52.0	6 min.	End R3 at 51.0 ft. Begin R4 at 51.0 ft. Fresh, moderately hard, gray, medium grained GNEISS. Low angle foliation (approx. 5 to 10 degrees). No joints noted.	
51.5					REC = 94%; RQD = 94% (excellent) Water return color: milky white.	3
52.0			52.0-53.0	6 min.		
52.5					52.3 ft.: Mechanical break in rock core.	
53.0			53.0-54.0	6 min.		
53.5						
54.0			54.0-55.0	4.5 min.		
54.5						

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 9 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
55.0		R4 (cont.)	55.0-56.0	6 min.		
55.5						
56.0		R5	56.0-57.0	6 min.	55.7 to 56.0 ft.: Rock core not recovered. Attempt constant head permeability test. Test unsuccessful, water return noted up HW drill casing. End R4 at 56.0 ft. Begin R5 at 56.0 ft. Fresh, moderately hard, gray, medium grained GNEISS. Low angle foliation (approx. 5 to 10 degrees). No joints noted. REC = 100%; RQD = 100% (excellent) Water return color: milky white.	
56.5						
57.0			57.0-58.0	5 min.		
57.5						
58.0			58.0-59.0	5 min.		
58.5					58.5 ft.: Mechanical break in rock core.	
59.0			59.0-60.0	5.5 min.		
59.5						

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5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 10 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
60.0		R5 (cont.)	60.0-61.0	6 min.	60.2 ft.: Mechanical break in rock core.	
60.5						
61.0			61.0-62.0		60.8 ft.: Mechanical break in rock core. End R5 at 61.0 ft. Bottom of exploration at 61.0 ft. Boring terminated in bedrock. Grout completed borehole to mudline with cement/bentonite grout, specific gravity = 1.40.	
61.5						
62.0			62.0-63.0			
62.5						
63.0			63.0-64.0			
63.5						
64.0			64.0-65.0			
64.5						

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
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4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 11 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

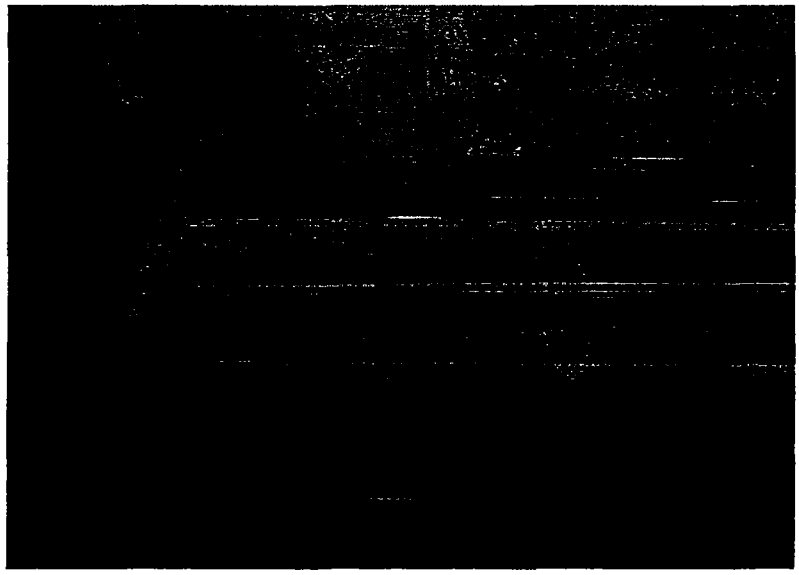
Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Falling Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R1 through R3

Core Runs R1 through R3

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 12 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

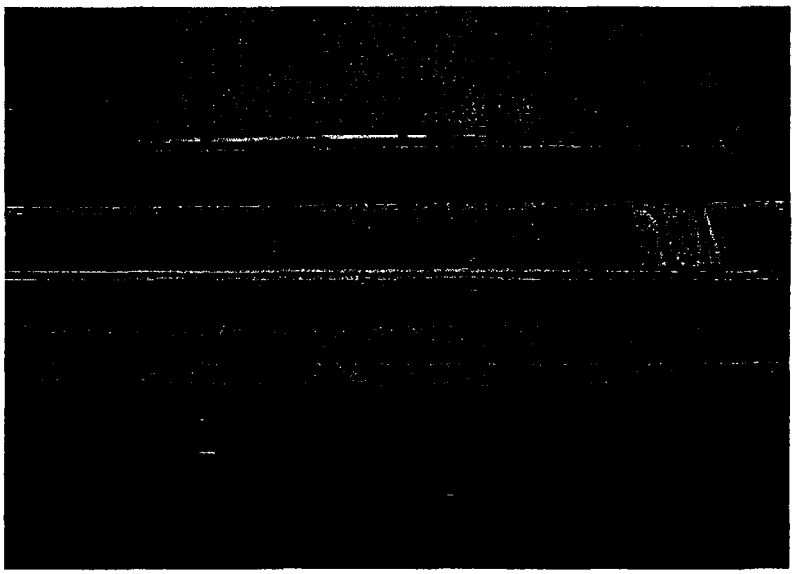
Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R1 through R3

Core Runs R1 through R3

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 13 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

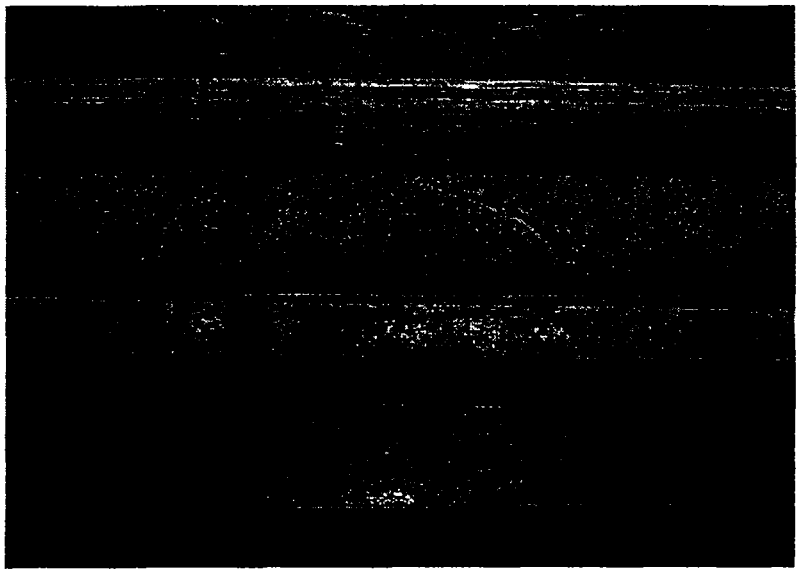
Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Falling Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

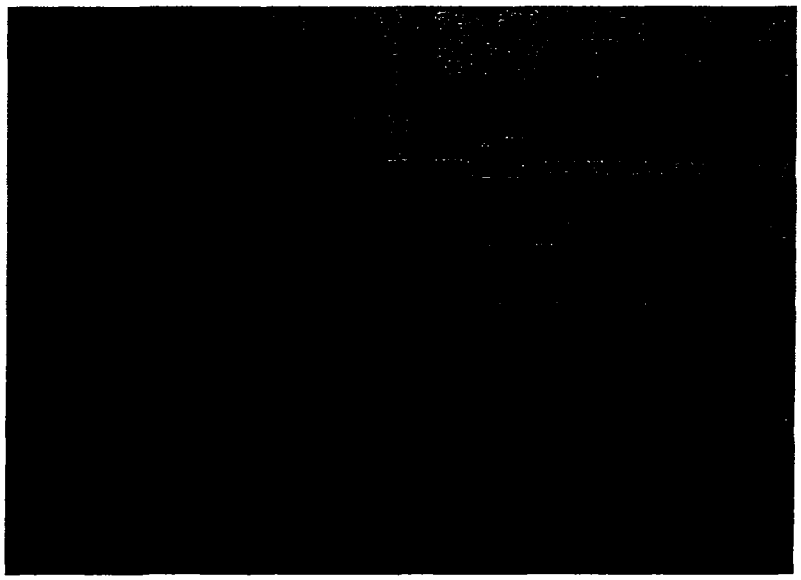
Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Healed sand infilled joint noted in R3



Core Runs R4 and R5

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

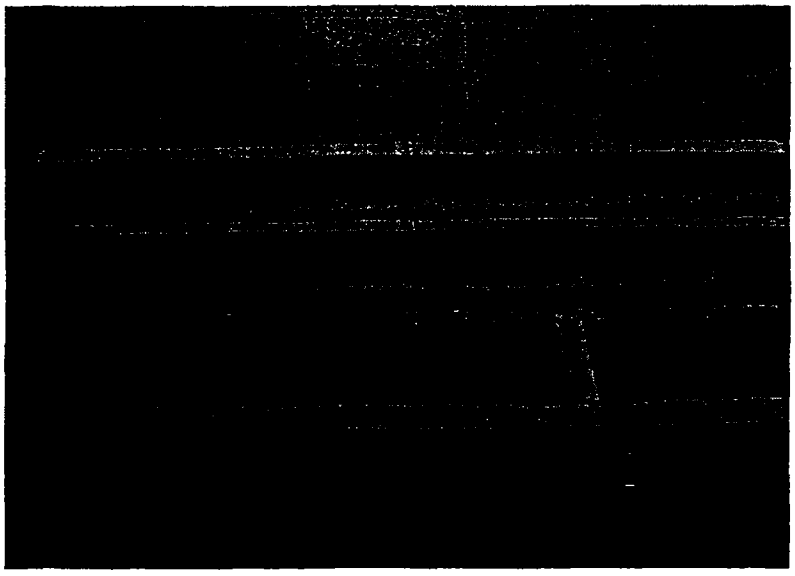
Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 14 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

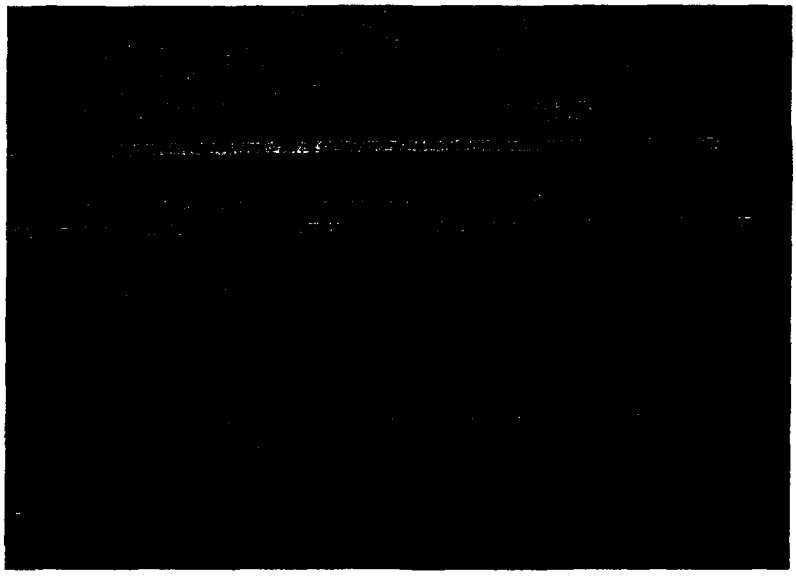
Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R4 and R5



Core Runs R4 and R5

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-108 SHEET 15 of 15 FILE NO. 48138.27 CHKD. BY J. Trottier

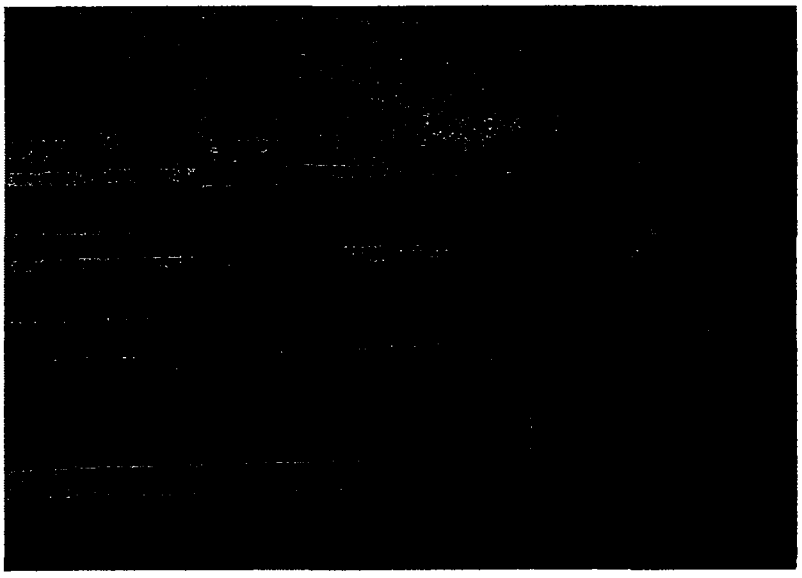
Boring Co.	Warren George, Inc.	Boring Location	northing 2696632	easting 814464	
Driller	S. Laurenza	Mudline El.	-12.46	Datum	NGVD
Logged By	A. Juneau / C. Thunberg	Date Start	12/21/00	Date End	12/29/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. center hole hammer free falling from a height of 30 inches.
Drill Rig: Failing Truck Rig
Drilling Method: 5-inch (PW), 4-inch (HW), and 3-inch (NW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R4 and R5

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
3) RQD biased low due to recovery of less than 100%.
4)

Nobis Engineering
18 Chenell Drive
Concord, New Hampshire 03301

PROJECT		
Remedial Design For Operable Unit 01	BORING NO.	FD-113
New Bedford Harbor Superfund Site	SHEET	1 of 10
New Bedford, Massachusetts	FILE NO.	48138.27
	CHKD. BY	J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696239	easting 814464	
Driller	E. Thomas	Mudline El.	-33.31	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/18/00	Date End	12/20/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing. Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
							Advance PW drill casing to 2 ft.		
1	WOC								
2	WOC								
		S-1	24/1	2-4	WOR/24	—	Organic soil (OH); 95% organic clay/silt, 5% fine sand, strong organic odor, black.		
							Advance PW drill casing to 4 ft.		
3	WOC							ORGANIC CLAY	
4	WOC								
		S-2	24/6	4-6	WOR/24	—	Organic soil (OH); similar to S-1 except black to dark gray, slight sheen noted.		
							Advance PW drill casing to 6 ft.		
							Advance 3-7/8 in. roller bit to 6 ft., no water return noted.		
5	WOC								
6	WOC								
		S-3	24/18	6-8	WOR/24	—	S-3A: Organic soil with sand (OH); very soft, 75% organic clay/silt, 25% fine sand, moderate organic odor, black to dark gray. (12 in.)		
							S-3B: Poorly graded sand with silt (SP-SM); 5% coarse sand, 30% medium sand, 55% fine sand, 10% silt, gray-brown. (6 in.)		
7	WOC						Advance PW drill casing to 8 ft.		
							Advance 3-7/8 in. roller bit to 8 ft.	7.5 ft.	
8	WOC								
		S-4	24/12	8-10	4-3-4-3	7	S-4A: Poorly graded sand (SP); loose, 50% medium sand, 40% fine sand, 5% gravel, 5% silt, gray-brown. (4 in.)	MARINE SAND	
							S-4B: Poorly graded sand with gravel (SP); 15% coarse sand, 40% medium sand, 15% fine sand, 25% gravel, 5% silt, subrounded to subangular sand and gravel, brown. (8 in.)		
9	11								
							Advance PW drill casing to 10 ft.	9.5 ft.	
							Mix bentonite drilling mud, specific gravity = 1.09.	GLACIO FLUVIAL	
10	13						Advance 3-7/8 in. roller bit to 10 ft.		

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
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4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-113 SHEET 2 of 10 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696239	easting 814464	
Driller	E. Thomas	Mudline El.	-33.31	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/18/00	Date End	12/20/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
		S-5	24/12	10-12	3-3-3-3	6	**Poorly graded sand with silt (SP-SM); 11% coarse sand, 26% medium sand, 42% fine sand, 13% gravel, 8% silt, yellowish brown.** Subrounded to subangular sand and gravel.		1
11	DROP						PW drill casing dropped to 12 ft. Advance 3-7/8 in. roller bit to 12 ft.		
12	DROP								
		S-6	24/6	12-14	7-4-3-5	7	Poorly graded sand with gravel (SP); loose, 35% coarse sand, 30% medium sand, 10% fine sand, 20% gravel, 5% silt, subangular to angular sand and gravel, brown.		
13	26						Advanced PW drill casing to 14 ft. Advance 3-7/8 roller bit to 14 ft.		
14	28								
	WOH	S-7	24/10	14-16	6-5-6-6	11	**Silty sand with gravel (SM); 13% coarse sand, 15% medium sand, 15% fine sand, 41% gravel, 16% silt, brown.** Subrounded to subangular sand and gravel.		1
15	7						Advance PW drill casing to 19 ft. Advance 3-7/8 in. roller bit to 19 ft.	GLACIO FLUVIAL	
16	34								
17	43								
18	69								
19	68								
		S-8	9/6	19-19.8	9-5/3-25/0	-	Silty sand with gravel (SM); 20% coarse sand, 10% medium sand, 15% fine sand, 40% gravel, 15% silt, subrounded to subangular sand and gravel, brown.		
20	45/10						Advance PW drill casing to 19.8 ft. Casing refusal on probable cobble. Advance 4-7/8 in. roller bit to 20.5 ft. Probable cobble from 19.8 to 20.1 ft.	19.8 ft. COBBLE	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
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REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-113 SHEET 3 of 10 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696239	easting 814464	
Driller	E. Thomas	Mudline El.	-33.31	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/18/00	Date End	12/20/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
							Advance 4-7/8 in roller bit to 20.5 ft. Telescope HW drill casing to 20.5 ft. Advance 3-7/8 in. roller bit with stabilizer to 21 ft. Probable cobble 20.5 to 21 ft.	GLACIO FLUVIAL	
								COBBLE	
21	SPIN							20.75 ft.	
		S-9	24/5	21-23	15-14-6-6	20	**Silty sand with gravel (SM); 11% coarse sand, 20% medium sand, 21% fine sand, 27% gravel, 21% silt, brown.** Subangular sand and gravel.	GLACIO FLUVIAL	1
							Advance HW drill casing to 26 ft.		
22	SPIN								
23	SPIN								
24	SPIN								
25	SPIN								
26	SPIN							26.0 ft.	
		S-10	19/14	26-27.6	11-16-21-8/1	37	S-10A: Poorly graded sand with silt and gravel (SP); dense, 60% medium sand, 20% fine sand, 15% gravel, 5% silt.	GLACIAL TILL	
					25/0		S-10B: Possible Glacial Till; 10% coarse sand, 20% medium sand, 20% fine sand, 30% gravel, 20% silt.		
27									
28								27.9 ft.	
							Advance 3-7/8 in. bit with stabilizer to 29 ft.	BEDROCK	
							Top of competent bedrock 27.9 ft.		
29							Advance HW drill casing to 28.4 ft.		
							Advance 3-7/8 in. roller bit to remove cuttings.		
							Begin HQ rock core at 29 ft.		
							(boring log continued on next page)		
30									

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
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31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-113 SHEET 4 of 10 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696239	easting 814464	
Driller	E. Thomas	Mudline El.	-33.31	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/18/00	Date End	12/20/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R1	29-30	5 min.	Begin R1 at 29 ft. Fresh, moderately hard, gray, fine-grained GNEISS. Low angle (approx. 10 degrees) foliation. REC. = 88%; RQD = 63% (fair). Water return color: milky white.	
29.5					29.6 ft.: Mechanical break in rock core. 29.8 ft.: Primary joint: low angle, rough, undulating, and open. Distinct black discoloration on fracture surface. Loss of return water at 29.8 ft.	
30.0			30-31	4.5 min.	29.9 to 30.5 ft.: Secondary joint: high angle to vertical, rough, planar, discolored, and open. Distinct black discoloration noted on fracture surface. 30.1 ft.: Mechanical break in rock core.	
30.5					30.5 and 30.7 ft.: Primary joints: low angle to horizontal, rough, planar, discolored, and open.	
31.0			31-32	5 min.	31.2 ft.: Primary joint: low angle, smooth, planer, discolored, and open. Distinct black discoloration on fracture surfaces.	
31.5					31.4 and 31.5 ft.: Primary joints: low angle, rough to smooth, planar, discolored, and open. Distinct black discoloration on fracture surfaces.	
32.0			32-33	6 min.		
32.5					32.4 ft.: Mechanical break in rock core.	
33.0					32.8 ft.: Mechanical break in rock core.	
			33-34	6 min.		
33.5					33.5 to 34.0 ft.: Rock fragments from overcore of R2. Perform packer test from 30 to 34 ft.	
34.0					End R1 at 34 ft.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-113 SHEET 5 of 10 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696239	easting 814464	
Driller	E. Thomas	Mudline El.	-33.31	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/18/00	Date End	12/20/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R2	34-35	4.5 min	Begin R2 at 34 ft. Fresh, moderately hard, gray, fine-grained GNEISS. Low angle (approx. 10 degrees) foliation. REC. = 97%; RQD = 85% (good). No return water noted.	
34.5					34.2 ft.: mechanical break in rock core. 34.4 ft.: Primary joint: low angle, smooth, planar, discolored, and tight. 34.5 and 34.6 ft.: Tight joints; not fractured during coring.	
35.0					34.6 to 34.8 ft.: Highly to completely weathered zone. Discolored rock weathered to residual soil in the form of sand, silt, and gravel.	
			35-36	4 min	35.1 ft.: Mechanical break in rock core.	
35.5						
36.0					35.6 ft.: Mechanical break in rock core.	
			36-37	5 min		
36.5					36.3 ft.: Mechanical break in rock core. 36.3 to 36.5 ft.: Secondary joint: high angle, smooth, planar, slightly discolored, and tight.	
37.0						
			37-38	5.5 min		
37.5					37.4 ft.: Mechanical break in rock core.	
38.0					37.7 ft.: Primary joint: low angle, smooth, planar, discolored, and tight.	
			38-39	4 min		
38.5						
39.0					Perform packer test from 32 to 39 ft. End R2 at 39 ft.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-113 SHEET 6 of 10 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696239	easting 814464	
Driller	E. Thomas	Mudline El.	-33.31	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/18/00	Date End	12/20/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R3	39-40	5 min.	Begin R3 at 39 ft. Fresh, very hard, gray, fine-grained GNEISS. Low angle (approx. 10 to 20 degree) foliation. REC = 98%; RQD = 98% (excellent). No water return noted.	
39.5						
40.0						
			40-41	3 min.		
40.5						
41.0						
			41-42	3 min.		
41.5						
42.0					41.8 to 42.2 ft.: Secondary joint: moderately dipping to high angle, smooth, planar, slightly discolored, and tight. Possible mechanical break of healed joint.	
			42-43	3 min.		
42.5						
43.0						
			43-44	4 min.		
43.5					43.4 ft.: Mechanical break in rock core.	
44.0					End R3 at 44 ft.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
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3)
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-113 SHEET 7 of 10 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696239	easting 814464	
Driller	E. Thomas	Mudline El.	-33.31	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/18/00	Date End	12/20/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMARKS
		R4	44-45	3 min.	Begin R4 at 44 ft. Fresh, hard, gray, fine-grained GNEISS. Low angle (approx. 20 -30 degree) foliation. REC = 100%; RQD = 100% (excellent). No water return noted.	
44.5						
45.0					44.9 ft.: Mechanical break in rock core.	
			45-46	3 min.	45.0 ft.: Primary joint: horizontal to low angle, smooth, planar, discolored, and tight.	
45.5					45.4 ft.: Primary joint: horizontal to low angle, smooth, planar, discolored and tight.	
46.0						
			46-47	3.5 min.		
46.5						
47.0						
			47-48	4.5 min.	46.9 to 47.2 ft.: Secondary joint: high angle, smooth, planar, slightly discolored, and tight. Possible mechanical break of healed joint.	
47.5						
48.0						
			48-49	6 min.		
48.5						
					Perform packer test from 39 to 49 ft. End of R4 at 49 ft. Bottom of exploration at 49.0 ft; boring terminated in bedrock. Grout completed boring to mudline with cement/bentonite slurry, specific gravity = 1.45.	
49.0						

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-113 SHEET 8 of 10 FILE NO. 48138.27 CHKD. BY J. Trottier

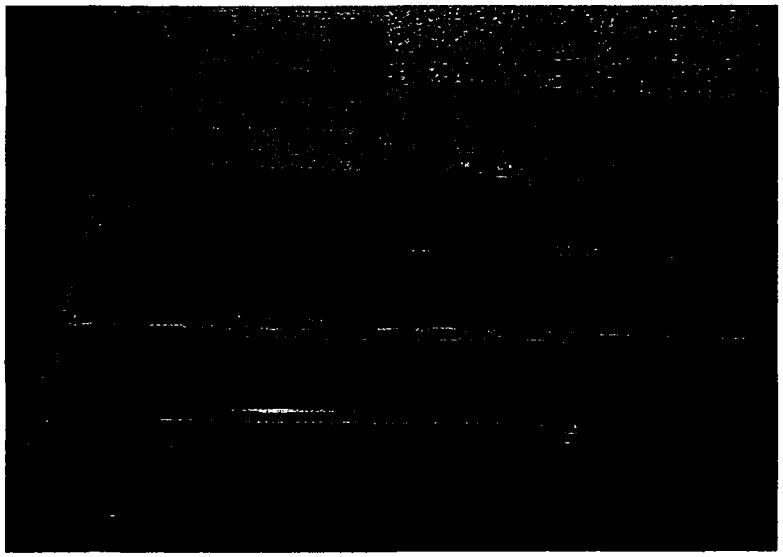
Boring Co.	Warren George, Inc.	Boring Location	northing 2696239	easting 814464	
Driller	E. Thomas	Mudline El.	-33.31	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/18/00	Date End	12/20/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R1 through R3

Core Runs R1 through R3

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-113 SHEET 9 of 10 FILE NO. 48138.27 CHKD. BY J. Trottier

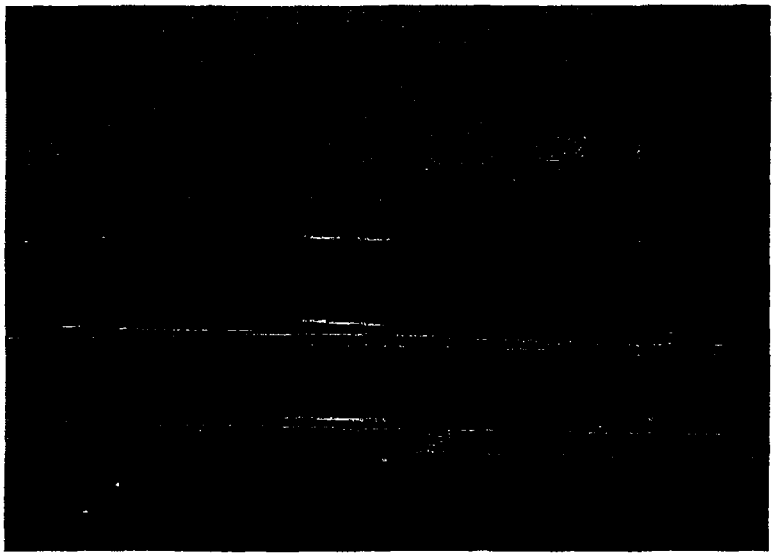
Boring Co.	Warren George, Inc.	Boring Location	northing 2696239	easting 814464	
Driller	E. Thomas	Mudline El.	-33.31	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/18/00	Date End	12/20/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

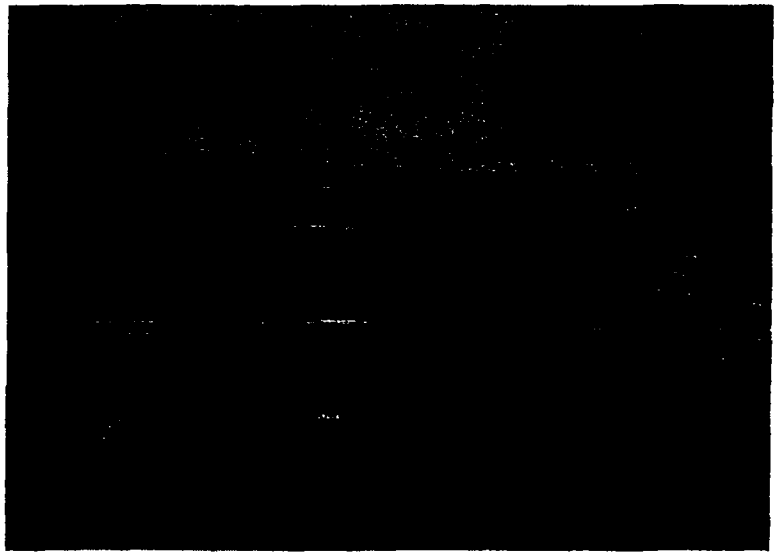
Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R1 through R3



Core Runs R1 through R3 and overcore from bottom of R1

REMARKS:
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-113 SHEET 10 of 10 FILE NO. 48138.27 CHKD. BY J. Trottier

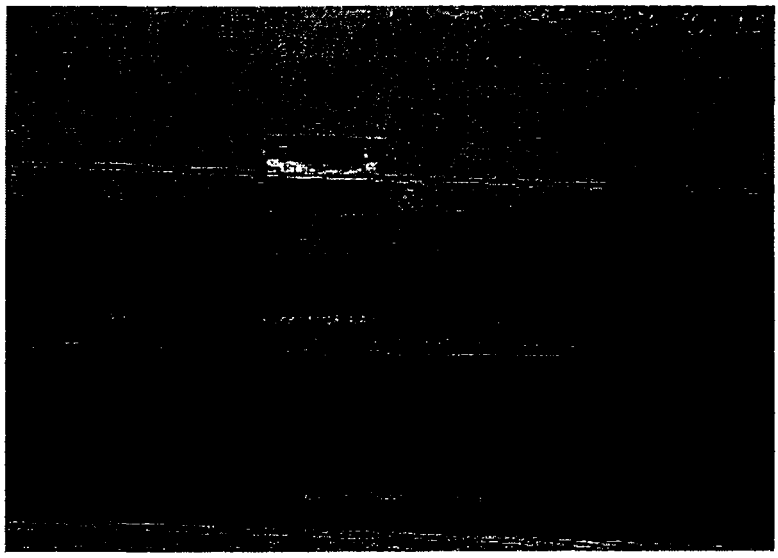
Boring Co.	Warren George, Inc.	Boring Location	northing 2696239	easting 814464	
Driller	E. Thomas	Mudline El.	-33.31	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/18/00	Date End	12/20/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

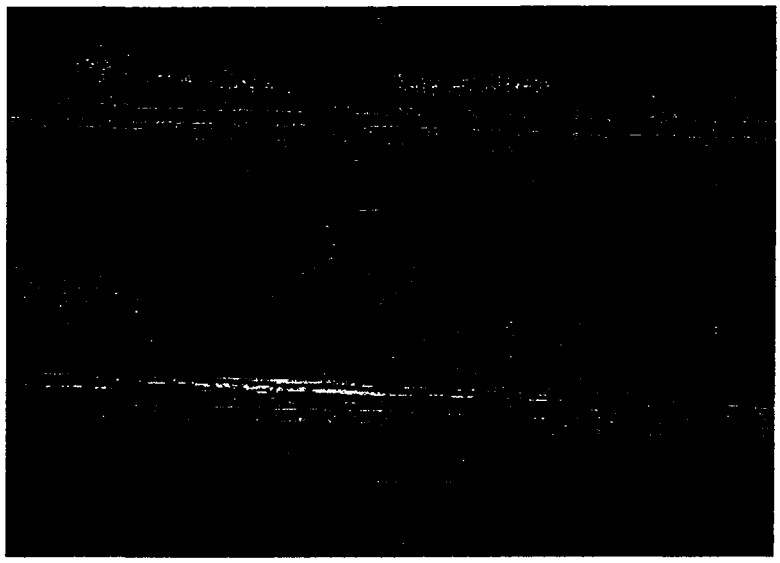
Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Weathered/residual soil zone noted in R2



Weathered/residual soil zone noted in R2

REMARKS:
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3)
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 1 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
							Advance PW drill casing to 2 ft.		
1	WOC								
2	WOC								
		S-1	24/6	2-4	WOR/24	—	Organic soil (OH); 95% organic clay/silt, 5% fine sand, strong organic odor, black to dark gray.	ORGANIC CLAY	
3	WOC						Advance PW drill casing to 4 ft.		
4	WOC								
		S-2	24/18	4-6	WOR/18-8	—	S-2A: Organic soil (OH); similar to S-1. (12 in.) S-2B: Silty sand (SM); 10% coarse sand, 35% medium sand, 35% fine sand, 5% gravel, 15% silt, subround sand and gravel, gray. (6 in.).		
5	WOC						Advance PW drill casing to 6 ft. Advance 3-7/8 in. roller bit to 6 ft.		
								5.5 ft.	
6	WOC						Perform falling head permeability test at 6 ft.	MARINE SAND	
		S-3	24/6	6-8	15-12-10-11	22	**Silty sand with gravel (SM); 10% coarse sand, 20% medium sand, 19% fine sand, 33% gravel, 18% silt, light brown.** Subround to subangular sand and gravel		1
7	37						Advance PW drill casing to 11 ft. Advance 3-7/8 in. roller bit to 11 ft.		
8	35							GLACIO FLUVIAL	
9	21								
10	23								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) RQD biased low due to recovery of less than 100%.
3)
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 2 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
11	20								
		S-4	24/10	11-13	8-8-6-14	14	**Well-graded gravel with silt and sand (GW-GM); 50% gravel, 13% coarse sand, 18% medium sand, 12% fine sand, 7% silt, brown.**		1
12	22						Subangular sand and gravel. Advance PW drill casing to 16 ft. Advance 3-7/8 in. roller bit to 16 ft.	GLACIO FLUVIAL	
13	35								
14	29								
15	27						Approximately 12 in. of material in bottom of casing. Mix bentonite drilling mud to remove material, specific gravity = 1.08. Flush casing with water to remove drilling mud.		
16	28						Perform falling head permeability test at 16 ft.		
		S-5	11/2	16-16.9	18-75/5	—	Poor recovery; spoon refusal on probable cobble. Advance PW drill casing to 16.5 ft. Advance 3-7/8 in. roller bit to 17.5 ft. Probable cobble from 17 to 17.5 ft.		
17	109/6							17.0 ft.	
								COBBLE 17.5 ft.	
18	40						Advance PW drill casing to 21 ft. Mix additional bentonite drilling mud, specific gravity = 1.09. Advance 3-7/8 in. roller bit to 21 ft.	GLACIO FLUVIAL	
19	57								
20	54								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) RQD biased low due to recovery of less than 100%.
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 3 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
21	53								
		S-6	24/10	21-23	12-14-15-17	29	**Well-graded gravel with silt and sand (GW-GM); 62% gravel, 6% coarse sand, 13% medium sand, 12% fine sand, 7% silt, brown.**		1
							Subangular sand and gravel.		
22	57						Advance PW drill casing to 23 ft.		
							Advance 3-7/8 in. roler bit to 23 ft. with bentonite drilling mud to remove material from casing. Flush casing with water to remove drilling mud.		
23	63						Perform constant head permeabiltiy test at 23 ft.		
		S-7	24/6	23-25	40-59-16-14	75	**Poorly graded gravel with silt and sand (GP-GM); 12% coarse sand, 16% medium sand, 15% fine sand, 48% gravel, 9% silt, brown.**		1
							Subround to subangular sand and gravel.		
24	100						Advanced sampler past probable cobble from 23 to 24 ft.		
							Advanced PW drill casing to 25 ft. Pushed probable cobble with casing.		
							Mix additional bentonite drilling mud. Advance 3-7/8 in. roller bit to 26 ft. past cobble.	GLACIO FLUVIAL	
25	95								
26	64						Unable to keep hole open, Advance PW drill casing to 27 ft. Mix additional bentonite drilling mud, specific gravity = 1.09.		
							Advance 3-7/8 in. roller bit to 27 ft.		
27	113								
		S-8	24/10	27-29	14-14-14-12	28	Poorly graded sand with silt and gravel (SP-SM); medium dense, 10% coarse sand, 40% medium sand, 20% fine sand, 20% gravel, 10% silt, subrounded to subangular sand and gravel, brown.		
28	60						Advance PW drill casing to 31.5 ft; casing refusal. Top of bedrock 31.5 ft.		
							Advance 3-7/8 in. roller bit to 32 ft.		
29	52								
30	58								

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Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 4 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
							Advance 4-7/8 in. roller bit to 32.5 ft. Cuttings indicate possible weathered bedrock.		
							Telescope NW drill casing to 33 ft. (spin).	GLACIO FLUVIAL	
31	90								
	123							31.5 ft.	
32								BEDROCK	
33							Begin HQ rock core at 32.5 ft. (boring log continued on next page)		
34									
35									
36									
37									
38									
39									
40									

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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 5 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

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Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMARKS
		R1	32.5-33.5	6.5 min.	Begin R1 at 32.5 ft. Fresh, hard, gray medium to fine grained GNEISS. Low angle foliation (approx. 10-15 degrees). REC = 92%; RQD = 80% (good). Water return color: rust.	
33.0						
33.5					33.4 ft.: Mechanical break in rock core.	
			33.5-34.5	5 min	33.5 ft.: Pause advancement of core R1 to advance HW drill casing to achieve better casing seal.	
34.0						
					34.2 ft.: Mechanical break in rock core.	
34.5					34.4 and 34.5 ft.: Primary joints: low angle, rough, planar, discolored, and open.	
			34.5-35.5	4.5 min.	34.5 ft.: Loss of water return noted. 34.4 to 34.8 ft.: Discoloration of rock core noted.	
35.0						
					35.1 ft.: Primary joint: low angle, rough, planar, partially discolored, and tight. Possible mechanical break.	
35.5						
			35.5-36.5	4 min.	35.5 ft.: Primary joint: horizontal, rough, planar, discolored, and open. 35.5 to -35.7 ft.: Secondary joint: moderatly dipping to high angle, smooth, planar, discolored, and open.	
36.0					35.6 to 36.1 ft.: Distinct discoloration and slight weathering of core noted. 36.0 ft.: Primary joint: low angle, rough, stepped, discolored, and open. Possible mechanical break.	
					36.2 and 36.3 ft.: Mechanical break in rock core.	
36.5						
			36.5-37.5	5.5 min.	36.6 to 37.2 ft.: Quartz/feldspar vein. Dark gray to milky white/pink in color. (pegmatic)	
37.0						
					37.2 ft.: Primary joint: low angle, rough, undulating, discolored, and tight.	
37.5					End R1 at 37.5 ft.	

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5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
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4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 6 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. cerfter hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R2	37.5-38.5	4.5 min.	Begin R2 at 37.5 ft. Fresh, hard, gray, medium to fine grained GNEISS. Low angle foliation (approx. 10-20 degrees). No natural joints/fractures or mechanical breaks noted. REC = 93%; RQD = 93% (excellent). No water return noted during R2.	2
38.0						
38.5			38.5-39.5	4 min.		
39.0						
39.5			39.5-40.5	3.5 min.		
40.0						
40.5			40.5-41.5	4 min.		
41.0						
41.5			41.5-42.5	2.5 min.		
42.0						
42.5					End R2 at 42.5 ft.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) RQD biased low due to recovery of less than 100%.
3)
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 7 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R3	42.5-43.5	4.5 min.	Begin R3 at 42.4 ft. Fresh to slightly weathered, hard, gray, medium to fine grained, GNEISS. Low angle foliation (approx. 10 degrees). REC = 90%; RQD = 90% (good/excellent). No water return noted during R2.	2
43.0						
43.5					43.4 ft.: Mechanical break in rock core.	
			43.5-44.5	4 min.	43.6 ft.: Mechanical break in rock core.	
44.0					43.8 ft.: Mechanical break in rock core. 44.0 ft.: Primary joint: low angle, smooth, planar, discolored, and open.	
44.5						
			44.5-45.5	5 min.		
45.0					44.9 ft.: Mechanical break in rock core.	
45.5						
			45.5-46.5	4 min.	45.6 to 47.0 ft.: Slightly weathered zone; minor discoloration noted. 45.7 ft.: Primary joint: low angle, smooth, planar, discolored, and open.	
46.0					46.2 ft.: Mechanical break in rock core. 46.3 and 46.4 ft.: Mechanical breaks in rock core.	
46.5						
			46.5-47.5	4.5 min.		
47.0					47.0 ft.: Mechanical break in rock core. 47.0 to 47.1 ft.: Quartz/feldspar vein. Dark gray to pink in color.	
47.5					End R3 at 47.5 ft.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) RQD biased low due to recovery of less than 100%.
3)
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 8 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R4	47.5-48.5	5.5 min.	Begin R4 at 47.5 ft. Fresh to slightly weathered, hard, gray, medium to fine grained GNEISS. REC = 100%; RQD = 85% (good). No water return noted during R4. 47.5 to 47.6 ft.: Weathered zone; discoloration noted. 48.4 ft.: Mechanical break in rock core.	
48.0						
48.5			48.5-49.5	3.5 min.		
49.0					48.9 ft.: Primary joint: low angle, rough, planar, discolored, and tight. 48.9 to 49.5 ft.: Weathered zone. Mechanical break at 49.1 ft. Rock has been weathered to a residual soil along mechanical break; material is friable.	
49.5			49.5-50.0	5.5 min.	49.6 ft.: Primary joint: low angle, to horizontal, smooth, planar, discolored, and tight. Possible mechanical break.	
50.0					50.2 ft.: Mechanical break in rock core.	
50.5			50.0-50.5	5 min.		
51.0					51.3 ft.: Mechanical break in rock core.	
51.5			50.5-51.0	5 min.		
52.0					52.3 ft.: Mechanical break in rock core. 52.4 to 52.5 ft.: Quartz/feldspar vein. Dark gray/pink in color. 52.5 ft.: Primary joint: low angle, smooth, planar, discolored, and open.	
52.5					End R4 at 52.5 ft.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) RQD biased low due to recovery of less than 100%.
3)
4)

Nobis Engineering, 18 Chenell Drive, Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 9 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing. Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R5	52.5-53.5	6 min.	Begin R5 at 52.5 ft. Fresh, very hard, gray, medium to fine grained GNEISS. Low angle foliation (approx. 10 degrees). REC = 97%; RQD = 93% (excellent).	2
53.0					No water return noted during R5. 52.5 to 52.7 ft.: Secondary joint: moderately dipping, rough, planar, discolored, and open. 53.0 to 53.2 ft.: Quartz/feldspar vein. Dark gray/pink in color.	
53.5					53.2 ft.: Mechanical break in rock core.	
			53.5-54.5	5.5 min.	53.9 ft.: Mechanical break in rock core.	
54.0						
54.5					54.3 ft.: Mechanical break in rock core.	
			54.5-55.5	6 min.		
55.0					55.0 ft.: Mechanical break in rock core. 55.0 to 55.1 ft.: Quartz/feldspar vein. Dark gray/pink in color.	
55.5					55.3 ft.: Mechanical break in rock core.	
			55.5-56.5	7 min.	55.7 ft.: Mechanical break in rock core	
56.0					56.0 to 56.1 ft.:Quartz/feldspar vein. Dark gray/pink in color.	
56.5					56.4 to 56.5 ft.:Quartz/feldspar vein. Dark gray/pink in color.	
			56.5-57.5	6.5 min.		
57.0					Perform single packer test from 47.5 to 57.5 ft. Perform single packer test from 37.5 to 57.5 ft. End R5 at 57.5 ft. Bottom of exploration at 57.5 ft; boring terminated in bedrock.	
57.5					Grout completed boring to mudline with cement/bentonite slurry, specific gravity = 1.40.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) RQD biased low due to recovery of less than 100%.
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 10 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

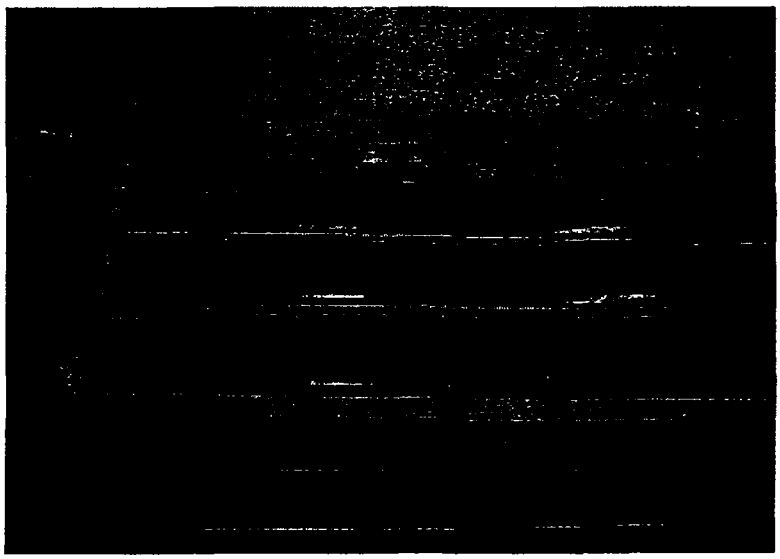
Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R1 through R3

Core Runs R1 through R3

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) RQD biased low due to recovery of less than 100%.
3)
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 11 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

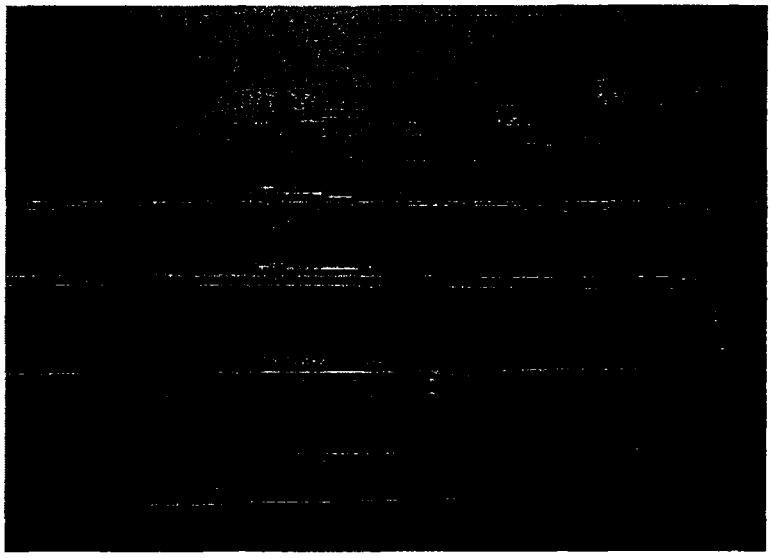
Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

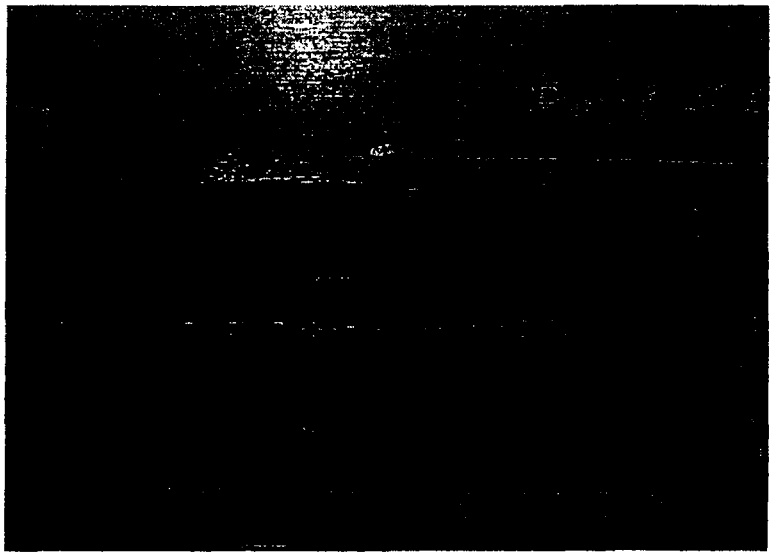
Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R1 through R3



Quartz/feldspar vein (pegmatic) noted in bottom of R1

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) RQD biased low due to recovery of less than 100%.
3)
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-109 SHEET 12 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

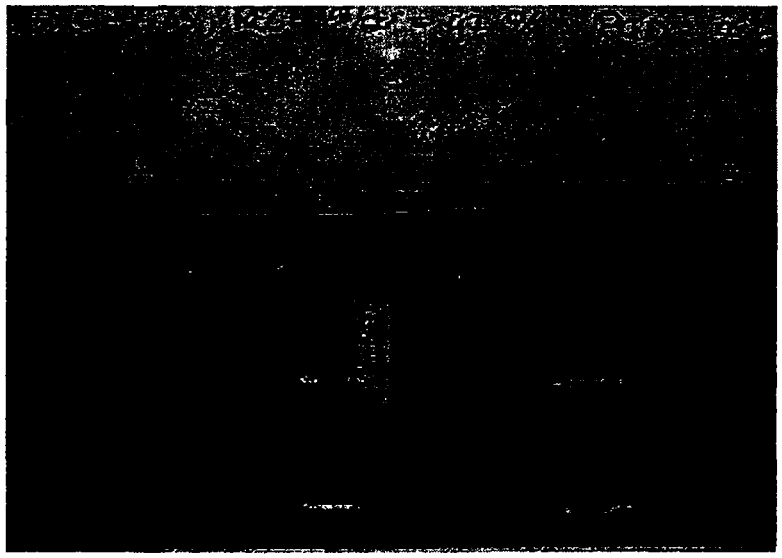
Boring Co.	Warren George, Inc.	Boring Location	northing 2696353	easting 814480	
Driller	E. Thomas	Mudline El.	-33.04	Datum	NGVD
Logged By	E. Thibodeau	Date Start	12/20/00	Date End	12/27/00

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Casing driven with a 300 lb. center hole hammer free falling from a height of 24 inches.

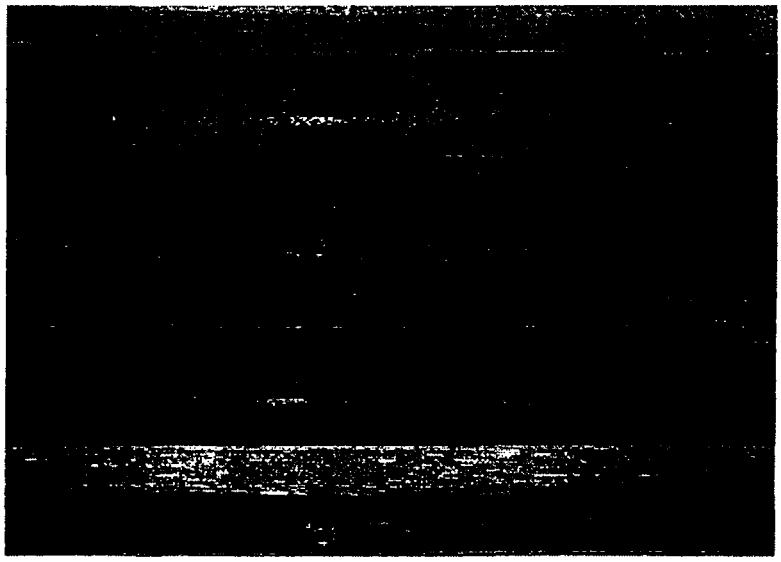
Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Weathered zone noted in top of R4



Quartz/feldspar vein noted in R5

REMARKS:
1) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
2) RQD biased low due to recovery of less than 100%.
3)
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 1 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing 4-inch (HW) flush joint drill casing.
Spin and wash.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
		S-1	4/1	0-0.3	50/4"	—	Casing resting on mudline, very hard bottom, attempt split barrel sample.		
							S-1: Spoon refusal. Rock fragment noted in tip of sampler.	BOULDER/	
							Advance 4-7/8 in. roller bit to 1.2 ft.	DEBRIS	
1	SPIN						Probable boulder or piece of debris		
							Telescope HW drill casing to 2 ft. (spin and wash)	1.2 ft	
2	SPIN								
		S-2	24/6	2-4	1-1-3-6	4	Clayey sand (SC); loose, 20% organic clay/silt, 40% medium sand, 30% fine sand, 5% coarse sand, 5% shell fragments, strong organic odor, black.		
							Advance HW drill casing to 4 ft.		
3	SPIN						Advance 3-7/8 in. roller bit to 4 ft.	ORGANIC	
								CLAY	
4	SPIN							4.0 ft.	
		S-3	24/6	4-6	7-5-5-11	10*	Poorly graded sand with gravel (SP); loose, 15% coarse sand, 35% medium sand, 20% fine sand, 25% gravel, 5% silt, subrounded to subangular sand and gravel, slight organic odor, gray. Several pieces of gravel were flat and elongated.		1
5	SPIN						Advance HW drill casing to 6 ft.	MARINE	
							Advance 3-7/8 in. roller bit to 6 ft.	SAND	
6	SPIN						Perform falling head permeability test at 6 ft.		
		S-4	24/1	6-8	8-8-7-14	15	Poorly graded sand with silt (SP-SM); medium dense, 40% medium sand, 50% fine sand 10% silt, gray-brown.		
							Headspace: < 1 ppm.		
7	SPIN						Advance HW drill casing to 9 ft.		
							Advance 3-7/8 in. roller bit to 9 ft.		
8	SPIN								
9	SPIN								
		S-5	24/12	9-11	13-6-1-1	7	**Silt with sand (ML); 74% silt, 3% medium sand, 23% fine sand, light brown.**		2
							Headspace: < 1 ppm.		
							Advance HW drill casing to 14 ft.		
10	SPIN						Advance 3-7/8 in. roller bit to 14 ft.		

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
2) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
3)
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 2 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Spin and wash.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
11	SPIN							MARINE SAND	
12	SPIN								
13	SPIN								
14	SPIN						Perform falling head permeability test at 14 ft.		
		S-6	24/12	14-16	25-22-11-11	33	**Silty sand (SM); 3% coarse sand, 14% medium sand, 56% fine sand, 4% gravel, 23% silt, brown.** Subrounded to subangular sand and gravel.		2
15	SPIN						Headspace: < 1 ppm. Advance HW drill casing to 19 ft. Advance 3-7/8 in. roller bit to 19 ft.		
16	SPIN							16.5 ft.	
17	SPIN							GLACIO FLUVIAL	
18	SPIN								
19	SPIN								
		S-7	24/3	19-21	13-11-7-4	18	Poorly graded sand with silt and gravel (SP-SM); medium dense, 20% coarse sand, 25% medium sand, 20% fine sand, 25% gravel, 10% silt, brown. Subrounded to subangular sand and gravel.		
20	SPIN						Advance HW drill casing to 21 ft.		

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
2) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
3)
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 3 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Spin and wash.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
							Advance 3-7/8 in. roller bit to 21 ft.		
21	SPIN						Perform constant head permeability test at 21 ft.		
		S-8	24/1	21-23	13-11-5-3	16	Poor recovery. Several large pieces of angular coarse gravel recovered.		
							One large angular flat and elongated piece of coarse gravel noted.		
							Advance HW drill casing to 23 ft.		
22	SPIN						Advance 3-7/8 in. roller bit to 23 ft.		
23	SPIN							GLACIO	
		S-9	24/10	23-25	22-17-22-27	39*	**Poorly graded sand with silt and gravel (SP-SM); 5% coarse sand, 38% medium sand, 17% fine sand, 34% gravel, 6% silt, brown.** Subrounded to subangular sand and gravel.	FLUVIAL	1,2
							(2 jars)		
24	SPIN						Headspace: 21 ppm. (jar #2)		
							Advance HW drill casing to 27 ft.		
							Advance 3-7/8 in. roller bit to 27 ft.		
25	SPIN								
26	SPIN								
27	SPIN								
		S-10	24/7	27-29	7-4-4-21	8*	**Poorly graded sand with silt and gravel (SP-SM); 11% coarse sand, 16% medium sand, 22% fine sand, 46% gravel, 5% silt, brown.** Rounded to subangular sand and gravel.		1,2
							(2 jars)		
28	SPIN						Headspace: 18 ppm. (jar #2)		
							Advance HW drill casing to 29 ft.		
							Advance 3-7/8 in. roller bit to 29 ft.		
							Perform constant head permeability test at 29 ft.		
29	SPIN							29.0 ft.	
		S-11	1/1	29-29.1	75/1"	—	Washed sample.		
			Interval		Time		Advance 3-7/8 in. roller bit to 29.5 ft.	BOULDER	
			29.5-30.5		7.5 min.		Advance HW drill casing to 29.7 ft.		
30	SPIN						Begin HQ rock core at 29.5 ft.		

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
2) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
3)
4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 4 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing. Spin and wash.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	PEN/REC (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
			Interval		Time				
							Core: 29.5 to 32.0 ft.		
			30.5-31.5		5 min.		Core barrel penetrated boulder at 32 ft., core run terminated.		
31	SPIN						Advance 3-7/8 in. roller bit to 32 ft.	BOULDER	
							Roller bit cuttings recovered utilizing a U.S. No. 140 sieve and preserved in sample jar. Cuttings indicate coarse to fine sand and gravel. Unable to keep hole through boulder open.		
			31.5-32.0		5 min.		Advance HW drill casing to 32 ft.		
32	SPIN							32.0 ft.	
		S-12	24/12	32-34	10-12-15-12	27	**Poorly graded sand with silt and gravel (SP-SM); 16% coarse sand, 23% medium sand, 31% fine sand, 19% gravel, 11% silt, brown.** Subrounded to angular sand and gravel.		2
							Headspace: <1 ppm.		
33	SPIN						Advance 3-7/8 in. roller bit to 37 ft.	GLACIO FLUVIAL	
							Advance HW drill casing to 37 ft.		
							Advance 3-7/8 in. roller bit to wash out casing.		
34	SPIN								
35	SPIN								
36	SPIN								
37	SPIN								
		S-13	16/9	37-38.3	14-36-75/4"	—	S-13A: Poorly graded gravel with silt and sand (GP-GM); 65% gravel, 10% coarse sand, 10% medium sand, 5% fine sand, 10% silt, subrounded to subangular sand and gravel, brown. (3 in.)		
38	SPIN						Headspace: <1 ppm. (S-13A)		
							S-13B: Weathered bedrock / residual soil. (6 in.)		
							Headspace: <1 ppm. (S-13B)		
							Advance 3-7/8 in. roller bit to wash out casing.		
39	SPIN						Advance 3-7/8 in. roller bit to 40.5 ft.	39.0 ft.	
							Advance HW drill casing to 39.5 ft.		
							Top of competent bedrock at 40.0 ft.	WEATHERED BEDROCK	
							Begin HQ rock core at 40.5 ft.		
40	SPIN						(boring log continued on next page)	40.0 ft.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
2) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
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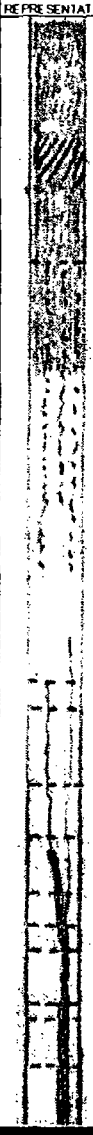
Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 5 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Spin and wash

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R1	40.5-41.5	4.5 min.	Begin R1 at 40.5 ft. Slightly weathered, medium to moderately hard, gray, fine to medium grained GNEISS. Low angle (approx. 10-30 degrees) foliation. REC. = 95%; RQD = 45% (poor). Water return color: rust. 40.5 to 42.1 ft.: Weathered zone. Rock notably discolored. Rock structure still intact. Rock is slightly friable from 41 to 41.2 ft.	
41.0						
41.5			41.5-42.5	6 min.	41.6 ft.: Mechanical break in rock core. 41.6 to 43.0 ft.: Set of three high angle to vertical healed joints or fractures.	
42.0						
42.5			42.5-43.5	5.5 min.	42.5 ft.: Loss of water return.	
43.0						
43.5			43.5-44.5	4 min.	43.3 to 45.5 ft.: High angle to vertical joint. Joint is intact from 43.3 to 43.5 ft. Possible machine break from 43.5 to 45.5 ft. joint is smooth, planar, discolored, and tight. 43.5, 43.6, 43.9, 44.2, 44.4, 44.6, 44.7, 44.9, 45.0, and 45.2 ft.: Mechanical break in rock core along foliation and perpendicular to high angle joints. 43.5 to 45.0 ft.: High angle to vertical joint. Joint runs parallel to other high angle joint and the two joints appear to merge at 44.7 ft. Joint is rough, undulating, discoloration noted from 43.5 to 44.3 ft. Joint becomes open but infilled from 44.3 to 45.5 ft. Infilling material is dark gray in color.	
44.0						
44.5			44.5-45.5	5 min.		
45.0						
45.5					Perform packer test from 43 to 45.5 ft. End R1 at 45.5 ft.	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
2) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 6 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing. Spin and wash.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMARKS
		R2	45.5-46.5	4 min	Begin R2 at 45.5 ft. Fresh, hard, gray, fine to medium grained GNEISS. No distinct foliation noted. REC. = 100%; RQD = 17% (very poor). RQD biased low due to the presence of high angle/vertical joints. No water return noted. 45.5 to 47.6 ft.: High angle to vertical joint/fracture. Joint is rough, undulating, and infilled. Joint is intact from 46.7 to 47.6 ft. Several mechanical breaks noted throughout zone. All breaks may be mechanical / broken during coring. Infilling material is dark gray in color. Appears to be comprised mostly of sand.	
46.0						
46.5			46.5-47.5	4 min		
47.0						
47.5			47.5-48.5	4.5 min		
48.0					47.8 to 50.2 ft.: High angle to vertical joint/fracture. Joint is healed and intact with calcite or quartz infilling. Joint runs parallel to another high angle / verticle joint. Joints intersect at 49.2 ft. then split again. Several mechanical breaks noted across joint.	
48.5					48.4 to 50.0 ft.: High angle to vertical joint/fracture. Joint is infilled and intact. Intersects aforementioned joint at 49.2 ft. then splits again. Infilling material appears to be comprised mostly of sand.	
			48.5-49.5	5.5 min		
49.0						
49.5			49.5-50.5	6 min	49.5 to 49.7 ft.: Quartz/feldspar zone. Pink/dark gray in color. Pegmatic.	
50.0					49.8 to 50.2 ft.: Quartz/feldspar zone. Pink/dark gray in color. Pegmatic. 50.2 ft.: Mechanical break in rock core. 50.2 to 50.5 ft.: High angle/vertical joint. Distinct discoloration and weathering noted on joint surface. End R2 at 50.5 ft.	
50.5						

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
2) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 7 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing. Spin and wash.

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R3	50.5-51.5	3.5 min.	Begin R3 at 50.5 ft. Fresh to slightly weathered, hard, gray, fine to medium grained GNEISS. Horizontal to low angle foliation (0 to 10 degrees). REC. = 100%; RQD = 30% (poor). RQD biased low due to the presence of high angle/vertical joints. No water return noted. 50.5 to 53.6 ft.: High angle/vertical joint/fracture. Joint is rough, undulating, discolored, and weathered from 50.5 to 51.7 ft. Joint is dark gray in color and consists primarily of sand/silt. Joint is broken/heavily fractured from coring process.	
51.0						
51.5						
			51.5-52.5	6 min.	51.5 ft.: Mechanical break in rock core.	
52.0						
					52.2 ft.: Mechanical break in rock core.	
52.5						
			52.5-53.5	4 min.		
53.0						
53.5						
			53.5-54.5	5.5 min.	53.6 to 53.9 ft.: Healed joint/fracture. 53.6 to 54.4 ft.: Healed joint/fracture.	
54.0						
					54.1 ft.: Mechanical break in rock core.	
54.5						
			54.5-55.5	4 min.		
55.0						
					55.2 ft.: Mechanical break in rock core. 55.2 to 55.5 ft.: Mechanical break in rock core. (vertical) Perform packer test from 45.5 to 55.5 ft.	
55.5					End R3 at 55.5 ft.	

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11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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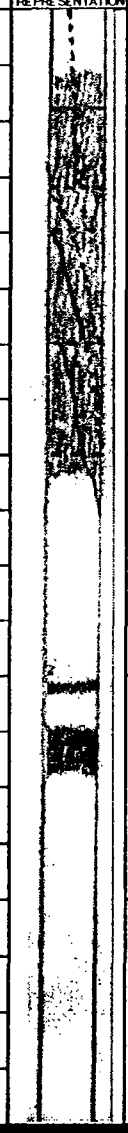
Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 8 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing.
Spin and wash.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMARKS
		R4	55.5-56.5	2.5 min.	Begin R4 at 55.5 ft. Fresh to slightly weathered, moderately hard, gray, fine to medium grained GNEISS. Low angle foliation (approx. 10 to 20 degrees). REC. = 100%; RQD = 82% (good). No water return noted. 55.8 to 57.6 ft.: Slight discoloration/weathering noted. 55.5 to 56.3 ft.: Healed joint. High angle to vertical. Some discoloration noted along joint surface. 56.3, 56.5, 57.0, and 57.5 ft.: Mechanical breaks in rock core.	
56.0						
56.5			56.5-57.5	3 min.	56.3 to 57.1 ft.: Healed joint. High angle to vertical. Some discoloration noted along joint surface. 56.3 to 56.5 ft.: Mechanical break in rock core. 56.5 to 57.5 ft.: Secondary joint: high angle, smooth, planar, discolored, and tight. Healed from 57.0 to 57.5 ft. Possible mechanical break. 57.0 to 57.7 ft.: Secondary joint: high angle, smooth, planar, discolored, and tight. Possible mechanical break.	
57.0						
57.5			57.5-58.5	3.5 min.		
58.0						
58.5			58.5-59.5	3 min.	58.6 ft.: Quartz/feldspar vein. Dark gray/pink in color. 58.7 to 58.9 ft.: Quartz/feldspar vein. Dark gray/pink in color.	
59.0						
59.5			59.5-60.5	3 min.		
60.0					End of R4 at 60.5 ft. Bottom of exploration at 60.5 ft; boring terminated in bedrock. Grout completed boring to mudline with cement/bentonite slurry, specific gravity = 1.45.	
60.5						

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Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
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REMARKS:
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 9 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
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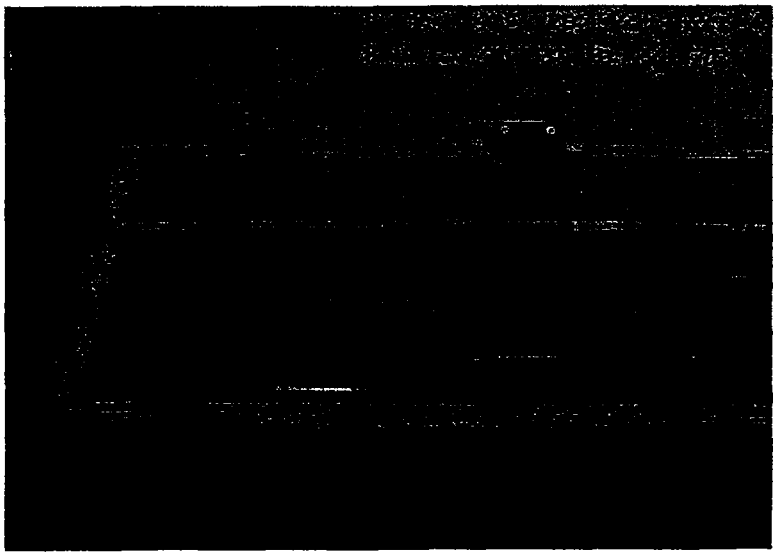
Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R1, R2, and boulder core

Core Runs R1, R2, and boulder core

REMARKS:
1) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
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Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 10 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
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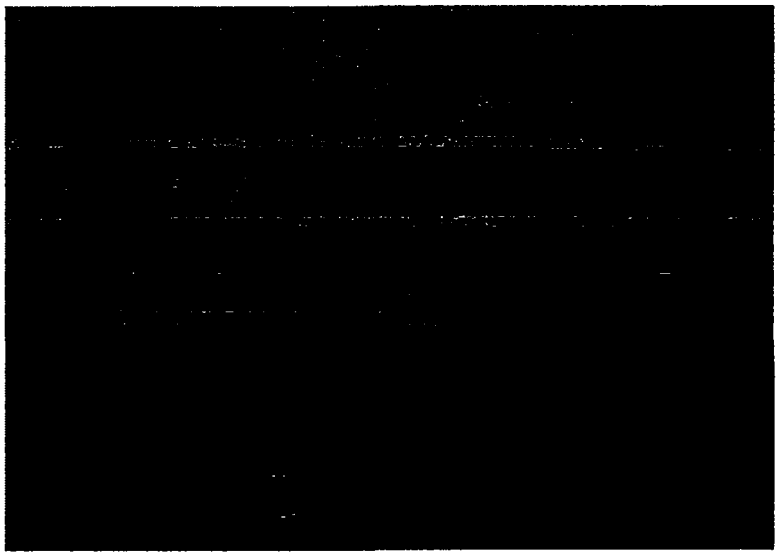
Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R1 and R2

Core Runs R1 and R2

REMARKS:
1) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
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4)

Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 11 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

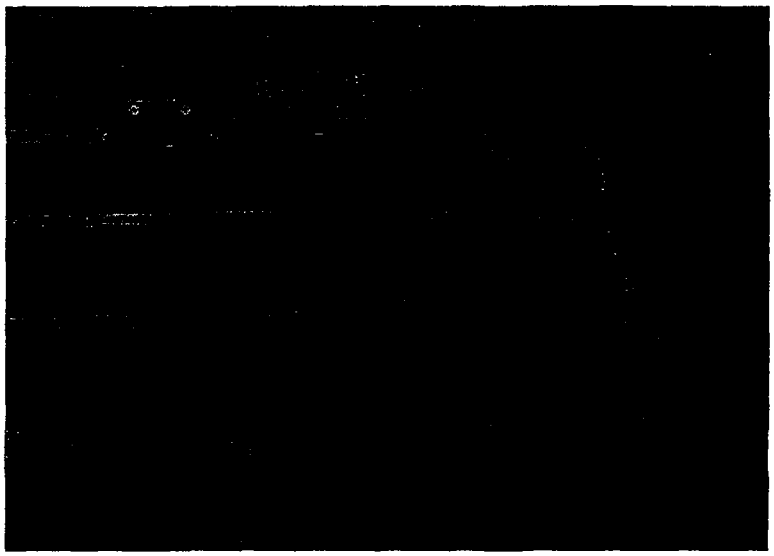
Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing. Spin and wash.

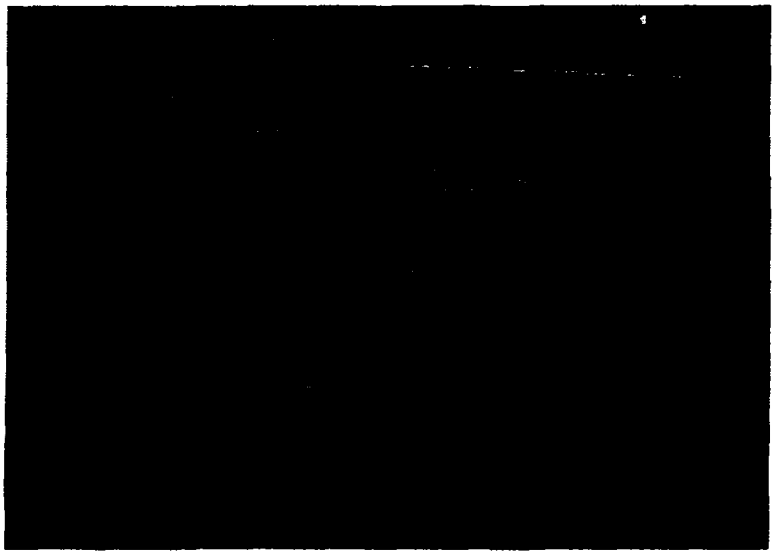
Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R1 and R2



Core Runs R3 and R4

REMARKS:
1) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
2) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
3)
4)

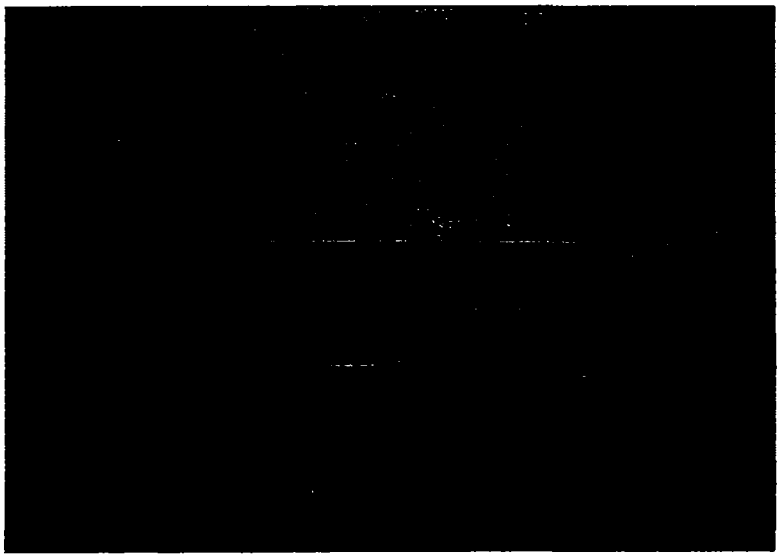
Nobis Engineering 18 Chenell Drive Concord, New Hampshire 03301	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD-114 SHEET 12 of 12 FILE NO. 48138.27 CHKD. BY J. Trottier

Boring Co.	Warren George, Inc.	Boring Location	northing 2696166	easting 814321	
Driller	E. Thomas	Mudline El.	-20.28	Datum	NGVD
Logged By	E. Thibodeau	Date Start	1/2/01	Date End	1/5/01

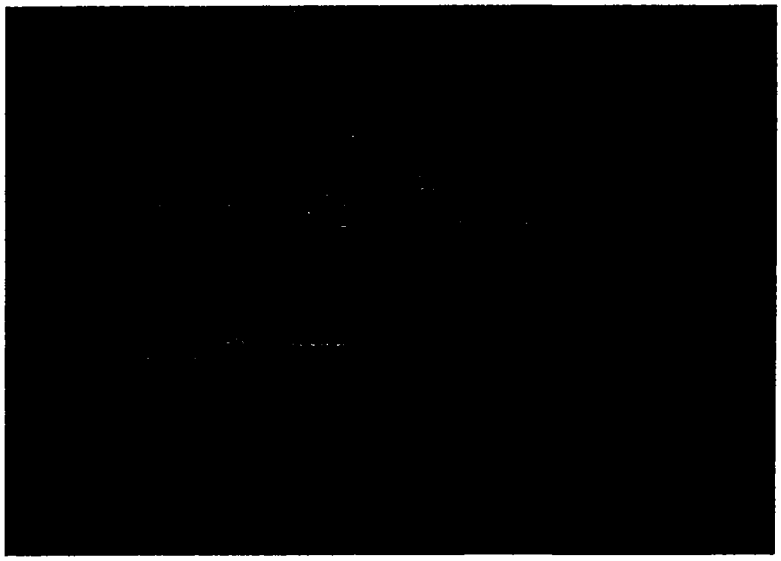
Sampler: 2-inch O.D. split-barrel sampler driven 24 inches with a 140 lb. automatic hammer free falling from a height of 30 inches.
Drill Rig: Acker AD II Truck Rig
Drilling Method: 5-inch (PW) flush joint drill casing. 4-inch (HW) flush joint drill casing. Spin and wash.

Groundwater Readings Not Applicable for Offshore Borings				
Date	Time	Depth	Elev.	Stabilization Time

ROCK CORE PICTURES



Core Runs R3 and R4



Core Runs R3 and R4

REMARKS:
1) *3-inch O.D. split-barrel sampler driven 24 inches with a 300 lb. center hole hammer free falling from a height of 24 inches.
2) Sample description based on laboratory classification. Refer to GeoTesting Express Report dated March 5, 2001. Laboratory description presented in bold.
3)
4)

TEST PIT LOG

Nobis Engineering
PO Box 2890
Concord, New Hampshire 03302

PROJECT	
Remedial Design For Operable Unit 01	
New Bedford Harbor Superfund Site	
New Bedford, Massachusetts	

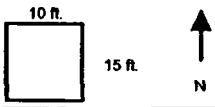
TEST PIT NO.	TP-D7
SHEET	1 of 1
FILE NO.	48138.23
CHKD. BY	C. Thunberg

Logged By	E. Thibodeau	Make	Hyundai	Ground El.	
Contractor	Foster Wheeler Environmental	Model	320 LC-3	Datum	
Operator	E. Perry	Capacity	2.5 cubic yd. bucket	Date Start	9/13/00
Weather	Light rain, hot, humid	Reach	36 ft.	Date End	9/13/00

DEPTH BELOW GRADE (ft)	STRATA CHANGE & WATER LEVEL	SUBSURFACE DESCRIPTION (ASTM D2488)	EXCAVATION EFFORT	PHOTO NUMBER	PID READING (PPM)	REMKS
1		FILL: Poorly graded sand with silt and gravel (SP-SM); dry, 10% coarse sand, 30% medium sand, 20% fine sand, 30% gravel, 10% silt, brown. Trace cobbles, and brick. Large boulder noted (Class C). Approximately 5 - 10% debris.	E		0	
2			E		0	
3			E		0	
4		3.5 to 6ft.: Continuous layer of black polyethylene plastic embedded in a layer of medium to coarse sand. Possible cap system.	E		0	
5			E		0	
6			E		0	
7	FILL ▽	6.0 ft.: FILL: mixture of sand & gravel, concrete, cobbles, and boulders (Class A&B). Approximately 20 - 30% debris.	E		0	1
8		7.0 ft.: Becomes wet.	E		0	
9			E		0	
10		9.0 ft.: Large piece of concrete debris.	E	9A	0	
11			E		0	
12		11.0 ft.: Distinct petroleum like odor noted. Traces of organic clay noted in material.	E		0	
13			E		0	
14	OH	13.0 ft.: Fill/organic clay interface.	E		0	
15		Bottom of exploration at 14 ft.				
16						
17		**Samples Submitted to Lab and Headspace Analysis Summary:** TP-D7 (0-0.5 ft.); Headspace: N/A				2
18		TP-D7 (8.5-9 ft.); Headspace: N/A TP-D7 (11.5-12 ft.); Headspace: N/A				

REMARKS:
1) Groundwater first noted at approximately 7 feet.
2) PID effected by high humidity and moisture. Headspace readings not available.

TEST PIT PLAN



BOULDER	CLASS
12"-18"	A
18"-36"	B
>36"	C

TEST PIT COORDINATES	
Northing: 2696290.5	Easting: 813996.6
Northing: 2696291.2	Easting: 813989.9
Northing: 2696300.6	Easting: 813994.2
Northing: 2696305.7	Easting: 813987.1

EXCAVATION EFFORT
E = Easy
M = Moderate
D = Difficult

TEST PIT LOG

Nobis Engineering
PO Box 2890
Concord, New Hampshire 03302

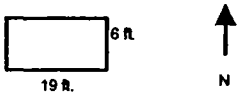
PROJECT			
Remedial Design For Operable Unit 01		TEST PIT NO.	TP-D10
New Bedford Harbor Superfund Site		SHEET	1 of 1
New Bedford, Massachusetts		FILE NO.	48138.23
		CHKD. BY	C. Thunberg

Logged By	E. Thibodeau	Make	Hyundai	Ground El.	
Contractor	Foster Wheeler Environmental	Model	320 LC-3	Datum	
Operator	E. Perry	Capacity	2.5 cubic yd. bucket	Date Start	9/12/00
Weather	Sunny, warm	Reach	36 ft.	Date End	9/12/00

DEPTH BELOW GRADE (ft)	STRATA CHANGE & WATER LEVEL	SUBSURFACE DESCRIPTION (ASTM D2488)	EXCAVATION EFFORT	PHOTO NUMBER	PID READING (PPM)	REMKS
1		FILL: Silty sand with gravel (SM); dry to moist, 5% coarse sand, 15% medium sand, 30% fine sand, 35% gravel, 15% silt, gray-brown.	E	9F	0	
2		1.5 ft.: FILL: mixture of sand & gravel, concrete, brick, cobbles, and boulders (Class B & C). Pieces of granite curbing noted.	M	9B, 9C	0	
3		Approximately 10 - 20% debris. 2.0 ft.: Notable layer of concrete debris.	D		0	
4			D		0	
5			M		0	
6			M		0	
7		6 to 7.5 ft.: Continuous layer of black polyethylene plastic embedded in a layer of medium to coarse sand.	M	9D, 9E	0	
8	FILL	7.5 ft.: FILL: mixture of sand & gravel, concrete, asphalt, brick, cobbles, and boulders (Class A & B). Slight organic odor noted.	D		20 0	
9	▽	Approximately 20 - 30% debris.	D		0	1
10		9.0 ft.: Becomes wet.	D		0	
11			D		0	
12			D		0	
13			D		0	
14		13.0 ft.: Layer of asphalt debris noted.	D		0	
15			D		0	
16		Bottom of exploration at 15 ft. Test pit terminated due to excessive groundwater infiltration.				
17		**Samples Submitted to Lab and Headspace Analysis Summary:** TP-D10 (0-0.5 ft.); Headspace: 0 ppm.				
18		TP-D10 (7-7.5 ft.); Headspace: 20 ppm. TP-D10 (9-10 ft.); Headspace: 0 ppm.				

REMARKS:
1) Groundwater first noted at approximately 9 feet.

TEST PIT PLAN



BOULDER	CLASS
12"-18"	A
18"-36"	B
>36"	C

TEST PIT COORDINATES

Northing: 2696245.4 Easting: 814134.5
Northing: 2696253.2 Easting: 814134.4
Northing: 2696247.4 Easting: 814115.2
Northing: 2696242.6 Easting: 814117.0

EXCAVATION EFFORT

E = Easy
M = Moderate
D = Difficult

Attachment B

Previous Construction Documents

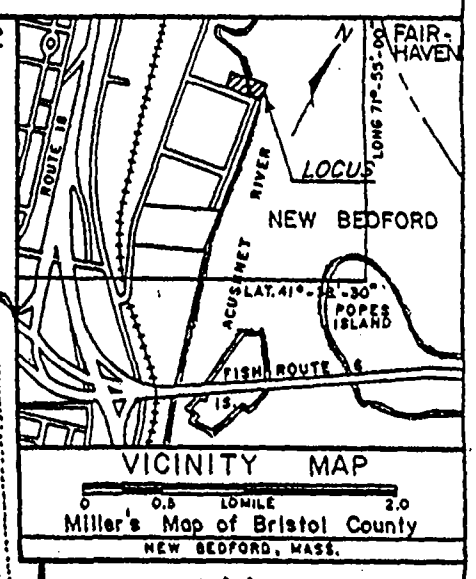
REC'D & RECORDED
1984 OCT 25 PM 1:30
REGISTRY OF DEEDS
BRISTOL COUNTY
SOUTHERN DISTRICT

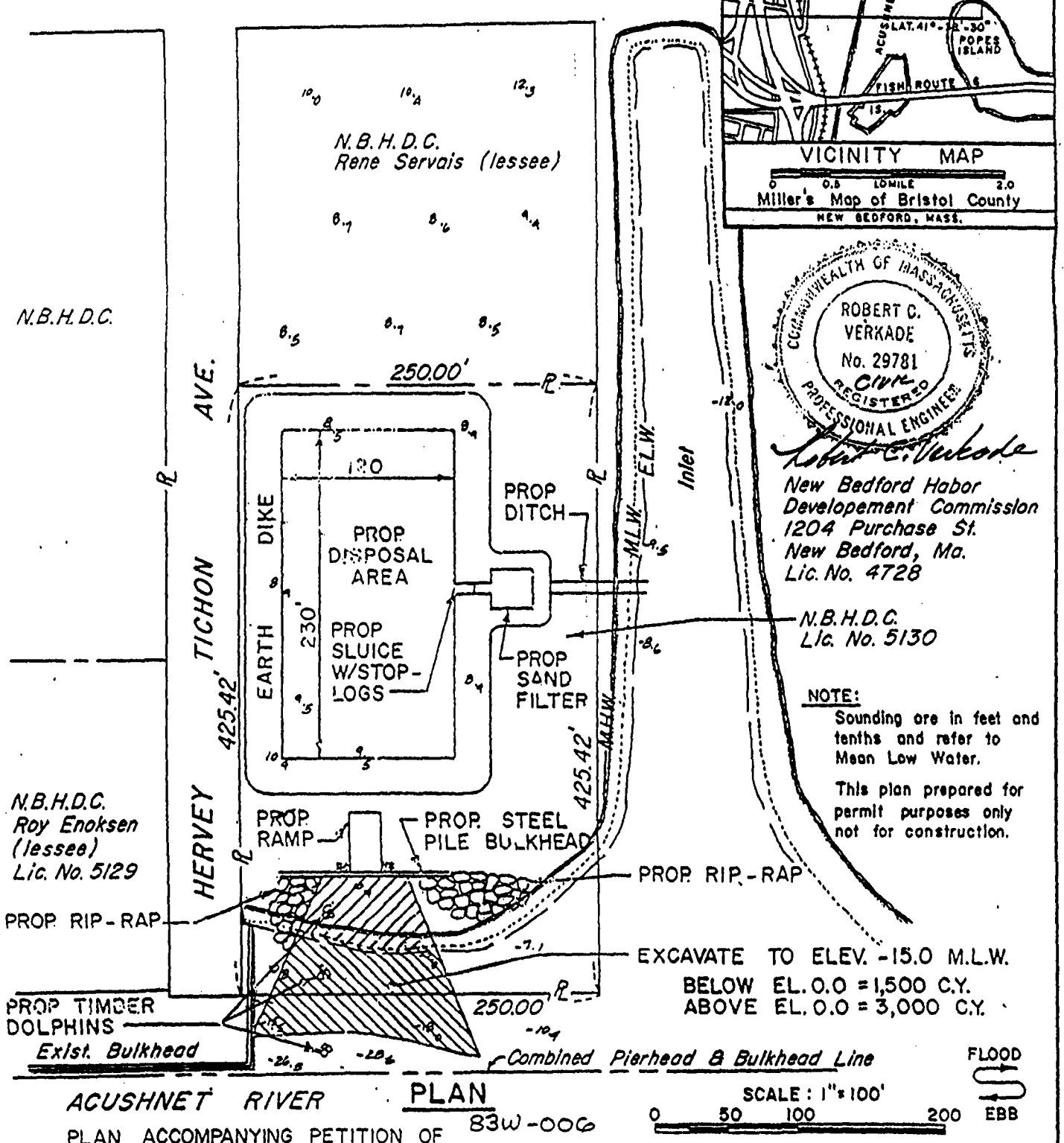
GENERAL LAW 36 SECTION 13A

I CERTIFY THAT THIS PLAN CONFORMS WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS.

Robert C. Verkade
PROFESSIONAL ENGINEER

SHEET 1 OF 2





ACUSHNET RIVER PLAN
83W-006

PLAN ACCOMPANYING PETITION OF

PACKER MARINE INC.

TO CONSTRUCT AND MAINTAIN BARGE LOADING RAMP, STEEL SHEET BULKHEAD, STONE SHORE PROTECTION AND TO DREDGE ACCESS CHANNEL
IN
ACUSHNET RIVER NEW BEDFORD HARBOR
NEW BEDFORD, MASSACHUSETTS
NOV. 26, 1982

TIBBETTS ENGINEERING CORP. NEW BEDFORD, MA.

LICENSE PLAN NO. 1023
Approved by Department of Environmental Quality Engineering of Massachusetts OCTOBER 14, 1983
COMMISSIONER
CHIEF ENGINEER

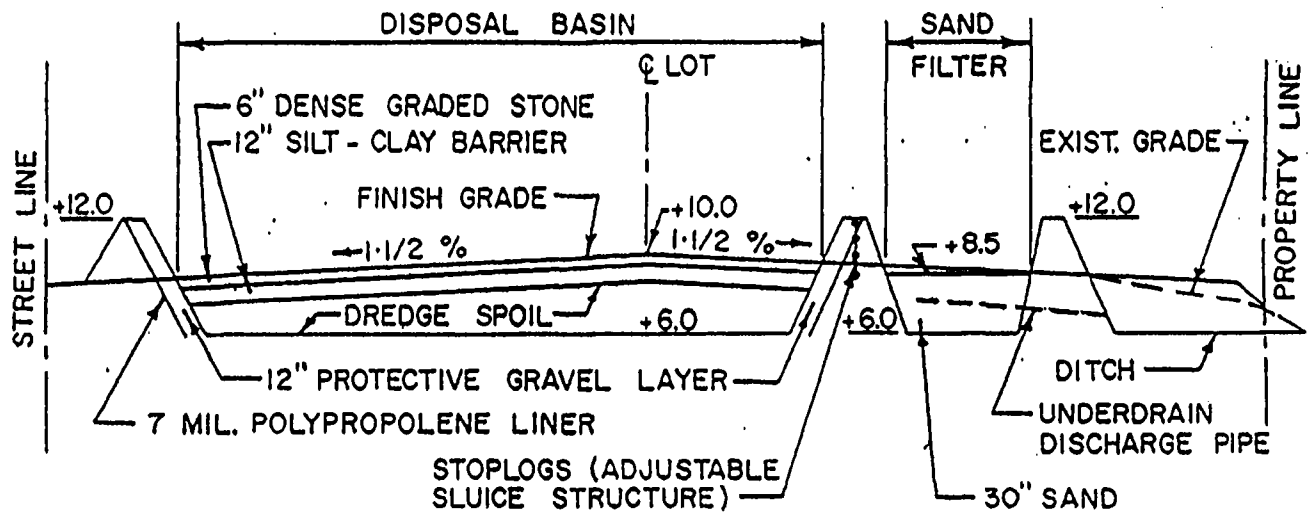
110-123

110-123

GENERAL LAW 36 SECTION 13A

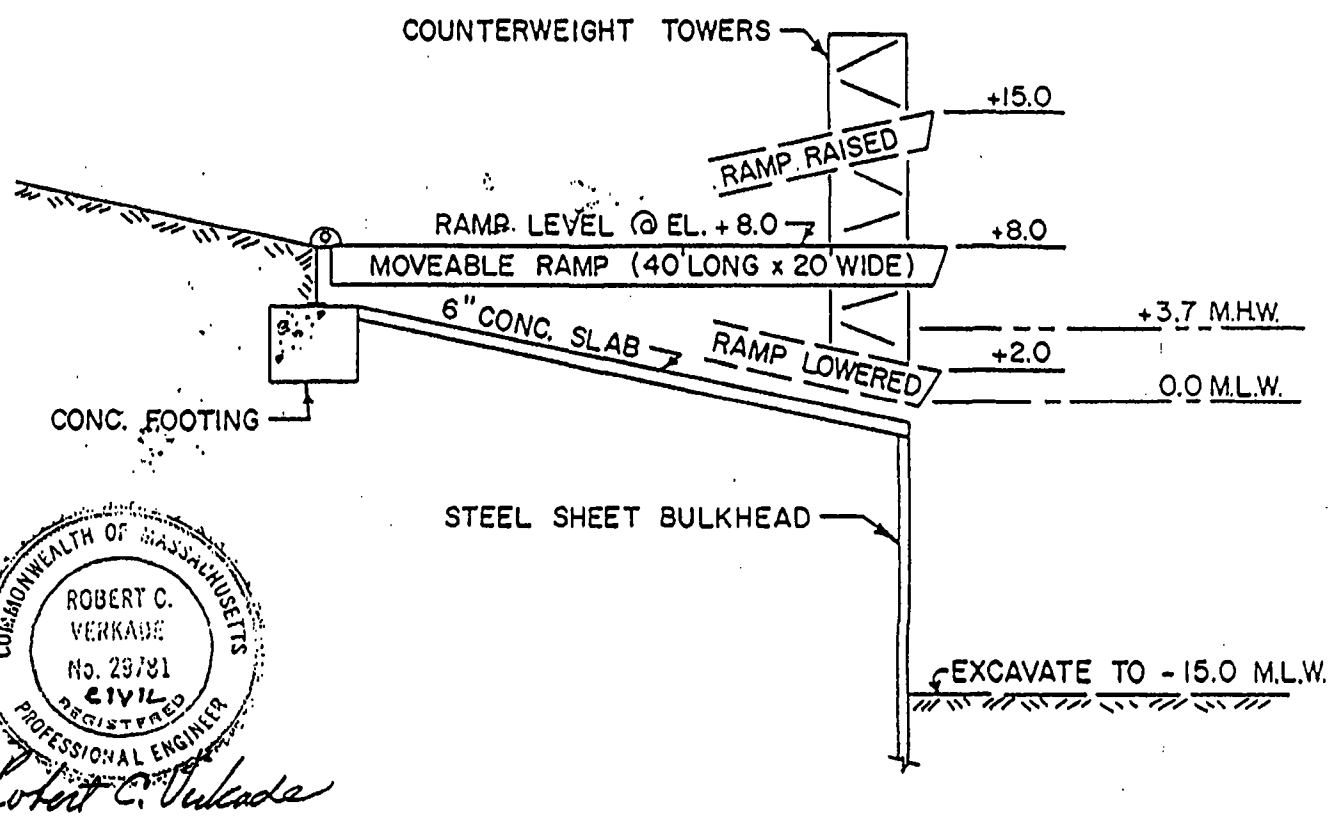
I CERTIFY THAT THIS PLAN CONFORMS WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS

Robert C. Verkade
PROFESSIONAL ENGINEER



SECTION THRU DISPOSAL AREA

SCALES : 1" = 40' HORIZ.
1" = 10' VERT.



COMMONWEALTH OF MASSACHUSETTS
ROBERT C. VERKADE
No. 29781
CIVIL
REGISTERED PROFESSIONAL ENGINEER

Robert C. Verkade

SECTION AT LOADING RAMP

SCALE : 1" = 10'

LICENSE PLAN NO. 1023

Approved by Department of Environmental Quality Engineering
OCTOBER 14, 1983

PLAN ACCOMPANYING PETITION OF
PACKER MARINE INC.
NOV. 26, 1982

83W-006

TIBBETTS ENGINEERING CORP. NEW BEDFORD, MA.

110-123

Attachment C

Phase III Boring Logs

FOSTER WHEELER Foster Wheeler Environmental 133 Federal Street, 6th Floor Boston, Massachusetts 02110	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 201 SHEET 1 of 9 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 366.633	Easting: 813 818.267	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.818 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/20/01	Date End	9/20/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
							Switch out 140 lb for 300lb hammer @100/6" - Refusal		
							Poorly Graded Sand w/Gravel & Silt - Light Brown, 15% Gravel (Coarse to Fine),		
							10% Coarse Sand, 20% Medium Sand, 45% Fine Sand, 10% Fines, Very Dense ,Dry, Round	SP-SM	
1	S-1		19/24	0-2'	68-100/6"-34-31	>100	to Subround Gravel, Subround Coarse to Med Sand, Trace Crushed Concrete in Tip of	(FILL)	
							Split Spoon	0 PID	
2									
							Switch out 140 lb for 300lb hammer @97 - refusal		
							Silty Sand w/Gravel - Brown, Dry, 32% gravel, 8% coarse 15% medium sand, 24% fine	SM	
							sand, 17% silt, 4% clay, Very Dense	(FILL)	
3	S-2		15/24	2-4'	97-33-29-19	>100		7 ppm	
4							Advance 4" Casing to 4' (300lb Driven) - Dense		
								SM	
5	S-3		10/24	4-6'	12-9-4-5	13	Same as S-2, Slightly Moister, Medium Dense	(FILL)	
								7 ppm	
6									
7	S-4		8/24	6-8'	4-6-7-9	13	**Silty Sand** - Dark Brown, Moist, 10% Gravel, 10% Coarse Sand	SM/SC	
							10% Medium Sand, 40% Fine Sand, 30% Fines, Medium Dense, Mainly topsoil	Fill	
								4 ppm	
8							Advance 4" Casing to 9' (300lb Driven) - Dense		
							Spin and Wash		
9									
							Poor Recovery - Classification used spoon tip sample (Tip Blocked with Cobble)		
							Silty Sand with Gravel - Grey, Wet, 35% Gravel (fine), 10% Coarse Sand	SM	
10	S-5		1/24	9-11'	40-13-10-22	23	30% Medium Sand, 20% Fine Sand, 15% Fines, Loose, Gasoline Odor	3 ppm	

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

FOSTER WHEELER

Foster Wheeler Environmental
133 Federal Street, 6th Floor
Boston, Massachusetts 02110

PROJECT

Remedial Design For Operable Unit 01
New Bedford Harbor Superfund Site
New Bedford, Massachusetts

BORING NO. FD 201
SHEET 2 of 9
FILE NO.
CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 366.633	Easting: 813 818.267	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.818 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/20/01	Date End	9/20/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
							Obstruction - Probable Boulder (Casing Slanted Upon Driving)	
11							Advance 4' Casing ot 11' (300lb Driven)	
							Roller bit out / Wash (Asphalt bits in wash water)	
12								
13								
14								
							Switch out 140 lb for 300lb hammer @100/0"	
15		S-6	16/24	14-16'	100/0" 44-9-7-6	>100	**Well graded Sand with silt and gravel** - Dark Grey, 19% gravel, 16% coarse sand (Subangular grains), 36% medium sand, 22% fine sand, 7% fines, dense, wet	SW
16							Straighten Casing (Pull and Readvance)	
							Advance 4" Casing to 19' (300lb Driven) - Very Dense	
17								
18								
19								
							Switch out 140 lb for 300lb hammer @100/6"	
20		S-7	7/24	19-21'	100/6"-35-7-5	>100	**Poorly Graded Sand** - 10% Gravel, 40% Coarse Sand, 30% Medium Sand 20% Fine Sand, Light Brown, Wet, Subround Coarse to Medium Grains, Granitic Sand and gravel particles	SP

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

FOSTER WHEELER

Foster Wheeler Environmental
133 Federal Street, 6th Floor
Boston, Massachusetts 02110

PROJECT		
Remedial Design For Operable Unit 01	BORING NO.	FD 201
New Bedford Harbor Superfund Site	SHEET	3 of 9
New Bedford, Massachusetts	FILE NO.	
	CHKD. BY	

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 366.633	Easting: 813 818.267	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.818 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/20/01	Date End	

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
21							Advance 4" Casing ot 24' (300 lb) - Medium Dense Spin and Wash		
22									
23									
24									
							(Poor Recovery) - Classification Based on poor sample **Well Graded Sand w/gravel** - Similar to S-7 But reddish brown, less fines	SW	
25		S-8	1/24	24-26'	93-15-10-9	25	20% gravel, 30% coarse sand, 30% medium sand, 20% fine sand (granitic coarse and medium sand), wet, medium dense, no dilatancy		
26							Advance 4" casing to 29' - medumium dense to dense Spin and wash		
27									
28									
29							S-9 similar to S-8		
							Poorly Graded Sand w/Gravel - Brown (reddish), 19% gravel, 10% coarse sand,	SP	
30		S-9	7-24	29-31'	80-34-10-11	44	32% medium sand, 17% fine sand, 2% fines, medium dense, no dilatancy, granitic particles, wet		

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
1)
2)
3)
4)

FOSTER WHEELER

Foster Wheeler Environmental
133 Federal Street, 6th Floor
Boston, Massachusetts 02110

PROJECT

Remedial Design For Operable Unit 01
New Bedford Harbor Superfund Site
New Bedford, Massachusetts

BORING NO. FD 201
SHEET 4 of 9
FILE NO.
CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 366.633	Easting: 813 818.267	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.818 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/20/01	Date End	9/20/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
31							Advance 4" casing to 34' (300lb) - medium dense to dense	
32							sand in wash similar to S-9	
33								
34								
35		S-10	3/24	34-36'	69-27-38-42	65	Top (2")- **Poorly Graded Sand** - mostly coarse sand, brown Bottom - **Silty Sand** - Whitish Grey, 70% fines sand, 30% fines (silty), slow dilatancy, trace gravel, very dense	SP.
36							Advance open hole (white wash water) Hard - probable boulder or bedrock Advance 4" casing to 39' (300lb Driven) - very dense	
37								
38								
39								
40		S-11	8/24	39-41'	11-16-34-13	50	Top cobble **Poorly Graded Sand** - Light brown, 50% medium sand, 30% fine sand, dense, wet, trace gravel and fines, dense Bottom cobble blocking spoon	SP

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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FOSTER WHEELER

Foster Wheeler Environmental
133 Federal Street, 6th Floor
Boston, Massachusetts 02110

PROJECT	
Remedial Design For Operable Unit 01	BORING NO. FD 201
New Bedford Harbor Superfund Site	SHEET 5 of 9
New Bedford, Massachusetts	FILE NO.
	CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 366.633	Easting: 813 818.267	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.818 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/20/01	Date End	9/20/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
41							Advance open hole 49' - roller bit out		
42							Loss of water (no return)		
43							Roller bit blocked (possible top of rock?) Minimal water return Last few feet drilled through boulder		
44							Sept 24 Advance 31/2" casing to 46'; Top of Rock at 44.5' Trouble Seating Casing (large water loss)		
45									
46							Start rock coring		
47									
48									
49									
50									

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER	PROJECT	BORING NO. FD 201
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 6 of 9 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 366.633	Easting: 813 818.267	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.818 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/25/01	Date End	9/25/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION
	FS	R1	8:45:18		Slight water return (gradual loss) FS - Sandy silt along fracture surface, very thin filling, bedding plane separation Medium grained granite - 85% pink K-feldspar, 5% hornblende/biotite, 10% Na- feldspar
	RS				RS - discoloration, rust staining
47.0			8:47:10		Medium grained granitic gneiss, 10% pink K-feldspar, 30% thinly banded biotite layers, 50% Na-fledspar 10% quartz, low angle of folidation (20°) , hard, schistous layers of biotite
	FS				FS- Silty sand in fracture (brown), biotite mineral along 70% of surface, clean break along foliation angle (bedding plane separation), Recovery = 60"/60" = 100% RQD=91
48.0			8:48:50		
49.0			8:50:05		Slightly more water return (minimal loss)
50.0	MB		8:51:30		MB - mechanical hammer break, folliation break
51.0			8:52:54		

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER	PROJECT	BORING NO. FD 201
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 7 of 9 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 366.633	Easting: 813 818.267	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.818 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/25/01	Date End	9/25/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMARKS
		R2	9:38:35		Some water return (constant loss)	
					R2 same as R1 - Medium grained granitic gneiss	
52.0			9:40:20			
	FB					
					Recovery = 59"/60" = 98% RQD=62	
53.0			9:42:00		Slightly more water return (minimal loss)	
	FC FB FB				FC - Fracture with chlorite along break (green, silky) clean breaks FB - Fracture, fresh break HL - Hairline fracture healed FR - Fracture, rusted fracture surface	
54.0			9:44:09		Slightly more water return (minimal loss)	
	FC				MB	
55.0	FR FR		9:46:00		Loss of water return	
	FC HL FB					
56.0			9:48:50			

GRANULAR SOILS (N Value)	COHESIVE SOILS (N Value)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER	PROJECT	BORING NO. FD 201
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 8 of 9 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 366.633	Easting: 813 818.267	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.818 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/25/01	Date End	9/25/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION
		R3	10:03:50		Some water return (constant loss)
					R3 same as R2 - Medium grained granitic gneiss
					Recovery = 57"/60" = 95%
					RQD=87.5
	FB				FB - Fracture, fresh break
57.0			10:05:48		
	RS				RS - discoloration, rust staining
58.0			10:08:48		Slightly more water return (minimal loss)
	B				B - biotite seam, moderately thin
	FR				FR - Fracture, rusted fracture surface, clean, tight break
	Fl				K-Felspar seam (>1"), pegmatitic (large crytaline)
					Fl -Irregular open fracture along middle of k-feldspar seam, some spot rust staining
59.0			10:12:30		Slightly more water return (minimal loss)
	RS				
60.0	Fl		10:15:52		
					Fl- Feldspar seam (K&Na), less than 3", biotite along fracture, rust staining, angular breaks
					Bottom of R3 - contains larger amount of Na-Feldspar than usual
61.0			10:20:10		

GRANULAR SOILS (N Values)	COHESIVE SOILS (N Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Der ion.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER	PROJECT	BORING NO. FD 201
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 9 of 9 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 366.633	Easting: 813 818.267	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.818 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/25/01	Date End	9/25/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
	RS	R4			Minimal water return (constant loss)	
					Fresh fine to medium grained granitic gneiss - grey, with 15% K-Feldspar, same as R1,R2,R3	
					Recovery = 60"/60"=100% RQD = 70%	
62.0						
	FB				FB - Fracture, fresh break, along foliation (0-5°), biotite over 90% of break surface	
63.0						
64.0	FC				FC - Fracture with chlorite along break (green, silky) clean breaks	
	HL				HL - Hairline fracture healed, very fine	
	FB				FB - fracture fresh break	
65.0	HL				HL - Hairline fracture healed, evidence of chlorite along fracture	
	FC				FC - Fracture with chlorite along break (green, silky) clean breaks	
	FB				FB - fracture fresh break	
66.0	FB				FB - fracture fresh break	

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 202 SHEET 1 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 364.566	Easting: 813 979.004	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.126 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/17/01	Date End	9/17/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
1		S-1	15/24	0-2'	25-53-53-37	>100	Silty Sand - Brown 10% gravel, 10 % coarse sand, 10% medium sand, 50% fine sand, 20% fines, trace asphalt and concrete, very dense	SM (FILL) 0 PID
2								
3		S-2	15/24	2-4'	27-55-43-29	98	Silty Sand - Brown, Dry, 10 % Gravel , 10% Coarse Sand, 20% Medium Sand, 30% fine sand, 30% fines, trace brick and gravel, moist, very dense	SM (FILL) 0 PID
4							Advance 4" Casing to 4' (300lb Driven) - Dense Grinding, rubber traces in wash water (tire?)	
5		S-3	4/24	4-6'	13-7-5-4	12	Clayey Sand - black/dark brown, 10% coarse sand, 30% medium sand, 40% fine sand, 20% fines, no dilatancy, wood debris, petroleum odor, medium dense	SC (FILL) 2 ppm
6							Similar to S-3 - 10% medium sand, 50% fine sand, 40% fines(silty), medium dilatancy	
7		S-4	10/24	6-8'	3-5-7-29	12	Silty Sand - 9% gravel, 9% coarse sand, 29% medium sand, 40% fine sand, 10% silt, 3% clay, medium dilatancy, black	SM (FILL) 4 ppm
8							Advance 4" Casing to9' (300lb Driven)	
9							End of Sept. 17/2001	
							Start of Sept. 18/2001 Clear out hole (no water return)	
							can't advance roller bit	
10							Abandon hole, move 4' over reassign to FD 202B	

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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FOSTER WHEELER

Foster Wheeler Environmental
133 Federal Street, 6th Floor
Boston, Massachusetts 02110

PROJECT		
Remedial Design For Operable Unit 01	BORING NO.	FD 202B
New Bedford Harbor Superfund Site	SHEET	2 of 11
New Bedford, Massachusetts	FILE NO.	
	CHKD. BY	

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 355.097	Easting: 813 982.976	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.248 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/18/01	Date End	9/18/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
							Relocation of FD201		
1							Advance 4" Casing to 9' (300lb Driven)		
							Spin and Wash		
2									
3									
4									
5									
6							Dark Grey/Blk wash return		
7									
8							Black wash water		
9									
10		S-5	8/24	9-11'	10-6-7-7	13	**Poorly Graded Sand w/Silt** - 10% coarse sand, 30% medium sand, 50% fine sand, 10% fines, petroleum odor, wet dark grey, subround med.grains, medium dense	SP-SM (Fill)	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER

Foster Wheeler Environmental
133 Federal Street, 6th Floor
Boston, Massachusetts 02110

PROJECT

Remedial Design For Operable Unit 01
New Bedford Harbor Superfund Site
New Bedford, Massachusetts

BORING NO. FD 202B
SHEET 3 of 11
FILE NO.
CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 355.097	Easting: 813 982.976	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.248 ft	Datum	
Logged By	Andrew Tognon	Date Start	9/18/01	Date End	

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
11							Advance Casing to 14' (300 lb Driven) - Very dense S&W	
12								
13							Black wash return	
14								
15		S-6	10/24	14-16'	8-3-2-4	5	**Clayey Sand** - Dark Grey, 10% medium sand, 50% fines sand, 40% fines, trace gravel none to slow dilatancy, (Ball sample - medium plastic, medium dry strength), loose	S (FILL)
16							Advance Casing to 19' (300 lb Driven)	
17							Dark grey wash return	
18							Change in wash grey	
19								
20		S-7	18/24	19-21'	12-16-17-22	33	**Silt with Sand** - 85% fines, 15% fine sand, light olive brown, medium dilatancy, wet, no plasticity (no thread), 1" rust stain in middle, very low to slight dry strength, dense/v. stiff (Ball sample - low plasticity)	ML

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
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Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER	PROJECT	BORING NO. FD 202B
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 4 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 355.097	Easting: 813 982.976	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.248 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/18/01	Date End	9/18/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
21							Advance 4" casing to 24' (300lb driven) Light olive brown wash return		
22									
23									
24									
25		S-8	18/24	24-26'	10-12-15-16	27	**Silt with sand** - light olive brown, 35% fine sand, 49% silt, 16% clay, medium dilatancy , no plasticity, similar to S-8	ML	
							Bottom Silty sand, light olive brown, 70% fine sand, 30% fines (silty) high dilatancy, no plasticity, wet, medium dense (similar to ML but more fine sand)	SM	
26							Advance to 24' open hole		
27									
28									
29									
							Sandy Silt - 70% fines(est. 60% silt, 10% clay), 30% fine sand, light olive brown, wet, stiff, medium dilantant, medium dense/very stiff	ML	
30		S-9	18/24	29-31'	8-15-13-12	28	Bottom 8" coarse medium grained sand (rust stained)		

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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FOSTER WHEELER

Foster Wheeler Environmental
133 Federal Street, 6th Floor
Boston, Massachusetts 02110

PROJECT

Remedial Design For Operable Unit 01

New Bedford Harbor Superfund Site

New Bedford, Massachusetts

BORING NO. FD 202B

SHEET 5 of 11

FILE NO.

CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 355.097	Easting: 813 982.976	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.248 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/18/01	Date End	9/18/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
31							Advance 4" casing to 34' (300lb driven)	
32								
33								
34								
35		S-10	10/24	34-36'	20-16-21-32	37	**Well Graded Sand with Silt** - Brown, 20% coarse sand, 45% medium sand, 25% fine sand, 10%, fines, trace granitic gravel, wet , loose to medium dense in spoon	SW
36							Advance hole to 39' open hole	
37								
38								
39							Drilling effort - roller bit jumpy near bottom Stop advance 3 1/2" casing to 39' (300lb driven) spin and wash	
40		S-11	8/24	39-41'	20-11-7-31	18	**Poorly Graded Sand with Silt** - Brown, similar to S-10 poorly graded, 10% coarse sand, 30%, medium sand, 50% fine sand, 10% fines, subrounded coarse/medium grains, medium dense, wet	SP-SM

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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FOSTER WHEELER

Foster Wheeler Environmental
133 Federal Street, 6th Floor
Boston, Massachusetts 02110

PROJECT

Remedial Design For Operable Unit 01

New Bedford Harbor Superfund Site

New Bedford, Massachusetts

BORING NO. FD 202B
SHEET 6 of 11
FILE NO.
CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 355.097	Easting: 813 982.976	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.248 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/18/01	Date End	9/18/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
41							Advance 4" casing to 44' (300lb driven) - very hard		
42							obstruction - possible boulder, roller bit through, high effort		
43									
44									
45		S-12	6/24	44-46'	11-5-19-59	24	**Poorly Graded Sand w/ Silt** - Brown, 10% coarse sand, 50% medium sand, 30% fine sand, 10% fines, wet , medium dense	SP-SM	
46							Advance 3 1/2" casing to 49' (300lb driven)		
47									
48									
49									
50		S-13	16/24	49-51'	13-24-34-36	58	**Poorly Graded Sand with Gravel** - 20% gravel (gneiss), 30% medium sand, 40% fine sand, 10% fines, very dense, brown, wet	SP	

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER	PROJECT	BORING NO. FD 202B
Foster Wheeler Environmental	Remedial Design For Operable Unit 01	SHEET 7 of 11
133 Federal Street, 6th Floor	New Bedford Harbor Superfund Site	FILE NO.
Boston, Massachusetts 02110	New Bedford, Massachusetts	CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 355.097	Easting: 813 982.976	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.248 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/18/01	Date End	9/18/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
51							Advance to 54' open hole	
52								
53							loss of water return	
54							Stop for Sept. 18/2001	
							Sept. 19/2001, clear out hole advance 3 1/2" casing to 54' (top of bedrock) seat core	
55								
56								
57								
58								
59								
60								

0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER	PROJECT	BORING NO. FD 202B
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 8 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 355.097	Easting: 813 982.976	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.248 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/19/01	Date End	9/19/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMARKS
	FR, RS, FO, FR	R1	8:51:40		Rounded rust stained top of core FR - Fracture, rusted fracture surface, slightly open RS - discoloration, rust staining FO - Open fracture, moderately wide, weathered fracture zone, rough irregular fracture surface FR - Fracture, rusted fracture surface Fresh fined grained granitic gneiss, low angle of foliation,(10-30°), very hard (>steel), grey, portions noticeably discolored with rust staining, breaks along bedding layers/foliations, grains thinly banded smooth to rough fracture surfaces	
55.0			8:54:24			
	FR, RS				FR - Fracture, rusted moderately open, rough fracture surface, along foliation (30°) Recovery = 40% RQD=25	
56.0			8:55:40			
	RS, FS				RS - discoloration, rust staining FS - fine brown sand/silt at bottom of core very thin layer complete water loss	
57.0			8:56:40		water return slight	
58.0			8:58:43		Bottom of core	
					Trouble seating casing bottom	
59.0			8:58:43			

GRANULAR SOILS (N Value)	COHESIVE SOILS (N Value)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 202B SHEET 9 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 355.097	Easting: 813 982.976	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.248 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/19/01	Date End	9/19/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION
	RS FB FR	R2	10:49:50		FB - Fracture, rusted fracture surface, open, rough RS - Discoloration, rust staining FR - Fracture, rusted fracture surface, open, rough, irreggular Recovery = 56"/60" = 93% RQD=75
	RS FR				RS - Discoloration, rust staining FR - Fracture, rusted fracture surface, slightly irregular break
60.0			10:51:26		
					Fresh fined to medium grained granitic gneiss, low thinly banded foliations (15 to 30°), grey, very hard K-felspar streaks
					Water loss, no return
	FR				FR - Rusted fracture surface, thin (>1/4") highly rusted seam, fractured along middle, flaked, straight brake along rust band, along foliation angle (25°), moderately open
61.0			10:52:48		
					All fractures - micous fractures, biotite grains, over 30 to 50% of surface, coarse grained straight fractures along foliation angle
	FB RS FR				FB - Fresh Break along top of discoloration zone, clean slightly open break along foliation RS - Discoloration, rust staining FR - Rusted fracture surface, break along foliation, slightly open, sandy silt present in break (brown)
62.0	HL		10:54:24		HL - Hairline fracture, healed
	FS				FS - Fresh fracture with silt along break (grey), moderately open , clean tight break along foliation
63.0			10:56:15		
	RS PR				RS - Discoloration band , rust staining FR - Rusted fracture surface, break along foliation, slightly open, sandy silt present in break (brown)
	FR RS FR				RS - Discoloration band , rust staining FR - Fracture, rusted surfade, thinly flaked (1/2"), along foliation
64.0	MB		10:58:10		MB - Mechanical Break

GRANULAR SOILS (N Values)	COHESIVE SOILS (N Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER	PROJECT	BORING NO. FD 202B
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 10 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 355.097	Easting: 813 982.976	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.248 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/19/01	Date End	9/19/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R3	11:35:40		Top 9" sandy gravel, 50% gravel (granitic particles), 40% coarse sand, 10% medium sand	
					Fresh fined to medium grained granitic gneiss, low angle of foliation (5-15°), very hard(>steel), slight pink feldspar patches	
65.0	FS		11:37:20		FS - Fracture, sandy silt (brown) present in fracture (moderately thin), break along foliation	
	FS				FS - Fracture, sandy silt (brown) present in fracture (thin filling), break along foliation	
	FB				FB - Fresh break, tight clean	
	FS				FS - Fracture, sandy silt (brown) present in fracture (very thin), break along foliation	
66.0			11:39:00		Recovery = 60"/60" = 100% RQD = 76	
	FB				FB - Fresh break, tight clean	
	HL				HL - Hairline fracture, healed , Na-Feldspar band	
	FB				FB - Fresh break, tight clean	
	HL				HL - Hairline fracture, healed	
	FB				FB - Fresh break	
67.0			11:41:05/11:43:10		Stop add 2' dirll rod, restart	
	FS				FS - Fracture, sandy silt (brown) present in fracture , break along foliation Slightly coarser grained gneiss medium grained pink (k) feldspar patches (15%)	
68.0	FS		11:44:49		FS - Fracture, sandy silt (brown) present in fracture , break along foliation,slight rust discolorization	
	FS FS				FS - Fracture, sandy silt (brown) present in fracture , some slaking along foliation, rough break	
69.0	MB		11:46:20		MB - Mechanical Break	

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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FOSTER WHEELER	PROJECT	BORING NO. FD 202B
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 11 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 355.097	Easting: 813 982.976	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.248 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/19/01	Date End	

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION
		R4	12:08:50		Fresh fined to medium grained granitic gneiss, low planar angle of foliation (5-10°), very hard(>steel), slight pink feldspar patches, grey
70.0			12:10:28		
	FB				FB - Fresh break, along foliation, straight, tight break Recovery = 59"/60" = 98% RQD = 97
71.0			12:11:40		
	FB				K-Felspar seam (3"), pegmatitic (large crytaline), some quartz FB - Fresh break, along K-Feldspar seam
72.0			12:13:10/12:14:10		Stop add 2'drill rod
	FO				K-Felspar seam (5"), pegmatitic (large crytaline), coarse K-feldspar grains, FO - Fresh open break, along K-Feldspar seam, irregular coarse crystalline surface, weathered to gravel (k-f) yellow shistous inclusion small.
73.0			12:15:50		
74.0	MB		12:18:00		MB - Mechanical Break

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
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11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 203 SHEET 1 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 266.721	Easting: 813 851.011	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.384 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/25/01	Date End	9/25/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
1	0-2'	S-1	19/24	0-2'	26-43-60-40	>100	**Poorly Graded Sand with Silt and Gravel** - Brown 20% gravel, 10 % medium sand, 60% fine sand, 10% fines, trace asphalt, dry, very dense	SP-SM (FILL) 0 PID	
2									
3	2-4'	S-2	18/24	2-4'	17-38-34-41	72	**Poorly Graded Sand with Silt and Gravel** - Brown 20% gravel, 10 % medium sand, 60% fine sand, 10% fines, trace asphalt, dry, very dense Same as S-1	SP-SM (FILL) 0 PID	
4							*Advance 4" Casing to 4' (300lb Driven) - Medium Dense* Pulled casing (obstruction misaligment), soil plug conatins larger particles (1/2" to 1 1/2" cobbles)		
5		S-3	9/24	4-6'	12-12-11-6	23	Top 3" same as S-2, medium dense Bottom 6" asphalt and sand mix	SP-SM (FILL)	
6									
7		S-4	12/24	6-8'	6-14-19-23	33	Clayey Sand - 10% medium sand, 50% fine sand, 30% fines, 10% asphalt, dark brown, moist dense	SC (FILL)	
8							Advance 4" Casing to9' (300lb Driven) - medium dense Stop for Sept. 25/01		
9							Clean out casing start of Sept. 26/01 - spin and wash Start of Sept. 18/2001 Clear out hole (no water return) 1" asphalt plug in top of spoon (Poor Recovery) SP?		
10		S-5	5/24	9-11'	40-23-33-12	56	**Poorly graded gravel with sand** - brown, 60% gravel, 10% medium sand, 30% fine sand, wet, very dense	GP (FILL)	

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
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31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 203 SHEET 2 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 266.721	Easting: 813 851.011	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.384 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/25/01	Date End	9/25/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
11							Advance 4" Casing to 14' (300lb Driven) - Dense	
12								
13							Black wash return	
14								
15		S-6	20/24	14-16'	28-18-21-29	39	Silty Sand - light olive brown, 70% fine sand, 30% fines (silty), low dilatancy (slow to rapid), dense, wet, no plasticity (no thread), similar to other observed ML's but greater amount of fine sand	S
16							Advance 4" Casing to 19 (300lb Driven) - dense	
17								
18								
19								
20		S-7	9/24	19-21'	20-21-29-34	50	Poorly graded sand - brown (reddish orange),10% coasre sand, 60% medium sand, 25% fine sand, 5% fines, wet, very dense, granitic paritcles	SP

GRANULAR SOILS (N-Value)	COHESIVE SOILS (N-Value)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
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FOSTER WHEELER	PROJECT	BORING NO. FD 203
Foster Wheeler Environmental 133 Federal Street, 6th Floor Boston, Massachusetts 02110	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 3 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 266.721	Easting: 813 851.011	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.384 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/26/01	Date End	9/26/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
21							Advance 4" Casing to 24' (300lb Driven) - Dense		
22									
23									
24									
25		S-8	12/24	24-26'	17-27-30-41	57	**Poorly graded sand with gravel** -25% gravel, 60% coarse sand, 10% medium sand, 5% fine sand, brown (reddish), very dense, wet	SP	
26							Advance 4" Casing to 39' (300lb Driven) - very dense		
27									
28									
29									
30		S-9	6/24	29-31'	19-11-17-23	28	**Poorly graded sand** - brown (reddish), 10% coarse sand, 70% medium sand, 20% fine sand, wet, medium dense, granitic particles	SP	

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 203 SHEET 4 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 266.721	Easting: 813 851.011	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.384 ft	Datum	
Logged By	Andrew Tognon	Date Start	9/26/01	Date End	

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
31							Advance 4" Casing to 34' (300lb Driven) - Dense	
32							hit obstruction (cobble/boulder), jammed roller bit	
33								
34								
35		S-10	5/24	24-36'	29-46-46-49	92	Spoon jammed in casing (probable cobble in casing) hammer out spoon **Poorly graded sand** - brown(reddish), 15% coarse sand, 60% medium sand, 25% fine sand, very dense, wet, granitic particles, some trace grey silt on top coarser granitic sand particles in bottom of spoon	SP
36							Advance 4" Casing to 49' (300lb Driven) - very dense grinding roller bit, drilling effort jumpy (boulder)	
37								
38								
39							Switched out 140lb to 300lb hammer at 100/5" - refusal	
40			7/24	S-11	36-100/5"-100/0"	>100	**Silty sand** - olive brown, 10% coasre sand, 10% medium sand, 50% fine sand, 30% fines (silty), medium dilatancy, very dense, wet	SM

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
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FOSTER WHEELER Foster Wheeler Environmental 133 Federal Street, 6th Floor Boston, Massachusetts 02110	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 203 SHEET 5 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 266.721	Easting: 813 851.011	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.384 ft	Datum	
Logged By	Andrew Tognon	Date Start	9/26/01	Date End	

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
41							Advance to 44' open hole		
42									
43							Top of rock at 43', seat 31/2" casing for rock coring		
44									
45									
46									
47									
48									
49									
50									

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
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Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
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FOSTER WHEELER	PROJECT	BORING NO. FD 203
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 6 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 266.721	Easting: 813 851.011	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.384 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/26/01	Date End	9/26/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION
		R1	1:09:52		Slow gradual loss of water
					Fresh fined grained granitic gneiss, banded biotite foliations, low angle of foliation (10-30°), *very hard (>steel), grey, K-feldspar patches, fleck of garnet (v. small)*
					Recovery = 58"/60" = 97% RQD=96
44.0			1:12:59		
	FB				FB - Fracture, fresh break along foliation (30°), 80% biotite, tight straight break
45.0			1:15:28		
	FB				FB - Fracture, fresh break along foliation (25°), tight straight break
46.0			1:18:30		
47.0			1:21:42		
48.0			1:25:36		

GRANULAR SOILS (N Values)	COHESIVE SOILS (N Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
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Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 7 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 266.721	Easting: 813 851.011	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.384 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/26/01	Date End	9/26/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMARKS
		R1	1:40:09			
					Same as R1 - Fresh fined grained gneiss (granitic), thin bands of biotite, low foliation angle (10-25°), very hard, patches of feldspar	
	FB				FB - Fracture, fresh break along foliation (20°), tight staight break	
49.0			1:43:33			
					Recovery = 60"/60" = 100% RQD = 98	
50.0			1:46:48			
		FB				
51.0			1:49:28			
	S				S - Biotite seam 3/16" thick	
52.0			1:53:40			
	FB				FB - Fracture, fresh break, rough	
53.0			1:58:26			

GRANULAR SOILS (N Values)	COHESIVE SOILS (N Values)	SYMBOL KEY	
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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 204 SHEET 1 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 260.098	Easting: 814 036.077	
Driller	Ray Eastwood / Kevin LaRose	Elevation	8.250 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/12/01	Date End	9/12/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
							Switch out 140 lb for 300lb hammer at 100/6"	
1		S-1	13/24	0-2'	24-46-58-81	>100	**Well graded sand with silt and gravel** - brown, 15% gravel, 20% coarse sand, 35% medium sand, 20% fine sand, 10% fines (silty), dry, very dense	SP-SM (FILL) 0 PID
2								
3		S-2	20/24	2-4'	37-100/6"-27-34	>100	Switch out 140 lb for 300lb hammer at 100/6" Same as S-1, slightly greater fine sand percentage	SP-SM (FILL) 0 PID
4							Advance 4" Casing to 4' (300lb Driven)	
5		S-3	10/24	4-6'	18-28-20-24	48	**Poorly graded sand** - dark grey to black, 30% coarse sand, 40% medium sand, 30% fine sand, trace silt, very dense, wet	SP (FILL) 1 ppm
6								
7		S-4	14/24	6-8'	100/6"-37-40-48	77	Switch out 140 lb for 300lb hammer at 100/6" **Poorly graded sand** - brown, 35% coarse sand, 50% medium sand, 15% fine sand, very dense, wet	SP (FILL) 10 ppm
8							Advance 4" Casing to 9' (300lb Driven) Spin and wash	
9								
10		S-5	10/24	9-11'	25-18-19-22	37	**Clayey sand** - dark grey, 10% gravel, 20% coarse sand, 30% medium sand, 20% fine sand, 20% fines (clayey), clay lumps in sand, dense, wet	SC (FILL) 0 PID

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Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 204 SHEET 2 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 260.098	Easting: 814 036.077	
Driller	Ray Eastwood / Kevin LaRose	Elevation	8.250 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/12/01	Date End	9/12/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
11							Advance 4" Casing to 14' (300lb Driven) - meidum dense to dense rubber bits in drill wash		
12									
13									
14									
							Top (6") similar to S-5 slightly more clay	SC	
15		S-6	12/24	14-16'	12-2-3-4	5	Bottom: Silty sand - grey, 2% gravel, 11% coarse sand, 32% medium sand, 40% fine sand, 12% silt, 3% clay, *loose wet, slow to rapid dilatancy, loose/firm*	SM 0 PID	
16							Advance 4" Casing to 19' (300lb Driven) - medium dense to dense		
17									
18									
19									
20		S-7	14/24	19-21'	17-10-14-18	24	Silt - grey/olive brown, 85% silt, 11% clay, 4% fine sand, inorganic, medium dilatancy (slow to rapid), no plasiticity (no thread), very stiff/dense	ML 0 PID	

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FOSTER WHEELER Foster Wheeler Environmental 133 Federal Street, 6th Floor Boston, Massachusetts 02110	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 204 SHEET 3 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 260.098	Easting: 814 036.077	
Driller	Ray Eastwood / Kevin LaRose	Elevation	8.250 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/12/01	Date End	9/12/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
21							Advance 4" Casing to 21' (300lb Driven) - medium dense to dense	
							Similar to S-7	
22		S-8	12/24	21-23'	12-13-15-20	28	Silt - grey/olive brown, 90% fines ,10% fine sand, wet, medium dense	ML 0 PID
23							Advance 4" Casing to 29' (300lb Driven) Spin and wash	
24								
25								
26								
27								
28								
29								
30		S-9	13/24	29-31'	11-20-17-13	37	Sandy Silt - same as S-8, rust stain in silt (larger sand content), 70% fines (silty), 30% fine sand, 4" sand lense (brown, medium/coarse sand grains), dense	ML SP

GRANULAR SOILS (N-Value)	COHESIVE SOILS (N-Value)	SYMBOL KEY	
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FOSTER WHEELER Foster Wheeler Environmental 133 Federal Street, 6th Floor Boston, Massachusetts 02110	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 204 SHEET 4 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 260.098	Easting: 814 036.077	
Driller	Ray Eastwood / Kevin LaRose	Elevation	8.250 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/12/01	Date End	9/12/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
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DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
31							Advance 4" Casing to 34' (300lb Driven)		
							add mud to wash water - spin and wash		
32									
33							change in drill effort - roller bit jumpy		
34									
35		S-10	8/24	34-36'	15-9-9-12	18	Poorly graded sand with gravel - brown, 15% gravel, 25% coarse sand,30% medium sand, 25%, fine sand, 5% fines, wet, medium dense, some granitic sand and gravel particles	SP	
36							Advance 4" Casing to 39' (300lb Driven) spin and wash		
37									
38									
39									
40		S-11	0/24	39-41'	100/1"	>100	Switch out 140 lb for 300lb hammer at 100/1" Refusal		

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 204 SHEET 5 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
Driller	Ray Eastwood / Kevin LaRose	Elevation	9.139 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/13/01	Date End	9/13/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
41							Advance 4" Casing to 45' (300lb Driven) - very difficult, very dense	
42							Top of rock, bedrock at 42', seat 3 1/2" casing, prep. for coring	
							end of Sept. 12/01	
43								
44								

GRANULAR SOILS (N-Value)	COHESIVE SOILS (N-Value)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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FOSTER WHEELER	PROJECT	BORING NO. FD 204
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 6 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 260.098	Easting: 814 036.077	
Driller	Ray Eastwood / Kevin LaRose	Elevation	8.250 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/13/01	Date End	9/13/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMARKS
		R1		3 min	Slow gradual loss of water	
					Fresh fined grained granitic gneiss,banded biotite foliations, low angle of foliation(30°), very hard (>steel), grey, K-feldspar patches	
					Recovery = 60"/60" = 100% RQD=95	
43.0						
				3 min		
	FB				FB - Fracture, fresh break along foliation (30°), tight straight break	
44.0						
				3 min		
45.0						
				3.5 min		
46.0						
				3.5 min		
47.0	MB				MB - Mechanical break	

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FOSTER WHEELER	PROJECT	BORING NO. FD 204
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 7 of 7 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 260.098	Easting: 814 036.077	
Driller	Ray Eastwood / Kevin LaRose	Elevation	8.250 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/13/01	Date End	9/13/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION
	FZ	R1		3 min	FZ - Fracture zone, weathered fracture zone (cobbles), rough irregular fracture surfaces, rust staining
	RS				RS - discoloration, rust staining
					Highly weathered fined grained granitic gneiss, low angle of foliation,(10-30°), very hard (>steel), grey
	FB				similar ot R1 but highly fractured
					FB - Fracture, weathered rough surface
	FB				FB - Fracture, weathered rough surface
	FB				FB - Fracture, weathered rough surface
47.0	RS				RS - discoloration, rust staining
	FR			3 min	FR - Fracture, weathered rough surface, rust staining along fracture surface
	FB				
	FZ				
	FR				FR - Fracture, weathered rough surface,slight rust staining along fracture surface
48.0	FZ				FZ - Fracture zone, weathered fracture zone (cobbles), rough irregular fracture surfaces, rust staining
	RS			3 min	RS - discoloration, rust staining
					Recovery = 40%
					RQD=58
49.0	FS				FS - Fracture, fresh break, silt present in seam, tight straight fracture, rust discoloration below break
	RS			3.5 min	RS - discoloration, rust staining
50.0	MB				MB - Mechanical break, tight straight
				3.5 min	
51.0					

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FOSTER WHEELER	PROJECT	BORING NO. FD 205
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 1 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
Driller	Ray Eastwood / Kevin LaRose	Elevation	9.139 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/13/01	Date End	9/13/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig. Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
							Switch out 140 lb for 300lb hammer at 100/6"		
1		S-1	20/24	0-2'	100/2"-100/6"	>100	**Poorly Graded Sand with Gravel** - grey, 25% gravel, 20% coarse sand, 30% medium sand, 25% fine sand, dry, very dense, trace silt	SP (FILL) 0 PID	
2									
3		S-2	2/24	2-4'	100/0"- 58/6"	>100	Switch out 140 lb for 300lb hammer at 100/6" - refusal Same as S-1 (poor recovery)	SP (FILL) 0 PID	
4							Advance 4" Casing to 4' (300lb Driven) - Very Dense		
5		S-3	9/24	4-6'	21-13-18-20	31	**Poorly graded sand with gravel** - dark grey/brown, 30% gravel, 35% coarse sand, 25% medium sand, 10% fine sand, trace asphalt, wet, dense	SP (FILL) 0 PID	
6									
7		S-4	11/24	6-8'	32-27-21-19	48	**Poorly graded gravel with sand** - dark brown, wet, 69% gravel, 10% coarse sand, 12% medium sand, 6% fine sand, 3% fines, dense	GP (FILL) 0 PID	
8							Advance 4" Casing to 9' (300lb Driven) Spin and wash		
9									
10		S-5	14/24	9-11'	29-22-20-48	42	**Poorly graded sand with gravel** - dark brown, 15% gravel, 30% coarse sand, 35% medium sand, 20% fine sand, 5% fines, very dense to dense, wet, trace silt	SP (FILL) 0 PID	

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	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 205 SHEET 2 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
Driller	Ray Eastwood / Kevin LaRose	Elevation	9.139 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/13/01	Date End	9/13/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
11							Advance 4" Casing to 14' (300lb Driven)	
12								
13								
14								
15		S-6	12/24	14-16'	72-15-14-100/3"	29	Crushed rock at top (3") of sample at 72/"6" **Poorly graded sand** - dark brown, 5% gravel, 25% coarse sand, 45% medium sand, 25% fine sand, wet, medium dense, brick fragments	S[redacted] (FILL) 0 PID
16							Advance 4" Casing to 19' (300lb Driven)	
17								
18								
19								
20		S-7	14/24	19-21'	24-12-19-20	31	**Silt w/Sand** - grey/olive brown,80% fines, 20% fine sand, inorganic, medium dilatancy (slow to rapid), no plasiticity (no thread), hard/dense	ML 0 PID

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 205 SHEET 3 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
Driller	Ray Eastwood / Kevin LaRose	Elevation	9.139 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/14/01	Date End	9/14/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
21							Advance 4" Casing to 24' (300lb Driven) Spin and wash		
22									
23									
24									
25							Similar to S-7		
		S-8	10/24	24-26'	12-15-18-21	33	Silt - grey/olive brown, 90% fines ,10% fine sand, wet, hard/dense,some rust staining	ML 0 PID	
26							Advance to 29' open hole		
27									
28									
29									
30							Silt - olive brown, 11% fine sand, 83% silt, 6% clay, wet, hard/dense some trace gravel, 1" fine sand lense	ML	
		S-9	18/24	29-31'	13-15-19-17	34			

GRANULAR SOILS (N-Value)	COHESIVE SOILS (SPT-Value)	SYMBOL KEY	
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Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
Driller	Ray Eastwood / Kevin LaRose	Elevation	9.139 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/13/01	Date End	9/13/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
31							Advance to 34' open hole	
32								
33								
34								
							Same as S-9	
35		S-10	16/24	34-36'	10-11-10-10	21	**Silt with Sand** - grey/olive brown, 85% silt, 15% fine sand, medium dilatancy, wet, very stiff, none to low plasticity (no thread)	ML
36							Attempt undisturbed sampling	
37		UO-1	0/24	36-38'			No recovery	
38							Advance to 39' open hole	
39								
							Silt with Sand - 80% fines (silty), 20% fine sand, medium dilatancy, similar to S-10,	ML
40		S-11	16/24	39-41'	12-11-11-12	22	none to low plasticity, very stiff/medium dense, light olive brown	

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Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
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41							Advance to 44' open hole		
42									
43									
44									
45		S-12	10/24	44-46'	9-13-15-14	28	Sandy silt - similar to S-11, olive brown, wet, trace clay, 1" fine sand lense	ML	
46							Advance to 49' open hole		
47									
48									
49									
50		S-13	13/24	49-51'	31-37-40-42	77	Poorly graded sand - brown (reddish), 1% gravel, 4% coarse sand, 65% medium sand, 26% fine sand, 4% fines, wet, granitic sand particles, very dense	SP	

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Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
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Groundwater Readings Not Applicable for Offshore Borings

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DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
51							Advance to 54' open hole	
52								
53							Change in drill effort (choppy)	
54							Advance 3 1/2" casing to 54'	
55		S-13	1/24	54-56'	14-12-12-14	24	Poor Recovery **Poorly graded gravel with sand - light brown, 55% gravel, 30% coarse sand, 15% medium to fine sand, wet loose, medium dense**	GP/SP
56							Advance 3 1/2" casing to 59' (300lb Driven)	
57								
58								
59								
60		S-14	0/24	59-61'	49-67-30-19	97	No Recovery (suspected cobbles/ boulders) Spoon blocked by gneiss cobble	

GRANULAR SOILS (N Values)	COHESIVE SOILS (N Values)	SYMBOL KEY	
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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 205 SHEET 7 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
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Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
61							Advance to 64' open hole		
62									
63							Loss of drill fluid, advance 3 1/2" casing		
64									
							No Recovery		
65		S-14	0/24	64-66'	38-53-37-100/6"	90	Spoon blocked by cobbles, pushing cobbles ahead of spoon		
66									
							Advance 3 1/2" casing to 69' (300lb Driven)		
67									
68							Top of rock at 68'		
69									
70									

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
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FOSTER WHEELER	PROJECT	BORING NO. FD 205
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 8 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
Driller	Ray Eastwood / Kevin LaRose	Elevation	9.139 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/14/01	Date End	9/14/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION
		R1	1:50:30		Top of core - weathered bedrock cobbles with some rust staining
	RS				RS - discoloration, rust staining
					Fresh fine grained granitic gneiss,grey, low angle of foliation(10-30°), thinly foliated layers, very hard Recovery = 36"/60" = 60% RQD = 48
69.0			1:53:00		
	FR RS				FB - Fractures, fresh break along foliation (15°), feldspar grains along break RS - discoloration, rust staining
70.0			1:55:00		constant water loss
	FS				FS - Fractures, sandy silt present in break (thin brown), break along foliation (10°), moderatel tight
71.0			1:57:46		
	EB				FB - Fracture, fresh break, along foliation, biotite along break surface
					End of core recovery End of Sept. 14/01
72.0					
73.0					

GRANULAR SOILS (N-Value)	COHESIVE SOILS (N-Value)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Desi[illegible]n.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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FOSTER WHEELER	PROJECT	BORING NO. FD 205
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 9 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
Driller	Ray Eastwood / Kevin LaRose	Elevation	9.139 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/17/01	Date End	9/17/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMARKS
		R2	8:20:14		Top of core - weathered bedrock cobbles with some rust staining	
					RS - discoloration, rust staining	
					Fresh fine to medium grained granitic gneiss, grey, low angle of foliation(5-15°), thinly banded foliated layers, very hard	
74.0			8:23:00		Recovery = 60"/60" = 100% RQD = 83	
	FR				FR - Fractures, rust staining along break surface fresh break along foliation (10°)	
75.0			8:25:00			
76.0			8:26:38			
77.0			8:28:25			
	MB				MB - Mechanical break	
78.0			8:30:20			

GRANULAR SOILS (N Values)	COHESIVE SOILS (N Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER	PROJECT	BORING NO. FD 205
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 10 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
Driller	Ray Eastwood / Kevin LaRose	Elevation	9.139 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/17/01	Date End	9/17/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION
		R3	8:52:00		Water loss constant (approximately 42 gal/min - pump capacity) no return
					Top of core - weathered bedrock cobbles with some rust staining
					Fresh fine to medium grained granitic gneiss, grey, low angle of foliation(5°), thinly banded foliated layers, very hard
					Recovery = 60"/60" = 100%
					RQD = 91
79.0	S		8:54:30		S - Na-Feldspar seam, between two biotite bands
	FB				FB - Fracture, fresh break, tight straight break
	B				Biotite Seam (1/4")
	FB				FB - Fresh break, moderately open, rough straight, along foliation
	FB				FB - Fresh break, thin staight
	FB				FB - Fresh break, tight, rough straight, along foliation
80.0			8:57:20		
					MB - Mechanical break
81.0	MB		8:59:50		Slightly less water return (still no return)
					Medium grained grainitic gneiss, greater amount of K-feldspar increasing towards bottom
82.0	FB		9:02:20		S - K-Feldspar seam, (6"), very coarse grains pegmatitic 80% feldpsar,
					FB - Fresh break, along middle of feldspar seam, straight, tight clean break
83.0			9:04:55		

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Des[illegible]ion.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER	PROJECT	BORING NO. FD 205
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 11 of 11 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 264.308	Easting: 814 174.859	
Driller	Ray Eastwood / Kevin LaRose	Elevation	9.139 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/17/01	Date End	9/17/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH (feet)	VISUAL REPRESENTATION	CORE INFORMATION: CORE RUN	CORE INTERVAL	CORE TIME	ROCK CORE DESCRIPTION	REMKS
		R4	9:23:30		Water loss constant (approximately 42 gal/min - pump capacity) no return	
					Top of core - weathered bedrock cobbles	
					Fresh fine to medium grained granitic gneiss, grey with pink feldspar grains, low angle of foliation(10°), thinly banded foliated layers, very hard (>6)	
					Recovery = 60"/60" = 100%	
					RQD = 92	
84.0			9:25:50		Still no water return	
85.0			9:27:10			
86.0	FW		9:28:50		FW - Fracture, weathered break, biotite along break surface	
87.0			9:30:30			
88.0			9:32:06			

GRANULAR SOILS (N Values)	COHESIVE SOILS (N Values)	SYMBOL KEY	
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Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 206 SHEET 1 of 4 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 288.000	Easting: 813 990.500	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.382 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/28/01	Date End	9/28/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
1		S-1	14/24	0-2'	20-38-40-38	78	**Poorly graded sand with silt** - brown, 10medium sand, 80% fine sand, 10% fines, dry, very dense, trace gravel	SP-SM (FILL)
2								
3		S-2	3/24	2-4'	13-34-47-63	87	**Poorly graded sand with silt and gravel** - brown, 20% gravel, 70% fine sand, 10% fines, dry, very dense, trace granitic particles	SP-SM (FILL)
4							Advance 4" Casing to 4' (300lb Driven)	
5		S-3	12/24	4-6'	22-15-20-32	35	**Poorly graded sand** - brown, 5% coarse sand, 20% medium sand, 75% fine sand, dense, moist, trace gravel thin polypropylene geotextile (silt fence) in spoon tip (jarred)	SP (FILL)
6								
7		S-4	12/24	6-8'	40-100/6"-16-24	>100	Switch out 140 lb for 300lb hammer at 100/6" Same as S-3, rust staining in sand Bottom of spoon plugged with black stained wood, moderate odor (creosote timber)	SP (FILL)
8							Advance 4" Casing to 9' (300lb Driven) Spin and wash Large amount of wood chips in wash water, strong odor (creosote), wash water dark grey to black, drilling through wood piles/timber	
9								
10		S-5	8/24	9-11'	15-9-45-23	54	Hit something at 45 blows **Well graded gravel with silt and sand** - black, 55% gravel, 11% coarse sand, 15% medium sand, 10% fine sand, 9% fines, trace clay, very dense, wet	GW-GM (FILL)

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
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Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 206 SHEET 2 of 4 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 288.000	Easting: 813 990.500	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.382 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/28/01	Date End	9/28/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
11									
12		S-6	13/24	11-13'	38-52-43-27	95	**Poorly graded sand with silt** - dark grey/black, 10% coarse sand,40% medium sand, 40% fine sand, 10% fines, wet, very dense, slight petroleum odor	SP-SM (FILL)	
13							Trace clayey sand in bottom of spoon Advance 4" Casing to 13' (300lb Driven) Spin and wash roller bit out to 13'		
14		S-7	0/24	13-15'	28-5-5-4	10	No recovery (spoon clean)		
15									
16		S-8	0/24	15-17'	28-5-5-4	10	Top (2") poorly graded sand, dark brown **Sandy silt** - grey/brown, 2% gravel, 6% coarse sand, 12% medium sand, 21% fine sand, 54% silt, 5% clay, wet, loose to medium dense, medium dilatancy	ML	
17							Advance 4" Casing to 17' (300lb Driven)		
18		UO-1	0/24	17-19'			No Recovery		
19							Advance 4" Casing to 19' (300lb Driven)		
20		S-9	13/24	19-21'	17-18-16-22	34	**Sandy silt** - olive brown, 55% fines (silty), 45% fine sand, wet, dense, medium dilatantancy (slow to rapid), very stiff/dense	ML/SM	

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
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11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 206 SHEET 3 of 4 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 288.000	Easting: 813 990.500	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.382 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/28/01	Date End	9/28/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
21							Advance 4" Casing to 24' (300lb Driven) Spin and wash	
22								
23								
24								
25		S-10	19/24	24-26'	8-9-10-15	19	Silt - light olive brown,1% gravel, 2% coarse sand, 10% fine sand, 87% fines, wet, very stiff/dense, low plasticity, medium dilatancy middle (2") - clay seam, olive brown, CL	ML
26							Advance 4" Casing to 29' (300lb Driven)	
27								
28								
29								
30		S-11	18/24	29-31'	6-9-10-15	19	Same as S-10 Sandy Silt - 90% fines, 10% fine sand, more clay than above, medium plasticity, v.stiff	ML

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
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FOSTER WHEELER	PROJECT	BORING NO. FD 206
Foster Wheeler Environmental *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	SHEET 4 of 4 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 288.000	Easting: 813 990.500	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.382 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/28/01	Date End	9/28/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMKS
31							Terminate Hole		
32									
33									
34									
35									
36									
37									
38									
39									
40									

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 207 SHEET 1 of 5 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 169.399	Easting: 813 818.577	
Driller	Ray Eastwood / Kevin LaRose	Elevation	7.062 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/27/01	Date End	9/27/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Tnp)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
1		S-1	18/20	0-2'	54-75-47-20	>100	**Silty Sand with Gravel** - brown, 15% gravel, 60% fine sand, 25% fines, dry, very dense, trace concrete cobbles/asphalt	SM (FILL) 0 PID
2								
3		S-2	11/24	2-4'	16-18-37-21	55	**Silty Sand with Gravel** - brown, 20% gravel, 55% fine sand, 25% fines, dry, medium very dense, trace asphalt	SM (FILL) 0 PID
4							Advance 4" Casing to 4' (300lb Driven) - very dense roller bit out to 4' wash, hit obstruction (boulder), loss of water	
					100/0"		Switch out 140 lb for 300lb hammer at 100/0"	
5		S-3	15/24	4-6'	13-22-32-10	>100	Top 4" dense beige sand (hard cemented) mixes with S-2	GM (FILL)
6							**Silty gravel with sand** - 46% gravel, 4% coarse sand, 14% medium sand, 20% fine sand, 16% fines, moist, dense in spoon Bottom (5") silty sand, grey, moist, dense, 10% gravel (grey cobble fragments), 70% fines sand, 20% fines(silty)	
7		S-4	15/24	6-8'	36-12-7-9	19	**Silty sand** - brown, 80% fine sand, 20% fines (silty), moist, medium dense Layered, top wet silty sand, middle moist silty sand, bottom poorly graded sand 20% medium sand, 70% fines, 10% fines(silty) dark brwon, wet	SM (FILL)
8							Advance 4" Casing to 9' (300lb Driven) - refusal pull casing attempt to realign casing -refusal relocate to FD 207B	
9								
10								

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	PROJECT Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 207B SHEET 2 of 5 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 164.282	Easting: 813 818.577	
Driller	Ray Eastwood / Kevin LaRose	Elevation	6.793 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/27/01	Date End	9/27/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
1								
2								
3								
4								
5								
6								
7								
8								
9							Advance 4" Casing to 9' (300lb Driven)	
10		S-5	4/24	9-11'	13-14-13-14	27	**Silty sand** - light olive brown, 70% fine sand, 30% fines (silty), medium dense, wet, no plasticity, similar to previously encoutered ML but >fine sand, trace gravel, med dilatancy	SM

GRANULAR SOILS (N-Value)	COHESIVE SOILS (N-Value)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

REMARKS:
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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 207B SHEET 3 of 5 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 164.282	Easting: 813 818.577	
Driller	Ray Eastwood / Kevin LaRose	Elevation	6.793 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/27/01	Date End	9/27/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
11							Advance 4" Casing to 14' (300lb Driven) - medium dense to loose	
12							black wash water return	
13								
14		S-6	16/24	13-15'	21-23-22-33	45	**Silty sand** - grey brown, 1% medium sand, 52% fine sand, 37% silt, 10% clay, dense, wet, low dilatancy, 1" clay seam (grey, stiff)	SM
15							Advance to 19' open hole Spin and wash	
16								
17								
18								
19								
20		S-7	9/24	19-21'	16-21-31-27	52	**Poorly graded sand** - brown, 20% coarse sand, 60% medium sand, 20% fine sand, wet, loose to medium dense in spoon, trace gravel, granitic particles	SP

GRANULAR SOILS (N-Value)	COHESIVE SOILS (N-Value)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
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Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 207B SHEET 4 of 5 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 164.282	Easting: 813 818.577	
Driller	Ray Eastwood / Kevin LaRose	Elevation	6.793 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/27/01	Date End	9/27/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (R)	SAMPLE INFORMATION Type & No	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
21							Advance 4" Casing to 24' (300lb Driven) Spin and wash		
22									
23									
24									
25		S-8	18/24	24-26'	14-14-21-23	35	**Well graded sand** - grey brown, 15% gravel, 30% coarse sand, 30% medium sand, 20% fine sand, 5% fines wet, dense, granitic particles	SW-SM	
26							Advance 4" Casing to 29' (300lb Driven)		
27									
##									
29									
30		S-9	0/24	29-31'	100/0"	>100	Refusal - bits of angular gravel in tip of spoon		

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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Driller	Ray Eastwood / Kevin LaRose	Elevation	6.793 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	9/27/01	Date End	9/27/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
31							Advance to 34' open hole	
							possible top of rock (flakes in wash water)	
							high drilling effort - very slow roller bit advancement	
32								
33							Terminate hole at 33' at suspected top of rock	
34								
35								
36								
37								
38								
39								
40								

GRANULAR SOILS (N-Value)	COHESIVE SOILS (N-Value)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 208 SHEET 1 of 4 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 181.810	Easting: 814 079.5316	
Driller	Ray Eastwood / Kevin LaRose	Elevation	8.128 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	10/1/01	Date End	10/1/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
Drill Rig: Truck Mounted Mobile B57
Drilling Method: Mud Rotary, 4" Flush Jointed Casing, Driven w/300 lb hamer

Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
1		S-1	14/24	0-2'	55-100/3"-38-34	>100	**Poorly graded sand with silt and gravel** - brown/grey, 30% gravel, 10% medium sand, 50% fine sand, 10% fines, dry, very dense	SP-SM (FILL)	
2							Advance 4" Casing to 4' (300lb Driven)		
3									
4									
5		S-2	16/24	4-6'	37-38-100/0"-28	>100	Switch out 140 lb for 300lb hammer at 100/0" **Well graded gravel with sand** - grey brown, 64% gravel, 7% coarse sand, 13% medium sand, 13% fine sand, 3% fines, wet, very dense	GW (FILL)	
6									
7		S-3	12/24	6-8'	47-93-17-29	>100	Switch out 140 lb for 300lb hammer at 93 **Poorly graded sand** - brown (reddish), 15% coarse sand, 50% medium sand, 35% fine sand wet, very dense.	SP (FILL)	
8							Advance 4" Casing to 8' (300lb Driven) Spin and wash		
9		S-4	8/24	8-10'	35-100/3"-15-16	>200	Switch out 140 lb for 300lb hammer at 100/3" (hit something at 40 blows) **Silty sand w/ Gravel** - grey, 21% gravel, 10% coarse sand, 18% medium sand, 30% fine sand, 21% fines, wet, very dense	SM (FILL)	
10							Advance 4" Casing to 10' (300lb Driven)		

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
5 to 10 - Loose	3 to 4 - Soft	2. U denotes 3-inch O.D. undisturbed sample.	8. PPM denotes parts per million.
11 to 30 - Medium Dense	5 to 8 - Medium Stiff	3. UO denotes 3-inch Osterberg undisturbed sample.	9. PP denotes Pocket Penetrometer.
31 to 50 - Dense	9 to 15 - Stiff	4. PEN denotes penetration length of sampler.	10. FVST denotes field vane shear test.
Over 50 - Very Dense	16 to 30 - Very Stiff	5. REC denotes recovered length of sample.	11. RQD denotes Rock Quality Designation.
	Over 30 - Hard	6. SPT denotes Standard Penetration Test.	12. R denotes core run number.

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FOSTER WHEELER *Foster Wheeler Environmental* *133 Federal Street, 6th Floor* *Boston, Massachusetts 02110*	**PROJECT** Remedial Design For Operable Unit 01 New Bedford Harbor Superfund Site New Bedford, Massachusetts	BORING NO. FD 208 SHEET 2 of 4 FILE NO. CHKD. BY

Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 181.810	Easting: 814 079.5316	
Driller	Ray Eastwood / Kevin LaRose	Elevation	8.128 ft	Datum	NGVD
Logged By	Andrew Tognon	Date Start	10/1/01	Date End	10/1/01

Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
3" Shelby Tube (Stainless)
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Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
							dark grey wash return	
							Poor recovery	
11		S-5	4/24	10-12'	17-13-5-9	18	**Poorly graded sand with gravel** - dark grey, 20% gravel, 10% coarse sand, 20% medium sand, 50% fine sand, loose to medium dense, wet, petrolium odor	SP (FILL)
12								
13		S-6	3/24	12-14'	2-4-5-6	9	Poor recovery **Silty sand** - dark grey to black, 60% fine sand, 40% fines (silty), wet, loose, petrolium odor	SM
14							Advance 4" casing to 15' (300lb driven)	
15		S-7	20/24	14-16'	28-5-5-4	10	**Organic silt with sand** - 3% gravel, 1% coarse sand, 8% medium sand, 28% fine sand, 47% silt, 13% clay, dark grey to black, firm, wet, largely silty but with clay (OH) seam,	OL
16							Bottom (3") - silty sand (20% medium sand, 60% fine sand, 20% fines), grey	
17		S-8	22/24	16-18'	8-13-19-24	32	**Poorly graded sand w/silt** - dark grey, 5% gravel, 11% coarse sand, 19% medium sand, 53% fine sand, 12% fines, wet, medium dilatancy (slow to rapid), low to no plasticity, dense, trace coarse sand	SP-SM
18							Bottom (3-5" poorly graded sand - medium dense (SP)	
19							Advance 4" casing to 19' (300lb driven) *Roller bit out to 19' S/W*	
20		S-9	20/24	19-21'	20-28-21-24	49	**Silty sand - olive brown, 55% fine sand, 45% fines (silt), dense, medium dilatancy, wet, similar to other encountered ML (although greater percentage of fine sand), dense**	SM

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
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Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 181.810	Easting: 814 079.5316	
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Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION	REMARKS
21							Advance 4" Casing to 24' (300lb Driven) Spin and wash		
22									
23									
24									
25		S-10	9/24	24-26'	8-9-10-8	19	**Silt with Sand** - light olive brown, 85% fines, 15% fine sand, wet, stiff/very dense, low plasticity, medium dilatancy, trace clay seams	ML	
26							Advance 4" Casing to 29' (300lb Driven)		
27									
28									
29									
30		S-11	15/24	29-31'	13-13-15-19	28	**Silty sand** - 9% gravel, 10% coarse sand, 19% medium sand, 26% fine sand, 36% fines, dense, wet, silty seam (3") in middle, bottom same as top	SM	

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
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Boring Co.	Geologic Inc	Boring Location	Northing: 2 696 181.810	Easting: 814 079.5316	
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Sampler: 2" Split Spoon Sampler, 140lb Achker Donut Hammer (Auto/Trip)
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Groundwater Readings Not Applicable for Offshore Borings

Date	Time	Depth	Elev.	Stabilization Time

DEPTH	Casing Blows (ft)	SAMPLE INFORMATION Type & No.	REC/PEN (inches)	DEPTH (feet)	BLOWS PER 6 INCHES	SPT N-Value	SAMPLE DESCRIPTION (ASTM D2488)	STRATUM DESCRIPTION
31							Shallow boring terminate hole at 31'	
32								
33								
34								
35								
36								
37								
38								
39								
40								

GRANULAR SOILS (N-Values)	COHESIVE SOILS (N-Values)	SYMBOL KEY	
0 to 4 - Very Loose	0 to 2 - Very Soft	1. S denotes split-barrel sampler.	7. PID denotes Photoionization Detector
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Attachment D

Analytical Results from Phase III Drilling and Sampling

Metals

Sample Name		MCP-MOHML Criteria		FD201 S-2	Q	FD201 S-3	Q	FD202 S-2	Q	FD202 S-4	Q	FD202 S-6	Q	FD203 S-2	Q
Sample Date		S1	S2	9/20/01		9/20/01		9/17/01		9/17/01		9/18/01		9/6/01	
Sample Depth (ft)				2-4		4-6		2-4		6-8		14-16		2-4	
Metals (mg/kg)	Abbrev.	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
Antimony	Sb	10	40	1.00		0.9	B	0.91	B	1.1		0.42	B	0.05	U
Arsenic	As	30	30	2.2		2.2		3.8		3.7		2.7		1.3	
Beryllium	Be	0.7	0.8	0.22	B	0.23	B	0.22	B	0.21	B	0.19	B	0.28	
Cadmium	Cd	30	80	0.94		0.54		0.61		0.54		0.36		0.22	B
Chromium	Cr	1000	2500	19.1		14.3		18.6		17.5		7.2		24.4	
Copper	Cu	1000	10000	39.5		22.0		58.8		69.6		8.9		22.9	
Lead	Pb	300	600	137		97.6		245		190		3.9		74.7	
Mercury	Hg	20	60	0.3		0.13		0.4		0.3		0.02	B	0.13	
Nickel	Ni	300	700	8.3		7.6		8.8		7.9		4.9		11.1	
Selenium	Se	400	2500	0.3	U	0.29	U	0.31	U	0.31	U	0.3	U	0.03	U
Silver	Ag	100	200	0.15	B	0.048	U	0.051	U	1.0	B	0.05	U	0.05	U
Thallium	Tl	8	30	0.099	U	0.38	B	0.37	B	0.4	B	0.1	U	0.14	B
Zinc	Zn	2500	2500	66.5		45.6		112		93.1		15.6		39.3	
Cyanide -Total mg/kg	CN	100	100	0.34	U	0.32	U	0.39	U	0.37	U	0.39	U		R

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = Non-detect

EM = Result is an EMPC (estimated maximum potential concentration) value.

B = Value less than CRDL, but greater than IDL

R = rejected, out of holding time

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yivian Zhang

Metals

Sample Name		MCP-MOHML Criteria		FD203 S-4	Q	FD204 S-1	Q	FD204 S-4	Q	FD205-S-1		FD205-S-4		FD206 S-5	Q
Sample Date		S1	S2	9/6/01		9/13/01		9/13/01		9/13/01		9/13/01		9/28/01	
Sample Depth (ft)				6-8		0-2		6-8		0-2		6-8		9-11	
Metals (mg/kg)	Abbrev.	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
Antimony	Sb	10	40	0.052		0.32	B	0.079	B	0.19	B	0.64	B	0.63	B
Arsenic	As	30	30	2.5		1.9		0.98	B	2.9		0.5	B	4.5	
Beryllium	Be	0.7	0.8	0.26		0.2	B	0.091	B	0.22	B	0.21	B	0.27	
Cadmium	Cd	30	80	0.3		0.44		0.43		0.36		0.35		0.69	
Chromium	Cr	1000	2500	13.8		26.4		28.9		16.4		22.5		11.7	
Copper	Cu	1000	10000	31.6		48.8		50.6		11.5		33.6		46.5	
Lead	Pb	300	600	224		26.1		21.1		12.9		20.6		416	
Mercury	Hg	20	60	0.32		0.042	B	0.023	B	0.017	U	0.052		0.32	
Nickel	Ni	300	700	7.6		8.7		4.5		12.1		12.8		7.5	
Selenium	Se	400	2500	0.31	U	1.6		0.75	B	3.4		2.6		0.32	U
Silver	Ag	100	200	0.052	U	0.45	B	0.051	U	0.85	B	0.77	B	0.054	U
Thallium	Tl	8	30	0.2	B	0.48	B	0.1	U	1.7		1.3		0.12	B
Zinc	Zn	2500	2500	64.6		46.4		24.8		28.7		36.7		177	
Cyanide -Total mg/kg	CN	100	100		R	0.31	U	0.32	U	0.32	U	0.34	U	0.35	U

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = Non-detect

EM = Result is an EMPC (estimated maximum potential concentratio

B = *Value less than CRDL, but greater than IDL*

R = rejected, out of holding time

Creat : Heather Ferro

Metals

Sample Name		MCP-MOHML Criteria		FD206 S-6	Q	FD207 S-3	Q	FD207 S-4	Q
Sample Date		S1	S2	9/28/01		9/27/01		9/27/01	
Sample Depth (ft)				11-13		4-6		6-8	
Metals (mg/kg)	Abbrev.	(mg/kg)		Value	Q	Value	Q	Value	Q
Antimony	Sb	10	40	0.05	U	0.049	U	0.054	U
Arsenic	As	30	30	3.2		0.59	B	1.2	
Beryllium	Be	0.7	0.8	0.3		0.11	B	0.19	B
Cadmium	Cd	30	80	0.43		0.26		0.14	B
Chromium	Cr	1000	2500	22		83.6		6.9	
Copper	Cu	1000	10000	30.8		28.8		11	
Lead	Pb	300	600	171		8.4		5.5	
Mercury	Hg	20	60	0.16		0.048		0.017	U
Nickel	Ni	300	700	11.1		36.2		3.0	
Selenium	Se	400	2500	0.49	B	0.6	B	0.32	U
Silver	Ag	100	200	0.05	U	0.049	U	0.054	U
Thallium	Tl	8	30	0.1	U	0.56	B	0.11	U
Zinc	Zn	2500	2500	61.9		26.1		13.7	
Cyanide -Total mg/kg	CN	100	100	0.40	U	0.30	U	0.38	U

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

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EM = Result is an EMPC (estimated maximum potential concentratio

B = Value less than CRDL, but greater than IDL

R = rejected, out of holding time

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD201 S-2	Q	FD201 S-3	Q	FD202 S-2	Q	FD202 S-4	Q	FD202
Sample Date	S1	S2	9/20/01		9/20/01		9/17/01		9/17/01		9/18/01
Sample Depth (ft)			2-4		4-6		2-4		6-8		14-16
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q	Value
Dichlorodifluoromethane	1000	10000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Chloromethane	100	1000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Vinyl Chloride	0.3	0.4	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Bromomethane	3	3	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Chloroethane	100	1000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Trichlorofluoromethane	1000	10000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,1-Dichloroethene	0.1	0.1	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Acetone	3	60	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Iodomethane	100	1000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Carbon Disulfide	100	1000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Methylene Chloride	0.1	200	0.23	U	0.10	U	0.06	J	0.25	U	0.09
trans-1,2-Dichloroethene	4	500	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Methyl tert-butyl ether	3	200	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,1-Dichloroethane	3	400	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Vinyl Acetate	1000	10000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
cis-1,2-Dichloroethene	2	500	0.23	U	0.32	U	0.23	U	0.25	U	0.37
2,2,-Dichloropropane	Not available	Not available	0.23	U	0.32	U	0.23	U	0.25	U	0.37
2-Butanone	0.3	40	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Bromochloromethane	Not available	Not available	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Chloroform	0.1	10	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,1,1-Trichloroethane	30	500	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,1-Dichloropropene	Not available	Not available	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Carbon Tetrachloride	1	4	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,2-Dichloroethane	0.05	0.2	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Benzene	10	60	0.23	U	0.32	U	0.23	U	0.10	J	0.37
Trichloroethene	0.4	20	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,2-Dichloropropane	0.1	0.2	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Dibromomethane	500	5000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Bromodichloromethane	0.1	20	0.23	U	0.32	U	0.23	U	0.25	U	0.37
cis-1,3-Dichloropropene	0.01	0.1	0.23	U	0.32	U	0.23	U	0.25	U	0.37
4-Methyl-2-pentanone	0.5	70	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Toluene	90	500	0.23	U	0.32	U	0.23	U	0.08	J	0.37
trans-1,3-Dichloropropene	0.01	0.1	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,1,2-Trichloroethane	0.3	3	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,3-Dichloropropane	500	5000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Tetrachloroethene	0.5	30	0.23	U	0.32	U	0.23	U	0.25	U	0.37
2-Hexanone	100	1000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Dibromochloromethane	0.09	20	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,2-Dibromoethane	0.005	0.02	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Chlorobenzene	8	40	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,1,1,2-Tetrachloroethane	0.4	0.5	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Ethylbenzene	80	500	0.23	U	0.32	U	0.07	J	0.33		0.37
Styrene	2	20	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Xylene (total)	500	500	0.23	U	0.32	U	0.06	J	0.25	U	0.37
Bromoform	0.1	20	0.23	U	0.32	U	0.23	U	0.19	J	0.37
Isopropylbenzene	1000	10000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,1,2,2-Tetrachloroethane	0.02	0.2	0.23	U	0.32	U	0.23	U	0.25	U	0.37
Bromobenzene	100	1000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
1,2,3-Trichloropropane	100	1000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
n-Propylbenzene	100	1000	0.23	U	0.32	U	0.23	U	0.25	U	0.37
2-Chlorotoluene	100	1000	0.23	U	0.32	U	0.23	U	0.25	U	0.37

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD201 S-2	Q	FD201 S-3	Q	FD202 S-2	Q	FD202 S-4	Q	FD202 S-6	Q
Sample Date	S1	S2	9/20/01		9/20/01		9/17/01		9/17/01		9/18/01	
Sample Depth (ft)			2-4		4-6		2-4		6-8		14-16	
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
1,3,5-Trimethylbenzene	10	1000	0.23	U	0.32	U	0.23	U	0.25	U	0.37	U
4-Chlorotoluene	Not available	Not available	0.23	U	0.32	U	0.23	U	0.25	U	0.37	U
tert-Butylbenzene	100	1000	0.23	U	0.32	U	0.23	U	0.25	U	0.37	U
1,2,4- Trimethylbenzene	1000	10000	0.23	U	0.32	U	0.23	U	0.09	J	0.37	U
sec-Butylbenzene	Not available	Not available	0.23	U	0.32	U	0.23	U	0.25	U	0.37	U
1,3-Dichlorobenzene	100	500	0.23	U	0.32	U	0.23	U	0.25	U	0.37	U
4-Isopropyltoluene	100	1000	0.23	U	0.32	U	0.23	U	0.06	J	0.37	U
1,4-Dichlorobenzene	2	60	0.23	U	0.32	U	0.23	U	0.25	U	0.37	U
n-Butylbenzene	Not available	Not available	0.23	U	0.32	U	0.23	U	0.05	J	0.37	U
1,2-Dichlorobenzene	100	500	0.23	U	0.32	U	0.23	U	0.25	U	0.37	U
1,2-Dibromo-3-chloropropane	10	100	0.23	U	0.32	U	0.23	U	0.25	U	0.37	U
1,2,4-Trichlorobenzene	100	500	0.23	U	0.32	U	0.23	U	0.05	J	0.37	U
Hexachlorobutadiene	3	3	0.23	U	0.32	U	0.23	U	0.25	U	0.37	U
Napthalene	4	1000	0.23	U	0.11	J	0.23	J	1.00		0.37	U
1,2,3-Trichlorobenzene	Not available	Not available	0.23	U	0.32	U	0.23	U	0.10	J	0.37	U

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = non-detect

J = estimated value, below the method detection limit

R = rejected, out of holding time

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD203 S-2	Q	FD203 S-4	Q	FD204 S-1	Q	FD204 S-4	Q	FD2[illegible]
Sample Date	S1	S2	9/6/01		9/6/01		9/13/01		9/13/01		9/13
Sample Depth (ft)			2-4		6-8		0-2		6-8		0-2
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q	Value
Dichlorodifluoromethane	1000	10000		R		R	0.26	U	0.27	U	0.20
Chloromethane	100	1000		R		R	0.26	U	0.27	U	0.20
Vinyl Chloride	0.3	0.4		R		R	0.26	U	0.27	U	0.20
Bromomethane	3	3		R		R	0.26	U	0.27	U	0.20
Chloroethane	100	1000		R		R	0.26	U	0.27	U	0.20
Trichlorofluoromethane	1000	10000		R		R	0.26	U	0.27	U	0.20
1,1-Dichloroethene	0.1	0.1		R		R	0.26	U	0.27	U	0.20
Acetone	3	60		R	0.24	J	0.26	U	0.27	U	0.20
Iodomethane	100	1000		R		R	0.26	U	0.27	U	0.20
Carbon Disulfide	100	1000		R		R	0.26	U	0.27	U	0.20
Methylene Chloride	0.1	200		R		R	0.09	J	0.08	J	0.07
trans-1,2-Dichloroethene	4	500		R		R	0.26	U	0.27	U	0.20
Methyl tert-butyl ether	3	200		R		R	0.26	U	0.27	U	0.20
1,1-Dichloroethane	3	400		R		R	0.26	U	0.27	U	0.20
Vinyl Acetate	1000	10000		R		R	0.26	U	0.27	U	0.20
cis-1,2-Dichloroethene	2	500		R		R	0.26	U	0.27	U	0.20
2,2,-Dichloropropane	Not available	Not available		R		R	0.26	U	0.27	U	0.20
2-Butanone	0.3	40		R		R	0.26	U	0.27	U	0.20
Bromochloromethane	Not available	Not available		R		R	0.26	U	0.27	U	0.20
Chloroform	0.1	10		R		R	0.26	U	0.27	U	0.20
1,1,1-Trichloroethane	30	500		R		R	0.26	U	0.27	U	0.20
1,1-Dichloropropene	Not available	Not available		R		R	0.26	U	0.27	U	0
Carbon Tetrachloride	1	4		R		R	0.26	U	0.27	U	0[illegible]
1,2-Dichloroethane	0.05	0.2		R		R	0.26	U	0.27	U	0.20
Benzene	10	60		R		R	0.26	U	0.27	U	0.20
Trichloroethene	0.4	20		R		R	0.26	U	0.27	U	0.20
1,2-Dichloropropane	0.1	0.2		R		R	0.26	U	0.27	U	0.20
Dibromomethane	500	5000		R		R	0.26	U	0.27	U	0.20
Bromodichloromethane	0.1	20		R		R	0.26	U	0.27	U	0.20
cis-1,3-Dichloropropene	0.01	0.1		R		R	0.26	U	0.27	U	0.20
4-Methyl-2-pentanone	0.5	70		R		R	0.26	U	0.27	U	0.20
Toluene	90	500		R		R	0.26	U	0.27	U	0.20
trans-1,3-Dichloropropene	0.01	0.1		R		R	0.26	U	0.27	U	0.20
1,1,2-Trichloroethane	0.3	3		R		R	0.26	U	0.27	U	0.20
1,3-Dichloropropane	500	5000		R		R	0.26	U	0.27	U	0.20
Tetrachloroethene	0.5	30	0.13	J		R	0.26	U	0.27	U	0.20
2-Hexanone	100	1000		R		R	0.26	U	0.27	U	0.20
Dibromochloromethane	0.09	20		R		R	0.26	U	0.27	U	0.20
1,2-Dibromoethane	0.005	0.02		R		R	0.26	U	0.27	U	0.20
Chlorobenzene	8	40		R		R	0.26	U	0.27	U	0.20
1,1,1,2-Tetrachloroethane	0.4	0.5		R		R	0.26	U	0.27	U	0.20
Ethylbenzene	80	500		R		R	0.26	U	0.27	U	0.20
Styrene	2	20		R		R	0.26	U	0.27	U	0.20
Xylene (total)	500	500		R	0.1	J	0.26	U	0.27	U	0.20
Bromoform	0.1	20		R		R	0.26	U	0.27	U	0.20
Isopropylbenzene	1000	10000		R		R	0.26	U	0.27	U	0.20
1,1,2,2-Tetrachloroethane	0.02	0.2		R		R	0.26	U	0.27	U	0.20
Bromobenzene	100	1000		R		R	0.26	U	0.27	U	0.2[illegible]
1,2,3-Trichloropropane	100	1000		R		R	0.26	U	0.27	U	0.[illegible]
n-Propylbenzene	100	1000		R		R	0.26	U	0.27	U	0.20
2-Chlorotoluene	100	1000		R		R	0.26	U	0.27	U	0.20

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD203 S-2	Q	FD203 S-4	Q	FD204 S-1	Q	FD204 S-4	Q	FD205 S-1
Sample Date	S1	S2	9/6/01		9/6/01		9/13/01		9/13/01		9/13/01
Sample Depth (ft)			2-4		6-8		0-2		6-8		0-2
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q	Value
1,3,5-Trimethylbenzene	10	1000		R		R	0.26	U	0.27	U	0.20
4-Chlorotoluene	Not available	Not available		R		R	0.26	U	0.27	U	0.20
tert-Butylbenzene	100	1000		R		R	0.26	U	0.27	U	0.20
1,2,4- Trimethylbenzene	1000	10000		R	0.17	J	0.26	U	0.27	U	0.20
sec-Butylbenzene	Not available	Not available		R		R	0.26	U	0.27	U	0.20
1,3-Dichlorobenzene	100	500		R		R	0.26	U	0.27	U	0.20
4-Isopropyltoluene	100	1000		R		R	0.26	U	0.27	U	0.20
1,4-Dichlorobenzene	2	60		R		R	0.26	U	0.27	U	0.20
n-Butylbenzene	Not available	Not available		R		R	0.26	U	0.27	U	0.20
1,2-Dichlorobenzene	100	500		R		R	0.26	U	0.27	U	0.20
1,2-Dibromo-3-chloropropane	10	100		R		R	0.26	U	0.27	U	0.20
1,2,4-Trichlorobenzene	100	500		R		R	0.26	U	0.27	U	0.20
Hexachlorobutadiene	3	3		R		R	0.26	U	0.27	U	0.20
Napthalene	4	1000	0.29	J	0.06	J	0.05	U	0.27	U	0.20
1,2,3-Trichlorobenzene	Not available	Not available		R		R	0.26	U	0.27	U	0.20

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = non-detect

J = estimated value, below the method detection limit

R = rejected, out of holding time

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		Q	FD205 S-4	Q	FD206 S-5	Q	FD206 S-6	Q	FD207 S-3	Q
Sample Date	S1	S2		9/13/01		9/28/01		9/28/01		9/27/01	
Sample Depth (ft)				6-8		9-11		11-13		4-6	
Analyte (mg/kg)	(mg/kg)		Q	Value	Q	Value	Q	Value	Q	Value	Q
Dichlorodifluoromethane	1000	10000	U	0.31	U	0.37	U	0.30	U	0.25	U
Chloromethane	100	1000	U	0.31	U	0.37	U	0.30	U	0.25	U
Vinyl Chloride	0.3	0.4	U	0.31	U	0.37	U	0.30	U	0.25	U
Bromomethane	3	3	U	0.31	U	0.37	U	0.30	U	0.25	U
Chloroethane	100	1000	U	0.31	U	0.37	U	0.30	U	0.25	U
Trichlorofluoromethane	1000	10000	U	0.31	U	0.37	U	0.30	U	0.25	U
1,1-Dichloroethene	0.1	0.1	U	0.31	U	0.37	U	0.30	U	0.25	U
Acetone	3	60	U	0.31	U	0.16	J	0.15	J	0.25	U
Iodomethane	100	1000	U	0.31	U	0.37	U	0.30	U	0.25	U
Carbon Disulfide	100	1000	U	0.31	U	0.37	U	0.30	U	0.25	U
Methylene Chloride	0.1	200	J	0.31	U	0.37	U	0.30	U	0.25	U
trans-1,2-Dichloroethene	4	500	U	0.31	U	0.37	U	0.30	U	0.25	U
Methyl tert-butyl ether	3	200	U	0.31	U	0.37	U	0.30	U	0.25	U
1,1-Dichloroethane	3	400	U	0.31	U	0.37	U	0.30	U	0.25	U
Vinyl Acetate	1000	10000	U	0.31	U	0.37	U	0.30	U	0.25	U
cis-1,2-Dichloroethene	2	500	U	0.31	U	0.37	U	0.30	U	0.25	U
2,2,-Dichloropropane	Not available	Not available	U	0.31	U	0.37	U	0.30	U	0.25	U
2-Butanone	0.3	40	U	0.31	U	0.37	U	0.30	U	0.25	U
Bromochloromethane	Not available	Not available	U	0.31	U	0.37	U	0.30	U	0.25	U
Chloroform	0.1	10	U	0.31	U	0.37	U	0.30	U	0.25	U
1,1,1-Trichloroethane	30	500	U	0.31	U	0.37	U	0.30	U	0.25	U
1,1-Dichloropropene	Not available	Not available	U	0.31	U	0.37	U	0.30	U	0.25	U
Carbon Tetrachloride	1	4	U	0.31	U	0.37	U	0.30	U	0.25	U
1,2-Dichloroethane	0.05	0.2	U	0.31	U	0.37	U	0.30	U	0.25	U
Benzene	10	60	U	0.31	U	0.37	U	0.30	U	0.25	U
Trichloroethene	0.4	20	U	0.31	U	0.37	U	0.30	U	0.25	U
1,2-Dichloropropane	0.1	0.2	U	0.31	U	0.37	U	0.30	U	0.25	U
Dibromomethane	500	5000	U	0.31	U	0.37	U	0.30	U	0.25	U
Bromodichloromethane	0.1	20	U	0.31	U	0.37	U	0.30	U	0.25	U
cis-1,3-Dichloropropene	0.01	0.1	U	0.31	U	0.37	U	0.30	U	0.25	U
4-Methyl-2-pentanone	0.5	70	U	0.31	U	0.37	U	0.30	U	0.25	U
Toluene	90	500	U	0.31	U	0.09	J	0.30	U	0.25	U
trans-1,3-Dichloropropene	0.01	0.1	U	0.31	U	0.37	U	0.30	U	0.25	U
1,1,2-Trichloroethane	0.3	3	U	0.31	U	0.37	U	0.30	U	0.25	U
1,3-Dichloropropane	500	5000	U	0.31	U	0.37	U	0.30	U	0.25	U
Tetrachloroethene	0.5	30	U	0.31	U	0.37	U	0.30	U	0.25	U
2-Hexanone	100	1000	U	0.31	U	0.37	U	0.30	U	0.25	U
Dibromochloromethane	0.09	20	U	0.31	U	0.37	U	0.30	U	0.25	U
1,2-Dibromoethane	0.005	0.02	U	0.31	U	0.37	U	0.30	U	0.25	U
Chlorobenzene	8	40	U	0.31	U	0.37	U	0.30	U	0.25	U
1,1,1,2-Tetrachloroethane	0.4	0.5	U	0.31	U	0.37	U	0.30	U	0.25	U
Ethylbenzene	80	500	U	0.31	U	0.12	J	0.30	U	0.25	U
Styrene	2	20	U	0.31	U	0.37	U	0.30	U	0.25	U
Xylene (total)	500	500	U	0.31	U	0.11	J	0.30	U	0.25	U
Bromoform	0.1	20	U	0.31	U	0.37	U	0.30	U	0.25	U
Isopropylbenzene	1000	10000	U	0.31	U	0.37	U	0.30	U	0.25	U
1,1,2,2-Tetrachloroethane	0.02	0.2	U	0.31	U	0.37	U	0.30	U	0.25	U
Bromobenzene	100	1000	U	0.31	U	0.37	U	0.30	U	0.25	U
1,2,3-Trichloropropane	100	1000	U	0.31	U	0.37	U	0.30	U	0.25	U
n-Propylbenzene	100	1000	U	0.31	U	0.37	U	0.30	U	0.25	U
2-Chlorotoluene	100	1000	U	0.31	U	0.37	U	0.30	U	0.25	U

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		Q	FD205 S-4	Q	FD206 S-5	Q	FD206 S-6	Q	FD207 S-3	Q
Sample Date	S1	S2		9/13/01		9/28/01		9/28/01		9/27/01	
Sample Depth (ft)				6-8		9-11		11-13		4-6	
Analyte (mg/kg)	(mg/kg)		Q	Value	Q	Value	Q	Value	Q	Value	Q
1,3,5-Trimethylbenzene	10	1000	U	0.31	U	0.37	U	0.30	U	0.25	U
4-Chlorotoluene	Not available	Not available	U	0.31	U	0.37	U	0.30	U	0.25	U
tert-Butylbenzene	100	1000	U	0.31	U	0.37	U	0.30	U	0.25	U
1,2,4- Trimethylbenzene	1000	10000	U	0.31	U	0.09	J	0.30	U	0.25	U
sec-Butylbenzene	Not available	Not available	U	0.31	U	0.37	U	0.30	U	0.25	U
1,3-Dichlorobenzene	100	500	U	0.31	U	0.37	U	0.30	U	0.25	U
4-Isopropyltoluene	100	1000	U	0.31	U	0.37	U	0.30	U	0.25	U
1,4-Dichlorobenzene	2	60	U	0.31	U	0.37	U	0.30	U	0.25	U
n-Butylbenzene	Not available	Not available	U	0.31	U	0.37	U	0.30	U	0.25	U
1,2-Dichlorobenzene	100	500	U	0.31	U	0.37	U	0.30	U	0.25	U
1,2-Dibromo-3-chloropropane	10	100	U	0.31	U	0.37	U	0.30	U	0.25	U
1,2,4-Trichlorobenzene	100	500	U	0.31	U	0.37	U	0.30	U	0.25	U
Hexachlorobutadiene	3	3	U	0.31	U	0.37	U	0.30	U	0.25	U
Napthalene	4	1000	U	6.10		2.50		0.25	J	0.25	U
1,2,3-Trichlorobenzene	Not available	Not available	U	0.31	U	0.37	U	0.30	U	0.25	U

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = non-detect

J = estimated value, below the method detection limit

R = rejected, out of holding time

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD207 S-4	Q
Sample Date	S1	S2	9/27/01	
Sample Depth (ft)			6-8	
Analyte (mg/kg)	(mg/kg)		Value	Q
Dichlorodifluoromethane	1000	10000	0.26	U
Chloromethane	100	1000	0.26	U
Vinyl Chloride	0.3	0.4	0.26	U
Bromomethane	3	3	0.26	U
Chloroethane	100	1000	0.26	U
Trichlorofluoromethane	1000	10000	0.26	U
1,1-Dichloroethene	0.1	0.1	0.26	U
Acetone	3	60	0.26	U
Iodomethane	100	1000	0.26	U
Carbon Disulfide	100	1000	0.26	U
Methylene Chloride	0.1	200	0.26	U
trans-1,2-Dichloroethene	4	500	0.26	U
Methyl tert-butyl ether	3	200	0.26	U
1,1-Dichloroethane	3	400	0.26	U
Vinyl Acetate	1000	10000	0.26	U
cis-1,2-Dichloroethene	2	500	0.26	U
2,2,-Dichloropropane	Not available	Not available	0.26	U
2-Butanone	0.3	40	0.26	U
Bromochloromethane	Not available	Not available	0.26	U
Chloroform	0.1	10	0.26	U
1,1,1-Trichloroethane	30	500	0.26	U
1,1-Dichloropropene	Not available	Not available	0.26	U
Carbon Tetrachloride	1	4	0.26	U
1,2-Dichloroethane	0.05	0.2	0.26	U
Benzene	10	60	0.26	U
Trichloroethene	0.4	20	0.26	U
1,2-Dichloropropane	0.1	0.2	0.26	U
Dibromomethane	500	5000	0.26	U
Bromodichloromethane	0.1	20	0.26	U
cis-1,3-Dichloropropene	0.01	0.1	0.26	U
4-Methyl-2-pentanone	0.5	70	0.26	U
Toluene	90	500	0.26	U
trans-1,3-Dichloropropene	0.01	0.1	0.26	U
1,1,2-Trichloroethane	0.3	3	0.26	U
1,3-Dichloropropane	500	5000	0.26	U
Tetrachloroethene	0.5	30	0.26	U
2-Hexanone	100	1000	0.26	U
Dibromochloromethane	0.09	20	0.26	U
1,2-Dibromoethane	0.005	0.02	0.26	U
Chlorobenzene	8	40	0.26	U
1,1,1,2-Tetrachloroethane	0.4	0.5	0.26	U
Ethylbenzene	80	500	0.26	U
Styrene	2	20	0.26	U
Xylene (total)	500	500	0.26	U
Bromoform	0.1	20	0.26	U
Isopropylbenzene	1000	10000	0.26	U
1,1,2,2-Tetrachloroethane	0.02	0.2	0.26	U
Bromobenzene	100	1000	0.26	U
1,2,3-Trichloropropane	100	1000	0.26	U
n-Propylbenzene	100	1000	0.26	U
2-Chlorotoluene	100	1000	0.26	U

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD207 S-4	Q
Sample Date	S1	S2	9/27/01	
Sample Depth (ft)			6-8	
Analyte (mg/kg)	(mg/kg)		Value	Q
1,3,5-Trimethylbenzene	10	1000	0.26	U
4-Chlorotoluene	Not available	Not available	0.26	U
tert-Butylbenzene	100	1000	0.26	U
1,2,4- Trimethylbenzene	1000	10000	0.26	U
sec-Butylbenzene	Not available	Not available	0.26	U
1,3-Dichlorobenzene	100	500	0.26	U
4-Isopropyltoluene	100	1000	0.26	U
1,4-Dichlorobenzene	2	60	0.26	U
n-Butylbenzene	Not available	Not available	0.26	U
1,2-Dichlorobenzene	100	500	0.26	U
1,2-Dibromo-3-chloropropane	10	100	0.26	U
1,2,4-Trichlorobenzene	100	500	0.26	U
Hexachlorobutadiene	3	3	0.26	U
Napthalene	4	1000	0.26	U
1,2,3-Trichlorobenzene	Not available	Not available	0.26	U

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = non-detect

J = estimated value, below the method detection limit

R = rejected, out of holding time

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Semi-Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD201 S-2	Q	FD201 S-3	Q	FD202 S-2	Q	FD202 S-4	Q
Sample Date	S1	S2	9/20/01		9/20/01		9/17/01		9/17/01	
Sample Depth (ft)			2-4		4-6		2-4		6-8	
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q
Phenol	60	500	1.00	U	1.00	U	0.37	U	0.38	U
bis(2-Chloroethyl) Ether	0.7	0.7	1.00	U	1.00	U	0.37	U	0.38	U
2-Chlorophenol	0.7	20	1.00	U	1.00	U	0.37	U	0.38	U
1,3-Dichlorobenzene	100	500	1.00	U	1.00	U	0.37	U	0.38	U
1,4-Dichlorobenzene	2	60	1.00	U	1.00	U	0.37	U	0.38	U
1,2-Dichlorobenzen	100	500	1.00	U	1.00	U	0.37	U	0.38	U
2-Methylphenol	500	5000	1.00	U	1.00	U	0.37	U	0.38	U
2,2-oxybis (1-Chloropropane)	0.7	3	1.00	U	1.00	U	0.37	U	0.38	U
4-Methylphenol	500	500	1.00	U	1.00	U	0.04	J	0.05	J
N-Nitroso-di-n-propylamine	50	500	1.00	U	1.00	U	0.37	U	0.38	U
Hexachloroethane	6	10	1.00	U	1.00	U	0.37	U	0.38	U
Nitrobenzene	500	5000	1.00	U	1.00	U	0.37	U	0.38	U
Isophorone	100	1000	1.00	U	1.00	U	0.37	U	0.38	U
2-Nitrophenol	100	1000	1.00	U	1.00	U	0.37	U	0.38	U
2,4-Dimethylphenol	0.7	10	1.00	U	1.00	U	0.37	U	0.38	U
2,4-Dichlorophenol	10	90	1.00	U	1.00	U	0.37	U	0.38	U
1,2,4-Trichlorobenzene	100	500	1.00	U	1.00	U	0.37	U	0.38	U
Naphthalene	4	1000	0.34	J	0.16	J	0.27	J	0.79	
4-Chloroaniline	1	30	1.00	U	1.00	U	0.37	U	0.38	U
bis(2-Chlorethoxy) methane	500	5000	1.00	U	1.00	U	0.37	U	0.38	U
Hexachlorobutadiene	3	3	1.00	U	1.00	U	0.37	U	0.38	U
4-Chloro-3-Methylphenol	1000	1000	1.00	U	1.00	U	0.37	U	0.38	U
2-Methylnaphthalene	4	1000	0.17	J	0.11	J	0.17	J	0.64	
Hexachlorocyclopentadiene	50	500	1.00	U	1.00	U	0.37	U	0.38	U
2,4,6-Trichlorophenol	3	60	1.00	U	1.00	U	0.37	U	0.38	U
2,4,5-Trichlorophenol	2	2	2.10	U	2.10	U	0.75	U	0.78	U
2-Chloronaphthalene	1000	10000	1.00	U	1.00	U	0.37	U	0.38	U
2-Nitroaniline	Not available	Not available	2.10	U	2.10	U	0.75	U	0.78	U
Dimethylphthalate	0.7	0.7	1.00	U	1.00	U	0.37	U	0.38	U
Acenaphthylene	100	1000	0.29	J	0.30	J	0.34	J	0.38	J
2,6-Dinitrotoluene	100	1000	1.00	U	1.00	U	0.37	U	0.38	U
3-Nitroaniline	Not available	Not available	2.10	U	2.10	U	0.75	U	0.78	U
Acenaphthene	20	2500	0.74	J	0.65	J	0.27	J	0.94	
2,4,-Ditnitrophenol	3	6	2.10	U	2.10	U	0.75	U	0.78	U
4-Nitrophenol	100	1000	2.10	U	2.10	U	0.75	U	0.78	U
Dibenzofuran	100	1000	0.58	J	0.48	J	0.15	J	0.38	J
2,4-Dinitrotoluene	0.7	2	1.00	U	1.00	U	0.37	U	0.38	U
Diethylphthalate	0.7	0.7	1.00	U	1.00	U	0.37	U	0.38	U
4-Chlorophenyl-phenylehter	1000	10000	1.00	U	1.00	U	0.37	U	0.38	U
Fluorene	400	2000	0.92	J	0.66	J	0.29	J	0.96	
4-Nitroaniline	1000	10000	2.10	U	2.10	U	0.75	U	0.78	U
4,6-Dinitro-2-methylphenol	50	500	2.10	U	2.10	U	0.75	U	0.78	U
N-Nitrosodiphenylamine	100	1000	1.00	U	1.00	U	0.37	U	0.38	U
4-Bromophenyl-phenylether	100	1000	1.00	U	1.00	U	0.37	U	0.38	U
Hexachlorobenzene	0.7	0.8	1.00	U	1.00	U	0.37	U	0.38	U
Pentachlorophenol	5	10	2.10	U	2.10	U	0.75	U	0.78	U
Phenanthrene	100	100	8.60		7.70		2.50		6.10	
Anthracene	1000	1000	2.50		2.70		0.75		1.80	
Carbazole	Not available	Not available	0.98	J	0.47	J	0.18	J	0.42	
Di-n-butylphthalate	50	500	1.00	U	1.00	U	0.37	U	0.38	U
Fluoranthene	1000	1000	10.00		11.00		3.50		5.60	

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Semi-Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD201 S-2	Q	FD201 S-3	Q	FD202 S-2	Q	FD202 S-4	Q
Sample Date	S1	S2	9/20/01		9/20/01		9/17/01		9/17/01	
Sample Depth (ft)			2-4		4-6		2-4		6-8	
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q
Pyrene	700	2000	8.90		10.00		3.60		5.40	
Butylbenzylphthalate	100	1000	1.00	U	1.00	U	0.37	U	0.38	U
3,3-Dichlorobenzidine	10	100	1.00	U	1.00	U	0.37	U	0.38	U
Benzo(a)anthracene	0.7	1	4.80		5.90		1.90		2.70	
Chrysene	7	10	4.30		5.10		1.90		2.60	
bis(2-Ethylhexyl) phthalate	100	300	0.11	BJ	1.00	U	0.33	BJ	0.31	BJ
Di-n-octylphthalate	1000	10000	1.00	U	1.00	U	0.37	U	0.38	U
Benzo(b) fluoranthene	0.7	1	5.20		5.80		2.00		2.80	
Benzo(k) fluroanthene	7	10	1.50		1.90		0.60		0.84	
Benzo(a) pyrene	0.7	0.7	4.20		5.00		1.80		2.30	
Indeno (1,2,3-cd) pyrene	0.7	1	2.60		3.00		1.10		1.40	
Dibenzo (a,h) anthracene	0.7	0.7	0.56	J	0.68	J	0.27	J	0.39	
Benzo (g,h,I) perylene	1000	2500	2.50		2.80		1.20		1.40	

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = non-detect

J = estimated value, below quantitation limit

R = rejected, out of holding time

B = <5Xblank

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Semi-Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD202 S-6	Q	FD203 S-2	Q	FD203 S-4	Q	FD204 S-1	Q
Sample Date	S1	S2	9/18/01		9/6/01		9/6/01		9/13/01	
Sample Depth (ft)			14-16		2-4		6-8		0-2	
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q
Phenol	60	500	0.38	U		R		R	0.65	U
bis(2-Chloroethyl) Ether	0.7	0.7	0.38	U		R		R	0.65	U
2-Chlorophenol	0.7	20	0.38	U		R		R	0.65	U
1,3-Dichlorobenzene	100	500	0.38	U		R		R	0.65	U
1,4-Dichlorobenzene	2	60	0.38	U		R		R	0.65	U
1,2-Dichlorobenzen	100	500	0.38	U		R		R	0.65	U
2-Methylphenol	500	5000	0.38	U		R		R	0.65	U
2,2-oxybis (1-Chloropropane)	0.7	3	0.38	U		R		R	0.65	U
4-Methylphenol	500	500	0.38	U		R		R	0.65	U
N-Nitroso-di-n-propylamine	50	500	0.38	U		R		R	0.65	U
Hexachloroethane	6	10	0.38	U		R		R	0.65	U
Nitrobenzene	500	5000	0.38	U		R		R	0.65	U
Isophorone	100	1000	0.38	U		R		R	0.65	U
2-Nitrophenol	100	1000	0.38	U		R		R	0.65	U
2,4-Dimethylphenol	0.7	10	0.38	U		R		R	0.65	U
2,4-Dichlorophenol	10	90	0.38	U		R		R	0.65	U
1,2,4-Trichlorobenzene	100	500	0.38	U		R		R	0.65	U
Naphthalene	4	1000	0.38	U		R		R	0.65	U
4-Chloroaniline	1	30	0.38	U		R		R	0.65	U
bis(2-Chlorethoxy) methane	500	5000	0.38	U		R		R	0.65	U
Hexachlorobutadiene	3	3	0.38	U		R		R	0.65	U
4-Chloro-3-Methylphenol	1000	1000	0.38	U		R		R	0.65	U
2-Methylnaphthalene	4	1000	0.38	U		R		R	0.65	U
Hexachlorocyclopentadiene	50	500	0.38	U		R		R	0.65	U
2,4,6-Trichlorophenol	3	60	0.38	U		R		R	0.65	U
2,4,5-Trichlorophenol	2	2	0.78	U		R		R	1.30	U
2-Chloronaphthalene	1000	10000	0.38	U		R		R	0.65	U
2-Nitroaniline	Not available	Not available	0.78	U		R		R	1.30	U
Dimethylphthalate	0.7	0.7	0.38	U		R		R	0.65	U
Acenaphthylene	100	1000	0.38	U	0.2	J		R	0.10	J
2,6-Dinitrotoluene	100	1000	0.38	U		R		R	0.65	U
3-Nitroaniline	Not available	Not available	0.78	U		R		R	1.30	U
Acenaphthene	20	2500	0.38	U		R		R	0.65	U
2,4,-Ditnitrophenol	3	6	0.78	U		R		R	1.30	U
4-Nitrophenol	100	1000	0.78	U		R		R	1.30	U
Dibenzofuran	100	1000	0.38	U		R		R	0.65	U
2,4-Dinitrotoluene	0.7	2	0.38	U		R		R	0.65	U
Diethylphthalate	0.7	0.7	0.38	U		R		R	0.65	U
4-Chlorophenyl-phenylehter	1000	10000	0.38	U		R		R	0.65	U
Fluorene	400	2000	0.38	U	0.19	J		R	0.65	U
4-Nitroaniline	1000	10000	0.78	U		R		R	1.30	U
4,6-Dinitro-2-methylphenol	50	500	0.78	U		R		R	1.30	U
N-Nitrosodiphenylamine	100	1000	0.38	U		R		R	0.65	U
4-Bromophenyl-phenylether	100	1000	0.38	U		R		R	0.65	U
Hexachlorobenzene	0.7	0.8	0.38	U		R		R	0.65	U
Pentachlorophenol	5	10	0.78	U		R		R	1.30	U
Phenanthrene	100	100	0.13	J	1.8		0.43	J	0.60	J
Anthracene	1000	1000	0.38	U	0.66	J		R	0.23	J
Carbazole	Not available	Not available	0.38	U		R		R	0.65	U
Di-n-butylphthalate	50	500	0.38	U		R	1.9	J	0.65	U
Fluoranthene	1000	1000	0.11	J	2		0.51	J	1.10	

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Semi-Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD202 S-6	Q	FD203 S-2	Q	FD203 S-4	Q	FD204 S-1	Q
Sample Date	S1	S2	9/18/01		9/6/01		9/6/01		9/13/01	
Sample Depth (ft)			14-16		2-4		6-8		0-2	
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q
Pyrene	700	2000	0.11	J	2		0.47	J	1.00	
Butylbenzylphthalate	100	1000	0.38	U		R		R	0.65	U
3,3-Dichlorobenzidine	10	100	0.38	U		R		R	0.65	U
Benzo(a)anthracene	0.7	1	0.06	J	1.1	J	0.23	J	0.59	J
Chrysene	7	10	0.06	J	0.99	J	0.4	J	0.56	J
bis(2-Ethylhexyl) phthalate	100	300	0.11	BJ	0.2	J	0.29	J	0.18	J
Di-n-octylphthalate	1000	10000	0.38	U		R		R	0.65	U
Benzo(b) fluoranthene	0.7	1	0.06	J	1	J	0.32	J	0.65	J
Benzo(k) fluroanthene	7	10	0.38	U	0.31	J		R	0.25	J
Benzo(a) pyrene	0.7	0.7	0.05	J	0.83	J	0.21	J	0.60	J
Indeno (1,2,3-cd) pyrene	0.7	1	0.38	U	0.46	J		R	0.38	J
Dibenzo (a,h) anthracene	0.7	0.7	0.38	U		R		R	0.10	J
Benzo (g,h,I) perylene	1000	2500	0.38	U	0.55	J	0.19	J	0.39	J

MCP-MOHML Criteria: Massachusetts Department of *Environmental Protection*, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = non-detect

J = estimated value, below quantitation limit

R = rejected, out of holding time

B = <5Xblank

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Semi-Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD204 S-4	Q	FD205 S-1	Q	FD205 S-4	Q	FD206 S-5	Q
Sample Date	S1	S2	9/13/01		9/13/01		9/13/01		9/28/01	
Sample Depth (ft)			6-8		0-2		6-8		9-11	
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q
Phenol	60	500	0.39	U	0.34	U	2.30	U	1.80	U
bis(2-Chloroethyl) Ether	0.7	0.7	0.39	U	0.34	U	2.30	U	1.80	U
2-Chlorophenol	0.7	20	0.39	U	0.34	U	2.30	U	1.80	U
1,3-Dichlorobenzene	100	500	0.39	U	0.34	U	2.30	U	1.80	U
1,4-Dichlorobenzene	2	60	0.39	U	0.34	U	2.30	U	1.80	U
1,2-Dichlorobenzen	100	500	0.39	U	0.34	U	2.30	U	1.80	U
2-Methylphenol	500	5000	0.39	U	0.34	U	2.30	U	1.80	U
2,2-oxybis (1-Chloropropane)	0.7	3	0.39	U	0.34	U	2.30	U	1.80	U
4-Methylphenol	500	500	0.39	U	0.34	U	2.30	U	1.80	U
N-Nitroso-di-n-propylamine	50	500	0.39	U	0.34	U	2.30	U	1.80	U
Hexachloroethane	6	10	0.39	U	0.34	U	2.30	U	1.80	U
Nitrobenzene	500	5000	0.39	U	0.34	U	2.30	U	1.80	U
Isophorone	100	1000	0.39	U	0.34	U	2.30	U	1.80	U
2-Nitrophenol	100	1000	0.39	U	0.34	U	2.30	U	1.80	U
2,4-Dimethylphenol	0.7	10	0.39	U	0.34	U	2.30	U	1.80	U
2,4-Dichlorophenol	10	90	0.39	U	0.34	U	2.30	U	1.80	U
1,2,4-Trichlorobenzene	100	500	0.39	U	0.34	U	2.30	U	1.80	U
Naphthalene	4	1000	0.39	U	0.34	U	3.80		1.10	J
4-Chloroaniline	1	30	0.39	U	0.34	U	2.30	U	1.80	U
bis(2-Chlorethoxy) methane	500	5000	0.39	U	0.34	U	2.30	U	1.80	U
Hexachlorobutadiene	3	3	0.39	U	0.34	U	2.30	U	1.80	U
4-Chloro-3-Methylphenol	1000	1000	0.39	U	0.34	U	2.30	U	1.80	U
2-Methylnaphthalene	4	1000	0.39	U	0.34	U	3.80		0.44	J
Hexachlorocyclopentadiene	50	500	0.39	U	0.34	U	2.30	U	1.80	U
2,4,6-Trichlorophenol	3	60	0.39	U	0.34	U	2.30	U	1.80	U
2,4,5-Trichlorophenol	2	2	0.78	U	0.69	U	4.70	U	3.80	U
2-Chloronaphthalene	1000	10000	0.39	U	0.34	U	2.30	U	1.80	U
2-Nitroaniline	Not available	Not available	0.78	U	0.69	U	4.70	U	3.80	U
Dimethylphthalate	0.7	0.7	0.39	U	0.34	U	2.30	U	1.80	U
Acenaphthylene	100	1000	0.05	J	0.34	U	0.37	J	0.26	J
2,6-Dinitrotoluene	100	1000	0.39	U	0.34	U	2.30	U	1.80	U
3-Nitroaniline	Not available	Not available	0.78	U	0.69	U	4.70	U	3.80	U
Acenaphthene	20	2500	0.06	J	0.34	U	6.20		0.45	J
2,4,-Ditnitrophenol	3	6	0.78	U	0.69	U	4.70	U	3.80	U
4-Nitrophenol	100	1000	0.78	U	0.69	U	4.70	U	3.80	U
Dibenzofuran	100	1000	0.09	J	0.34	U	5.90		0.30	J
2,4-Dinitrotoluene	0.7	2	0.39	U	0.34	U	2.30	U	1.80	U
Diethylphthalate	0.7	0.7	0.39	U	0.34	U	2.30	U	1.80	U
4-Chlorophenyl-phenylehter	1000	10000	0.39	U	0.34	U	2.30	U	1.80	U
Fluorene	400	2000	0.10	J	0.34	U	7.90		0.50	J
4-Nitroaniline	1000	10000	0.78	U	0.69	U	4.70	U	3.80	U
4,6-Dinitro-2-methylphenol	50	500	0.78	U	0.69	U	4.70	U	3.80	U
N-Nitrosodiphenylamine	100	1000	0.39	U	0.34	U	2.30	U	1.80	U
4-Bromophenyl-phenylether	100	1000	0.39	U	0.34	U	2.30	U	1.80	U
Hexachlorobenzene	0.7	0.8	0.39	U	0.34	U	2.30	U	1.80	U
Pentachlorophenol	5	10	0.78	U	0.69	U	4.70	U	3.80	U
Phenanthrene	100	100	0.88		0.34	U	36.00		2.90	
Anthracene	1000	1000	0.28	J	0.34	U	13.00		0.74	J
Carbazole	Not available	Not available	0.06	J	0.34	U	2.30	J	0.25	J
Di-n-butylphthalate	50	500	0.39	U	0.34	U	2.30	U	1.80	U
Fluoranthene	1000	1000	1.00		0.34	U	30.00		3.10	

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Semi-Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD204 S-4	Q	FD205 S-1	Q	FD205 S-4	Q	FD206 S-5	Q
Sample Date	S1	S2	9/13/01		9/13/01		9/13/01		9/28/01	
Sample Depth (ft)			6-8		0-2		6-8		9-11	
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q
Pyrene	700	2000	0.94		0.34	U	24.00		2.90	
Butylbenzylphthalate	100	1000	0.39	U	0.34	U	2.30	U	1.80	U
3,3-Dichlorobenzidine	10	100	0.39	U	0.34	U	2.30	U	1.80	U
Benzo(a)anthracene	0.7	1	0.45		0.34	U	12.00		1.50	J
Chrysene	7	10	0.42		0.34	U	10.00		1.50	J
bis(2-Ethylhexyl) phthalate	100	300	0.84		0.29	J	0.91	J	1.80	U
Di-n-octylphthalate	1000	10000	0.39	U	0.34	U	2.30	U	1.80	U
Benzo(b) fluoranthene	0.7	1	0.44		0.34	U	11.00		1.70	J
Benzo(k) fluroanthene	7	10	0.20	J	0.34	U	4.00		0.52	J
Benzo(a) pyrene	0.7	0.7	0.40		0.34	U	9.90		1.40	J
Indeno (1,2,3-cd) pyrene	0.7	1	0.25	J	0.34	U	5.50		0.85	J
Dibenzo (a,h) anthracene	0.7	0.7	0.06	J	0.34	U	1.60	J	0.21	J
Benzo (g,h,l) perylene	1000	2500	0.25	J	0.34	U	5.20		0.87	J

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = non-detect

J = estimated value, below quantitation limit

R = rejected, out of holding time

B = <5Xblank

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Semi-Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD206 S-6	Q	FD207 S-3	Q	FD207 S-4	Q
Sample Date	S1	S2	9/28/01		9/27/01		9/27/01	
Sample Depth (ft)			11-13		4-6		6-8	
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q
Phenol	60	500	1.90	U	0.38	U	0.36	U
bis(2-Chloroethyl) Ether	0.7	0.7	1.90	U	0.38	U	0.36	U
2-Chlorophenol	0.7	20	1.90	U	0.38	U	0.36	U
1,3-Dichlorobenzene	100	500	1.90	U	0.38	U	0.36	U
1,4-Dichlorobenzene	2	60	1.90	U	0.38	U	0.36	U
1,2-Dichlorobenzen	100	500	1.90	U	0.38	U	0.36	U
2-Methylphenol	500	5000	1.90	U	0.38	U	0.36	U
2,2-oxybis (1-Chloropropane)	0.7	3	1.90	U	0.38	U	0.36	U
4-Methylphenol	500	500	1.90	U	0.38	U	0.36	U
N-Nitroso-di-n-propylamine	50	500	1.90	U	0.38	U	0.36	U
Hexachloroethane	6	10	1.90	U	0.38	U	0.36	U
Nitrobenzene	500	5000	1.90	U	0.38	U	0.36	U
Isophorone	100	1000	1.90	U	0.38	U	0.36	U
2-Nitrophenol	100	1000	1.90	U	0.38	U	0.36	U
2,4-Dimethylphenol	0.7	10	1.90	U	0.38	U	0.36	U
2,4-Dichlorophenol	10	90	1.90	U	0.38	U	0.36	U
1,2,4-Trichlorobenzene	100	500	1.90	U	0.38	U	0.36	U
Naphthalene	4	1000	1.90	U	0.38	U	0.36	U
4-Chloroaniline	1	30	1.90	U	0.38	U	0.36	U
bis(2-Chlorethoxy) methane	500	5000	1.90	U	0.38	U	0.36	U
Hexachlorobutadiene	3	3	1.90	U	0.38	U	0.36	U
4-Chloro-3-Methylphenol	1000	1000	1.90	U	0.38	U	0.36	U
2-Methylnaphthalene	4	1000	1.90	U	0.38	U	0.36	U
Hexachlorocyclopentadiene	50	500	1.90	U	0.38	U	0.36	U
2,4,6-Trichlorophenol	3	60	1.90	U	0.38	U	0.36	U
2,4,5-Trichlorophenol	2	2	3.80	U	0.78	U	0.74	U
2-Chloronaphthalene	1000	10000	1.90	U	0.38	U	0.36	U
2-Nitroaniline	Not available	Not available	3.80	U	0.78	U	0.74	U
Dimethylphthalate	0.7	0.7	1.90	U	0.38	U	0.36	U
Acenaphthylene	100	1000	1.90	U	0.38	U	0.36	U
2,6-Dinitrotoluene	100	1000	1.90	U	0.38	U	0.36	U
3-Nitroaniline	Not available	Not available	3.80	U	0.78	U	0.74	U
Acenaphthene	20	2500	1.90	U	0.38	U	0.36	U
2,4,-Ditnitrophenol	3	6	3.80	U	0.78	U	0.74	U
4-Nitrophenol	100	1000	3.80	U	0.78	U	0.74	U
Dibenzofuran	100	1000	1.90	U	0.38	U	0.36	U
2,4-Dinitrotoluene	0.7	2	1.90	U	0.38	U	0.36	U
Diethylphthalate	0.7	0.7	1.90	U	0.38	U	0.36	U
4-Chlorophenyl-phenylehter	1000	10000	1.90	U	0.38	U	0.36	U
Fluorene	400	2000	1.90	U	0.38	U	0.36	U
4-Nitroaniline	1000	10000	3.80	U	0.78	U	0.74	U
4,6-Dinitro-2-methylphenol	50	500	3.80	U	0.78	U	0.74	U
N-Nitrosodiphenylamine	100	1000	1.90	U	0.38	U	0.36	U
4-Bromophenyl-phenylether	100	1000	1.90	U	0.38	U	0.36	U
Hexachlorobenzene	0.7	0.8	1.90	U	0.38	U	0.36	U
Pentachlorophenol	5	10	3.80	U	0.78	U	0.74	U
Phenanthrene	100	100	1.00	J	0.06	J	0.36	U
Anthracene	1000	1000	0.26	J	0.38	U	0.36	U
Carbazole	Not available	Not available	1.90	U	0.38	U	0.36	U
Di-n-butylphthalate	50	500	1.90	U	0.38	U	0.36	U
Fluoranthene	1000	1000	1.00	J	0.08	J	0.36	U

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

Semi-Volatile Organic Compounds

Sample Name	MCP-MOHML Criteria		FD206 S-6	Q	FD207 S-3	Q	FD207 S-4	Q
Sample Date	S1	S2	9/28/01		9/27/01		9/27/01	
Sample Depth (ft)			11-13		4-6		6-8	
Analyte (mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q
Pyrene	700	2000	1.20	J	0.08	J	0.36	U
Butylbenzylphthalate	100	1000	1.90	U	0.38	U	0.36	U
3,3-Dichlorobenzidine	10	100	1.90	U	0.38	U	0.36	U
Benzo(a)anthracene	0.7	1	0.53	J	0.05	J	0.36	U
Chrysene	7	10	0.55	J	0.05	J	0.36	U
bis(2-Ethylhexyl) phthalate	100	300	1.90	U	0.10	J	0.06	J
Di-n-octylphthalate	1000	10000	1.90	U	0.38	U	0.36	U
Benzo(b) fluoranthene	0.7	1	0.48	J	0.06	J	0.36	U
Benzo(k) fluroanthene	7	10	0.21	J	0.38	U	0.36	U
Benzo(a) pyrene	0.7	0.7	0.44	J	0.04	J	0.36	U
Indeno (1,2,3-cd) pyrene	0.7	1	0.25	J	0.38	U	0.36	U
Dibenzo (a,h) anthracene	0.7	0.7	1.90	U	0.38	U	0.36	U
Benzo (g,h,I) perylene	1000	2500	0.28	J	0.04	J	0.36	U

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = non-detect

J = estimated value, below quantitation limit

R = rejected, out of holding time

B = <5Xblank

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yixian Zhang

PCB CONGENERS and TOC ANALYSIS

Sample ID	MCP-MOHML Criteria		FD201 S-2		FD201 S-3		FD202 S-2		FD202 S-4		FD202 S-6		FD203 S-2	
Sample Date	S1	S2	9/20/01		9/20/01		9/17/01		9/17/01		9/18/01		9/6/01	
Sample Depth (ft)			2-4		4-6		2-4		6-8		14-16		2-4	
(mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
2,4' DiCB (8)			0.0051	U	0.0053	U	0.0057	U	0.018		0.0058	U		R
2,2',5 TriCB (18)			0.0066		0.0061	P	0.012		0.036		0.0089			R
2,4,4' TriCB (28)			0.0096		0.0053	U	0.019		0.043		0.017			R
2,2',3,5' TetraCB (44)			0.0058	P	0.0053	U	0.0072	P	0.015	P	0.0058	U		R
2,2',5,5' TetraCB (52)			0.0089		0.0053	U	0.015	P	0.021		0.0076			R
2,3',4,4' TetraCB (66)			0.0081	P	0.0053	U	0.014	P	0.025		0.0063	P		R
2,2',4,5,5' PentaCB (101)			0.0078	P	0.0053	U	0.025		0.035		0.0058	U		R
2,3,3',4,4' PentaCB (105)			0.0051	U	0.0053	U	0.0066	P	0.0081	P	0.0058	U		R
2,3',4,4',5 PentaCB (118)			0.0051	U	0.0053	U	0.012		0.018		0.0058	U		R
2,2',3,3',4,4' HexaCB (128)			0.0051	U	0.0053	U	0.0057	U	0.0058	U	0.0058	U		R
2,2',3,4,4',5' HexaCB (138)			0.0051	U	0.0053	U	0.023		0.048		0.0058	U		R
2,2',4,4',5,5' HexaCB (153)			0.0051	U	0.0053	U	0.017	P	0.041	P	0.0058	U		R
2,2',3,3',4,4',5 HeptaCB (170)			0.0051	U	0.0053	U	0.0057	U	0.028	P	0.0058	U		R
2,2',3,4,4',5,5' HeptaCB (180)			0.0051	U	0.0053	U	0.0076		0.052		0.0058	U		R
2,2',3,4',5,5',6 HeptaCB (187)			0.0051	U	0.0053	U	0.0057	U	0.022		0.0058	U		R
2,2',3,3',4,4',5,6 OctaCB (195)			0.0051	U	0.0053	U	0.0057	U	0.0073		0.0058	U		R
2,2',3,3',4,4',5,5',6 NonaCB (206)			0.0051	U	0.0053	U	0.0057	U	0.0058	U	0.0058	U		R
DecaCB (209)			0.0051	U	0.0053	U	0.0057	U	0.0058	U	0.0058	U		R
NOAA PCB Congeners Total			0.0468		0.0061		0.1584		0.4174		0.0398			
Total PCBs (NOAA PCB Congeners Total×2.5)	2	2	0.117		0.015		0.396		1.044		0.100			

TOC (mg/kg)			12100		11000						3060			

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = Non-detect

P = Results from two columns exceed 25% RPD.

R = Rejected, out of holding time

Created by: Heather Ferro
Reviewed by: Steve Mattingly

PCB CONGENERS and TOC ANALYSIS

Sample ID	MCP-MOHML Criteria		FD203 S-4		FD204 S-1		FD204 S-4		FD205 S-1		FD205 S-4		FD206 S-5	
Sample Date	S1	S2	9/6/01		9/13/01		9/13/01		9/13/01		9/13/01		9/28/01	
Sample Depth (ft)			6-8		0-2		6-8		0-2		6-8		9-11	
(mg/kg)	(mg/kg)		Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
2,4' DiCB (8)				R	0.0048	U	0.015	P	0.0052	U	0.0072		0.0057	U
2,2',5 TriCB (18)				R	0.0048	U	0.055		0.0052	U	0.0055	U	0.0063	
2,4,4' TriCB (28)				R	0.017		0.07	P	0.0052	U	0.011	P	0.0084	
2,2',3,5' TetraCB (44)				R	0.018		0.031		0.0052	U	0.0058		0.0057	U
2,2',5,5' TetraCB (52)				R	0.028		0.046		0.0052	U	0.012		0.0076	P
2,3',4,4' TetraCB (66)				R	0.025	P	0.054	P	0.0052	U	0.011	P	0.014	P
2,2',4,5,5' PentaCB (101)				R	0.058		0.047	P	0.0052	U	0.018		0.016	
2,3,3',4,4' PentaCB (105)				R	0.0094	P	0.012		0.0052	U	0.0055	U	0.0076	
2,3',4,4',5 PentaCB (118)				R	0.035		0.038		0.0052	U	0.014		0.011	
2,2',3,3',4,4' HexaCB (128)				R	0.0097		0.0058	U	0.0052	U	0.0055	U	0.0057	U
2,2',3,4,4',5' HexaCB (138)				R	0.056		0.032		0.0052	U	0.0086	P	0.018	
2,2',4,4',5,5' HexaCB (153)				R	0.038	P	0.024	P	0.0052	U	0.012		0.014	
2,2',3,3',4,4',5 HeptaCB (170)				R	0.0056		0.0058	U	0.0052	U	0.0055	U	0.0057	U
2,2',3,4,4',5,5' HeptaCB (180)				R	0.0077		0.0058	U	0.0052	U	0.0055	U	0.011	
2,2',3,4',5,5',6 HeptaCB (187)				R	0.0048	U	0.0058	U	0.0052	U	0.0055	U	0.0058	
2,2',3,3',4,4',5,6 OctaCB (195)				R	0.0048	U	0.0058	U	0.0052	U	0.0055	U	0.0057	U
2,2',3,3',4,4',5,5',6 NonaCB (206)				R	0.0048	U	0.0058	U	0.0052	U	0.0055	U	0.0057	U
DecaCB (209)				R	0.0048	U	0.0058	U	0.0052	U	0.0055	U	0.0057	U
NOAA PCB Congeners Total					0.3074		0.424				0.0996		0.1197	
Total PCBs (NOAA PCB Congeners Total×2.5)	2	2			0.769		1.060				0.249		0.299	

TOC (mg/kg)					5940		7540		2330		11300			

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = Non-detect

P = Results from two columns exceed 25% RPD.

R = Rejected, out of holding time

Created by: Heather Ferro
Reviewed by: Steve Mattingly
Reviewed by: Yivian Zhang

PCB CONGENERS and TOC ANALYSIS

Sample ID	MCP-MOHML Criteria		FD206 S-6		FD207 S-4	
Sample Date	S1	S2	9/28/01		9/27/01	
Sample Depth (ft)			11-13		6-8	
(mg/kg)	(mg/kg)		Value	Q	Value	Q
2,4' DICB (8)			0.0055	U		R
2,2',5 TriCB (18)			0.0096		0.011	
2,4,4' TriCB (28)			0.012		0.027	
2,2',3,5' TetraCB (44)			0.0062	P	0.0086	P
2,2',5,5' TetraCB (52)			0.012	P	0.012	
2,3',4,4' TetraCB (66)			0.01	P	0.025	
2,2',4,5,5' PentaCB (101)			0.014		0.022	
2,3,3',4,4' PentaCB (105)			0.0055	U	0.0056	P
2,3',4,4',5 PentaCB (118)			0.0094		0.015	
2,2',3,3',4,4' HexaCB (128)			0.0055	U		R
2,2',3,4,4',5' HexaCB (138)			0.014		0.014	
2,2',4,4',5,5' HexaCB (153)			0.0099	P	0.01	P
2,2',3,3',4,4',5 HeptaCB (170)			0.0055	U		R
2,2',3,4,4',5,5' HeptaCB (180)			0.0055	U		R
2,2',3,4',5,5',6 HeptaCB (187)			0.0055	U		R
2,2',3,3',4,4',5,6 OctaCB (195)			0.0055	U		R
2,2',3,3',4,4',5,5',6 NonaCB (206)			0.0055	U		R
DecaCB (209)			0.0055	U		R
NOAA PCB Congeners Total			0.0971		0.1502	
Total PCBs (NOAA PCB Congeners Total×2.5)	2	2	0.243		0.376	

TOC (mg/kg)						

MCP-MOHML Criteria: Massachusetts Department of Environmental Protection, Massachusetts Contingency Plan (MCP), Subpart P-Massachusetts Oil and Hazardous Material List (MOHML).

U = Non-detect

P = Results from two columns exceed 25% RPD.

R = Rejected, out of holding time

Crea[illegible]y: Heather Ferro
Reviewed by: Steve Mattingly

Appendix E

Area D Bulkhead BD/DA
(To be provided by USACE)

Appendix F

Support Facility Conceptual Design Criteria/Analysis

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1.0 INTRODUCTION

Under Task Order No. 17 of the U.S. Army Corps of Engineers (USACE) Total Environmental Restoration Contract (TERC) No. DACW33-94-D-002, Foster Wheeler Environmental Corporation (Foster Wheeler) developed a conceptual design for the sediment dewatering support facilities (Support Facility) associated with the dredging activities for Operable Unit #1 (OU #1) of the New Bedford Harbor Superfund Site located in New Bedford, Massachusetts. This Basis of Design/Design Analysis (BD/DA) Report documents the design development.

1.1 Support Facility Description

The Support Facility will be a building immediately adjacent to the sediment dewatering building. It will provide support services including decontamination, locker rooms, and a lunch/break room for the staff working in the sediment dewatering building. The Support Facility will consist of eight rooms or spaces: decontamination room; male shower area; male locker room; female shower area; female locker room; lunch/break room; mechanical room; and cleaning/janitor's room.

1.2 Organization of the Report

The document is organized such that this section, Section 1.0, summarizes the background information and presents the design objectives and report organization. Section 2.0 summarizes the Applicable or Relevant and Appropriate Requirements (ARARs). Section 3.0 summarizes the design basis for the Support Facility. The attachment contains a conceptual layout drawing of the Support Facility.

2.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIRMENTS (ARARS)

ARARs that apply to the Support Facility were identified. ARARs generally fall into four categories: discharge standards; accessibility standards; decontamination facility standards; and construction standards, which are discussed in the following subsections. ARARs relating to the site location were not evaluated as part of this evaluation.

2.1 Discharge Standards

The Support Facility will have four discharges: decontamination wash and rinse water; domestic wastewater; stormwater from roof drains; and exhaust gas from the heating system. Discharges of decontamination and rinse water will be discharged to the dewatering building where it will be mixed with water from the sediment dewatering process. Discharge standards for the water from the Sediment Dewatering Building are defined in the Basis of Design/Design Analysis Report for the Water Treatment System (Foster Wheeler, 2001). Stormwater from the roof drains will discharge to the ground surface as already allowed for the main Dewatering Building.

Sewer Standards – Sewer discharges will be in accordance with City of New Bedford Sewer Use Ordinance. The wastewater discharges to the City of New Bedford will be typical of domestic wastewater.

It is not expected that this Support Facility will, of itself, exceed the threshold that would require air permitting. Discharge standards of ventilation from the decontamination room will be subject to the same requirements established for the Sediment Dewatering Building, which does not include the requirement for filtration or treatment.

2.2 Accessibility Standards

The Standards for Accessible Design (Attachment A to 29 CFR 36) promulgated under Title III of the Americans with Disabilities Act (ADA) (42 U.S.C. 12181) will apply to the design and construction of the Support Facility. The ADA prohibits discrimination on the basis of disability by public accommodations and requires places of public accommodation and commercial facilities to be designed, constructed, and altered in compliance with the accessibility standards established.

2.3 Decontamination Facility Standards

The regulations for Hazardous Waste Operations and Emergency Response (29 CFR 1910.120) include requirements for toilets, showers, and change rooms associated with decontamination procedures at hazardous waste sites. The 29 CFR 1910.120 includes, by reference, the sanitation regulations presented in 29 CFR 1910.141. Both of these regulations will be followed in the design of the Support Facility.

2.4 Construction Standards

Building construction will be completed in accordance with the following general building standards:

- Massachusetts State Building Code
- National Fire Protection Association (NFPA) 70, National Electric Code
- NFPA 101, Fire Safety Code
- NFPA 13, Standard for the Installation of Sprinkler Systems
- Commonwealth of Massachusetts Fuel Gas and Plumbing Code

Permits are not formally required as part of CERCLA projects; however, it is necessary to meet the substantive requirements of regulations. Because the permit process is the only mechanism the City of New Bedford (City) has to track specific utility connections, the permitting process may be followed for building, water, sewer, and electrical construction work completed at this site. The City may also issue a Certificate of Occupancy for the building. The appropriate City officials will be consulted prior to beginning the construction. Detailed design drawings will be prepared and will be stamped by Massachusetts-registered design professionals. Massachusetts licensed plumbers and electricians will be used for all plumbing and electrical work and utility connections.

2.5 List of Anticipated Permits

Any permits obtained will address both the Support Facility and the dewatering building under a single application. Permits that may be obtained for construction of the Support Facility include, but are not limited to, the following:

- Sewer connection permit
- Electrical permit
- Plumbing permit
- Construction permit
- Fire Suppression System Application
- Gas Service Application
- Water Service Application
- Telephone Service Application
- Electrical Service Application

3.0 DESIGN CRITERIA

This section presents the design criteria that define the requirements for the Support Facility. Design criteria are presented for the functional requirements for each room, civil/site work, geotechnical, architectural, structural, plumbing, heating and ventilation, electrical, and instrumentation.

3.1 Functional Requirements

3.1.1 General

The sizing of the decontamination room, shower and locker rooms, and lunch/break room will be based on maximum values for the following anticipated ranges of staffing levels:

Number of shifts per day	1-2
Length of shift (hours)	8-12
Number of staff per shift	15-20
Ratio of male to female staff	5 to 1
Number of days per week	5-7
Number of months per year	3-12

The USACE will hire a contractor to operate and maintain the Sediment Dewatering Building. This Operations Contractor will determine the exact number of staff. The ADA requirements will apply to the Support Facility. The Support Facility will be designed to handle personnel, protective equipment, and clothing. Tools, equipment, instruments, etc. will be handled in the Sediment Dewatering Building.

The following procedure illustrates the functional design requirements for decontamination of Level C PPE, however, actual decontamination procedures will be defined in the Health and Safety Plan to be developed by the Operations Contractor and may include some or all of the following steps:

<u>Decontamination Procedure (egress)</u>

1. Enter decontamination room from Sediment Dewatering Building.
2. Equipment Drop:
   - Drop hard hat, hand-held meters, etc. on counter top
   - Provide emergency eye-wash area
3. Wash outer garments, outer gloves, and outer boots:
   - Will occur in a designated decontamination shower area
   - A bucket of decontamination solution and brushes will be provided in the shower area
   - Showers will be walk through with sloped to floor drain (no curb)
   - Showers will also serve as emergency showers
   - Showers will have hand operated shower head on a flexible hose
4. Rinse outer garments, outer gloves, and outer boots:
   - Occurs in decontamination shower area
5. Remove outer gloves, outer boots, and outer disposable clothing:
   - Provide benches and disposal bins
   - Remove respirator and drop in designated area

- Provide counter top space

6. Wash and rinse safety boots.
7. Clean Equipment and Respirator:
   - Cleaning occurs with inner gloves still on
   - Basin required
   - Provide area for equipment storage
   - Provide counter top with electrical outlets for equipment recharging.
   - Respirators will be stored in staff lockers in the locker room.
   - Remove inner gloves
   - Provide disposal bin
8. Enter locker room.
9. Remove safety boots and work clothing:
   - Provide receptacle for work clothing to be picked up by laundry service
   - Assume three changes of work clothing provided per week
   - Provide lockers for work clothing, safety boots, and respirator
10. Shower.
11. Redress in personal clothing:
    - Provide separate locker for personal clothing
12. Exit to lunch/break room.

Entry Procedure (ingress)

1. Enter locker room from lunch/break room.
2. Remove personal clothing.
3. Put on work clothing and safety boots:
   - Provide drop off area for clean clothing from laundry service
4. Enter decontamination room.
5. Put on inner and outer gloves, outer boots, and outer garment:
   - Provide storage area for clean materials
   - Provide bench
6. Don respirator.
7. Pick up equipment.
8. Enter Sediment Dewatering Building.

3.1.2 Decontamination Room

The decontamination room will serve as the transition area from the Sediment Dewatering Building to the shower/locker room. Personnel working in the Sediment Dewatering Building will have to follow a decontamination procedure prior to entering the shower/locker room. For design purposes, the decontamination room will be designed for Level C personal protective equipment (PPE) decontamination, although lower PPE levels may be used. The primary contaminants of concern are PCBs and metals.

The work flow in the decontamination room will be such that separate egress and ingress doors are provided and the entry flow process will not pass through the shower and garment removal area of the decontamination process. A separate door to outside of the building on the opposite side of the Sediment Dewatering Building will be provided for accepting material deliveries and for removing containers of dirty PPE.

Chemicals – Decontamination procedures will not use any chemicals other than a basic soap solution used for the various wash steps. Instrument calibration fluids are also possible in the equipment storage areas.

Storage Space – Storage space is required within the decontamination room for decontamination soap, clean gloves, clean outer boots, clean outer garments, equipment storage, and equipment recharge.

Ventilation – The contaminants (PCBs and metals) have some potential to migrate with dust particles in the air of the decontamination facility; therefore, ventilation of this room will be separate from the rest of the building. Ventilation will meet the requirements established for the Dewatering Building, which does not require filtration or treatment of ventilation exhaust.

Plumbing – The room will require both cold and hot water service to supply water for the various wash and rinse steps.

Drains – All wash and rinse water from the decontamination room, including floor drains will drain to a sump. All floor drains will be trapped and vented. A pump with level controls will transfer this water to the Sediment Dewatering Building sump where it will be processed along with water from the dewatering operations. The pump intake will be set several inches above the floor of the sump such that solids may accumulate and not be transferred to the Sediment Dewatering Building sump.

Size – The room will be at least 400 square feet.

Utilities – The room will have access to hot water, cold water, heat, contaminated water sewer, and 115V electrical power.

Other – The room will include a first aid kit and fire extinguisher.

3.1.3 Showers and Locker Rooms

The final steps of the decontamination procedure and initial steps of the entry procedure will occur in the shower area and locker rooms. These procedures are described in the previous subsection. Male and female showers and locker rooms will be designed in accordance with OSHA regulations for hazardous waste site operations (29 CFR 1910.120 and 29 CFR 1910.141):

- Minimum ratio of staff to showers for each gender: 2 to 1
- Male shower area and locker room:

Number of conventional showers:	8
Number of conventional toilets:	1
Number of handicap accessible toilets:	1
Number of urinals:	1
Number of conventional basins:	2
Number of handicap accessible basins:	1

Number of conventional lockers for work clothing:	48
Number of conventional lockers for personal clothing:	48
Size of lockers:	Full length
Total number of lockers:	96
Storage area for dirty work clothing to go to laundry service:	Yes
Storage area for clean work clothing from laundry service:	Yes
Mirrors:	1 full-length wall mirror 1 over each basin

- Female shower area and locker room:

Number of conventional showers:	1
Number of conventional toilets:	1
Number of handicap accessible toilets:	1
Number of conventional basins:	1
Number of handicap accessible basins:	1
Number of conventional lockers for work clothing:	6
Number of conventional lockers for personal clothing:	6
Size of lockers:	Full length
Total number of lockers:	12
Storage area for dirty work clothing to go to laundry service:	Yes
Storage area for clean work clothing from laundry service:	Yes
Mirrors:	1 full length wall mirror 1 over each basin

- Size – Men's: 600 square feet minimum, Women's: 350 square feet minimum
- Utilities – Hot water, cold water, heat, air conditioning, domestic wastewater, 115V electrical
- Other

3.1.4 Lunch Break Room

The lunch break room will contain:

- Appliances – Refrigerator, microwave, basin, garbage disposal, vending machines. (Provide space for three vending machines. Machines will be provided by vendor.)
- Cabinets and Counters – Provide counter space and cabinets as indicated on the conceptual drawing. Base cabinets will be provided under the counter at the microwave. Overhead cabinets will be provided over the sink and microwave counters.
- Furniture – No furniture will be provided under this contract. The Operations Contractor of the Dewatering Building will provide furniture.
- Seating capacity of 25 people.
- Size – 400 square feet minimum.
- Utilities – Hot water, cold water, heat, air conditioning, domestic wastewater, water cooler, 115V electrical, telephone, and intercom to dewatering building. [Note: bottled water does not comply with Massachusetts code requirements.]
- Other – The lunch/break room will include a first aid kit and fire extinguisher.

3.1.5 Mechanical Room

Description – This room will house the heating and ventilation equipment, hot water heater, electrical panels, electrical service entrance, gas service entrance, and potable water entrance. The water service will split into domestic and fire protection water, with backflow preventers on each line. A water meter will be placed on the domestic line. Local authorities will be contacted to determine if the water services should be split prior to entering the building.

Size – This room will be a minimum of 300 square feet.

3.1.6 Janitor Room

Description – This room will be used for storage of cleaning supplies. It will contain a utility basin with hot and cold water.

Size – This room will be a minimum of 40 square feet.

3.2 Civil/Site Work

Civil/Site work design criteria for the Support Facility is provided in the Basis of Design/Design Analysis Report - Desanding and Dewatering Facilities (Foster Wheeler, 2002).

3.3 Geotechnical

Detailed information on geotechnical information for the site is available in the Foundation Report (Foster Wheeler, 2002). The onshore portion of the site is, in general, characterized by fill overlying dense inorganic sandy silts and dense poor to well graded sand, with the exception of two borings where a thin organic soil layer was encountered between the fill and the sandy silts.

Where fully penetrated, the fill encountered in the onshore borings and test pits ranges from approximately 6 to 23 feet in depth, with the average thickness being approximately 16 feet. The fill is mostly granular in nature and consists of poorly graded sands with varying amounts of silt and gravel. Other components include boulders, brick, concrete, wood, asphalt, and polypropylene plastic. The fill layer was typically dense to very dense, with frequent obstructions which often prevented casing advancement during the borehole installation. Upper portions of the fill were denoted by a moist brown matrix, where as lower portions of the fill strata were typically wet gray to black matrix. This lower discoloration is likely attributed to the mixing of the dark gray organic soils and the fill during historic backfilling of the shoreline.

The Contractor will be responsible for reviewing the Foundation Report (Foster Wheeler, 2002) for design of the building foundation. If the Contractor finds that the report does provide adequate data to support the design of the Support Facility foundation the Contractor shall provide any additional investigations deemed necessary.

3.4 Architectural

3.4.1 General

The design and layout of the Support Facility will be in compliance with the requirements of ADA regulations. A finish schedule is included in Table 1 that lists floor, wall, and ceiling finishes for all rooms and spaces in the Support Facility.

Unless noted otherwise, interior partition walls and interior surfaces of exterior walls shall be gypsum board over light-gauge, steel framing.

Doors and frames shall be hollow metal. Exterior doors shall be insulated. Where doors lead into spaces that are curbed for containment, ramps shall be provided at the door. A double-leaf door shall be provided to the mechanical room to allow moving of equipment into and out of the space.

Table 1
Room Finish Schedule Dewatering Support Facility

Room No.	Room Name	Flooring	Base	Walls	Ceiling	Ceiling Height
101	Mechanical Room	Sealed Conc.	None (1)	Structure (1)	Structure	N/A
102	Decontamination Area	Epx	Conc. Curb	FRP Liner (2)	ACT2	8'-0"
103	Mens Locker	VCT	Rubber	GWB/Paint	ACT	8'-0"
104	Mens Toilet/Shower	CT	CT	GWB2/Epx Paint	ACT2	8'-0"
105	Womens Locker	VCT	Rubber	GWB/Paint	ACT	8'-0"
106	Womens Toilet/Shower	CT	CT	GWB2/Epx Paint	ACT2	8'-0"
107	Break Room	VCT	Rubber	GWB/Paint	ACT	8'-0"
108	Janitor	Sealed Conc.	Rubber	GWB/Paint	Structure	N/A

Notes:

(1) Wall common with 102 shall have GWB (taped and mudded) and rubber base
(2) Corrugated FRP liner over moisture-resistant GWB
VCT = vinyl tile
CT = ceramic tile
GWB = gypsum board
GWB2 = moisture-resistant gypsum board
ACT = acoustical ceiling tile in suspended grid
ACT2 = high-humidity acoustical ceiling tile in suspended grid
Epx = epoxy
Structure = exposed building framed with insulation and covering

3.4.2 Decontamination Room

The decontamination room will be constructed for a continuously wet environment. The floor elevation of the decontamination room will be set lower than the adjacent mechanical room and locker rooms such that the room is curbed. Floor surfaces shall be coated for durability and shall be sloped to drains that lead to a sump in the Dewatering Building. The sump and the curbed room shall be sized to contain 20 minutes of fire sprinkler flow without the pump operating. Walls shall be capable of withstanding an impinging spray from wash-down hoses. The wall base shall be sealed to a concrete curb at the floor level. A ceiling (acoustical ceiling tile [ACT]), capable of withstanding high humidity, shall be provided.

Fixtures, shelves, or cabinets will be provided that will store new outer clothing in a manner that protects them from the wet decontamination steps.

3.4.3 Showers and Locker Room

The shower spaces shall have ceramic tile floors and moisture-resistant gypsum board walls to provide a typical water resistant space. The locker space shall have vinyl composition tile (VCT) flooring and painted gypsum board walls for a normal level of durability. Steel lockers shall be provided for workers, with extras for visitors or inspectors. Benches shall be provided at the lockers. Ceiling shall be high-humidity ACT.

Within this area, shelving or bins will be provided for drop off of wet work clothes and pick up of laundered work clothes.

3.4.4 Lunch/Break Room

The lunch/break room will have a kitchenette, vending area, first aid kits, and phones. The finishes in this area shall have VCT flooring and painted gypsum board walls for a normal level of durability. Windows shall be provided. The exterior door in this space shall be suitable for the main entrance and egress point for the Dewatering Building. Ceiling shall be ACT.

3.4.5 Janitor Room

The Janitor room shall be a space convenient to the locker area and to the break room. The space shall have a floor basin and shall have storage for cleaning equipment and soaps.

3.4.6 Mechanical Room

The mechanical room will be an unfinished space (i.e., sealed concrete floor and open to building structure.) Only the wall common with the decontamination room will be finished with gypsum board.

3.5 Structural

3.5.1 Building Codes and References

The following publications or documents form a part of the basis of design for providing the design and construction of the structural elements for the dewatering Support Facility, consisting of applicable building or design codes and references:

- American Concrete Institute (ACI): ACI 318 – (1995) *Building Code Requirements for Structural Concrete.*
- American Institute of Steel Construction (AISC): AISC M016 - (1989) *ASD Manual of Steel Construction, 9th Edition.*
- American Institute of Steel Construction (AISC): AISC M017 - (1989) *ASD Manual of Steel Construction, Volume II, Connections.*
- American Institute of Steel Construction (AISC): AISC M018L - (1998) *LRFD Manual of Steel Construction, 2nd Edition.*
- American Institute of Steel Construction (AISC): AISC M019L - (1998) *LRFD Manual of Steel Construction, Volume II, Connections.*
- American Society of Engineers (ASCE): ASCE 7 – (1995) *Minimum Design Loads for Buildings and Other Structures.*

- American Welding Society (AWS): AWS D1.1 – (1996) *Structural Welding Code Steel.*
- Commonwealth of Massachusetts, Board of Building Regulations and Standards: (1997 with all current amendments) *Massachusetts State Building Code.*
- Metal Building Manufacturers Association (MBMA): MBMA LRMBSM - (1996) *Low Rise Metal Building Systems Manual.*
- Underwriters Laboratories (UL): UL 580 – (1997) *Uplift Resistance to Roof Assemblies.*

3.5.2 Building Description

The building for the Support Facility shall consist of a pre-engineered metal building with steel framing and metal roof and wall panels. The building provided shall be complete and weather-tight and suitable for the functional requirements indicated. The building plan dimensions shall be as provided by the building manufacturer's standard, but not more than the dimensions indicated on the Conceptual Layout Design Drawing (Attachment A), nor less than the indicated dimensions by more than the amount of the closest standard size thereto. The inside clear height between the finished floor and bottom of roof steel shall be a minimum of 10 feet to provide a utility space between the roof steel and the finished ceiling height of 8 feet.

The Support Facility building shall consist of vertical walls and a sloped roof. The roof slope shall be a minimum of 1 to 12 (vertical to horizontal) to a maximum of 3 to 12. The roof shall drain stormwater to the ground surface. The building framing shall be rigid frame type providing a clear interior span.

3.5.3 Building Design Requirements

3.5.3.1 Design Loads

Loading combinations used shall be in accordance with the Massachusetts State Building Code or ASCE 7 or MBMA LRMBSM, as required.

The pre-engineered metal building shall be designed using the following minimum loads:

a) Dead Loads – Dead loads shall be determined from actual building components to be used.
b) Minimum Roof Live load – Use 16 pounds per square foot (psf).
c) Snow Loads – Compute and apply roof snow loads based on a flat (<30°) roof slope and the following parameters:
    - Ground Snow Load, $P_g = 30$ psf
    - Snow Exposure Factor, $C_e = 0.7$
    - Importance Factor, I = 1.1
d) Wind Loads – Compute and apply wind pressures to building walls, roof and components based on following parameters:
    - Basic Wind Speed, V = 90 mph
    - Wind Exposure = C
    - Importance Factor, I = 1.1
e) Seismic Loads – Compute and apply loads to building components as required to satisfy seismic requirements based on the following parameters:
    - Effective Peak Velocity-Related Acceleration Coefficient, Av = 0.11

- Effective Peak Acceleration Coefficient, Aa = 0.11
- Seismic Hazard Exposure Group = I
- Seismic performance Category = C
- Site Soil Coefficient, S = 1.2
- Structural System – ordinary moment frame

f) Collateral Loads – Include loads as required for HVAC equipment, mechanical equipment, fire protection system, or interior wall or ceiling finishes. A minimum of 5 psf shall be applied on framing systems for collateral loads.

3.5.3.2 Deflections

The building shall be designed to limit deflections to the maximum values indicated below, unless building finishes to be used require more restrictive deflection limits.

a) Structural Members – The maximum deflection of main framing members shall not exceed 1/240th of their respective spans.

b) Roof System – The maximum deflection due to the live roof loads for roof panels and purlins shall not exceed 1/180th of their respective spans, except that when interior finishes to be used require more restrictive deflection limits. Roof panels shall be provided to satisfy UL 580, Class 90. Maximum deflections of roof panels shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect. In addition to the live loads indicated above, roof decking shall be designed for a 200-pound concentrated load at midspan.

c) Wall System – The maximum deflection due to wind on wall panels and girts shall be limited to 1/120th of their respective spans, except that when interior finishes to be used require more restrictive deflection limits.

3.5.3.3 Building Materials

The pre-engineered building framing system, wall and roof panels, and other components shall consist of the steel and/or aluminum materials. Roof insulation shall be R-38 and exterior walls shall be R-13.

3.5.4 Foundation Description

The building foundation shall consist of reinforced concrete frost walls and footings and column footings as required to support the pre-engineered building. The floor shall consist of a reinforced concrete slab on grade. A vapor barrier shall be placed under the floor slab, consisting of a 15-mil poly sheeting with edge laps and penetrations sealed. Insulation shall be provided on the exterior of the frost walls.

3.5.5 Foundation Design Requirements

3.5.5.1 Design Loads

The building foundation shall be designed using worst case bearing, uplift, overturning, or sliding forces determined by the building manufacturer. A minimum factor of safety of 1.5 shall be used for overturning, sliding and uplift. The floor slab shall be designed for a minimum 100 psf uniform load with a minimum slab thickness of 6 inches.

3.5.5.2 Soil Data

The allowable soil bearing capacity is expected to be on the order of 4,000 psf. The bottom of footing depth shall be a minimum of 48 inches below final grade for frost protection. Frost wall and column footings shall be constructed on undisturbed firm subgrade material exposed during foundation excavation. The floor slab shall be placed on 8 inches of compacted granular material or structural fill.

3.5.5.3 Foundation Materials

Cast-in-place concrete for the building foundation and floor slab shall be reinforced and have a 28-day compressive strength of 4,000 pounds per inch (psi).

3.6 Plumbing

Plumbing shall be provided for the fixtures listed in previous sections. All sanitary flow from the toilet/shower area, janitor basin, and the kitchenette basin shall flow by gravity to a connection outside the building (see Attachment A), which flows to the municipal system in the road adjacent to the site.

Drainage for the Decontamination Room shall be directed to a sump in that space and shall be pumped to the Sediment Dewatering Building. If the routing is overhead, the line shall be insulated and heat-traced.

Shower stalls shall be molded plastic units. Lavatories, urinals, and water closets shall be vitreous china.

A hard-piped drinking water fountain shall be provided in the break room.

The Support Facility shall have sprinklers in accordance with NFPA 13 and Commonwealth of Massachusetts Fire Prevention Regulations.

3.7 Heating and Ventilation

3.7.1 General

Fuel for space and water heating shall be natural gas, which is available in the street adjacent to the site. The design of the HVAC systems shall be in accordance with the energy usage section of the Massachusetts State Building Code, ASHRAE Standard 90.1-1999 (Energy Standard for Buildings), and ASHRAE 62-1999 (Ventilation for Acceptable Air Quality). Space heating will be gas-fired, forced hot air units. Gas-fired water heater(s) shall provide hot water for showers, domestic use, and for the decontamination process.

Cooling shall be provided by split-system, DX units. Cooling will be provided only in spaces noted below.

3.7.2 Decontamination Room

The Decontamination Room shall be heated and ventilated with 100% supply and exhaust (air will not be returned to the space) when occupied. Dampers shall be provided that have operators tied to either a light switch or occupancy sensors to allow recirculation of air, rather than maintain 100% make-up. Cooling will not be provided in this space. In summer months, ventilation shall turn on at a set high temperature. In the summer months, the air handler shall run for the necessary length of time after the space is no longer occupied to remove humidity.

3.7.3 Showers and Locker Room

Heating and ventilation will be provided in this area. Exhaust in the toilet/shower area shall be tied to either a light switch or occupancy sensors in this area.

3.7.4 Lunch/Break Room

Heating and cooling will be provided in this area.

3.7.5 Mechanical Room

Heating only will be provided in this area. In summer months, ventilation shall turn on at a set high temperature.

3.7.6 Janitor Room

No separate heating, cooling, and ventilation will be provided in this area.

3.8 Electrical and Other systems

3.8.1 General

Electrical service to the building will be 120/208-volt, three-phase power, with a main breaker and associated power panels sized per NEC requirements. All electrical equipment, conduit, wiring, and systems shall meet NEC, the Massachusetts Electrical Code, and the Massachusetts Energy Code. Provision of 200 Amps of 240 VAC will be provided from the connection indicated on the Conceptual Layout Design Drawing (Attachment A). Final service size must be determined after selection of mechanical equipment.

General power receptacles will be located throughout the facility. Ground fault, receptacles will be provided in the Decontamination Room. Ground fault receptacles will also be provided in proximity to running water (e.g., locker room basins, kitchen basin, and janitor basin).

Standby or emergency power is not required for the Support Facility.

3.8.2 Lighting

Lighting in all areas with ceilings, except the decontamination area, shall be acrylic, fluorescent Troffer fixtures. In the decontamination area, lighting will be pendant-mounted, weatherproof fluorescent fixtures. In the mechanical room, the lighting shall be industrial, fluorescent strip fixtures and shall be hung from the building structure. Throughout the facility, battery-powered emergency lights and LED exit signs shall be provided, as required by NFPA 101. Exterior lighting shall be supplied at the doors only and shall be metal-halide wall-pack units sufficient to illuminate an area from the doors to 10 feet away from the doors. General site lighting will be supplied under other work scopes. Illumination shall be designed to meet IES-recommended levels.

3.8.3 Communications

In the break room, there will be a plant phone and a public phone. No data connections will be provided. Phone service will be available from the connection indicated on the Conceptual Layout Design Drawing.

An intercom system shall be installed throughout the Support Facility that ties into the plant-wide system at the connection indicated on the Conceptual Layout Design Drawing. Paging from this building will not be provided.

3.8.4 Fire Alarm and Security Alarm

The Support Facility will have a fire alarm that is tied into the City of New Bedford Fire Department but is independent of the dewatering building fire alarm system. The main fire alarm control panel shall be located in the Support Facility. Remote annunciation shall be provided in the guard facility via the connection indicated on the Conceptual Layout Design Drawing. Communication for the fire alarm system shall be via master box or radio telemetry, as approved by the local authority.

The Support Facility will have a security alarm system. Sensors on external doors and windows will be provided to detect unwanted intrusion. Sensors will be connected to a security alarm system located in the adjacent Dewatering Building.

ATTACHMENT A

Conceptual Layout Design Drawing

Appendix G

HVAC (Figures, Process Flow Diagrams, Equipment Schedules, Design Parameters and other Details)

The HVAC evaluation for the Process/Loadout Buildings is based on the 90% design building layout that was larger than the current (100% Design) layout (165 ft x 195 ft vs. 165 ft x 180 ft). However, the new layout is only 5.13% smaller and will not significantly change the heating loads. Therefore, Appendix G was not revised for the 100% design submittal. The HVAC system for the support facility will be performance based and as a result is not included.

Process and Loadout Facility Heating and Ventilation

General:

The Process and Loadout Buildings are adjoining "General Purpose" high bay metal buildings. The Support Building also adjoins the process building on the West wall.

The process building which requires "Freeze Protection" heating utilizes wall insulation having a minimum thermal resistance of R-13 (hour-ft^2-°F)/Btu and roof insulation having a minimum thermal resistance of R-19 (hour-ft^2-°F)/Btu. The loadout area does not require insulation, unless condensation is a concern, since its temperature isn't controlled.

The process building is bordered on the East wall by the loadout area and on the West wall by the Breakroom Area. South, West, and North walls are exposed to the outside environment. Heating requirements resulting from losses through the East Wall consider the loadout area to be 11°F, or equal to the outside design temperature, since it is unheated.

Personnel traffic flow generally enters the Support Building Breakroom, through the Restroom/Locker Rooms, exiting through the Decontamination Area into the process building. Airflows subsequently are managed so the Breakroom is the most positively maintained area with exfiltration from the Breakroom into the Restroom/Locker Rooms, out into the Decontamination Area, where the exfiltrated air becomes mixed with the process building ventilation air. This exfiltration pattern results in airflow from the most clean facility area to less clean areas.

Outside air from the Support Building HVAC unit is supplied to the Decontamination Area to provide fresh conditioned air adjacent to the process building /Locker Room passageway.

An operating goal is to maintain the process building at a negative pressure with respect to the support facility and a positive pressure with respect to the loadout area.

Design Parameters:

Outside design conditions are 41.6° Latitude, 11°F_{db} for Winter and 85°F_{db}/72°F_{wb}, with 14.6 °F daily range for Summer. Average wind speed is 9 mph from 300° with an extreme wind speed of 29 mph. (Ref. 2001 ASHRAE Fundamentals Handbook, page 27.12 & 27.13, East Falmouth, MA)

The heating design goal is to maintain 40°F in the process building down to an outdoor temperature of 11°F to provide "Freeze Protection."

The cooling design goal is to maintain process and loadout area temperatures no more than 10°F above outdoor temperature using outside makeup air ventilation. Relative humidity is not controlled.

Freeze Protection Heating:

Heating loads are determined based on methods contained in the 2001 ASHRAE Fundamentals Handbook, and ASHRAE GRP 158 Cooling and Heating Load Calculation Manual.

Natural gas fired unit heaters located around the process building perimeter are used to replace heat losses through the walls, floor and roof in winter including heat losses associated with infiltration.

Ventilation Cooling:

The general ventilation system is sized to remove heat generated by lighting and electrical equipment located in the process building during the cooling season.

Ventilation rates necessary to maintain indoor temperature no more than 10°F above outdoor temperature are determined based on the above internal heat gains using methods similar to those included in Industrial Ventilation – A Manual of Recommended Practice, 23rd Ed., 1998, ACGIH, Pages 2-14 and 2-15.

Ventilation rates determined are based on cooling only. Although the ventilation rate established may provide sufficient ventilation for other functions, the presence of toxins, chemicals, odors, internal combustion engine use, or other dangerous off gases are not considered.

Roof exhaust fans are used to exhaust heat from the building. Outside makeup air ventilation is provided using wall combination louver/dampers located around the Process and loadout area perimeters.

HVAC Controls:

Heating:

During the heating season exhaust fans and wall dampers are closed to terminate forced ventilation and minimize infiltration into the building. Infiltration through the building envelop is sufficient to provide the 20 to 60 cfm ventilation required by each of the 15 estimated space occupants as outlined in Table 2 of ASHRAE Standard 62-1999, Pages 6 through 9.

Natural Gas Unit Heaters are thermostatically controlled to maintain 40°F space temperature. Again infiltration around the building envelop is sufficient to provide combustion air for the unit heaters which are vented to outside.

The installation of oxygen depletion and carbon monoxide sensors, located throughout the building, should be considered as a safety feature.

Ventilation Cooling:

During the cooling season exhaust fans and wall dampers are operated as required to provide outside makeup air ventilation to the building. Exhaust fans, their integral electric damper and wall electric dampers are interlocked to energize simultaneously. . Interlocked exhaust fans and wall dampers should utilize independent electric circuits to allow staged operation for building temperature and pressure control.

LEGEND

T-XX	THERMOSTAT
BDD-XX	BACK DRAFT DAMPER
	BALANCING DAMPER
SD-XX	SUPPLY DIFFUSER
EG-XX	EXHAUST/RETURN GRILLE
L-XX	WALL LOUVER
EF-XX	EXHAUST FAN
REF-XX	ROOF EXHAUST FAN
WEF-XX	WALL EXHAUST FAN
UH-XX	UNIT HEATER
DH-XX	DUCT HEATER
RH-XX	RADIANT HEATER

GENERAL NOTES

1. DRAWINGS PROVIDE CONCEPTUAL GUIDANCE. PERFORM WORK IN ACCORDANCE WITH GOVERNING CODES.
2. FIRE DAMPERS ARE NOT SHOWN. PROVIDE FIRE DAMPERS IN ACCORDANCE WITH GOVERNING CODES.
3. EQUIPMENT NUMBERING LEGEND:
   PROCESS BUILDING: 01 THRU 19
   SUPPORT BUILDING: 20 THRU 39
   DESANDING FACILITY: 40 THRU 49

INTERNAL DRAFT

US Army Corps of Engineers
New England District

Symbol	Description	Date	Appr
A	ISSUED FOR IDPCE REVIEW	03/13/02	MTG

Date: 02/13/02
Design file no. 172093-M-001Axx
Drawing name:
Designed by:
Drawn by:
Reviewed by:
Submitted by:
File name:
Plot scale:
Plot date:
Rev. A

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
DEWATERING FACILITIES DESIGN

MECHANICAL NOTES,
SYMBOLS AND ABBREVIATIONS

Reference number:
M-001
Sheet 53 of 60

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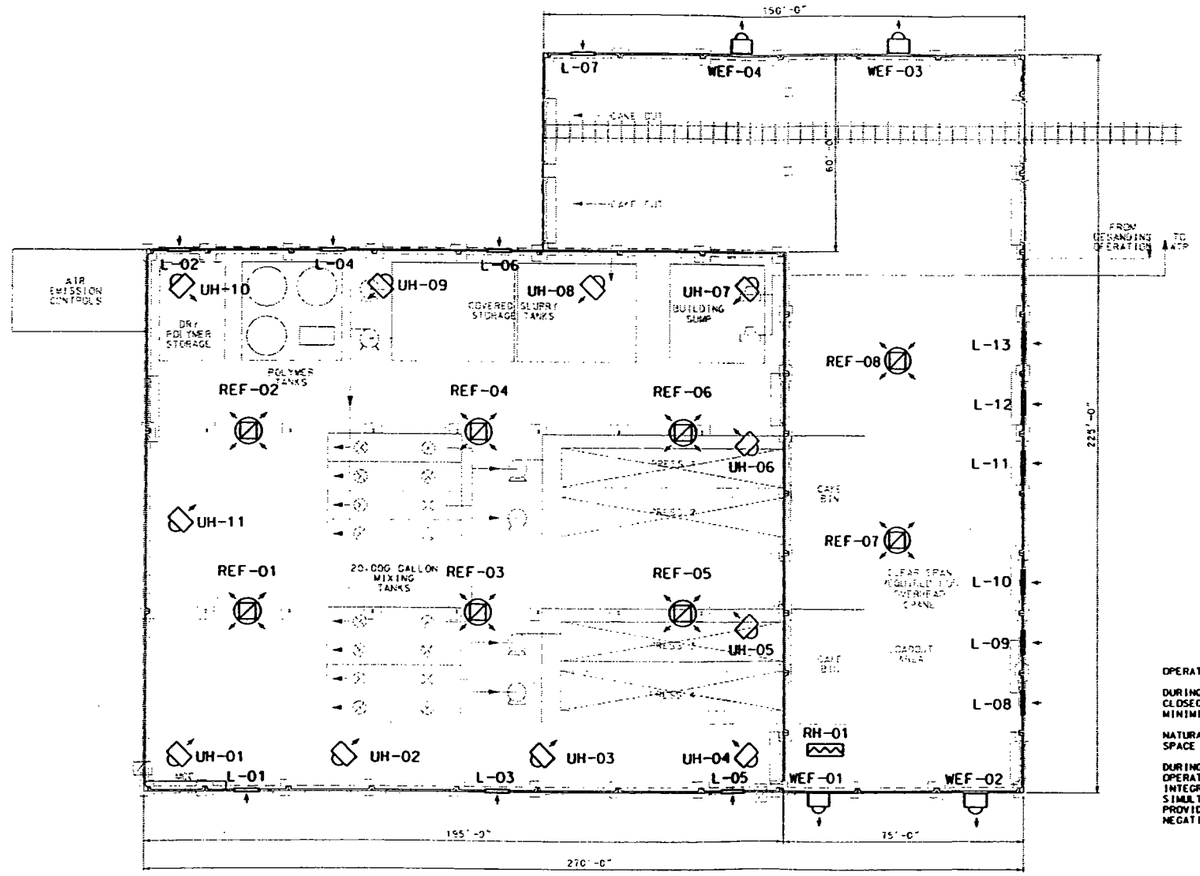

NOTES:

1. SEE M-001 FOR GENERAL NOTES, SYMBOLS AND ABBREVIATIONS.

2. SEE M-605 FOR EQUIPMENT SCHEDULE.

3. EXHAUST FANS EF-XX ARE LOCATED ON THE ROOF; WHEREAS, OTHER EQUIPMENT SHOWN IS EITHER LOCATED BELOW THE ROOF, IN THE WALLS, OR IN THE OCCUPIED SPACE.

REF-XX 12,000 SCFM ROOF EXHAUST FAN WITH INTEGRAL ELECTRIC OPERATED DAMPER AND ROOF CURB.

WEF-XX 12,000 SCFM WALL EXHAUST FAN WITH INTEGRAL ELECTRIC OPERATED DAMPER.

L-XX COMBINATION WALL LOUVER/DAMPER 60 INCH HIGH BY 96 INCH WIDE WITH 120 V ELECTRIC OPERATOR.

UH-XX 100,000 BTUH INPUT NATURAL GAS UNIT HEATER WITH INTEGRAL FAN, THERMOSTAT, TURNDOWN NOZZLE AND 50°-90° LATERAL AIR DEFLECTORS.

RH-01 RADIANT HEATER.

TOTAL PROCESS BUILDING SUMMER VENTILATION EXHAUST = 72,000 CFM

TOTAL LOADOUT BUILDING SUMMER VENTILATION EXHAUST = 48,000 CFM

OPERATING SEQUENCE:

DURING THE HEATING SEASON ROOF EXHAUST FANS, EF-xx AND WALL LOUVERS, L-xx ARE CLOSED EITHER MANUALLY OR AUTOMATICALLY TO TERMINATE FORCED VENTILATION AND MINIMIZE INFULTRATION INTO THE BUILDING.

NATURAL GAS UNIT HEATERS ARE THERMOSTATICALLY CONTROLLED TO MAINTAIN 40°F SPACE TEMPERATURE IN THE PROCESS BUILDING.

DURING THE COOLING SEASON ROOF EXHAUST FANS, EF-xx AND WALL LOUVERS, L-xx ARE OPERATED AS REQUIRED TO PROVIDE OUTSIDE AIR VENTILATION. EXHAUST FANS, THEIR INTEGRAL ELECTRIC DAMPER, AND WALL ELECTRIC DAMPERS ARE INTERLOCKED TO ENERGIZE SIMULTANEOUSLY. INTERLOCKED EXHAUST FANS AND WALL DAMPERS ARE STAGED TO PROVIDE BUILDING TEMPERATURE AND PRESSURE CONTROL WHILE MAINTAINING A MORE NEGATIVE PRESSURE IN THE LOADOUT BUILDING THAN IN THE PROCESS BUILDING.

INTERNAL DRAFT

SCALE 1"= 20'

US Army Corps of Engineers
New England District

Symbol	Description	Date	Appr.
A	ISSUE FOR 100% REVIEW	03/08	WTD

Date: 03/15/02
Rev. A
Design File no. 172093-M-601Axx
Drawing name:
Designed by:
Drawn by:
Reviewed by:
Quality Check by:
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File name:
File name:

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CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

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133 FEDERAL STREET
BOSTON, MASSACHUSETTS

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS
DEWATERING FACILITIES DESIGN

PROCESS & LOADOUT AREAS
GENERAL VENTILATION
PROCESS FLOW DIAGRAM

Reference number:
M-601
Sheet 54 of 60

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EQUIPMENT SCHEDULE

IDENTIFIER	DESCRIPTION	PERFORMANCE RATING
AC-21	PACKAGED ROOFTOP AIR CONDITIONING UNIT WITH NATURAL GAS HEAT - DOWN DISCHARGE. MINIMUM 2 STAGES OF HEAT. COMPLETE WITH MANUALLY OPERATED OUTSIDE AIR DAMPER. ROOM TEMPERATURE CONTROLLER WITH OFF. AUTO. HEAT AND COOL. AUTOMATIC HEATING TO COOLING CHANGE OVER. AND DAILY SETBACK/SETUP SCHEDULING CAPABILITY. FURNISH COOLING UNIT WITH HOT GAS BYPASS TO PROVIDE INCREMENTAL MODULATION OF THE SUPPLY AIR COOLING TEMPERATURE WITHOUT ON/OFF COMPRESSOR CYCLING AND ASSOCIATED PERIODS OF UNCONDITIONED SUPPLY AIR.	3.000 SCFM WITH CAPACITY TO PROVIDE A MINUMUM OF 1.6 INCH W.G. EXTERNAL STATIC PRESSURE
UH-1 THROUGH UH-11 & UH-23	NATURAL GAS UNIT HEATERS - COMPLETE WITH DOWNTURN AIR NOZZLE. VERTICAL LOUVERS. PROPELLOR FAN. AUTO IGNITION. VENT KIT. AND INTEGRAL ON/OFF/AUTO THERMOSTAT WITH HIGH/LOW HEAT ADJUSTMENT.	100.000 BTUH OUTPUT EACH
EF-20	EXHAUST BLOWER - SINGLE INLET. SINGLE WIDTH. CENTRIFUGAL. BACKWARD INCLINED. 2.100 RPM MAX. WITH MANUAL INLET VANE DAMPER. BELT DRIVE. MAX $1^1/_2$ HP 1.800 RPM MOTOR. DESIGNED FOR OUTDOOR SERVICE.	1.800 SCFM AT APPROXIMATELY 2.0 INCH W.G. STATIC PRESSURE
WEF-21	WALL EXHAUST FAN - CENTRIFUGAL. BELT DRIVEN OR DIRECT DRIVE WITH ADJUSTABLE CONTROLLER. 1.500 RPM MAX. WITH GRAVITY OPERATED BACKDRAFT DAMPER. WALL SLEEVE AND BIRD SCREEN. INTEGRAL TEMPERATURE CONTROL. MAX 2 HP 1.800 RPM MOTOR. DESIGNED FOR OUTDOOR SERVICE.	1.500 SCFM AT APPROXIMATELY 0.5 INCH W.G. STATIC PRESSURE
REF-01 THROUGH REF-08	ROOF EXHAUST FAN - CENTRIFUGAL. BELT DRIVEN. 1.000 RPM MAX. WITH ELECTRIC OPERATED DAMPER. ROOF CURB AND BIRD SCREEN. INTEGRAL TEMPERATURE CONTROLLER. MAX 5 HP 1.800 RPM MOTOR. DESIGNED FOR OUTDOOR SERVICE.	12.000 SCFM EACH AT APPROXIMATELY 0.5 INCH W.G. STATIC PRESSURE
SD-21 THROUGH SD-29	SUPPLY DIFFUSERS - ALUMINUM CONSTRUCTION WITH ADJUSTABLE DISCHARGE AND OPPOSED BLADE DAMPER.	AIR FLOW AS REQUIRED. 0.1 INCH W.G. MAX TOTAL PRESSURE LOSS. NC-30 MAX NOISE.
EG-01 THROUGH EG-05	EXHAUST GRILLES - ALUMINUM CONSTRUCTION WITH OPPOSED BLADE DAMPER.	AIR FLOW AS REQUIRED. 0.1 INCH W.G. MAX TOTAL PRESSURE LOSS. NC-30 MAX NOISE.
L-01 THROUGH L-07	WALL LOUVER/DAMPER COMBINATION - 700 FPM MAX VELOCITY ALUMINUM CONSTRUCTION. FRONT STATIONARY DRAINABLE BLADES WITH REAR ELECTRIC OPERATED DAMPER. BLADE AND JAM SEALS. 96 INCH WIDE BY 60 INCH HIGH BY 6 INCH TOTAL DEPTH. WITH BIRDSCREEN. STRUCTURALLY DESIGNED TO WITHSTAND A 90 MPH WIND LOAD. AMCA CERTIFIED AND RATED FOR A MAXIMUM AIR LEAKAGE OF 0.4 CFM/SQ. FT AT 0.10 IN. W. G. PRESSURE DIFFERENTIAL ACROSS THE CLOSED DAMPER. WATER PENETRATION OF 0.01 OZ./SQ. FT. AT 1.179 FPM.	12.000 SCFM EACH AT APPROXIMATELY 0.1 INCH W.G. STATIC PRESSURE
L-21	WALL LOUVER/DAMPER COMBINATION - 700 FPM MAX VELOCITY ALUMINUM CONSTRUCTION. FRONT STATIONARY DRAINABLE BLADES WITH REAR GRAVITY BACKDRAFT DAMPER. BLADE AND JAM SEALS. 30 INCH WIDE BY 30 INCH HIGH BY 6 INCH TOTAL DEPTH. WITH BIRDSCREEN. STRUCTURALLY DESIGNED TO WITHSTAND A 90 MPH WIND LOAD. AMCA CERTIFIED AND RATED FOR A MAXIMUM AIR LEAKAGE OF 0.4 CFM/SQ. FT AT 0.10 IN. W. G. PRESSURE DIFFERENTIAL ACROSS THE CLOSED DAMPER. WATER PENETRATION OF 0.01 OZ./SQ. FT. AT 1.179 FPM.	1.500 SCFM AT APPROXIMATELY 0.1 INCH W.G. STATIC PRESSURE
RH-01	RADIANT HEATER - GAS FIRED PACKAGED TUBULAR RADIANT. LOW INTENSITY HEATER FOR INDOOR/OUTDOOR USE. WITH VENT.	100.000 BTUH INPUT
DH-20 THROUGH DH-21	ELECTRIC DUCT HEATERS. OPEN ELEMENT. SILICON RECTIFIER CONTROLLER (SCR). THERMAL RESET. NEMA ENCLOSED CONTROL PANEL. PITOT TYPE AIRFLOW SWITCH. UL LISTED WITH SPACE TEMPERATURE SENSOR/CONTROLLER.	15°F TEMPERATURE RISE AT RATED AIRFLOW. 0.1 IN. W.G. MAX TOTAL PRESSURE LOSS
WEF-01 THROUGH WEF-04	WALL EXHAUST FAN - CENTRIFUGAL. BELT DRIVEN. 1.000 RPM MAX. WITH ELECTRIC OPERATED DAMPER. BIRD SCREEN. INTEGRAL TEMPERATURE CONTROLLER. MAX 5 HP 1.800 RPM MOTOR. DESIGNED FOR OUTDOOR SERVICE.	10.000 SCFM EACH AT APPROXIMATELY 0.5 INCH W.G. STATIC PRESSURE
L-08 THROUGH L-13	WALL LOUVER/DAMPER COMBINATION - 700 FPM MAX VELOCITY ALUMINUM CONSTRUCTION. FRONT STATIONARY DRAINABLE BLADES WITH REAR ELECTRIC OPERATED DAMPER. BLADE AND JAM SEALS. 48 INCH WIDE BY 96 INCH HIGH BY 6 INCH TOTAL DEPTH. WITH BIRDSCREEN. STRUCTURALLY DESIGNED TO WITHSTAND A 90 MPH WIND LOAD. AMCA CERTIFIED AND RATED FOR A MAXIMUM AIR LEAKAGE OF 0.4 CFM/SQ. FT AT 0.10 IN. W. G. PRESSURE DIFFERENTIAL ACROSS THE CLOSED DAMPER. WATER PENETRATION OF 0.01 OZ./SQ. FT. AT 1.179 FPM.	10.000 SCFM EACH AT APPROXIMATELY 0.1 INCH W.G. STATIC PRESSURE

NOTES:

1. SEE M-001 FOR GENERAL NOTES, SYMBOLS AND ABBREVIATIONS.

INTERNAL DRAFT

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New England District

Symbol	Description	Date	Appr.
A	ISSUED FOR GRADE REVIEW	02/14/02	WTD

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

FOSTER WHEELER ENVIRONMENTAL CORP.
ONE CONGRESS STREET
BOSTON, MASSACHUSETTS

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS
DEWATERING FACILITIES DESIGN

HVAC
EQUIPMENT SCHEDULE

Reference number:
M-605
Sheet 58 of 60

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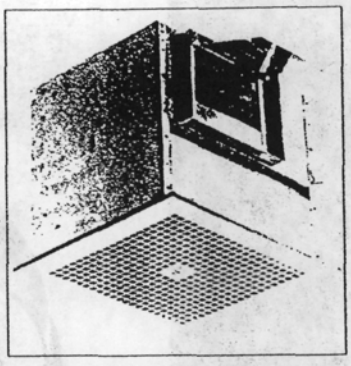
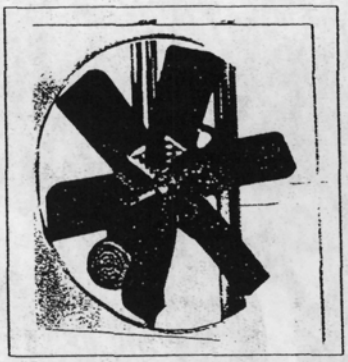
Other Penn Ventilation Catalogs

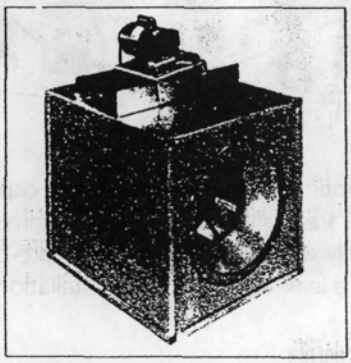
DOMEX Centrifugal Roof Exhausters



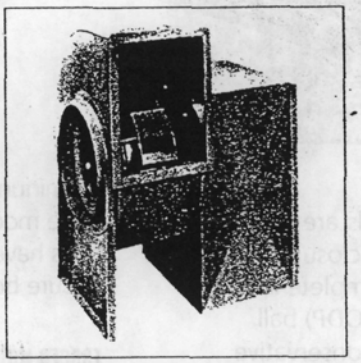
ZEPHYR Ceiling and Inline Fans



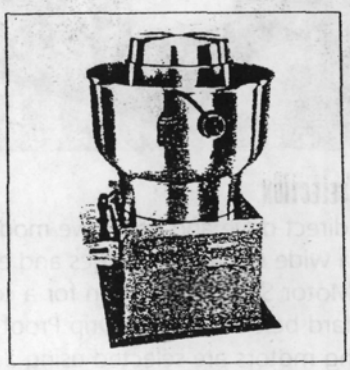
BREEZEWAY Exhaust Propeller Fans



CENTREX INLINER Centrifugal Inline Fans



DYNAMO Centrifugal Blowers



FUMEX FATRAP Kitchen Hood Centrifugal Exhausters Roof Exhausters

- Hi-Ex Vertical Discharge Air Exhauster
- Round Centrex
- Airette
- LC Dynafan
- Linea
- Large Capacity Zephyr
- Muffan
- Louvers
- Dampers
- Roof Curbs

PENN VENTILATION

1370 Welsh Road ■ North Wales, PA 19454 ■ 215.619.8800 ■ Fax 215.591.1916 ■ January 1999

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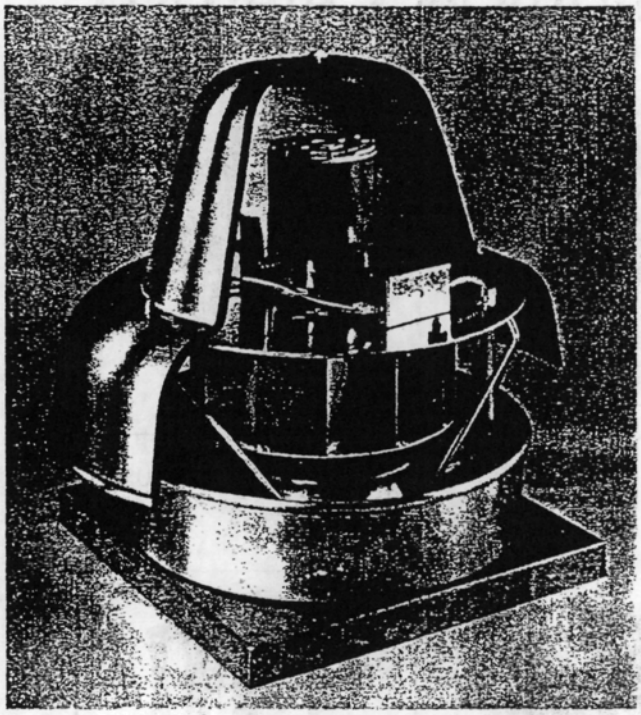
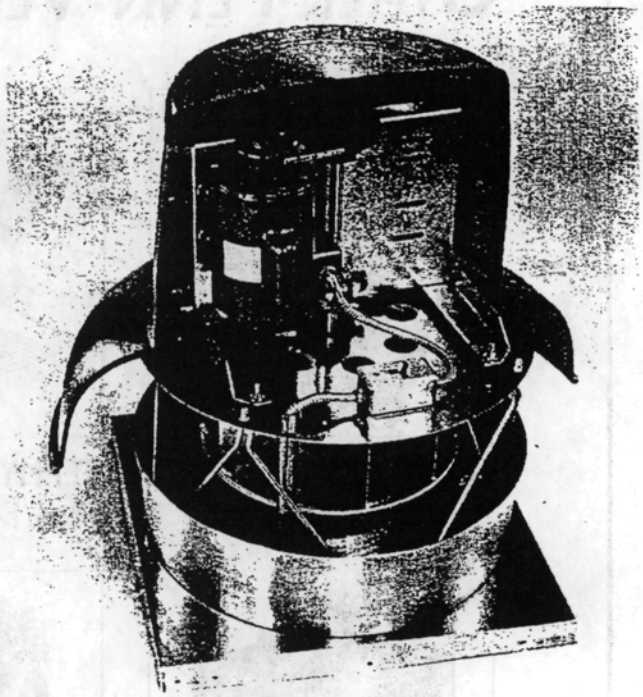




MOTOR SELECTION
Both direct drive and belt drive models are available with a wide range of voltages and enclosures. (See Motor Selection section for a complete listing). Standard belt drive Open Drip Proof (ODP) ball bearing motors are selected using a conservative portion of the NEMA service factor. Standard direct drive ODP motors have Class B insulation and internal overload protection. Each size is carefully engineered to match the motor to the wheel capacity.

INTERNAL WIRING
All direct drive models with ODP motors feature a polarized disconnect plug between the motor and junction box. This provides a positive method of electric shut-off. Belt drive units with ODP motors are factory-wired between the motor and junction box. For either direct drive or belt drive models, an electric disconnect is available.

SOUND PERFORMANCE
Lowest AMCA licensed sound performance in the industry. Units deliver outstanding air performance with minimal noise.

CURB CAPS (BASE)
Curb caps for direct drive and standard duty belt drive models are available in galvanized steel (standard) or aluminum (optional). Curb caps for high capacity belt drive models are available only in aluminum. All curb caps have fully welded corners and are pre-punched to ensure both a leak-tight and easy installation.

FORCED MOTOR COOLING
Breather slots between the motor dome and discharge apron enable fresh air to be drawn into the motor housing during fan operation. This positive cooling promotes longer life for motor and drive components.

STRUCTURAL INTEGRITY
Durable housings of spun aluminum have a high strength-to-weight ratio and incorporate a rolled bead for additional strength. There are no welds to break or seams to leak. The heavy-gauge motor mounting platform provides positive rigidity between all components of the power train assembly.

INTERNAL BRACING
Tri-Strut™ supports transfer the weight of the motor mounting platform directly to the curb mounting surface. The aluminum spun housing, therefore, is not used to support any weight.

EASY MAINTENANCE ACCESS
By removing the fasteners, the motor dome lifts off for complete access to all the drive train components.

SOLID STEEL SHAFTS
Sized so the first critical speed is a minimum of 130% of maximum cataloged operating speed, shafts are precision ground, polished and treated for rust resistance.

SELF-ALIGNING BEARINGS
Heavy-duty bearings are sized for a minimum L50 life in excess of 200,000 hours of operation. 100% factory tested, they are designed for air handling applications.

DRIVES AND BELTS
Pulleys are pre-set to the specified RPM. Cast iron variable pitch pulleys are adjustable, allowing for field balancing based on actual field conditions. All pulleys are sized for at least 150% of the driven horsepower.

VIBRATION ISOLATORS
Multidirectional, rubber-in-shear vibration isolators mitigate residual vibration transmission from the unit to the building.

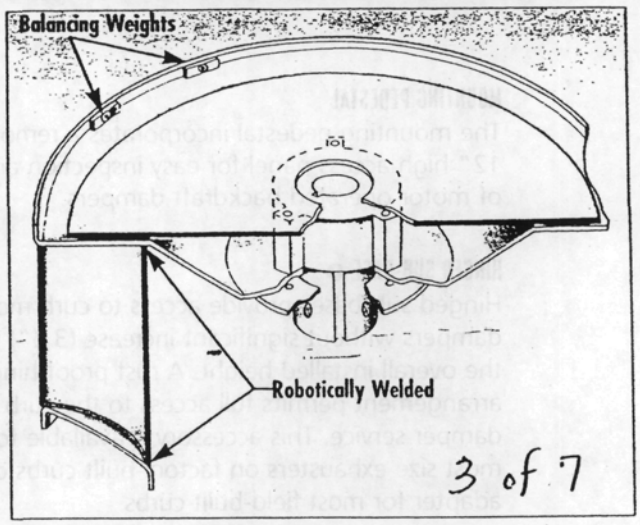
ALUMINUM BIRD SCREEN
Standard on all direct drive and belt drive models.

CONDUIT
Both direct and belt drive units include a large 1" nominal conduit chase for easy installation of wiring from the motor dome to below the curb cap.

ALUMINUM WHEELS
Domex fans offer *patented* wheel designs. Carefully matched highly-tooled venturis enhance the performance of these backwardly inclined and non-overloading centrifugal wheels. Made of advanced alloys, the various wheel components provide superior strength and durability.

Silent Wheel (Direct Drive and DX06B, 08B & 11B)

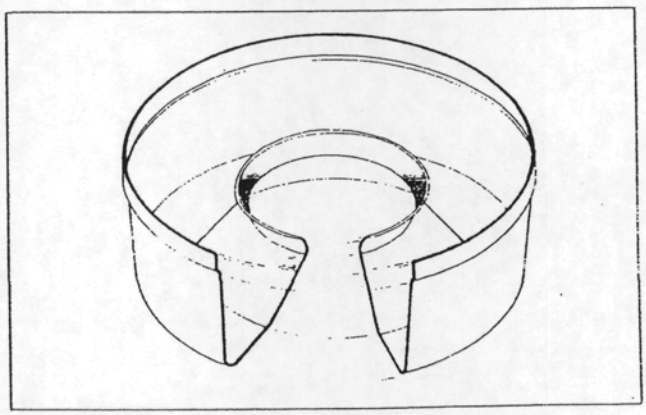
- Blades' highly curved leading edge provide unsurpassed low sound numbers with excellent air performance.
- Backplate and inlet are stamped for consistency, plus dynamic balancing assure smooth vibration-free operation.
- Riveted or riveted and welded construction ensure superior dependability over other wheel designs.



Wheel and Hub Combination

Standard Duty, All Welded Wheel (Standard Duty Belt Drive)

- Blades are curved for improved air performance while increasing their strength and rigidity.
- Backplate and inlet are stamped for consistency. They include a perimeter rim which enhances strength and improves balancing.
- Wheel assembly is robotically welded to provide extremely durable and consistent performance.
- Wheel is dynamically balanced. Balancing weights are mechanically attached to the inside of the rims of both the backplate and wheel inlet. This allows a precise placement of the weights anywhere within a full 360° range on two separate planes, without the possibility of detachment.



Reverse Venturi

REVERSE VENTURI
Reverse venturi reduces turbulence and improves distribution of the air as it enters the wheel inlet and is "captured" by the blades.

MOUNTING PEDESTAL
The mounting pedestal incorporates a removable 12" high access panel for easy inspection and service of motor operated backdraft dampers.

HINGED SUB-BASE ❶
Hinged sub-bases provide access to curb mounted dampers without significant increase (3 ½") in the overall installed height. A rust proof hinge arrangement permits full access to the curb well for damper service. This accessory is available for use with most size exhausters on factory-built curbs or with an adapter for most field-built curbs.

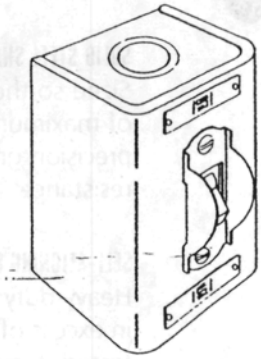
INSECT SCREENS ❷
An aluminum screen with a smaller mesh than the standard bird screen is available.

OPTIONAL FINISHES
Special coatings such as two-part, heavy-duty amido-amin Epoxy, Aluma-Glass™, Eisenheiss and Heresite, are available for applications involving corrosive conditions and/or other damaging influences.

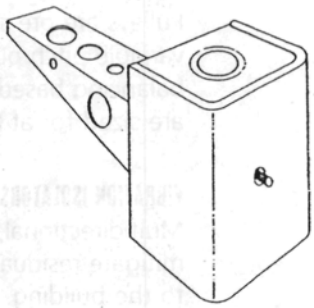
BACKDRAFT DAMPERS ❸
Backdraft dampers are available for either gravity or motorized operation (motor kit optional). Dampers feature square galvanized steel frame, multi-leaf, roll formed aluminum blades with nylon bearings.

Electrical Accessories

SAFETY DISCONNECT SWITCH ❹
Safety disconnect switches are wired to the motor and installed under the motor dome. This on/off type switch is available for all single and three phase motors. Factory wiring is not available for explosion-proof motors.



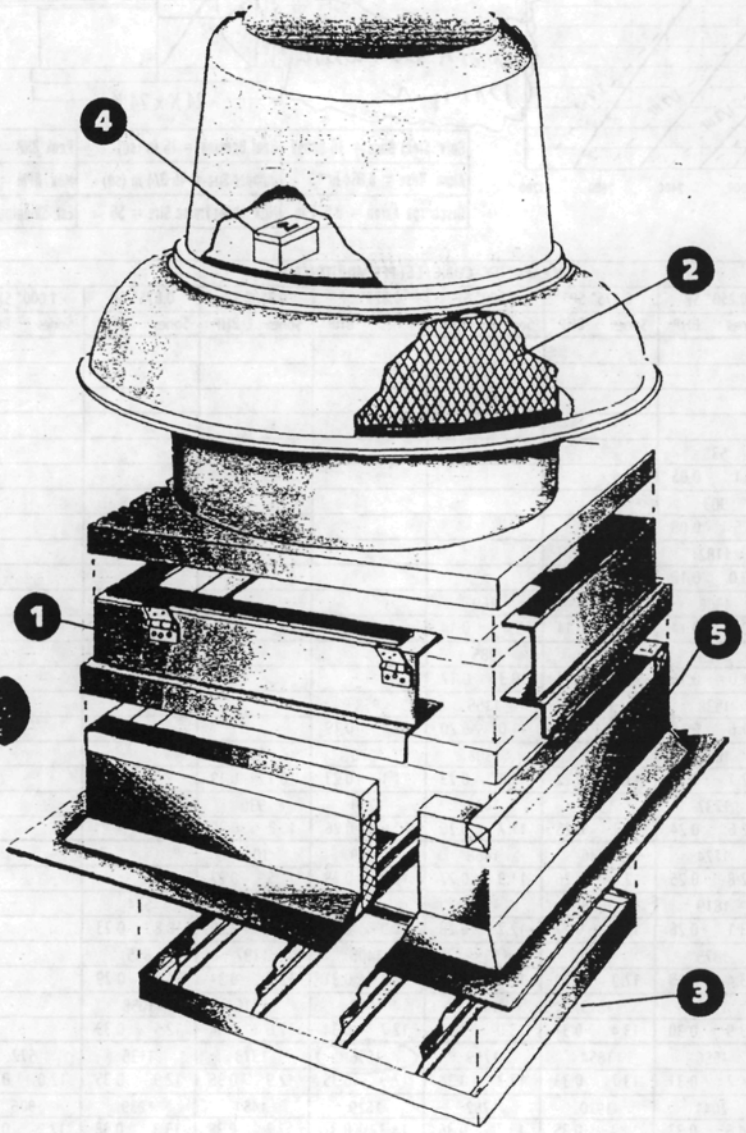
FIRESTAT SWITCH
Firestat switch automatically disconnects the unit when the temperature of the air being exhausted exceeds a preset rating.



TIME-DELAY SWITCH (DIRECT DRIVE MODELS ONLY)
The Airminder Model AM12 switch is a UL recognized and CSA certified time-delay relay that operates both the fan and room light to ventilate an area even after the occupants depart. In the "On" position, the Airminder turns the light and fan on immediately. In the "Off" position, the light goes off immediately and the fan is in operation for a period of time as preset from 1 to 60 minutes.

SPEED CONTROLS ❺ (DIRECT DRIVE MODELS ONLY)
The Lek-Trol™ unit allows adjustment of airflow. It can be installed under the motor dome which permits system balancing and eliminates unauthorized tampering of the setting. If wired to the unit from the building, the airflow may be adjusted easily by the occupants.

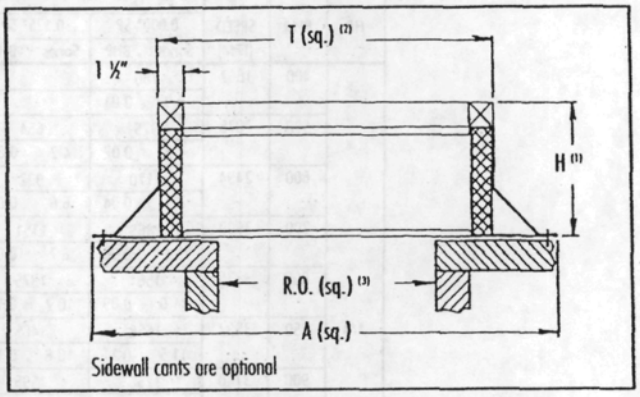
INTERNAL WIRING
NEMA 3R wiring is available for both direct drive and belt drive units.



Prefabricated Curbs ⑤

A variety of sizes of prefabricated roof curbs is available. For a complete listing of all curb types and sizes available, please consult the latest Penn Ventilation Curb Brochure.

DOMEX Unibeam Curb



DOMEX Curb Dimensions

MODEL	E (4) SQ	T (2) SQ	A SQ	R.O. (3) SQ	Damper Size SQ	Galv. Steel Gauge
DX08S/R	18.5	17	25	9	8.75	18
DX10S/R	18.5	17	25	11.5	11.25	18
DX11V/S/R/Q	18.5	17	25	11.5	11.25	18
DX13V/S/R/Q	18.5	17	25	11.5	11.25	18
DX16V/S/R/Q1/Q2	20.5	19	27	16	15.75	18
DX06B/DX08B	18.5	17	25	11.5	11.25	18
DX11B	20.5	19	27	16	15.75	18
DX12B/DX14B	24.75	23.25	31.25	16	15.75	18
DX16B/DX18B	28.5	27	35	20	19.75	18
DX24B	33.5	32	40	25	24.75	18
DX30B	36.5	35	43	28	27.75	18
DX36B	44.5	43	51	36	35.5	18
KB420	52.5	51	59	44	43.5	18
JB48	59	57.5	65.5	50	49.5	18
MB542	63.5	62	70	55	54.5	18

Notes:

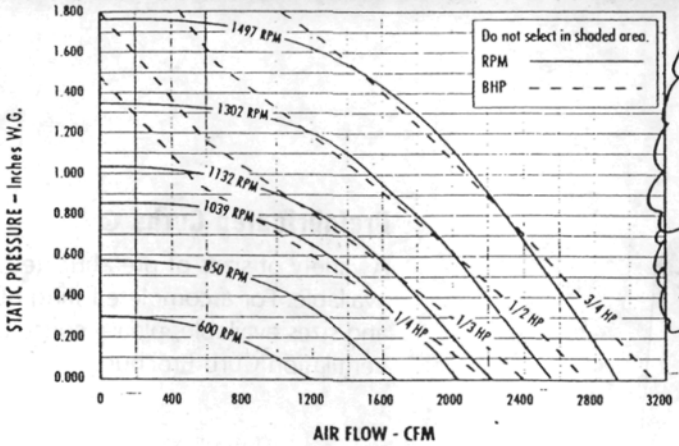
1. Standard heights (H) are 8", 12", and 18" including wood nailer.
2. "T" dimension of curb is 1 ½" less than the dimension of the inside base of the fan ("E")
3. R.O. refers to the Roof Opening.
4. "E" dimension is the inside base of fan.

SPARK RESISTANT CONSTRUCTION

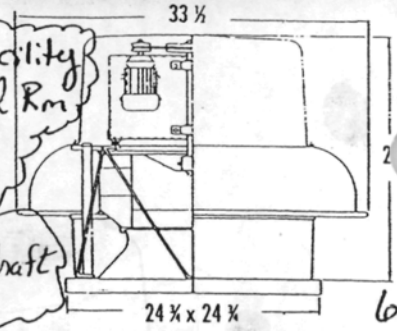
AMCA "B" construction is available for belt drive, (standard on direct drive models). Please refer to detailed information regarding AMCA Standards in the Engineering Notes section of this catalog. Select specific explosion proof motor as required for application.

GUARDS

Guards are highly recommended whenever a fan is mounted within seven feet of occupied space and/or otherwise unprotected with ductwork. Each application must be reviewed for OSHA compliance.



Support Facility Mechanical Rm Exhaust Wall Fan with Backdraft Damper



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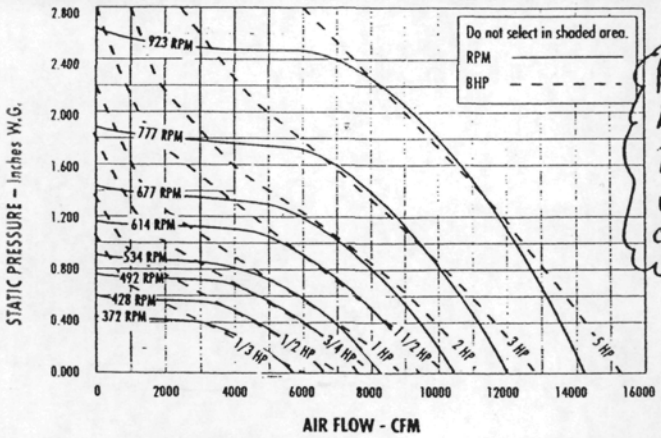
Galv. Steel Base = 16 gauge	Roof Opening = 16 in (sq)	Peak BHP = (RPM/1617)^3
Alum. Base = 0.064 in	Damper Size = 15 3/4 in (sq)	Max. RPM = 2007 (1 1/2 HP)
Discharge Apron = 0.064 in	Max. Motor Frame Size = 56	Est. Shipping Weight = 98 lbs

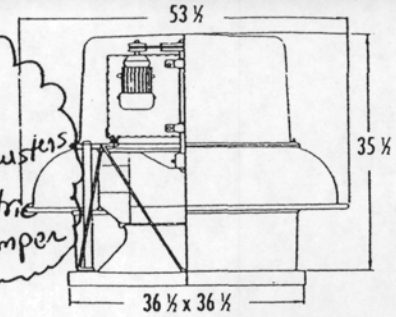
HP	RPM	TIP SPEED (FPM)	FAN CAPACITY - CUBIC FEET PER MINUTE (CFM)									
			0.000" SP	0.125" SP	0.250" SP	0.375" SP	0.500" SP	0.625" SP	0.750" SP	0.875" SP	1.000" SP	1.250" SP
			Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BH
1/4	400	1662	780									
			2.9 0.01									
	500	2078	975	654								
			4.9 0.02	4.2 0.03								
	600	2494	1170	922	538							
			7.1 0.04	6.6 0.05	6.1 0.05							
	700	2909	1365	1151	903							
			9.4 0.06	8.7 0.07	8.5 0.08							
	800	3325	1561	1375	1182	929						
			11.0 0.09	10.2 0.11	10.0 0.12	9.6 0.12						
	850	3533	1658	1485	1308	1084	769					
			11.5 0.11	10.8 0.13	10.4 0.14	10.2 0.14	9.4 0.14					
	900	3740	1756	1595	1425	1232	985					
			12.2 0.13	11.5 0.15	11.0 0.16	10.8 0.17	10.3 0.17					
	950	3948	1853	1703	1538	1371	1155	858				
			12.9 0.16	12.3 0.17	11.6 0.18	11.4 0.19	11.0 0.20	10.4 0.19				
	1000	4156	1951	1811	1650	1499	1308	1076	553			
			13.3 0.18	12.8 0.20	12.1 0.21	11.7 0.22	11.4 0.23	11.1 0.23	10.1 0.19			
	1039	4318	2027	1894	1737	1597	1422	1219	930			
			13.7 0.21	13.2 0.22	12.6 0.24	12.2 0.25	11.7 0.26	11.6 0.26	11.2 0.25			
1/3	1055	4385	2058	1928	1774	1636	1468	1269	1011			
			13.8 0.21	13.4 0.23	12.8 0.25	12.4 0.26	11.9 0.27	11.7 0.28	11.5 0.27			
	1075	4468	2097	1970	1819	1683	1525	1331	1094	524		
			14.1 0.23	13.6 0.24	13.1 0.26	12.6 0.27	12.2 0.28	12.0 0.29	11.8 0.29	10.8 0.23		
	1100	4572	2146	2023	1875	1740	1591	1408	1197	855		
			14.5 0.24	13.9 0.26	13.4 0.28	12.9 0.29	12.5 0.30	12.3 0.31	12.2 0.31	11.7 0.29		
	1132	4705	2208	2091	1946	1813	1673	1503	1316	1058		
			15.0 0.27	14.4 0.28	13.9 0.30	13.4 0.31	13.0 0.33	12.7 0.34	12.6 0.34	12.5 0.33		
1/2	1150	4779	2244	2128	1986	1854	1719	1556	1373	1136	572	
			15.3 0.28	14.7 0.29	14.2 0.31	13.7 0.33	13.3 0.34	12.9 0.35	12.9 0.36	12.9 0.35	12.0 0.28	
	1175	4883	2292	2180	2041	1910	1782	1629	1451	1239	906	
			15.7 0.30	15.2 0.31	14.6 0.33	14.2 0.35	13.7 0.36	13.3 0.37	13.2 0.38	13.3 0.38	12.9 0.35	
	1200	4987	2341	2231	2096	1966	1844	1700	1527	1341	1076	
			16.3 0.32	15.8 0.33	15.2 0.35	14.7 0.37	14.3 0.38	13.8 0.39	13.7 0.40	13.7 0.41	13.6 0.39	
	1250	5195	2439	2333	2206	2077	1963	1831	1676	1507	1300	
			17.2 0.36	16.8 0.37	16.2 0.40	15.7 0.42	15.1 0.43	14.7 0.44	14.4 0.45	14.4 0.46	14.5 0.45	
	1275	5299	2488	2384	2260	2134	2021	1895	1749	1585	1402	
			17.7 0.38	17.2 0.39	16.7 0.42	16.1 0.44	15.5 0.45	14.9 0.47	14.5 0.48	14.6 0.48	14.7 0.48	
	1302	5411	2540	2439	2319	2195	2082	1963	1827	1668	1503	869
			18.1 0.40	17.6 0.42	17.1 0.44	16.6 0.46	16.0 0.48	15.4 0.49	14.7 0.51	14.7 0.52	14.9 0.52	14.5 0.4
3/4	1325	5507	2585	2486	2369	2247	2134	2021	1891	1736	1576	1106
			18.5 0.43	18.0 0.44	17.5 0.46	17.0 0.49	16.4 0.50	15.8 0.52	15.2 0.53	14.8 0.54	15.0 0.55	15.1 0.5
	1350	5611	2634	2536	2423	2303	2190	2083	1956	1810	1654	1248
			18.9 0.45	18.4 0.47	17.9 0.49	17.4 0.51	16.8 0.53	16.3 0.54	15.7 0.56	15.2 0.57	15.1 0.58	15.6 0.5
	1400	5818	2731	2637	2530	2414	2302	2201	2084	1955	1807	1463
			19.9 0.50	19.4 0.52	18.8 0.54	18.3 0.57	17.7 0.59	17.2 0.60	16.7 0.62	16.1 0.63	15.9 0.64	16.2 0.6
	1425	5922	2780	2688	2584	2469	2357	2258	2147	2026	1882	1566
			20 0.53	19.9 0.55	19.3 0.57	18.7 0.60	18.2 0.62	17.7 0.63	17.2 0.65	16.6 0.66	16.2 0.67	16.3 0.6
	1450	6025	2829	2738	2637	2524	2413	2315	2210	2092	1955	1663
			21 0.56	20 0.58	19.9 0.60	19.3 0.62	18.7 0.65	18.2 0.66	17.6 0.68	17.1 0.69	16.6 0.70	
	1497	6222	2927	2833	2737	2627	2520	2421	2327	2212	2091	
			22 0.61	21 0.63	21 0.65	20 0.66	19.7 0.71	19.2 0.72	18.7 0.74	18.1 0.75	17.5 0.77	17.3 0.7

Performance shown is for installation type A: Free Inlet, Free Outlet. Power rating (BHP) does not include drive losses. For further information on estimating belt drive losses and motor service factors see page 15. FanSizer software automatically calculates drive losses when selecting equipment. The sound ratings shown are for loudness values, in fan sones at 5'0" (1.5m) in a hemispherical free field per AMCA Standard 301. Values shown are for installation type A: Free inlet fan sone levels. Performance ratings do not include the effects of appurtenances in the airstream. For further information on sound classification, see page 29. For sound power data, see pages 31-33. For accessories see pages 6 and 7.

DX30B



Process/ Loadout Roof Exhausters with Electric operated Damper



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Galv. Steel Base = 14 gauge	Roof Opening = 28 in (sq)	Peak BHP = (RPM/534)^3
Alum. Base = 0.080 in	Damper Size = 27 3/4 in (sq)	Max. RPM = 988 (5 HP)
Discharge Apron = 0.080 in	Max. Motor Frame Size = 184T	Est. Shipping Weight = 210 lbs

HP	RPM	TIP SPEED (FPM)	FAN CAPACITY - CUBIC FEET PER MINUTE (CFM)									
			0.000" SP	0.125" SP	0.250" SP	0.375" SP	0.500" SP	0.625" SP	0.750" SP	1.000" SP	1.250" SP	1.500" SP
			Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BHP	Sones BHP
1/3	225	1804	3480	2165								
			2.9 0.06	2.0 0.07								
	300	2405	4640	3849	2423							
			5.8 0.14	5.1 0.17	4.3 0.17							
	372	2983	5753	5164	4386	3184						
			8.7 0.27	8.0 0.30	7.4 0.33	6.6 0.32						
1/2	405	3247	6264	5732	5073	4186						
			9.7 0.35	8.9 0.38	8.2 0.42	7.5 0.43						
	428	3432	6619	6120	5514	4747	3627					
			10.4 0.41	9.7 0.45	9.0 0.49	8.3 0.51	7.4 0.49					
3/4	460	3688	7114	6653	6114	5468	4618					
			11.7 0.51	10.8 0.55	10.0 0.59	9.3 0.63	8.5 0.63					
	480	3848	7424	6985	6478	5897	5147	4103				
			12.6 0.57	11.5 0.62	10.5 0.66	9.9 0.71	9.0 0.72	8.4 0.70				
	492	3945	7609	7183	6695	6136	5430	4490				
			13.1 0.62	12.1 0.67	11.0 0.71	10.3 0.76	9.4 0.78	8.7 0.76				
1	520	4169	8042	7642	7195	6674	6071	5324	4225			
			14.1 0.73	13.3 0.79	12.4 0.83	11.6 0.87	10.8 0.91	9.9 0.92	8.9 0.87			
	534	4281	8259	7871	7443	6939	6375	5691	4760			
			14.7 0.79	13.9 0.85	13.2 0.89	12.4 0.94	11.6 0.98	10.6 1.00	9.5 0.97			
1 1/2	560	4490	8661	8295	7890	7427	6927	6303	5559			
			15.4 0.91	14.8 0.98	14.2 1.02	13.4 1.06	12.7 1.12	11.8 1.14	10.7 1.14			
	580	4650	8971	8617	8229	7792	7315	6757	6115			
			16.1 1.01	15.5 1.08	14.9 1.13	14.2 1.17	13.5 1.23	12.7 1.26	11.7 1.28			
	600	4811	9280	8938	8566	8153	7698	7192	6590	4847		
			16.8 1.12	16.2 1.19	15.6 1.24	15.0 1.29	14.3 1.34	13.5 1.39	12.5 1.41	10.4 1.33		
	614	4923	9496	9162	8801	8405	7964	7493	6917	5412		
			17.4 1.20	16.9 1.27	16.2 1.32	15.6 1.37	14.9 1.43	14.2 1.49	13.2 1.50	10.9 1.47		
2	640	5131	9899	9578	9234	8868	8452	8015	7504	6230		
			18.4 1.36	17.9 1.44	17.3 1.49	16.8 1.54	16.1 1.59	15.3 1.66	14.5 1.69	12.3 1.69		
	660	5292	10208	9897	9567	9222	8820	8400	7937	6798	4544	
			19.1 1.49	18.6 1.57	18.1 1.63	17.6 1.68	17.0 1.73	16.2 1.80	15.4 1.85	13.4 1.88	11.5 1.62	
	677	5428	10471	10168	9848	9513	9129	8724	8302	7235	5744	
			19.5 1.61	19.0 1.69	18.6 1.75	18.2 1.80	17.7 1.86	16.9 1.92	16.1 1.99	14.2 2.03	12.5 1.96	
3	710	5693	10981	10692	10392	10073	9723	9346	8952	8011	6801	
			20.0 1.86	19.9 1.94	19.5 2.01	19.1 2.06	18.7 2.12	18.1 2.18	17.3 2.26	15.6 2.32	14.0 2.30	
	735	5893	11368	11089	10802	10494	10169	9808	9431	8577	7519	5947
			21.0 2.06	21.0 2.15	20.0 2.22	20.0 2.28	19.6 2.33	19.1 2.39	18.3 2.47	16.8 2.56	15.0 2.59	13.8 2.45
	760	6093	11755	11485	11210	10912	10611	10263	9905	9120	8163	6886
			22.0 2.28	22.0 2.37	21.0 2.45	21.0 2.51	21.0 2.56	20.0 2.63	19.4 2.70	17.9 2.83	16.3 2.87	14.8 2.79
	777	6230	12018	11754	11488	11196	10905	10569	10224	9485	8564	7426
			23.0 2.44	22.0 2.53	22.0 2.61	22.0 2.67	21.0 2.73	21.0 2.79	20.0 2.86	18.7 3.01	17.1 3.06	15.5 3.01
5	815	6534	12605	12354	12102	11827	11549	11249	10924	10244	9441	8513
			24.0 2.81	24.0 2.91	23.0 3.00	23.0 3.06	23.0 3.12	23.0 3.19	22.0 3.25	21.0 3.42	18.8 3.50	17.2 3.55
	845	6775	13069	12827	12584	12323	12055	11781	11467	10819	10095	9237
			25.0 3.14	25.0 3.23	25.0 3.33	25.0 3.40	25.0 3.46	24.0 3.53	24.0 3.60	23.0 3.76	21.0 3.89	18.5 3.94
	875	7015	13533	13299	13065	12817	12558	12299	12006	11389	10739	9937
			26.0 3.48	26.0 3.58	26.0 3.68	26.0 3.76	26.0 3.83	26.0 3.89	26.0 3.96	24.0 4.12	23.0 4.30	20.0 4.34
	905	7256	13997	13771	13544	13308	13058	12808	12540	11952	11333	10610
			28.0 3.85	28.0 3.96	28.0 4.06	27.0 4.15	27.0 4.22	27.0 4.28	27.0 4.35	26.0 4.50	24.0 4.70	22.0 4.79
	923	7400	14276	14054	13831	13603	13357	13112	12859	12284	11680	11001
			29.0 4.09	29.0 4.19	29.0 4.30	28.0 4.39	28.0 4.46	28.0 4.53	28.0 4.60	27.0 4.75	25.0 4.95	23.0 5.07

Performance shown is for installation type A: Free Inlet, Free Outlet. Power rating (BHP) does not include drive losses. For further information on estimating belt drive losses and motor service factors see page 15. FanSizer software automatically calculates drive losses when selecting equipment. The sound ratings shown are for loudness values in fan sones at 5'0" (1.5m) in a hemispherical free field per AMCA Standard 301. Values shown are for installation type A: free inlet fan sone levels. Performance ratings do not include the effects of appurtenances in the airstream. For further information on sound classification, see page 29. For sound power data, see pages 31-33. For accessories see pages 6 and 7.

Process/Loadout Bldg
Combination
Louver/Dampers

Hobbs & Associates
January 15, 2002
REPS v3.1.0

BRAND: RUSKIN

Louvers

Model:	ELC6375D Deduct 1/4 Inch
FRAME:	BOX
SCREEN:	3/4 .051 AL
SCREEN MTG.:	REAR
FINISH TYPE:	MILL
BLD/JAMB SEALS:	STD. MATERIAL
ACT TYPE:	ELECTRIC/120 VOLT ← Electric operator
ACTUATOR:	ABAR-120
FAIL POS.:	CLOSE
AXLE&LNKG MATL:	STANDARD

QTY	WIDTH		HEIGHT	NET EACH	TOTAL NET
6	90	x	60	$ 1,880	$ 11,280

www.Ruskin.com

RUSKIN®

60"h x 90"w

3900 Dr. Greaves Rd. • Kansas City, MO 64030 • (816) 761-7476 • FAX (816) 765-8

ELC6375D COMBINATION LOUVER DRAINABLE BLADE

EXTRUDED ALUMINUM

STANDARD CONSTRUCTION

FRAME
6" (152) deep, 6063T5 extruded aluminum with .125" (3.2) nominal wall thickness. Downspouts and caulking slots provided.

BLADES
Front stationary drainable blades – 6063T5 extruded aluminum. .081" (2.1) nominal wall thickness positioned at 37½° angle and spaced approximately 4½" (114) center to center.

Rear adjustable blades – 6063T5 extruded aluminum, 125" (3.2) nominal wall thickness for single section widths through 48" (1219).

SCREEN
¾" x .051" (19 x 1) expanded, flattened aluminum bird screen in removable frame. Screen adds approximately ½" (13) to louver depth.

SEALS
Extruded vinyl blade edge seals on rear adjustable blades and flexible, compressible aluminum jamb seals.

LINKAGE
Concealed.

BEARINGS
Stainless steel sleeve pressed into frame.

AXLES
½" (13) plated steel hex.

ACTUATOR
Locking louver quadrant.

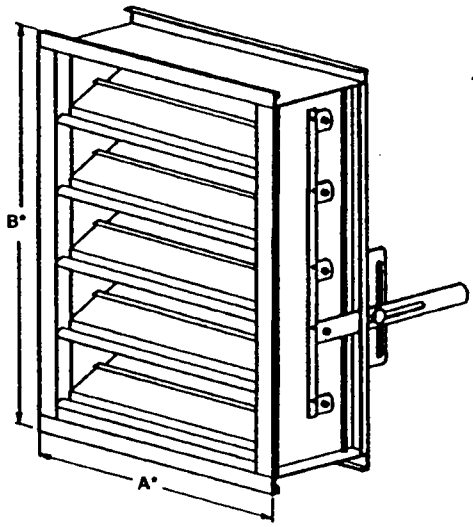
FINISH
Mill.

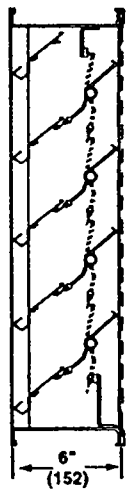
MINIMUM SIZE
12"w x 12"h (305 x 305).

APPROXIMATE SHIPPING WEIGHT
8 lbs. per sq. ft.

MAXIMUM FACTORY ASSEMBLY SIZE
64 sq. ft. (6m²). Sections must fit into standard enclosed trailer 90" high x 240" deep (2286 x 6096).

Louvers larger than the maximum factory assembly size will require field assembly of smaller sections.





FEATURES

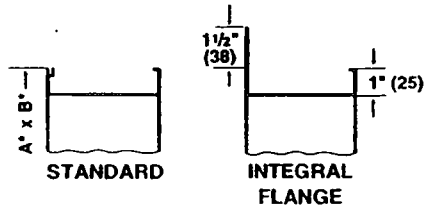
The ELC6375D offers:
- Published performance ratings based on testing in accordance with AMCA Standard 511.
- High free area, low water penetration, and low pressure drop.
- Ideally suited for air intake and exhaust applications that require tight shut off.
- Combines architectural styling with performance.
- Adjustable rear blades provide desired shut off in the same 6" (152) deep frame normally required by a louver alone.
- A drain gutter in each front stationary blade and downspouts in jambs and mullions drain water from the louver with minimum water cascade from blade to blade.
- Architecturally styled hidden mullions allowing continuous line appearance up to 120" (3048).

VARIATIONS

Variations to the basic design of this louver are available at additional cost. They include:
- Extended sill.
- Hinged frame.
- Front or rear security bars.
- Filter racks.
- A variety of bird and insect screens.
- Selection of finishes: baked enamel (modified fluoropolymer), epoxy, Kynar, Acrodize, prime coat, integral color and clear anodize. (Some variation in anodize color consistency is possible).
- A selection of manual, electric, and pneumatic actuators.

Consult Ruskin for other special requirements.

FRAME CONSTRUCTION



Dimensions in parenthesis ( ) indicate millimeters.

*Units furnished ¼" (6) smaller than given opening dimensions.

TAG	QTY.	SIZE		FRAME	VARIATIONS
		A*-WIDE	B*-HIGH		

PROJECT
ARCH./ENGR.
REPRESENTATIVE

LOCATION
CONTRACTOR
DATE

ALL STATED SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION.

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SUGGESTED SPECIFICATION

Furnish and install louvers as hereinafter specified where shown on plans or as described in schedules. Louvers shall be combination stationary adjustable drainable type with a drain gutter in each stationary blade and downspouts in jambs and mullions. Stationary blades and adjustable blades shall be contained within a single 6" (152) louver frame. Adjustable section shall include low leakage blade and jamb seals. Louver components (heads, jambs, sills, blades, & mullions) shall be factory assembled by the louver manufacturer. Louver sizes too large for shipping shall be built up by the contractor from factory assembled louver sections to provide overall sizes required. Louver design shall limit span between visible mullions to 120" (3048) and shall incorporate such other structural supports required to withstand a wind load of 20 lbs. per sq. ft. (.96kPa) (equivalent of a 90 mph wind [145 KPH] – specifier may substitute any loading required).

Louvers shall be Combination Drainable Type Ruskin Model ELC6375D extruded 6063T5 aluminum alloy construction as follows:

Frame: .125" (3.2) wall thickness.

Blades: Stationary front section .081" (2.1) wall thickness, drainable blade at 37½° angle on approximately 4½" (114) centers. Adjustable rear section .125" (3.2) wall thickness.

Finish: Select finish specification from Ruskin Finishes Brochure.

Published louver performance data bearing the AMCA Certified Ratings Seal for Air Performance & Water Penetration must be submitted for approval prior to fabrication and must demonstrate pressure drop and water penetration equal to or less than the Ruskin model specified.

PERFORMANCE DATA

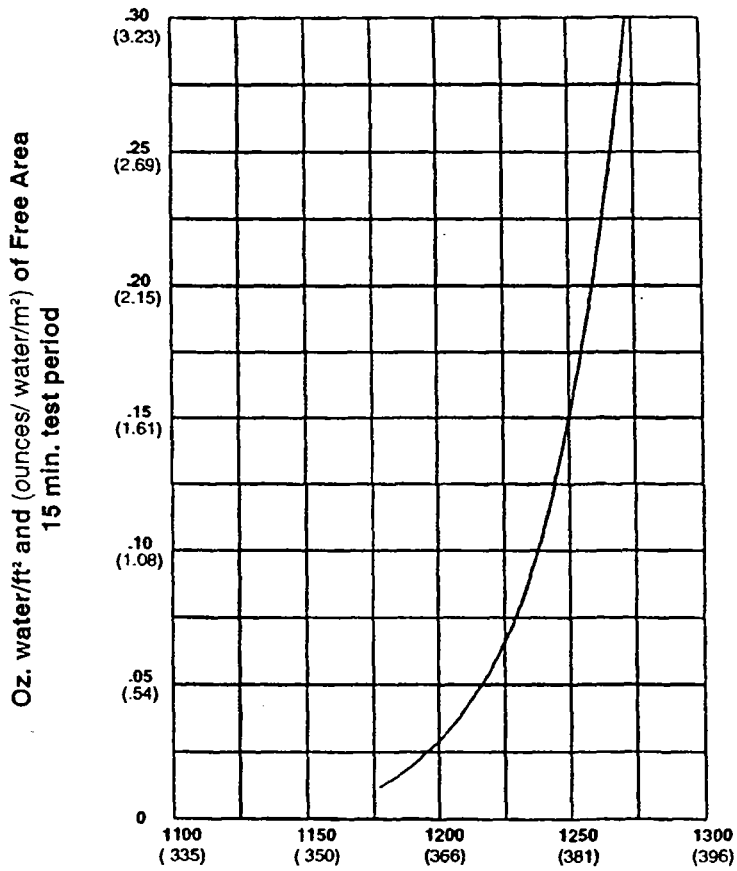
AMCA Standard 500 provides a reasonable basis for testing and rating louvers. Testing to AMCA 500 is performed under a certain set of laboratory conditions. This does not guarantee that other conditions will not occur in the actual environment where louvers must operate.

The louver system should be designed with a reasonable safety factor for louver performance. To ensure protection from water carry-over, design with a performance level somewhat below maximum desired pressure drop and .01 oz. of water penetration.

WATER PENETRATION

Test size 48" wide x 48" high (1219 x 1219)

Beginning point of water penetration at .01 oz./sq. ft. is 1179 fpm (359 m/min).



Free Area Velocity in feet and (meters) **per minute**
Standard air .075 lb/ft³

FREE AREA GUIDE

Free Area Guide shows free area in ft² and m² for various sizes of ELC6375D.

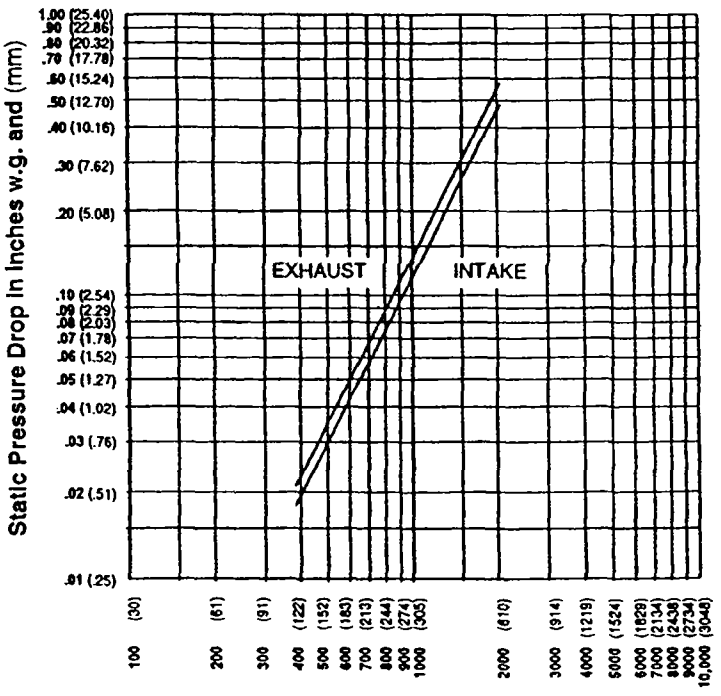
Width – Inches and Meters

Height – Inches and Meters	12 0.30	18 0.46	24 0.61	30 0.76	36 0.91	42 1.07	48 1.22	54 1.37	60 1.52	66 1.68	72 1.83	78 1.98	84 2.13	90 2.29	96 2.44
12 0.30	0.17 0.02	0.28 0.03	0.38 0.04	0.49 0.05	0.59 0.05	0.70 0.07	0.80 0.07	0.85 0.08	0.96 0.09	1.06 0.10	1.17 0.11	1.27 0.12	1.37 0.13	1.48 0.14	1.58 0.15
18 0.46	0.47 0.04	0.76 0.07	1.04 0.10	1.33 0.12	1.61 0.15	1.90 0.18	2.18 0.20	2.33 0.22	2.61 0.24	2.90 0.27	3.18 0.30	3.47 0.32	3.75 0.35	4.04 0.38	4.32 0.40
24 0.61	0.65 0.06	1.04 0.10	1.43 0.13	1.82 0.17	2.21 0.21	2.60 0.24	2.99 0.28	3.18 0.30	3.57 0.33	3.96 0.37	4.35 0.40	4.74 0.44	5.13 0.48	5.52 0.51	5.91 0.55
30 0.76	0.86 0.08	1.37 0.13	1.88 0.17	2.39 0.22	2.91 0.27	3.42 0.32	3.93 0.37	4.19 0.39	4.70 0.44	5.22 0.49	5.73 0.53	6.24 0.58	6.76 0.63	7.27 0.68	7.78 0.72
36 0.91	1.14 0.11	1.82 0.17	2.50 0.23	3.18 0.30	3.86 0.36	4.54 0.42	5.23 0.49	5.57 0.52	6.25 0.58	6.93 0.64	7.61 0.71	8.29 0.77	8.98 0.83	9.66 0.90	10.34 0.96
42 1.07	1.30 0.12	2.08 0.19	2.86 0.27	3.64 0.34	4.42 0.41	5.20 0.48	5.98 0.56	6.37 0.59	7.15 0.66	7.93 0.74	8.71 0.81	9.49 0.88	10.27 0.95	11.05 1.03	11.83 1.10
48 1.22	1.51 0.14	2.42 0.22	3.33 0.31	4.23 0.39	5.14 0.48	6.05 0.56	[illegible] [illegible]	7.41 0.69	8.31 0.77	9.22 0.86	10.13 0.94	11.04 1.03	11.94 1.11	12.85 1.19	13.76 1.28
54 1.37	1.84 0.17	2.94 0.27	4.04 0.38	5.15 0.48	6.25 0.58	7.35 0.68	8.46 0.79	9.01 0.84	10.11 0.94	11.21 1.04	12.32 1.14	13.42 1.25	14.52 1.35	15.63 1.45	16.73 1.55
60 1.52	1.95 0.18	3.12 0.29	4.29 0.40	5.46 0.51	6.63 0.62	7.81 0.73	8.98 0.83	9.56 0.89	10.73 1.00	11.90 1.11	13.07 1.21	14.24 1.32	15.42 1.43	16.59 1.54	17.76 1.65
66 1.68	2.17 0.20	3.47 0.32	4.77 0.44	6.07 0.56	7.36 0.68	8.66 0.80	9.96 0.93	10.61 0.99	11.91 1.11	13.21 1.23	14.51 1.35	15.81 1.47	17.11 1.59	18.41 1.71	19.71 1.83
72 1.83	2.49 0.23	3.99 0.37	5.49 0.51	6.98 0.65	8.48 0.79	9.98 0.93	11.47 1.07	12.22 1.14	13.72 1.28	15.21 1.41	16.71 1.55	18.20 1.69	19.70 1.83	21.20 1.97	22.69 2.11
78 1.98	2.68 0.25	4.29 0.40	5.90 0.55	7.51 0.70	9.12 0.85	10.73 1.00	12.34 1.15	13.15 1.22	14.76 1.37	16.37 1.52	17.98 1.67	19.59 1.82	21.20 1.97	22.81 2.12	24.42 2.27
84 2.13	2.82 0.26	4.51 0.42	6.21 0.58	7.90 0.73	9.59 0.89	11.29 1.05	12.98 1.21	13.82 1.28	15.52 1.44	17.21 1.60	18.90 1.76	20.60 1.91	22.29 2.07	23.98 2.23	25.67 2.39
90 2.29	3.15 0.29	5.04 0.47	6.93 0.64	8.82 0.82	10.71 1.00	12.60 1.17	14.49 1.35	15.43 1.43	17.32 1.61	19.21 1.79	21.10 1.96	22.99 2.14	24.88 2.31	26.77 2.49	28.66 2.66
96 2.44	3.34 0.31	5.34 0.50	7.35 0.68	9.35 0.87	11.35 1.05	13.36 1.24	15.36 1.43	16.36 1.52	18.36 1.71	20.37 1.89	22.37 2.08	24.37 2.26	26.38 2.45	28.38 2.64	30.38 2.82

Ruskin Manufacturing Company certifies that the ELC6375D Louvers shown herein are licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA Certified Ratings Seal applies to air performance and water penetration ratings.

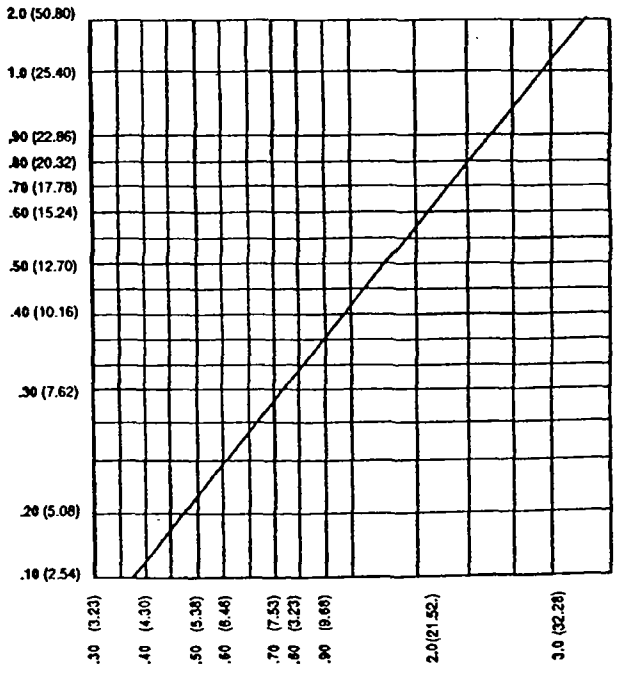
PRESSURE DROP

RESISTANCE TO AIR FLOW



Air Velocity in feet and (meters) per minute through Free Area

AIR LEAKAGE WITH DAMPER SECTION CLOSED



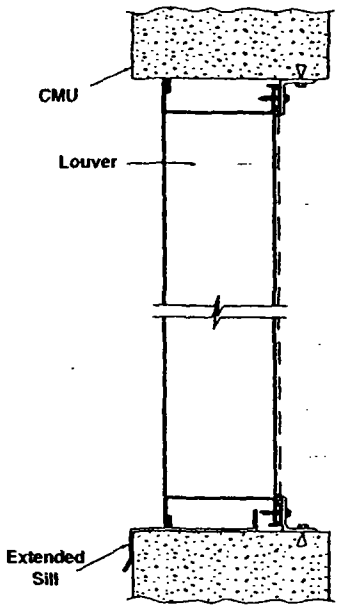
CMF Leakage per ft.² and (m²) of Face Area

The AMCA Certified Ratings Seal applies to air performance and water penetration ratings only.

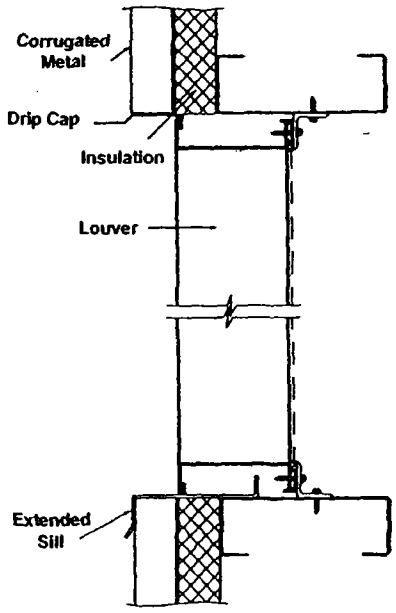
Ratings do not include the effect of a bird screen.

TYPICAL INSTALLATION DETAILS

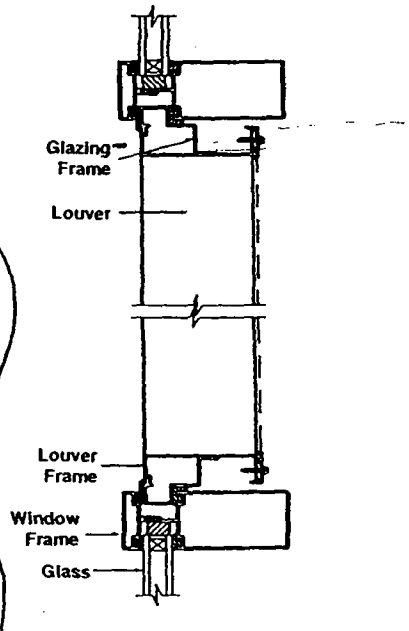
Masonry Wall



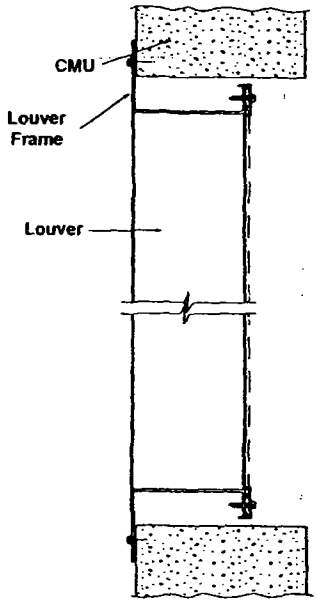
Metal Panel Wall



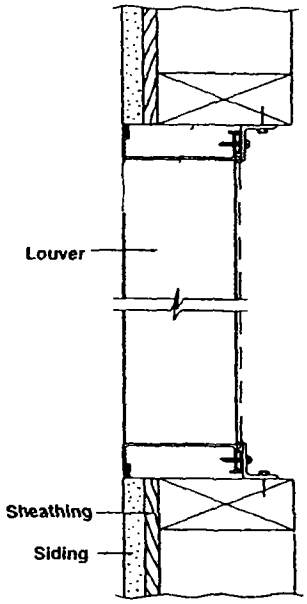
Glazing Frame



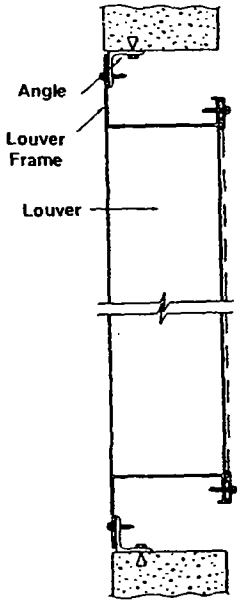
Flange Mount



Wood Installation



Angle Subframe

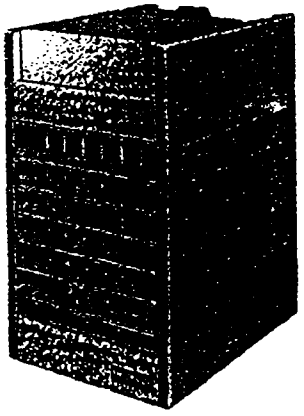


Accessories at additional cost.

REZNOR

MODEL FE

GAS-FIRED, POWER-VENTED, FAN-TYPE UNIT HEATER FOR COMMERCIAL/INDUSTRIAL USE



ANSI Z83.8

CAN/CGA 2.6

DESCRIPTION

Reznor® Series 100, Model FE gas-fired unit heaters are designed for 80% thermal efficiency and were developed to provide an annual fuel use improvement of up to 25% when compared with gravity-vented unit heaters. The use of a factory-installed power venter, with metered combustion air, limits burner flue losses while reducing vent pipe size. A sealed flue product collection chamber (in place of the draft diverter on a gravity-vented unit), reduces the loss of dilution air from the room in both the on and off cycles.

The Model FE unit heaters use either natural or propane gas, as specified, in sizes from 25,000 through 400,000 BTUH gas input. These units are designed for ceiling suspension with propeller fans for air delivery.

Standard features on the Model FE Series include an intermittent spark pilot and a single-stage, 24-volt gas valve. A terminal strip connector facilitates field connection to a remote 24-volt thermostat for automatic operation. Each unit is provided with a fan control and all required limit safety controls, including an energy cutoff (ECO) device and a combustion air pressure switch that verifies proper vent flow before allowing operation of the gas valve.

These units are design-certified by the American Gas Association (A.G.A.) and approved by the Canadian Gas Association (C.G.A.) and display either the A.G.A. or C.G.A. label. C.G.A. units include a vent cap; A.G.A. units do not include a vent cap but require use of a Reznor® optional vent cap or equivalent.

WARNING: Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. Installations in public garages or airplane hangars are permitted when in accordance with ANSI Z223.1 and NFPA 54 Codes or CAN1-B149 Codes and enforcing authorities.

STANDARD FEATURES

- Orifices for natural gas
- Aluminized steel heat exchanger
- Aluminized steel burner rack with stainless steel insert
- Spark-ignited intermittent safety pilot with electronic flame supervision
- Single-stage combination gas valve
- 115/1/60 supply voltage
- 115 volt fan motor with internal overload protection
- Fan and limit safety controls
- Differential air pressure switch to verify vent flow
- Energy cutoff (ECO) device
- 24-volt control voltage transformer
- Factory-installed power venter
- Individually adjustable horizontal louvers
- Full safety fan guard
- Terminal strip connector for 24-volt field wiring
- Convenient bottom burner access
- 2-point 3/8"-16 threaded hanger connections
- Vent cap (C.G.A. only)

OPTIONAL FEATURES - Factory Installed

- Equipped for propane gas
- Equipped for high altitude (2001-9000 ft)
- E-3 (409) stainless steel heat exchanger and burner
- Two-stage gas control (50% low fire) - Sizes 75-400
- Spark ignited, intermittent safety pilot with timed lockout (required for propane gas)
- Manual summer/winter switch
- Burner air shutters
- 208 single phase supply voltage - Sizes 125-400
- 230 single phase supply voltage - Sizes 100-300
- Totally enclosed 115V motor
- Low ambient fan control relay

ACCESSORIES - Field Installed

- Vertical louvers
- Downturn air nozzle, 25-65° or 50-90° variable air deflector range (includes 4-point suspension kit) See page 37
- Thermostat and relay kits
- Air recirculation kits - See page 35
- Manual summer/winter switch
- Multiple heater control
- 4-point suspension kit
- Unit-mounted thermostat bracket
- Vent cap (A.G.A.)
- Step down transformer 230/115 or 460/115 - See page 35
- Burner air shutters
- Low ambient fan control relay kit
- Hanger kit to suspend from 1" pipe (2 or 4 point suspension)
- Single-stage and two-stage thermostats
- Thermostat guard with locking cover
- Manual shutoff valve and union
- Gas conversion kit

NOTE: Not certified for residential use.

NOTE: Regulated combination redundant gas valve consists of combination pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff, all in one body. Gas supply pressure must not exceed 0.5 psi (8 oz. or 14" w.c.). Minimum inlet pressure for natural gas is 5" w.c.; minimum inlet pressure for propane gas is 11" w.c.

Process Bldg
N G Unit Heater
w/fan

TECHNICAL DATA - Model FE

Size	25	50	75	100	125	165	200	250	300	400
BTUH Input	25,000	50,000	75,000	100,000	125,000	165,000	200,000	250,000	300,000	400,000
BTUH Thermal Output (80%)*	20,000	40,000	60,000	80,000	100,000	132,000	160,000	200,000	240,000	320,00
Vent Diameter (inches)	4	4	4	4	5	5	5	5	6	6
Gas Connection - Natural Gas**	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"
Control Amps (24-volt)	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.65	0.65
Full-Load Amps (115 volt)	1.9	2.2	2.8	3.9	4.0	5.9	5.9	3.3	4.8	7.8
Normal Consumption (watts)	100	135	180	235	245	350	375	355	450	640
Throw at 8' Mounting Height***	35'	39'	48'	60'	73'	78'	85'	96'	108'	120'
Motor HP**** Standard	1/50	1/35	1/15	1/30	1/30	1/20	1/20	1/6	1/4	1/2
Optional Enclosed	--	1/15	1/15	1/8	1/8	1/8	1/6	1/6	1/2	1/2
Motor RPM	1550	1550	1550	1050	1050	1050	1050	850	850	850
Fan Diameter (inches)	10	10	12	14	16	16	20	22	22	24
CFM	380	650	980	1250	1600	2200	2800	3360	3800	4940
Outlet Velocity (FPM)	423	853	1166	1358	1332	1100	1217	1182	1426	1420
Approximate Net Wt (lbs)	76	83	92	101	132	154	175	209	226	281
Approximate Shipping Wt (lbs)	93	100	111	122	155	177	201	237	254	316

*A.G.A. ratings for altitudes to 2000 ft. Above 2000 ft, de-rate by orifice change, 4% for each 1000 ft above sea level.

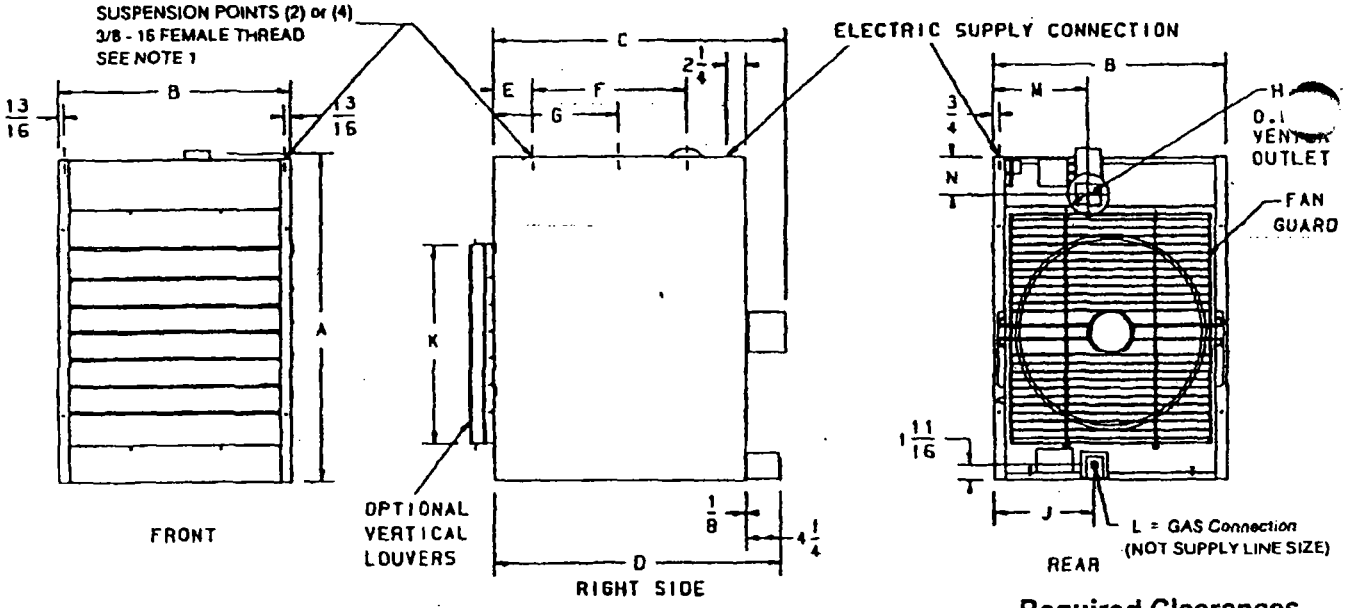
*C.G.A. ratings for altitudes to 2000 ft. High altitude units (2001-4500 ft) are de-rated by 10% of maximum input.

**Gas connection for propane is 1/2" for all sizes. Sizes shown are for gas connection to a single-stage gas valve; NOT gas supply line size.

***See page 28 for additional mounting heights.

****All other information in this table is based on a heater equipped with a standard 115v motor. (The standard motor for a Model 25 is an enclosed motor; all other standard motors are open motors. Optional enclosed motors are available in 115v only.)

DIMENSIONS (inches + or 1/8")



Size	A	B	C	D	E	F	G	H	J	K	L Nat	L Pro	M	N
25,50	29-3/4	13-1/2	27	31-1/2	5-7/8	14-1/2	14	4	10-1/4	16	1/2	1/2	9-3/4	3
75	29-3/4	15-1/2	27	31-1/2	5-7/8	14-1/2	14	4	10-1/2	16	1/2	1/2	10-1/2	3
100	29-3/4	17-1/2	30-1/2	31-1/2	5-7/8	14-1/2	14	4	12-7/8	16	1/2	1/2	10-1/2	3
125	29-3/4	23-1/4	30-1/2	31-1/2	5-7/8	14-1/2	14	5	14-1/2	16	1/2	1/2	11-1/2	2-5/8
165	40	20-1/4	35-1/2	36	4-7/8	19-1/2	15-3/4	5	14-1/4	24	1/2	1/2	11-3/4	4-5/8
200	40	23-1/4	36-1/4	36	4-7/8	19-1/2	15-3/4	5	14-3/8	24	1/2	1/2	11-3/4	4-5/8
250	40	28-3/4	36-1/4	36	4-7/8	19-1/2	15-3/4	5	12-3/8	24	1/2	1/2	11-3/4	4-5/8
300	40	28-3/4	36-1/4	36	4-7/8	19-1/2	15-3/4	6	12-3/8	24	3/4	1/2	11-3/4	3-5/8
400	40	37	37-1/4	36	4-7/8	19-1/2	15-3/4	6	13	24	3/4	1/2	11-3/4	3-5/8

SUSPENSION NOTES: 1) Use dimension "G" for 2-point suspension and "E" and "F" for 4-point suspension. **2)** Factory equipped with 2-point suspension; 4-point is optional.

Required Clearances

Top	6"
Flue Connector	6"
Sides	18"
Bottom	12"

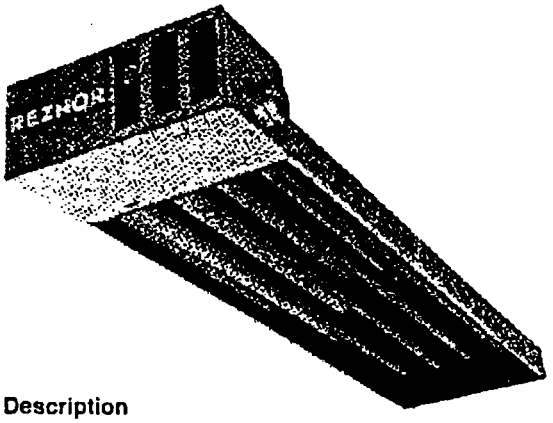
(when supplied with optional *downturn nozzle*, bottom clearance is 42"). For service purposes, in standard units, bottom clearance exceeding 12" minimum is not required, but may be desirable.

Rear
For service purposes the unit must have 24" clearance.

Loadout Bldg & Desanding Facility

REZNOR

TRP Gas-Fired Packaged Tubular Radiant, Low Intensity Heaters for Indoor/Outdoor Commercial-Industrial Use



ANSI Z83.6

CAN/CGA 2.16

WARNING: Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. Installations in public garages or airplane hangars are permitted when in accordance with ANSI Z83.6B and NFPA-406 and 88 Codes or CAN-B149 Codes and enforcing authorities.
NOTE: Not certified for residential use.

Description

The INFRA-REZ® heater Model TRP packaged tubular radiant heaters are available in BTUH inputs from 30,000 to 100,000. All sizes are available for use with natural or propane gas. Model TRP heaters provide full input rate heating capacity to 2,000 feet elevation. INFRA-REZ® tubular radiant heaters are engineered to provide quiet, reliable, energy-efficient comfort heating for both spot and space applications.

The Model TRP heater is designed with a burner/control box housing an inshot burner(s) and controls. The burner is equipped with a blower for supplying combustion air and a direct spark burner ignition (DSI) system. Controls in the box include an ignition control board, a pressure switch to verify combustion airflow, and a redundant single-stage gas valve.

A series of highly emissive tubes with polished reflectors provide for the transfer of radiant heat. For maximum efficiency, the exhaust end of all systems is equipped with an aluminized steel turbulator strip.

Combustion air can either come from the heated space or, when a system is specified to use outside air, it can be piped from the outside through a separated combustion air/vent system. The following applications require outside combustion air: (1) if the building atmosphere has negative pressure; (2) if the building atmosphere is dirty or dusty; (3) if the building atmosphere contains substances that will cause toxic gas when combined with flame or flue products; or (4) if the heater is being installed in a tightly closed room that does not provide required air for combustion.

Venting to the outdoors may be either vertical or horizontal. Dual venting of two units is permissible when using a specially designed optional Dual Vent Kit. In suitable applications, Model TRP systems may be operated with an indoor vent cap. When the unit includes a weatherizing option, it may be installed in outside areas such as courtyards or patios.

The Model TRP tubular packaged heater systems are shipped in a single package that does not require field assembly. (Sizes 50 and 100 are hinged for packaging and handling purposes.) Standard features such as built-in hangers for chain suspension, crimped tube connections, and a terminal board for thermostat connection are designed to facilitate installation.

These tubular radiant packaged heaters are approved for use in the United States and Canada by the Canadian Standards Association (CSA). The manufacturer provides a five-year limited warranty on the burner and a ten-year limited warranty on all tubes. (See Warranty Form for terms and limitations.)

Technical Data

Size		30	50	60	100
BTUH Input		30,000	50,000	60,000	100,000
Gas Supply Pressure (" W.C.)	Natural	4.5-14	4.5-14	4.5-14	4.5-14
	Propane	11-14	11-14	11-14	11-14
Gas Manifold Pressure (" W.C.)	Natural	3.5	3.5	3.5	3.5
	Propane	10	10	10	10
Voltage/Phase		115/1	115/1	115/1	115/1
Frequency (Hz)		60	60	60	60
Full-Load Amps (115 volt)		1.5	1.5	1.5	1.5
Gas Connection (inches) - Natural or Propane Gas		1/2	1/2	1/2	1/2
Vent Outlet Diameter (inches)		4	4	4	4
Approximate Net Wt (lbs)		85	130	110	180
Approximate Shipping Wt (lbs)		100	160	125	210

Standard Features:

- Natural gas operation
- Full input rate for elevation to 2000 ft
- Inshot burner(s)
- Direct spark ignition with 100% lockout
- Integrated circuit board with LED diagnostic indicator light
- Single-stage combination gas valve
- Differential air pressure switch to verify combustion airflow
- Post purge
- 115/1/60 supply voltage
- Grounded, plug-in cord
- 24-volt control voltage transformer
- Terminal board for thermostat connection
- 16-gauge aluminized steel tubes with a high emissivity coating
- Polished aluminum reflectors
- Aluminized steel flue gas turbulators
- Built-in suspension hangers
- Sight glass for burner observation
- Hinged burner/control box access door with latches
- Horizontal or vertical venting

Optional Features - Factory Installed

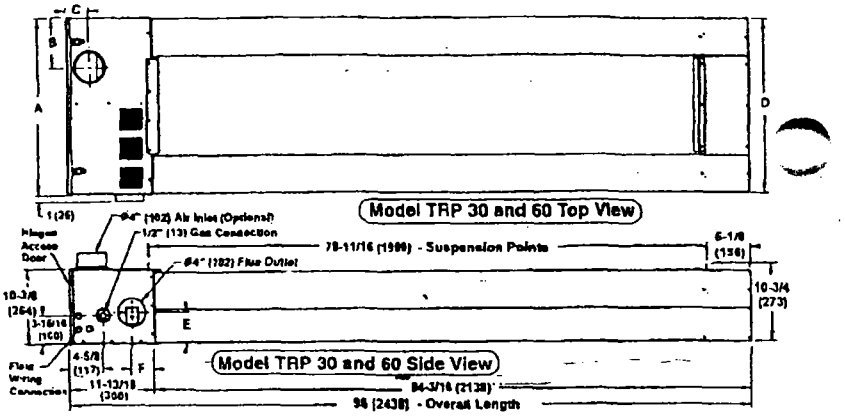
- Propane gas operation
- High altitude derate (2001-9000 ft)
- Separated combustion
- Weatherized for outdoor installation

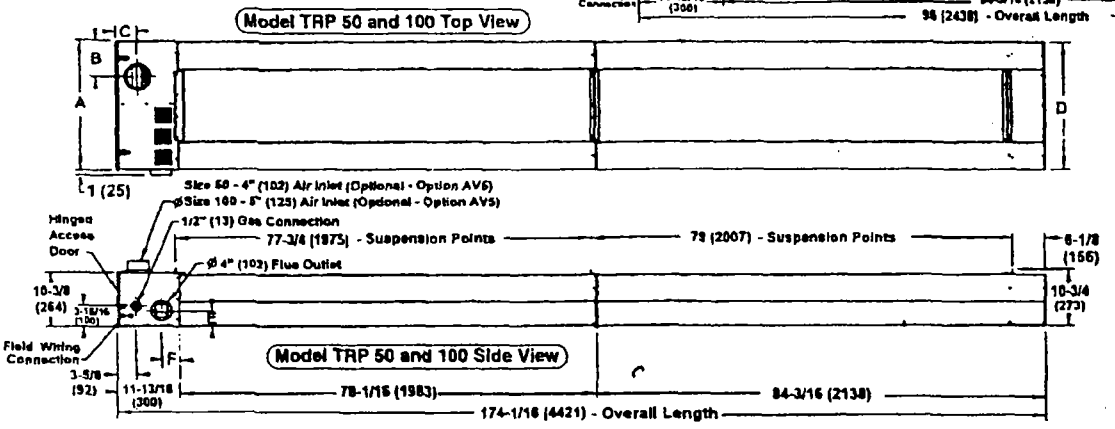
Accessories - Field Installed

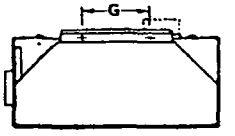
- Vent Cap
- Side Shield
- Dual Vent Kit
- Thermostat
- Turnbuckles
- Flexible Gas Connector
- Gas Conversion Kit

Dimensions (inches ± 1/8"; millimeters ± 3mm)

	30	50	60	100
A	18-3/8 (467)	18-3/8 (467)	24-3/8 (619)	24-3/8 (619)
B	2-5/8 (67)	2-5/8 (67)	6-7/8 (175)	6-7/8 (175)
C	3-1/4 (83)	3-1/4 (83)	3-1/4 (83)	4-1/4 (108)
D	18 (457)	18 (457)	24 (610)	24 (610)
E	4-3/8 (111)	4-3/8 (111)	4-3/8 (111)	3 (76)
F	3-1/8 (79)	3-1/8 (79)	3-1/8 (79)	3-3/8 (86)
G	6 (152)	6 (152)	8 (203)	8 (203)

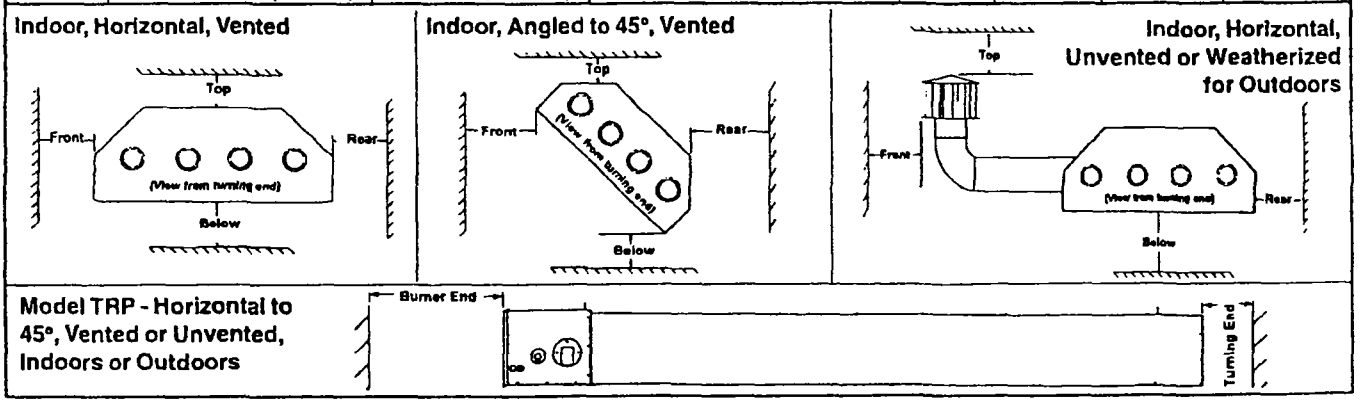






Clearances to Combustibles - Required clearances depend on the mounting angle, whether the unit is vented or unvented, and/or the addition of an optional side shield. The side shield is a field-installed modular shield that hangs vertically on the "rear" side along the entire length of the system. Refer to the illustration below to define clearances. These clearances are installation requirements. In addition, ANSI Z223-1, Section 6.18, requires that signs be posted specifying the maximum permissible stacking height for material stored below the heater.

Model TRP	Clearances to Combustibles (Inches and millimeters)						Mounting Angle	Minimum Mounting Height
	Top	Sides (Front and Rear) Horizontal	Sides (Front and Rear) Angled OR Horizontal *with* a Side Shield	Below	Burner End	Turning End		
All Sizes	Vented - 6" (152mm) Unvented - 24" (610mm)	Front - 24" (610 mm) Rear - 24"(610 mm)	Front - 60" (1524mm) Rear - 12" (305mm)	72" (1829)	24" (610)	18" (457)	0 - 45°	8 ft (2.4 M)



Location Recommendations for Efficient Application - When selecting the installation location, major factors to consider are (1) Personal and Property Safety; (2) Personal Comfort; and (3) Heating Efficiency. Because of the unique features of radiant heat transfer, selecting the most efficient location for infrared equipment depends on the "floor" coverage of the emitted heat rays. Floor coverage distance can be figured as approximately two times the mounting height of the unit. However, comfort level heating depends on the infrared intensity and on the balance of the radiant emission over the length of the system. Infrared intensity decreases with high mounting heights and greater floor coverage.

- **For space heating** infrared application, the location of the units must be evaluated as part of the heater size selection. Determine the total BTU's required, the floor coverage required, and the mounting height. From this information, design a heater size and location plan that will provide the most complete floor coverage without excessive overlapping. In most cases, perimeter heaters should be located parallel to the wall. The distance from the wall is determined by whether the heaters will be angled or horizontal.
- **For spot heating** application, the tubular system should be located to direct the rays toward the area requiring heat. Depending on the installation, this can be done either from directly overhead or with the heater angled from the side. Use the mounting height, the size of heater, and the application conditions to determine the most efficient location for the heater.

Venting Requirements

INFRA-REZ® HEATER Model TR

- Compliance with National and Local Codes
- 4" Vent Pipe (24-gauge single-wall galvanized metal)
- Terminal Vent Cap
  - —Units installed in the U.S.A., use Reznor vent cap or equivalent
  - —Units installed in Canada., use Reznor vent cap only
- Vent Length - see table below

SINGLE WALL METAL VENT PIPE

Model No.			50			75					100				
Length		Meters	6.1	7.6	9.1	6.1	7.6	9.1	10.7	12.2	9.1	10.7	12.2	13.7	15.2
		Feet	20	25	30	20	25	30	35	40	30	35	40	45	50
Vent Diameter		mm	102			102					102				
		in.	4			4					4				
Vent Length	Minimum	Meters	1.5			1.5					1.5				
		Feet	5			5					5				
	Maximum	Meters	6.1			13.7		10.7		6.1	13.7		10.7		6.1
		Feet	20			45		35		20	45		35		20
Equivalent Length for	90° Elbow	Meters	0.9			1.8		1.5		0.9	1.8		1.5		0.9
		Feet	3			6		5		3	6		5		3
	45° Elbow	Meters	0.5			0.9		0.8		0.5	0.9		0.8		0.5
		Feet	1.5			3.0		2.5		1.5	3.0		2.5		1.5
	Dual Vent Adapter*	Meters	0.9			1.8		1.5		0.9	1.8		1.5		0.9
		Feet	3			6		5		3	6		5		3

Model No.			150			175					200				
Length		Meters	15.2	16.8	18.3	15.2	16.8	18.3	19.8	21.3	15.2	16.8	18.3	19.8	21.3
		Feet	50	55	60	50	55	60	65	70	50	55	60	65	70
Vent Diameter		mm	102			102					102				
		in.	4			4					4				
Vent Length	Minimum	Meters	1.5			1.5					1.5				
		Feet	5			5					5				
	Maximum	Meters	18.3			18.3					18.3				
		Feet	60			60					60				
Equivalent Length for	90° Elbow	Meters	3.7			3.7					3.7				
		Feet	12			12					12				
	45° Elbow	Meters	1.8			1.8					1.8				
		Feet	6.0			6.0					6.0				
	Dual Vent Adapter*	Meters	3.7			3.7					3.7				
		Feet	12			12					12				

- Vent Terminal Direction - Horizontal or Vertical
- Dual Venting - with Optional Dual Vent Kit only**
- Unvented - Approved for Unvented Operation

Factors to Consider for Unvented Operation

- —Check local codes
- —Fresh Air Requirements - Natural gas, 4 CFM/1000 BTUH; Propane gas, 5 CFM/1000 BTUH
- —Unvented operation may cause excessive condensation
- —Do not operate unvented in dusty or dirty atmosphere
- —Do not operate unvented in a building where contaminants in the air will produce a toxic gas when burned or exposed to high temperature
- — Do not operate unvented with outside combustion air

echnical data for these options is found elsewhere in this catalog.

H

Appendix H

Diaphragm Filter Press Technical Information

SECTION 4.0

PROCESS ENGINEERING-

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Fig. 4-21. Hydraulic Ram Pump
Fig. 4-22. Progressive Cavity Pump
Fig. 4-23. Centrifugal Pump
Fig. 4-24 Typical Filter Press Performance

1.0 WHAT IS A FILTER PRESS?

1.1 While the origin of the term "filter press" is unclear, it most likely refers to the primary function of the equipment as that of a "filter" and the construction of the skeleton as that of a "press" frame similar to those used in printing and juice processing that were popular at the time presses were developed. Filter presses are sometimes referred to as "Plate-and-Frame Filters". This nomenclature refers to the style of filter element that was most prominent from the filter's development in the mid-1800s until the late 1960s. More recently they are more accurately referred to as "Recessed Plate or Diaphragm (Membrane) Plate Filters" since these are the majority of presses produced for today's markets. These different types are described in detail further on in this section.

1.2 In describing what a filter press is, it is best to classify it by the broad categories that differentiate it from other types of liquid/solid separation equipment. Its principle usage is as a "fixed volume, batch pressure filter". As a fixed volume filter, it requires a specific quantity of solids in the total influent stream for the press to work effectively and if not filled to capacity with solids the filter cake will not reach its maximum potential for cake dryness. The term "batch" refers to the operation of the press as a cyclical filtering device that requires interruption of the process to discharge the collected solids (filter cake). "Pressure" is used as the driving force in the separation process as opposed to vacuum, gravity, or centrifugal force.

1.3 Although not as often, the filter press may also be used as a continuous or "polishing" filter to remove minute quantities of solids from an influent stream (also known as "polishing" the filtrate, hence the name). In these applications the press is not sized for the quantity of "batch" or solids holding capacity but for maximum filtration area and hydraulic throughput. When used as a polishing filter the press is usually precoated and generally a dry filter cake is not developed. Rather, when throughput flow rates drop to an unacceptable level the cycle is ended, the solids are discharged, the press is closed and the filtration is restarted.

1.4 Another more recent adaptation of the filter press has converted it from a "fixed volume" filter to a "variable volume" filter through the use of a filter plate known as a diaphragm or membrane plate. This type of plate has a flexible drain-field which when sealed around the edges forms an integral bladder or diaphragm that may be inflated to physically press additional liquid from the filter cake. This process can significantly reduce the typical elapsed time for a press cycle and should produce a dry cake product regardless of the quantity of the solids contained in the filter press at the time of diaphragm inflation.

1.5 Figure 4-1 illustrates the basic U.S. Filter/JWI sidebar filter press and the nomenclature associated with it.

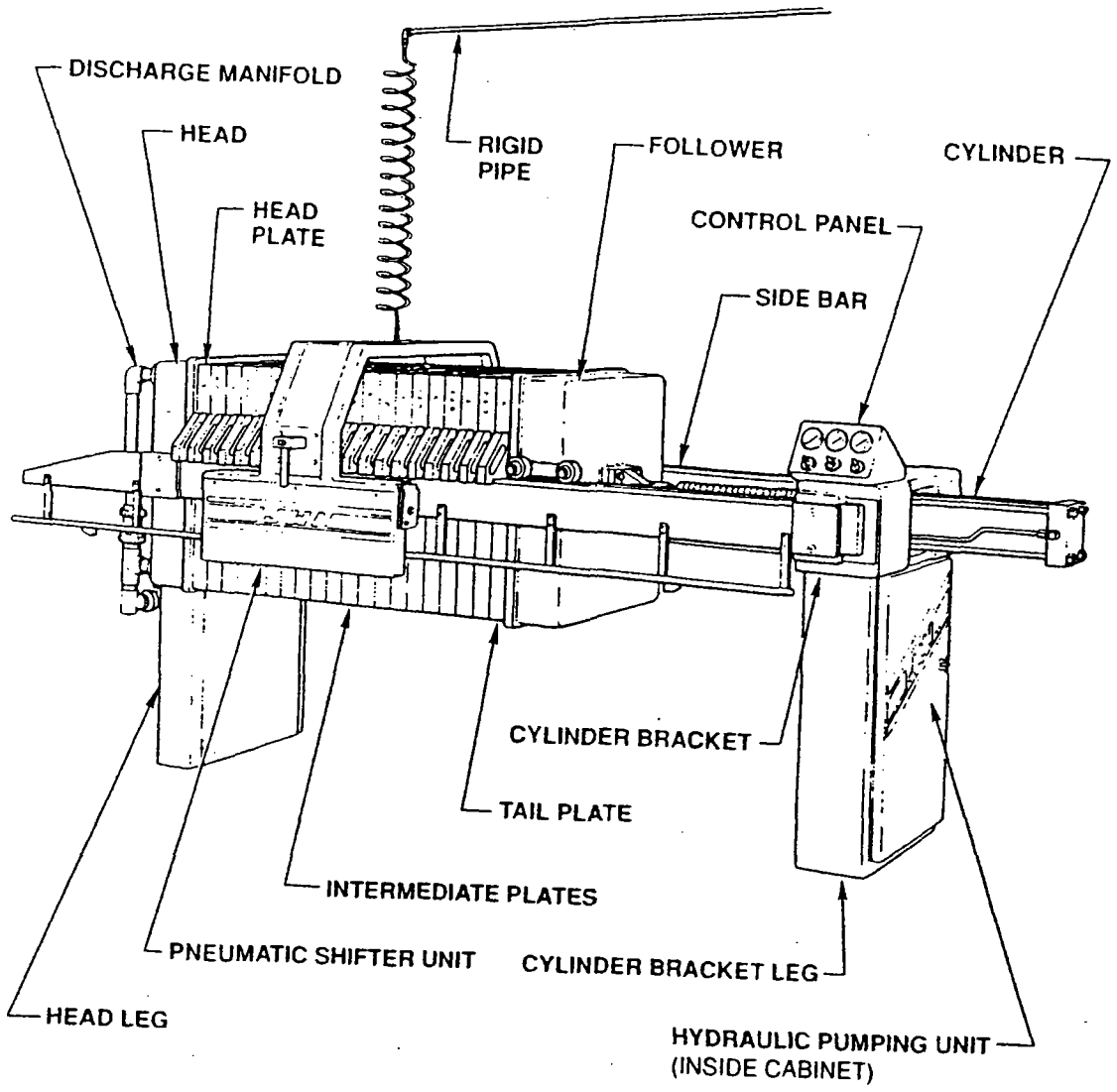


Fig. 4-1. Standard Sidebar Filter Press

Fig. 1

2.0 HOW DOES IT WORK?

2.1 The filter press is made up of two principle components. They are the filter pack and the skeleton or press frame. This is true for all filter presses of the "plate-and-frame, recessed plate or diaphragm plate" design and encompasses press frames of both the sidebar and overhead plate suspension types.

2.2 The skeleton has one chief function; that is to hold the filter pack together against the pressures developed internally during the filtration process. The terms used to describe the skeleton may vary slightly from manufacturer to manufacturer, but the sub-components remain essentially the same. These components include the stationary head, follower head, closure end and sidebars. Depending on the ancillary equipment supplied, a filter press skeleton may have some additional function such as plate shifting for cake discharge, automatic cake release, or cloth washing, etc.

2.3 The skeleton also provides for the influent and effluent connections with the filter pack. These are the piping connections, which pass through the stationary head and connect the feed and discharge manifold to the filter pack.

2.4 The filter pack is where the actual liquid/solid separation process takes place. The pack consists of a series of alternating filter elements that, when held together in the press skeleton, form a series of chambers. (Refer to Figure 4-2.) Each chamber wall known as the drain-field has a series of raised cylinders or grooves which is then covered with a porous cloth medium. These grooves or "pips"(as the cylinders are known) form a flow path for the liquid draining from the press. At alternating corners of the drain-field, interconnecting holes join the drain-field to the four corner discharge ports. When the plates are held together in a plate pack the corner discharge eyes form individual manifolds connecting the drain-fields of the plates with the external piping of the press. The center feed (or less frequently a corner feed) slurry inlet port also forms a manifold, which connects with the individual cake collection chambers of the plate pack.

2.5 In operation, a solids laden slurry is pumped under pressure into the press chambers through the piping at the stationary head of the filter press, via the feed connection. As each cake chamber fills with slurry, the liquid passes through the cloth medium, across the drain-field, through the drain ports and exits via gravity out of the corner discharge eyes.

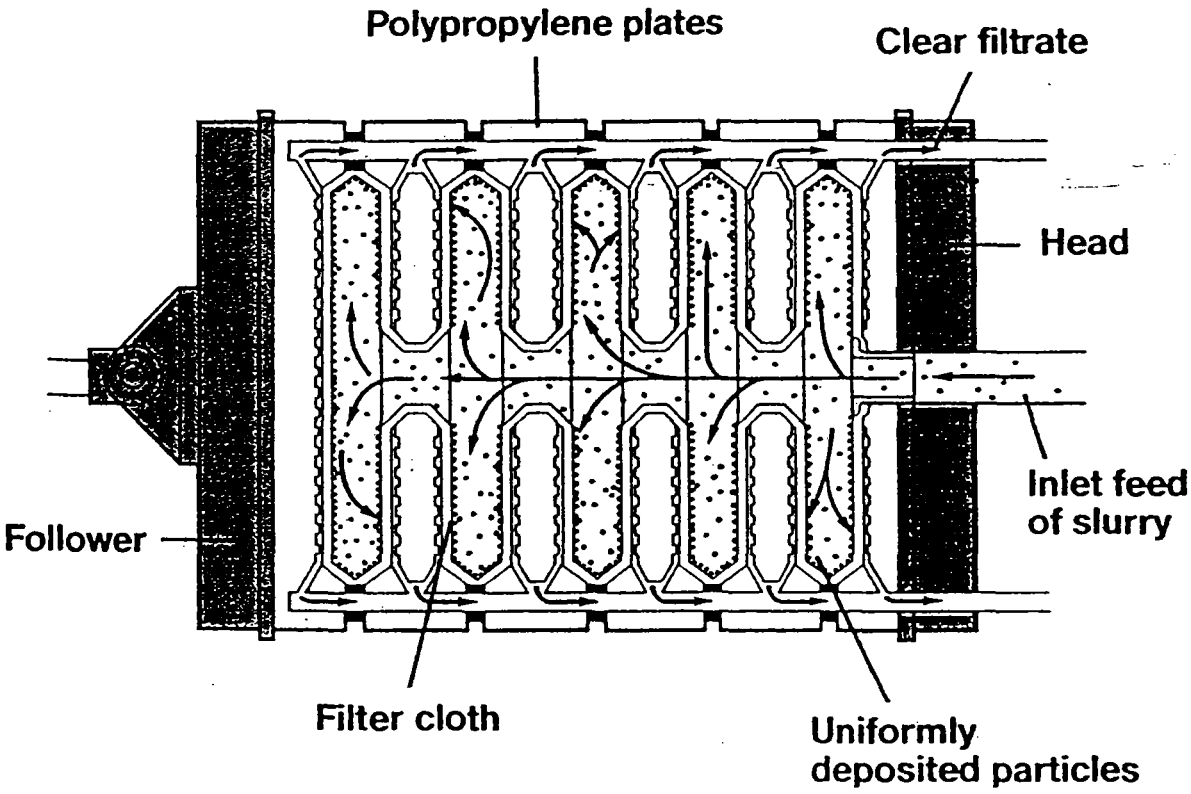


Fig. 4-2. Cross Section Of Filter Pack

2.6 The prime function of the media in cake filtration is to provide a porous support structure for the filter cake as it develops and builds. Initially, some solids may pass through the cloth media causing a slight turbidity in the filtrate, but gradually the larger particles within the slurry begin to bridge the openings in the media reducing the effective opening size. This allows smaller particles to bridge these reduced openings initiating the cake filtration process. Once a layer of solid particles achieves 1 to 2 mm in thickness, this "precoat" layer serves to separate out finer and finer particles as the cake builds in thickness, yielding a filtrate which is very low in turbidity.

2.7 The driving force behind the slurry (typically 100 psi, but up to 225 psi [7 to 16 bar]) is provided by a positive displacement or, less frequently, a high head centrifugal feed pump. With a gravity drain on the filtrate side of the press, a pressure differential between the feed pressure and the gravity discharge is created across the media and the filter cake solids as they build in thickness. It is the existence of this pressure differential, not just the feed pump pressure, which causes the filtering action to occur. Solids within the slurry will flow to the area of cake development with the lowest pressure differential, resulting in a filter cake that builds uniformly over the drain-field on either side of the chamber walls. This process is the basis for cake filtration and is illustrated in Figure 4-3.

2.8 This solids deposition process continues until the filter cakes forming on the individual chamber walls bridge at the center, completely filling the press with solids. It is at this point that the filtration process is complete.

2.9 Once this is achieved, the hydraulic closure of the press is retracted, the individual filter elements are separated and the collected solids (filter cake) are discharged, usually by gravity, to an appropriate receptacle.

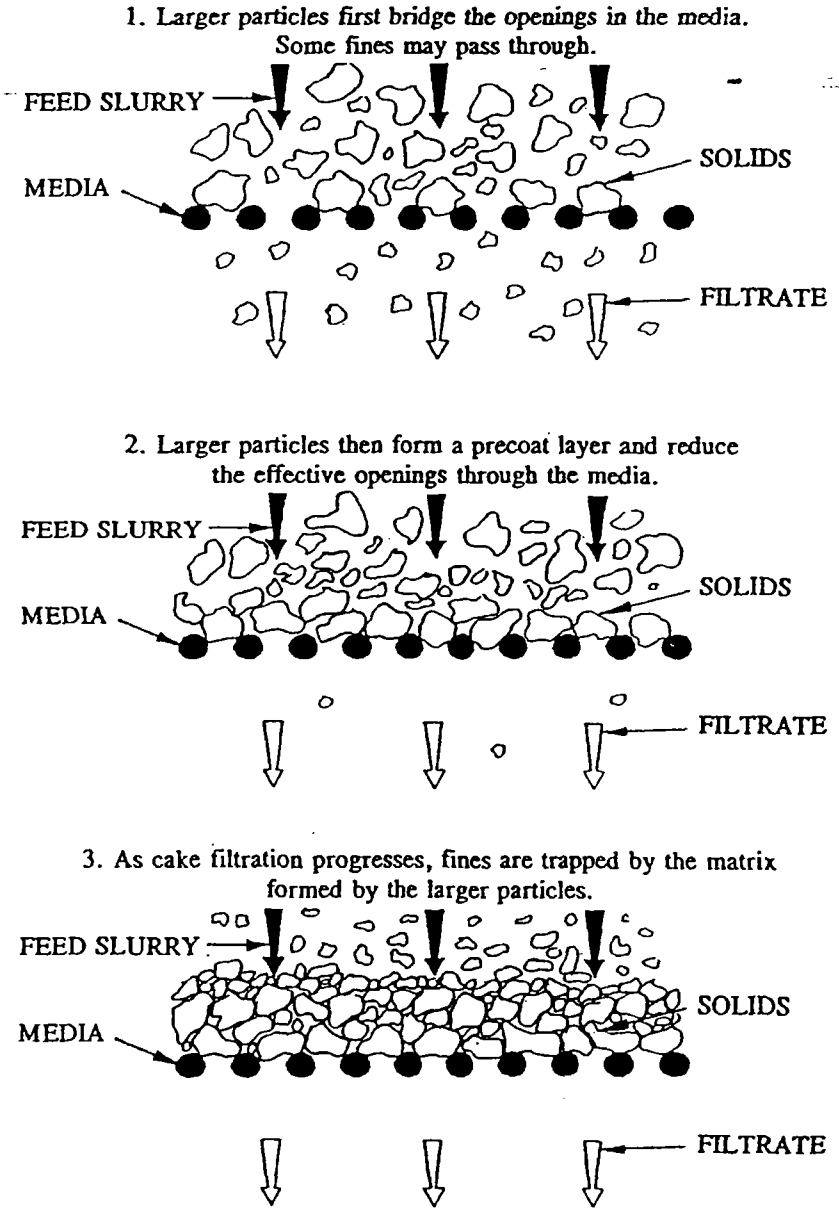


Fig. 4.3. Solids Deposition On Media

3.0 WHY USE DIFFERENT CAKE THICKNESSES?

3.1 During the filtration process, as the filter cake builds in thickness on the media, a concurrent increase of the differential pressure across the cake and a reduction in the rate of filtrate discharge flow occurs. Figure 4-4 represents a typical graph of cumulative filtrate discharge volume versus filtration cycle time. As can be seen, filtrate flow is not constant through out the cycle. At the onset of a filtration cycle when a cake layer does not yet exist and the measured pressure differential is very low or non-existent, flow rates are generally high. The flow rates begin to taper off as the cake builds in thickness and the pressure differential increases. The first one third to one half of the filtration cycle, when the majority of the total cake solids have been pumped into the press, is referred to as the fast fill stage. The balance of the cycle is known as the compaction or consolidation stage. It is during this final stage that the filter cake achieves maximum dryness. When a filter cake is fully developed, the filtrate flow rate will have reached a point at which the reduction in the filtrate flow is so low that the rate appears almost constant. In practice, this rate will become so low that to continue running the filter press would be inefficient. This is the end of the filtration cycle. A general rule of thumb used to determine the end of the filtering cycle is when filtrate discharge rates fall to:

.016 gpm/ft^2 of filter area (.65 liters/min./m^2)

This flow rate may be used as a guideline when first initiating a new filtration application. Every cake product has a different terminal filtrate discharge flow rate based upon cake characteristics and should be developed through experience.

3.2 A factor that impacts the filtrate flow rate is the cake thickness that is being developed. The cake thickness refers to the distance between the drain-fields of adjacent filter plates within the closed chambers of the filter pack. Filter elements are available in a number of different cake thicknesses, the common range being 1" (25 mm) to 2" (50 mm) in 1/4" (6-7 mm) increments. Of this range, the most common cake thicknesses are 1" (25 mm) and 1.3" (32 mm). However, there are instances that thinner cakes, down to 3/4" (20 mm), may be desirable.

3.3 The reason for the variety of cake thicknesses is based upon the ability of the solids within a liquid/solid suspension to form a porous cake matrix, when filtered, that will allow flow through it as the cake solids build in thickness. As cake thickness builds, differential pressure across the cake increases as does resistance to flow, thus a decrease in filtrate flow rate occurs. Every liquid/solid slurry has a limit as to the thickness of cake that can be developed with a given pressure differential across the thickness of the cake.

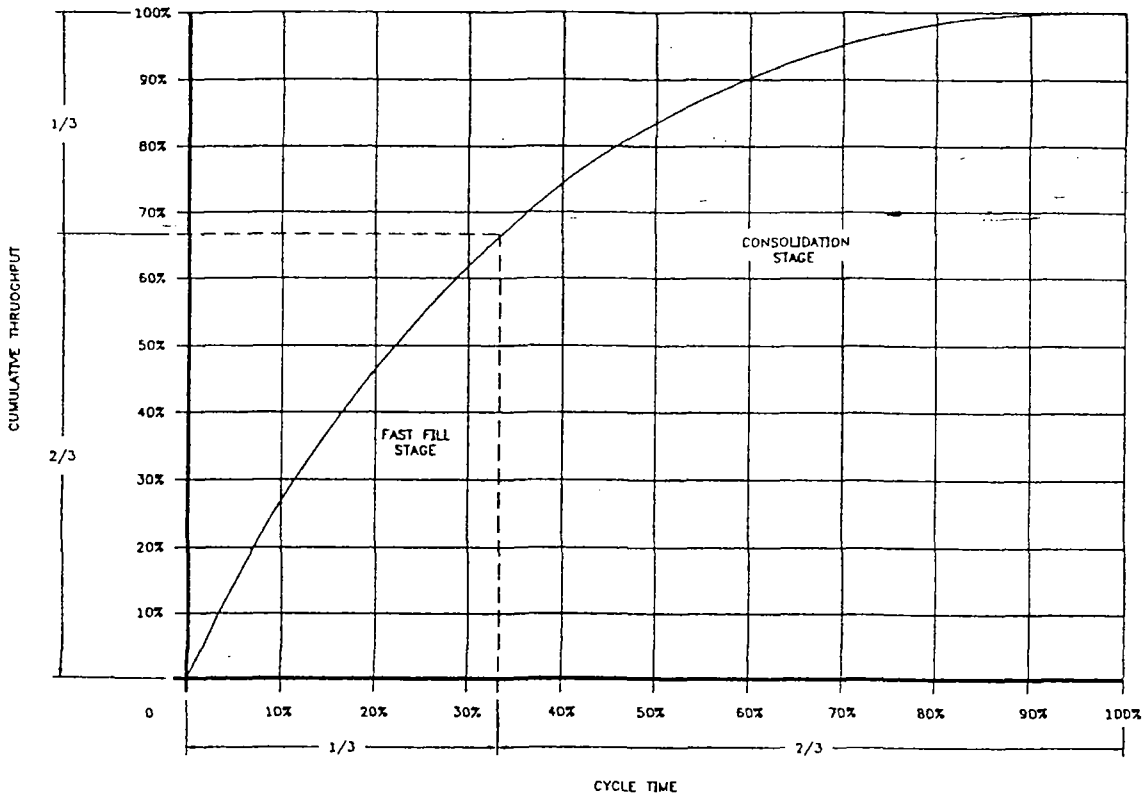


Fig. 4-4. Typical Throughput Curve

3.4 Referring to figure 4-3, as the filter cake builds in thickness the void spaces formed between the particles allow flow through the cake. Larger particles by their nature form larger void spaces when packed together. This allows the maintenance of higher flow rates through the cake as it builds in thickness. Therefore a thicker cake will develop before the maximum pressure differential is reached. Smaller particles nest more closely together, forming smaller void spaces. This allows less flow through the cake as it builds and therefore, the maximum pressure differential is reached at a thinner cake thickness than for that of the larger particles.

3.5 While experience will provide a guideline as to the maximum cake thickness that may be achieved for a particular liquid/solid suspension, there is no accurate way to predict how a different albeit similar slurry may filter without some level of experimentation. Therefore, the selection of a proper cake thickness is best performed by bench top testing. While using filter plates with thicker cakes will provide a less expensive filter press per cubic foot of filter cake capacity than one with thinner cakes and an equivalent volume, generally the press with the thinner cakes will yield a dryer cake product and reduced cycle times. This in turn may make the press with the thinner cake a more economical press to operate when factors such as cake disposal costs or energy required for cake drying are taken into consideration.

4.0 TYPES OF FILTER ELEMENTS, WHY AND WHEN TO USE THEM

4.1 There are three basic styles of filter elements used in filter presses today. In order of significance based upon the number of applications for which each is used in today's markets, they are; recessed plate filter elements, diaphragm plate filter elements, and plate-and-frame filter elements. Which one to use on a particular application will depend upon many factors such as the nature of the solids to be dewatered, the process design parameters (i.e. cake dryness required, post filtration operations, etc.) and the objectives of the owner (i.e. least expensive equipment to operate, lowest disposal cost of the cake product, etc.).

4.2 Standard Recessed and CGR Filter Elements (also known as Chamber Plates)

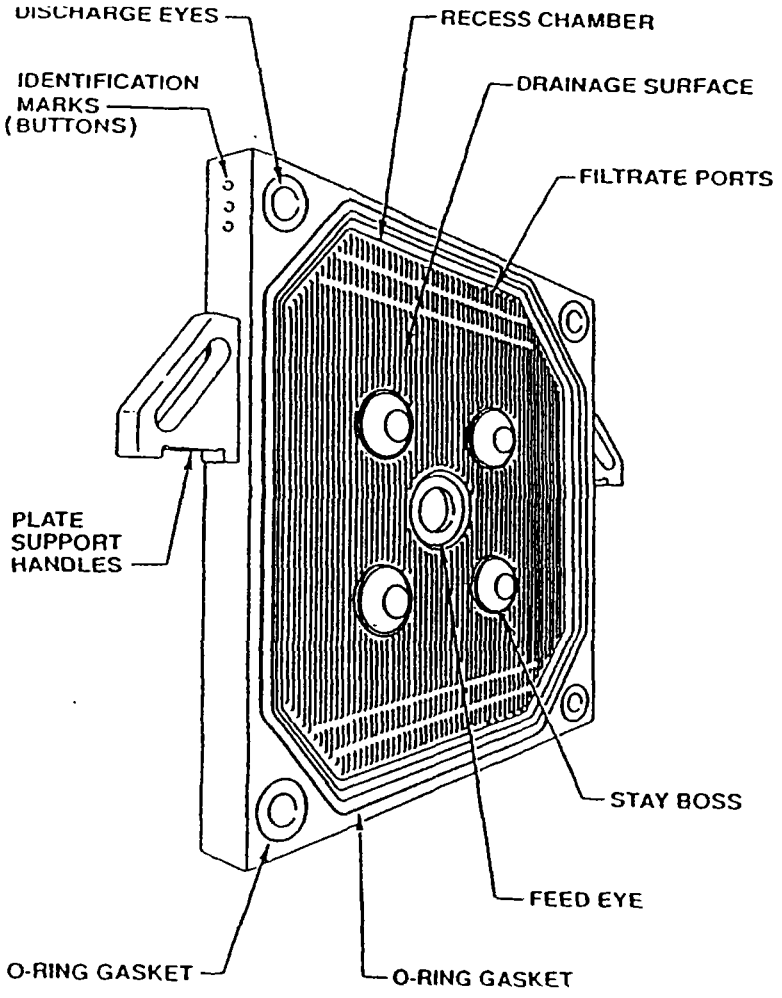


Fig. 4-5. Caulked, Gasketed, Recessed (CGR) Filter Plate

4.2.1 The standard recessed plate and caulked, gasketed, recessed (CGR) plate (refer to figure 4-5) are the most commonly used styles of filter elements in today's filter press market. Both plates are similar in construction having raised perimeters surrounding the drain-field. These form the recesses which become the cake chambers when multiple filter elements are held together in a filter pack. Typically, a series of raised staybosses equal in height to the perimeter are arranged on the drain-field in an equidistant pattern. The staybosses on adjacent plates butt against one another providing support for the center web. During the filtration cycle flexing of the web may occur due to pressure differentials between chambers. This flexing, if not prevented, will cause filter cakes of different thickness to develop, thereby increasing the length of time required to complete a filtration cycle. At worst, the flexing, were it not prevented by the staybosses, would lead to fracturing of the web and catastrophic failure of the filter element.

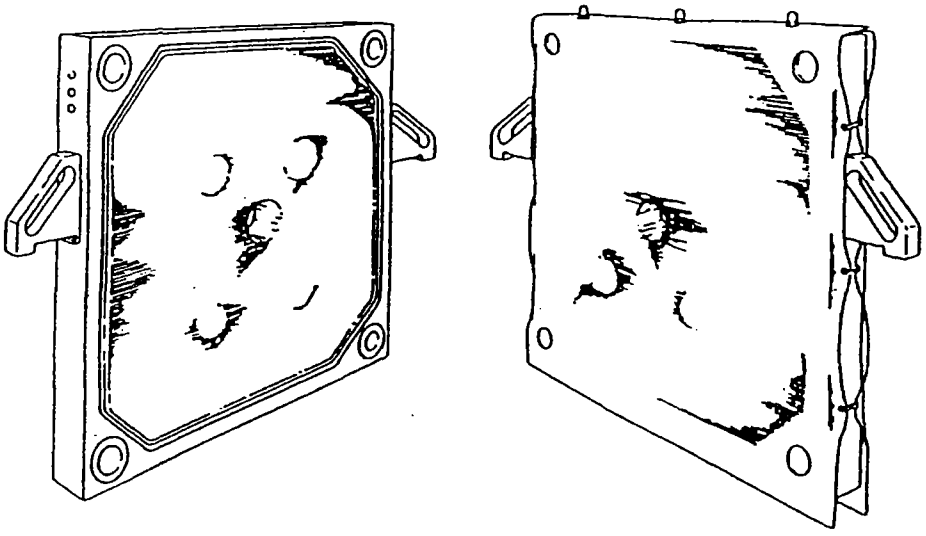


Fig. 4-6. Recessed Filter Plates

4.2.2 The method with which the filter media is mounted to the individual plate is the primary difference between the two styles of elements (refer to Figure 4-6). With the standard recess style, two pieces of cloth are attached together at the center (or corner) feed eye either by a sewn center sleeve or a mechanical locking ring known as a clip-nut. When the cloths are mounted to the plate they form an envelope around the plate with their edges extending beyond the perimeter of the plates. When installed in the filter pack and held in place by the hydraulic closure of the filter press skeleton, the cloths form a seal between the plates that will not allow sludge to escape during the filtering process. The edges of the cloths will exhibit some weepage of clear filtrate due to capillary (or wicking) action of the cloth media. Many times the edges of these cloths are painted with a latex or neoprene coating to form a better seal and inhibit this weepage from the filter pack (refer to figure 4-7).

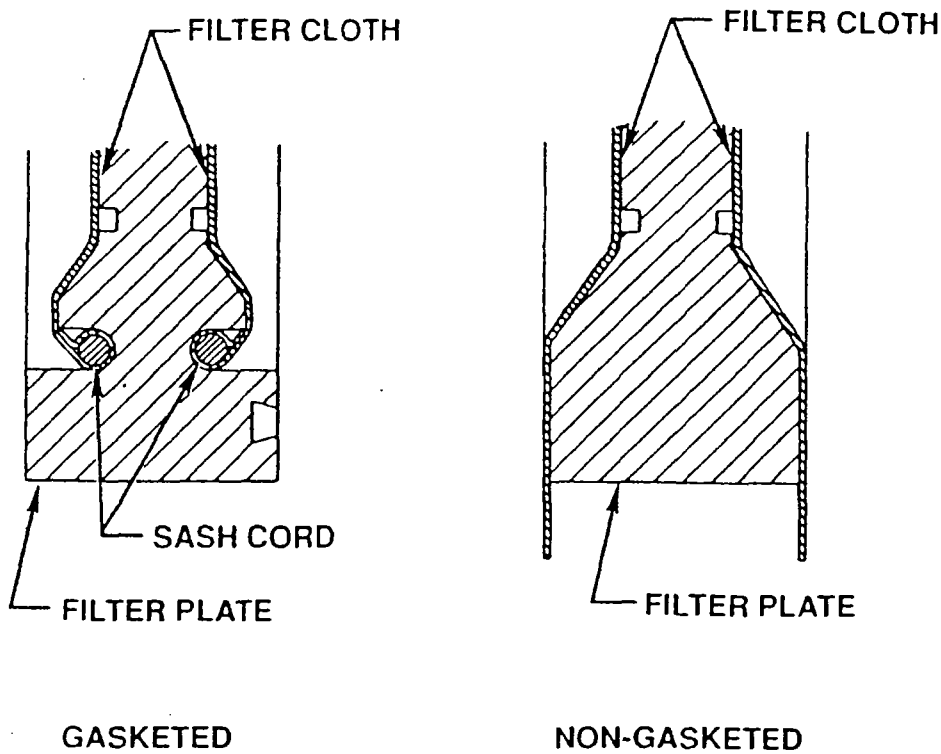


Fig. 4-7. Standard Filter Cloth Mounting

4.2.3 With a CGR plate, the cloth is constructed in a similar fashion to the standard recessed plate except that the cloth has a cord sewn into the perimeter which is "caulked" into a groove which surrounds the drain-field much in the way a wooden boat hull is caulked (Refer to Fig. 4-8). The cloth therefore does not extend beyond the perimeter of the plate. The perimeter face of the plate and the corner filtrate holes are surrounded by O-ring gasketing material, which forms the seal between the individual filter elements. When installed in a filter pack and held against adjacent plates under the pressure of the filter press closure, this type of plate provides almost leak free filter pack operation.

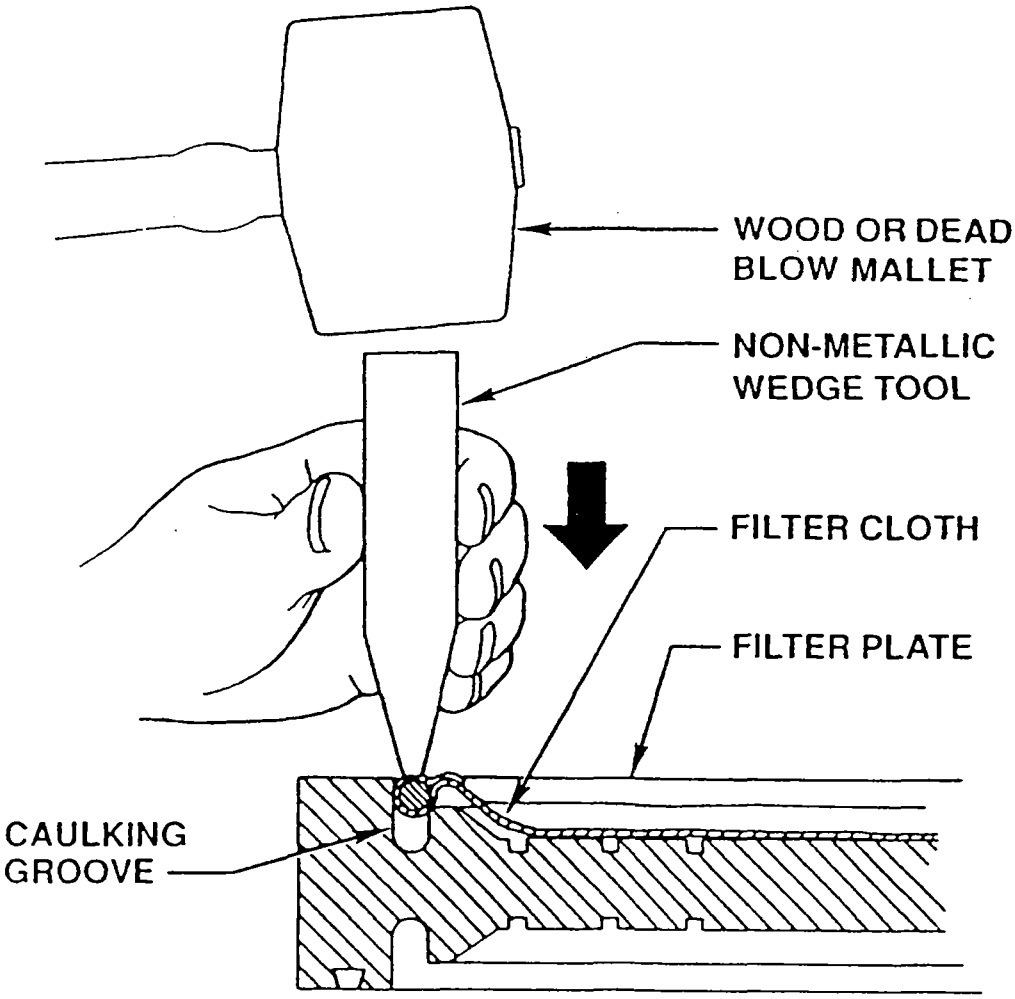


Fig. 4-8. How To Install Cloths For CGR Plates

4.2.4 Why and When to use Standard Recessed and CGR Filter Elements.

4.2.4.a The CGR plate is used when leakage from a filter press may cause a problem due to housekeeping considerations or is unacceptable due to the corrosive or hazardous nature of the filtrate which would weep from the edges of a standard recessed filter plate cloth.

4.2.4.b The difficulty an operator may have with the CGR type plate involves the changing of the filter cloth. It is a labor intensive task and may require 30-45 minutes/plate for the inexperienced installer. Since many applications require cloth changing as little as every other year this may not present a problem. Many processes also are amenable to insitu cloth cleaning which can prolong the life of the cloth. Cloth changing on a CGR plate may, however, present a maintenance problem with very large sidebar presses (1200 mm and up) and overhead suspension presses since the filter elements must be removed from the press in order to change cloths. In these types of situations the use of standard recessed plates may be advisable.

4.2.4.c The standard recess type filter element has the advantage of ease of cloth changing, but the disadvantage of filtrate weepage. This weepage can be reduced somewhat through the use of a latex or neoprene coating on the sealing edge of the filter cloth. The weepage is usually moderate at the start of a filtering cycle and diminishes as the cycle progresses. It can however be severe if filtering a slurry with a very low solids concentration, typically under 0.5%. While this weepage can be a nuisance, it can be collected through the use of drip trays located beneath the filter pack and may then be recycled back to the head of the system.

4.2.4.d When choosing either type of filter element, consideration should be given to the following operational parameters.

1. How often will cloths require changing?
2. Size of the press?
3. Availability of plate handling equipment (large presses only).
4. Owner's housekeeping requirements.

4.2.4.e Both CGR and standard recessed plates are available in operating pressures up to 225 psi (16 bar).

4.3 Diaphragm Plates (also known as membrane plates)

4.3.1 Diaphragm plate elements are very similar to a standard recessed plate in appearance with one important exception. The drain-field on either side of the plate is actually a flexible diaphragm that is sealed at both the center feed eye and the perimeter forming a bladder like structure between it and the body of the filter plate (refer to figure 4-9). The diaphragms are available in a number of thermoplastic and elastomer compounds such as polypropylene and EPDM. These plates are constructed in different manners. Some diaphragms are welded to their respective plate bodies and some are constructed as a detachable component.

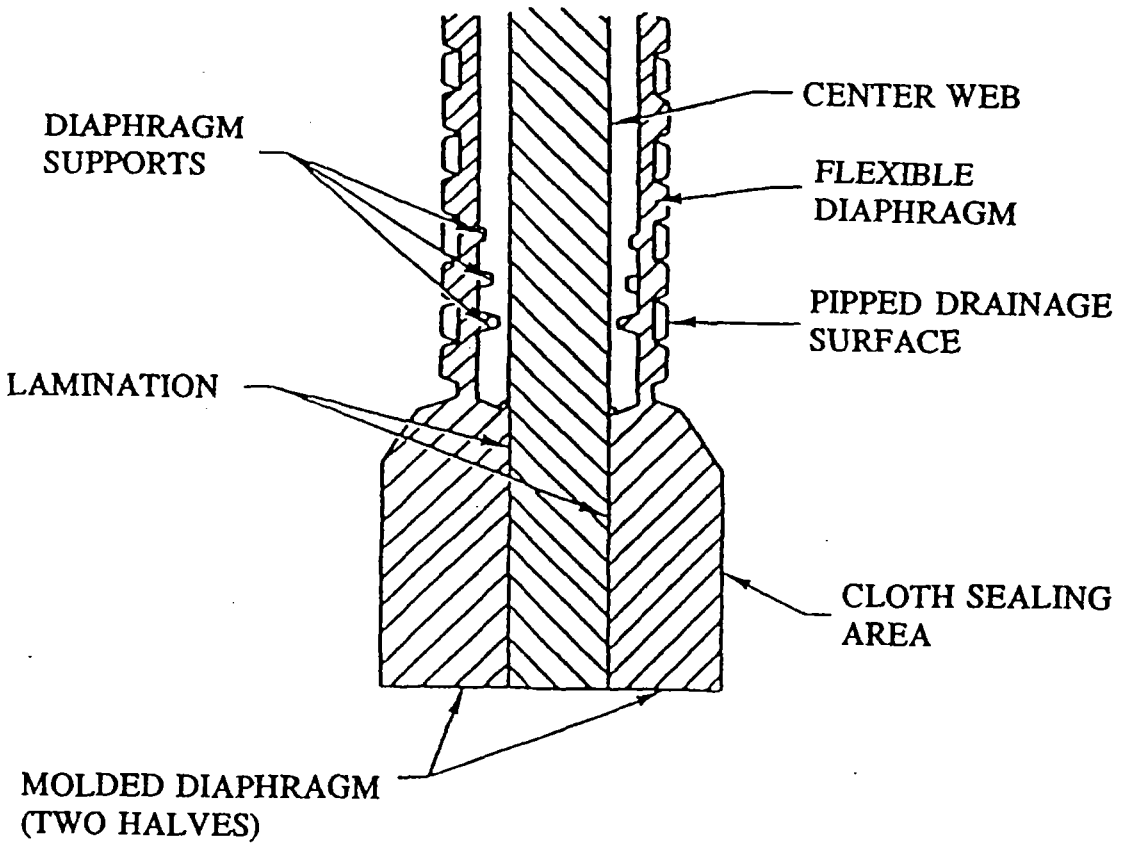


Fig. 4-9. Recessed, Diaphragm Filter Plate Cross Section

4.3.2 In operation, the filtering process is run as with the recessed plate elements. At the end of the cycle the diaphragms are inflated hydraulically (with H2O) with pressures up to 225 psi (16 bar) to compress the filter cake while in the press. The use of the mechanical squeeze action enables an operator to compress the cake and obtain a dryer filter cake in a shorter period of time than could normally be achieved through pressure differential alone. In some cases it enables the filtering of slurries that may not be filterable with recessed plate filter elements. A press equipped with diaphragm plates may sometimes be referred to as a variable volume filter as opposed to the fixed volume filter discussed earlier. It also enables an operator to utilize the most efficient part of the filtration cycle.

4.3.3 As illustrated in Figure 4-4, during a normal filtration cycle, 80% of the filterable solids fills the press in the first 50% of the cycle. The remaining cycle time is used for consolidation in order to form a dry dischargeable filter cake. With a filter press equipped with diaphragm style filter elements, the filtration cycle can be interrupted at 50% of the total cycle time, the diaphragms are then inflated. Filter press cycle time is maximized by reducing the normal consolidation stage and because a thinner cake is developed, overall cake dryness is improved over what might be attained with standard filter elements. This is illustrated in Fig. 4-9. In addition to shortened cycle times and dryer cakes, cake release from the filter cloth may also be enhanced.

4.3.4 Why and When to use Diaphragm Plates.

4.3.4.a There are a number reasons to consider the use of diaphragm plates.

1. Large volumes of materials need to be filtered and short cycle times are of the essence.

2. Maximum cake dryness is required.

3. Solids being filtered are not easily dewatered and require the additional mechanical squeezing action to obtain an acceptable cake dryness.

4. A combination of efficient cake washing and high cake dryness are required.

4.3.4.b A filter press utilizing diaphragm plate technology will carry a high initial investment. Depending on size, materials of construction and method of membrane attachment, diaphragm plates may cost roughly 3 to 5 times that of a recessed plate. In addition to the filter press the owner will also require ancillary equipment to perform the squeeze portion of the filtering cycle. However there are alternatives. A diaphragm plate filter press may be equipped in two different ways. All of the filter elements may be of the diaphragm style allowing the filter cakes to be squeezed from both sides or diaphragm plates may be alternated with either standard recessed plates or flush plates forming chambers that may be squeezed form one side only. This second style is known as a mixed pack and is used primarily for economics being less expensive from the first alternative or if process considerations require an extremely thin cake. As with any process equipment careful evaluation of the diaphragm plate technology should be made through testing and economic justification before selecting it versus recessed plate technologies.

4.3.4.c Consideration should also be given to the cost of replacement diaphragm plates. Flexing diaphragms are subject to wear and tear. The number of cycles that can be expected from a plate is dependent on many factors such as squeeze pressure, process temperature and squeeze duration. The effects of these operating conditions on the diaphragm can be estimated but only experience can accurately predict life span.

4.4 Plate and Frame Filter Elements

4.4.1 The plate-and-frame style filter elements (Refer to Fig. 4-10) are quite different than the recessed or diaphragm type. The plates are flush on both sides with a drain-field on each but without raised perimeters or bosses. The frames are, as the name implies, of window frame construction with a solid perimeter and no material in the center section. When sandwiched between two plates the frame forms the cake chamber. Filter cloths are installed by simply draping them over the plates. The plate-and-frame style is limited to four corner holes and therefore one corner is designated as the feed connection. The other three holes are drain, wash or air blow connections. The plate-and-frame style is not available in gasketed construction so the cloths form the gaskets similar to the standard recess plate construction.

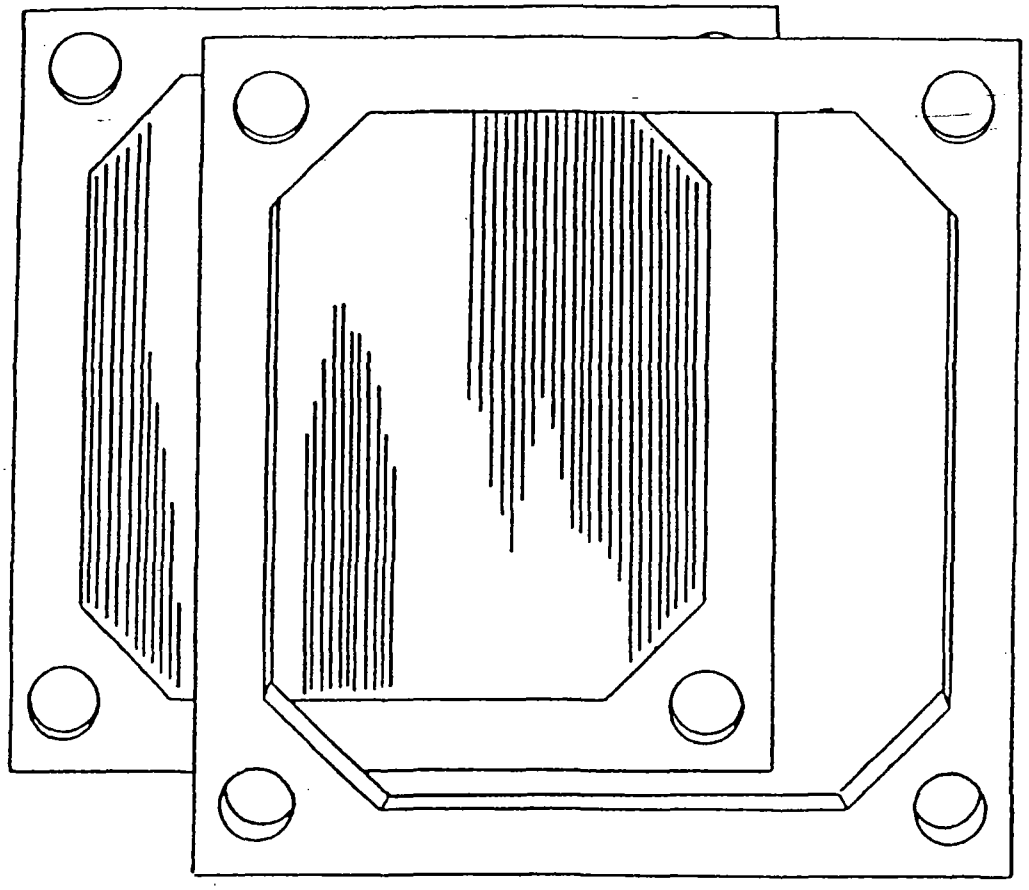


Fig. 4-10. Flush Filter Plate And Frame

4.4.2 Why and When to use Plate and Frame Filter Elements.

4.4.2.a Plate-and-frame filter elements once accounted for the majority of elements used in filter press applications. New materials and methods of construction, particularly molded polypropylene, in the manufacture of recessed filter plates significantly reduced the usage of plate-and-frame filter elements. However there are processes that still require their use. The principle reason for using plate-and-frame filter elements is when the use of a filter paper is required. Filter paper is used when it is desirous to filter out extremely fine particulate from the influent stream or when the press is being used as a polishing filter.

Another reason for using filter paper is to prevent particulate from impregnating the filter cloth as might be the case for precious metal filtration in the mining industry. The paper is draped over the filter cloth and is held in place along with the cloth by the frame. The paper is typically replaced after each cycle. A third reason for using the plate-and-frame style is the ability to perform thorough cake washing. Although it has been shown that effective cake washing may be accomplished with both recessed and diaphragm plates there are some companies that will insist on using plate-and-frame due to a history of success with that type of filter element.

4.4.2.b

There are some reasons for not using plate-and-frame style elements. Because of a lack of staybosses the plates can withstand very little pressure differential between chambers. As mentioned earlier this condition may lead to variation in cake thicknesses or plate fractures. Also, due to a lack of supporting structure the frame may eventually begin to blow out as a result of the internal pressure within the filter pack exceeding the closure force of the press hydraulics. That is the frame will bow at the sides, top and bottom. This is especially prominent with frames constructed from polypropylene but will not be found with those made of rigid materials such as ductile iron.

5.0 SLUDGE CONDITIONING

5.1 In order for pressure filtration to be successful more is required than good equipment. You must have a liquid/solid suspension that contains particles that are of sufficient size and density to form a porous cake matrix when filtered under pressure. This is fundamental to the proper operation of a filter press. Not all liquid/solid suspensions are amenable to pressure filtration due to a number of factors such as an over abundance of finely divided particles in the slurry which might not settle, solids which are pliable or soft, or mother liquors which are high in oils and greases. In certain circumstances slurries of this nature require the addition of certain chemicals or conditioning agents to improve their filterability. This is referred to as "Sludge Conditioning" and has two primary aims.

a. To increase the permeability of the filter cake formed during pressure filtration.

b. To reduce filtrate turbidity, improving filtrate clarity.

5.2 Broadly speaking, the various sludge conditioning techniques discussed herein can be divided into three basic categories:

a. Chemical

b. Physical

c. Thermal

5.3 Chemical Conditioning

5.3.1 Chemical conditioning can be further divided into the process of coagulation and flocculation. Coagulation is the driving together of colloidal particles by chemical forces and occurs within seconds of the application of the coagulating chemical. Flocculation is the coalescing of coagulated particles into larger particles. This process is much slower reaction than coagulation and is more dependent on time and agitation.

5.3.2 Generally speaking, the permeability of a filter cake decreases as the particles that comprise the filter cake decrease in size. The processes of coagulation and flocculation both involve the joining of particles to create larger particles, which will remain more permeable when compressed into cake form.

5.3.3 The particles contained within a slurry have an electrical surface charge which in many cases causes particles to repel one another, preventing them from agglomerating. In the process of coagulation, a coagulating agent is added to the liquid/solid suspension to modify this surface charge of the particles. thus destabilizing the particles through charge neutralization. By adding a surface charge modifier, the electrical repulsive forces can be overcome. The resultant joining together of the particles increases the particle mass and usually their filterability. Common inorganic coagulating agents used are as follows;

a. Acids and Alkalies
- Sulfuric Acid (H_2SO_4)
- Hydrochloric Acid (HCl)
- Sodium Hydroxide (Caustic/NaOH)
- Calcium Hydroxide (Lime/$Ca(OH)_2$)

b. Aluminum Chloride ($AlCl_3 * 6H_2O$)

c. Aluminum Sulfate (Alum/$Al_2(SO_4)_3 * 18H_2O$)

d. PolyAluminum Chloride ($[Al(OH)_{1.5}(SO_4)_{0.125}Cl_{1.25}]_n$)

e. Ferric Chloride ($FeCl_3 * 6H_2O$)

f. Ferrous Sulfate ($FeSO_4 * 7H_2O$)

5.3.4 Flocculation involves the addition of an agent containing long chain molecules to the particle suspension. These macro molecules have a large number of electrically active sites which attract or bridge the particles within the suspension. A large agglomeration of particles and flocculent molecules is formed having greatly enhanced filtration characteristics.

5.3.5 Many flocculating chemicals are available, both organic and inorganic. The use of high molecular weight organic polyelectrolyte (polymers) as flocculent is gaining popularity in the filter press industry due to their improving performance, ease of handling and non-corrosive nature. Polymers also generate significantly less sludge than inorganics. Inorganics may comprise as much as 20% of a dewatered sludge on a dry weight basis. Polymers are rarely required in dosage concentrations exceeding 1% of the sludge.

5.3.6 It should be noted that the choice of the correct flocculent is dependent on many factors both physical and economic and as such the optimum flocculent is best selected after pilot plant testing of the sludge to be filtered and an economic evaluation is performed.

5.4 Physical Conditioning

5.4.1 One form of physical conditioning is known as body feeding or filteraid filtration. It is used when the particles in a suspension can not be agglomerated through chemical conditioning or when the particles to be filtered are soft and deform under pressure. In both cases when the solids are compressed into a filter cake there is a reduction in the interstitial spaces between the particles. These spaces provide the flow path for liquid to pass through the filter cake as it forms. Therefore if they are restricted or eliminated, filtration is severely hampered. This effect is referred to as cake blinding.

5.4.2 It is possible to maintain a porous cake and overcome cake blinding by adding some rigid particles to the slurry that resist deformation under pressure. Provided these particles are added in sufficient quantity and are evenly dispersed throughout the cake, they provide a cake matrix that will remain permeable under the pressures of filtration. This gives the cake "body" and hence cake blinding is eliminated.

5.4.3 Typical addition rates for body feed materials vary depending upon the type of slurry that is being filtered and the material used as a body feed. However a useful initial dosage rate guideline is 75% to 100% body feed material by weight to each pound of dry solid contained within the batch. After a successful filtration cycle dosage rates can then be adjusted downward until a minimum acceptable filter cake solid is achieved.

5.4.4 Typical body feed materials are:

- Ash
- Diatomaceous Earth
- Cellulose
- Lime
- Perlite

5.4.5 It should be noted that many industrial sites have both sludge and solid materials to be disposed of. In these circumstances, it is often possible to use the solid materials as a body feed to aid in the filtration of the slurry.

5.4.6 The addition of a body feed material will, of course, increase the amount of dry matter produced by the filter. However, this is countered by the drier cake that can be produced. For example, it may be possible to achieve only 25% solids by weight on certain biological cakes. By adding a body feed material at a ratio of 1 part filter aid to 4 parts dry solids, the dryness of the cake may be increased to 40% solids. This is a 25% increase in the quantity of dry solids added to the total dry solids volume but an increase of 60% of the dry solids within the filter cake.

5.4.7 A second type of physical conditioning that also falls into the category of filter aid filtration is known as precoating. However unlike body feeding, the process is not sludge conditioning since it is not added to the sludge itself. Rather it is applied to the filter clothes within the filter press prior to the onset of each cake filtration cycle. The process of precoating involves laying a thin layer of porous filter aid material on the filter media prior to the filtration of the slurry. This is primarily done for three reasons.

a. Certain slurries, particularly those containing greases and oils can decrease the permeability of the pores in the filter media on contact. This is called cloth blinding. By coating the cloth each time the filtration is being performed, the cloth is protected and, therefore, the cloth life is extended and the cloth cleaning requirement is reduced.

b. At the very start of a filtration cycle, it is common for a small amount of solids to break through the filter media. Although this breakthrough diminishes greatly very quickly, it increases the overall turbidity of the filtrate. For applications where the clarity of the filtrate is paramount, the filter cloth is precoated to ensure that totally clear filtrate is produced throughout the complete filtration cycle. Examples of this application of precoating are the "polish" filtering of wine and beer.

c. In some instances, filter cake can be very sticky and, therefore, adhere to the filter cloth. This can substantially increase the labor and time required to discharge the filter cakes from the filter press. It is possible to greatly decrease this labor and time requirement by precoating the cloths. Generally speaking, precoat material is not sticky and, therefore, does not adhere to the filter cloths. Precoating allows a non-sticky layer of material to separate the cake from the cloth and prevent the cake from adhering to the cloth.

5.4.8 Typical materials used for precoating are the same as those used for body feed materials such as diatomaceous earth, ash, perlite, and cellulose. The application of precoat is performed just prior to the start of the filtration cycle. The precoat material is placed in a tank with a quantity of water which is approximately equal to one and one half times the total volume of the filter press to be precoated. The quantity of precoat material required should be sufficient to form a 1/16" to 3/32" layer on all of the filter media. This mixture is then fed to the press at a feed rate that has a minimum velocity of .25 gpm/ft^2 of filter area and recirculated back to the precoat tank until all of the precoat is removed from the mixture. Then while the precoat pump is still operating the slurry feed pump is started, after which the precoat pump can be stopped. This maintains a constant pressure differential across the deposited precoat layer keeping it in place on the media and preventing it from sagging or sloughing downwards. A typical precoat system schematic is illustrated in figure 4-11.

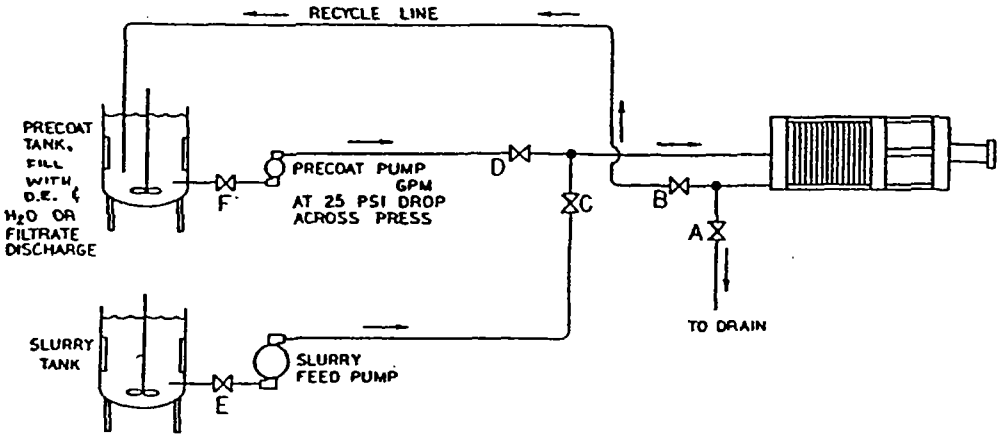


Fig. 4-11. Typical Precoat System Schematic

5.5 Thermal Conditioning

5.5.1 Some sludges, particularly those containing biological matter exhibit increased filterability when they have been frozen then thawed. The reason for this remains under discussion, but it is believed to be that the freezing process ruptures all of the biological cells freeing much of the liquid that would otherwise remain contained in the cells.

5.5.2 The obvious advantage of thermal conditioning is that no treatment chemicals must be employed. However, this must be weighted against the capital cost of the equipment required to freeze then thaw the sludge as well as the power required to operate it.

5.5.3 Heat is also used as a thermal conditioning agent. Slurries that are highly viscous exhibit increased filterability if the viscosity can be decreased. Such sludges are often heated prior to filtration for this reason.

5.6 Summary

5.6.1 The various methods described above for conditioning sludges are not necessarily mutually exclusive. Many may be used in conjunction with one another. Precoats may be used with body feeds or polymer conditioned sludges. Thermal conditioning may precede chemical conditioning. The objective, however is always the same, to optimize the operation of the filter press and yield the driest possible filter cake and the clearest filtrates.

6.0 LOW PRESSURE VS. HIGH PRESSURE VS. DIAPHRAGM PLATES

6.1 As stated earlier filter presses are available in basically two filtration operating pressures—100 and 225 psi. A third option is available through the use of diaphragm plate where the operating pressure of the filtration cycle is 100 psi and a mechanical squeeze of up to 225 psi can be applied to the filter cake.

6.2 How a liquid/solid suspension dewaters under each of these operating parameters can not be accurately predicted unless prior experiential information about the particular slurry is available. While some broad general assumptions can be made about how an individual material may filter, only through laboratory or pilot testing can the effects of different pressures on the final cake product be determined.

6.3 While it would seem logical that more than doubling the feed pressure would increase the volume of cake solids that may be compacted in a cake chamber under low pressure, in reality it may not yield a significant difference in the overall cake dryness. Factors such as overall particle size, particle size distribution, and compressibility of the particles may in fact inhibit filtration under increased pressure differential. Some basic statements can be made about when to consider high pressure filtration or low pressure but again it should be emphasized that testing be conducted and an economic evaluation be performed to determine if higher feed pressures obtain results that warrant the increased investment in the filtration equipment and associated pumps and piping.

a. Higher filtration pressures do not benefit slurries with compressible solids. They tend to collapse under the increased pressure and results in cake blinding.

b. Higher filtration pressures do not benefit slurries with finely divided particles. They pack very tightly in the cake matrix and may form a cake with low permeability.

c. Higher filtration pressure may improve the cake dryness results of those slurries that contain coarse, non-compressible particles.

6.4 It has been U.S. Filter/JWI's experience that increased filtration pressures result in improved performance, as determined by cake dryness, in only about 10 to 15% of all slurries tested in our laboratory.

6.5 As described earlier the diaphragm plate gives an operator the unique ability to mechanically apply increased pressure to the filter cake inside the filter press prior to discharge from the press. This squeezing action differs from the effects of higher filtration pressure on the cake. Higher filtration pressure relies upon the filter cake maintaining a non-compressible, permeable matrix across the entire thickness of the cake for filtrate to pass through until the filtration cycle is complete, while the mechanical squeeze of an inflated diaphragm plate relies on the compressibility of the solids in the cake chamber to drive additional moisture out to yield a dry cake. This gives a filter press equipped with diaphragm plates the ability to produce the dryer cakes obtained with high pressure filtration but with the versatility of handling the wide range of applications found with low pressure filtration. But again cost is a factor. Filter presses with diaphragm plate have a significantly higher initial investment and therefore a careful economic evaluation should be performed.

6.6 There are two specific reasons for using diaphragm plates on a particular liquid/solid separation application.

6.6.1 To obtain drier filter cakes than those achieved with standard filtration alone.

6.6.1.a In this case the press is run as it would be for a standard filtration cycle. Once the end of the cyclic is reached the diaphragms are inflated. This may be accomplished with pressures anywhere from the 100 psi filtration pressure up to 225 psi. This method works extremely well with solids which are compressible or form a very soft cake such as a biological waste. The object of using the press in this manner is simply to achieve the driest filter cake possible.

6.6.2 To reduce cycle times, utilizing the filter press during its most efficient cyclic phase and thereby increasing throughput.

6.6.2.a In this case, the filter press is being used during its period of peak filtration efficiency. Referring to figure 4-4, to optimize the use of the press with diaphragm plates the filtration cycle is stopped when roughly 80% of the feed material batch has been processed. The diaphragms are inflated at this point to consolidate the filter cake. Figure 4-12 is a graphical representation of this operation. The result is a reduction of cycle time of 50% while reducing the solids processing capabilities by only 20% or an increase of efficiency of 1.6 times that of standard filtration. This increase may vary with different processes and when additional cake discharge cycles are factored in. This method may be used on any type of liquid/solid suspension but is most effective on solids that are readily dewaterable and usually non-compressible.

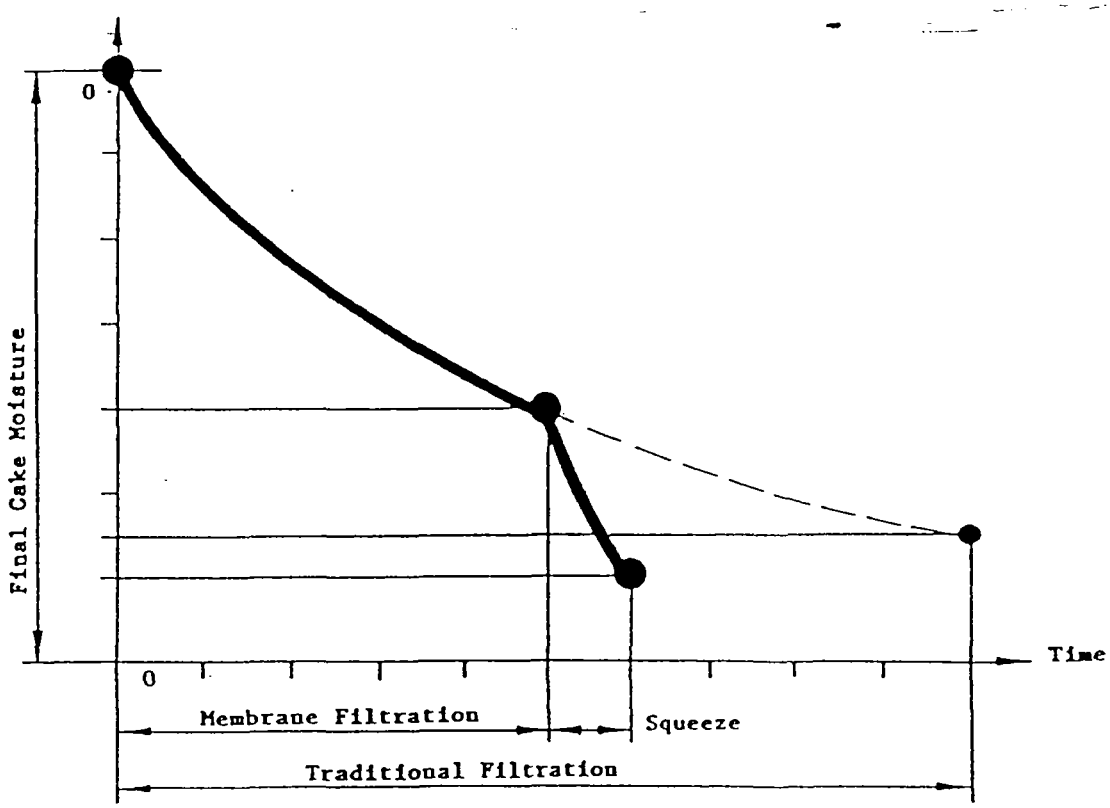


Fig. 4-12. Filtration Time Vs. Cake Moisture Content

7.0 MANIFOLDING OPTIONS

7.1 There are many ancillary operations that may be performed with a filter press prior to, during and after the filtration cycle. To perform these functions it is necessary to outfit the press with valving and piping to control the flow of liquids and gases into and out of the press. These piping and valving options are referred to as feed and discharge manifolds and may incorporate one or more of the functions listed below. Since so many variations exist we have limited the discussion to the six most commonly used. Each manifold described has two functions in common in that they provide for both the feeding of slurry to the press and the discharge of filtrate. What follows is a brief discussion of the different functions which may be performed as required.

7.2 Precoat/Even-fill (refer to figure 4-13)

7.2.1 The function of precoating is a pre-filtration operation previously described. The "Even-fill" is a filtration function which is used with rapidly settling solids. In both cases it is necessary to fill the press from the bottom up allowing for the uniform distribution of solids. This is accomplished through the addition of extra bottom discharge filtrate port valves, which allows discharge to initially exit only from the top discharge eyes. This evenly fills the press from the bottom up, end-to-end.

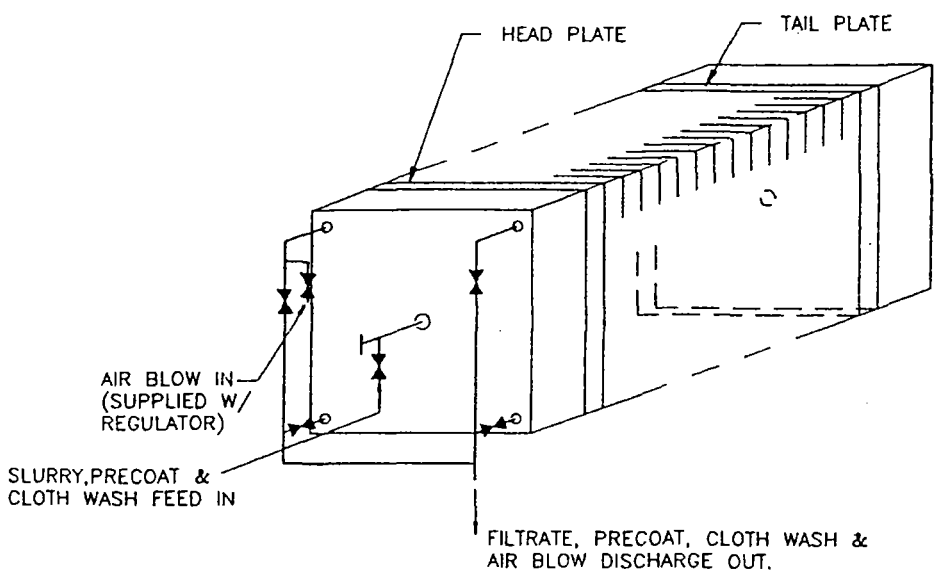


Fig. 4-13. Air Blow/Precoat/Cloth Wash Manifold Diagram

7.3 Double End Feed

7.3.1 The function of double end feed is a filtration operation which is utilized with longer than average filter packs or when rapid filling of the filter pack is required. The double end feed connection is located at the follower end of the filter pack. Since the follower must be mobile during cake discharge operations the feed connection may consist of either a flexible hose for low pressure feed (100 psi/7 bar) or a specially designed rigid piping system with three swivel connections for high pressure feed (225 psi/16 bar).

7.4 Air Blow (refer to figure 4-14)

7.4.1 The function of Air blowing of the cake is a post filtration operation that is performed to remove entrained filtrate from the filter cake and residual filtrate from the filter pack porting connections press prior to cake discharge. A pressurized gas, usually compressed air is introduced into the upper filtrate discharge port, forced through the cloth and filter cake in each chamber and out of the diagonally opposed, lower filtrate discharge port (refer to figure 4-15). The removal of excess filtrate will improve cake dryness and help loosen the filter cake for improved cake release.

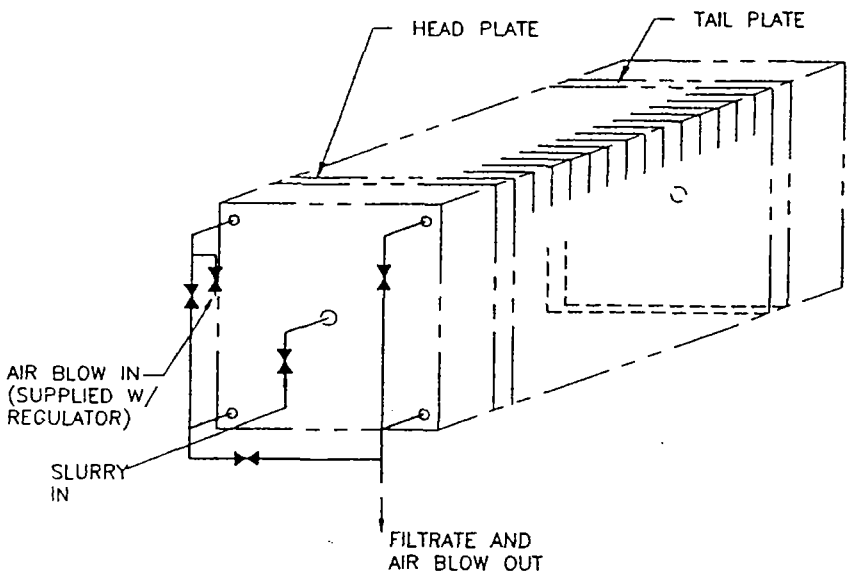


Fig. 4-14. Air Blow Down Manifold Diagram

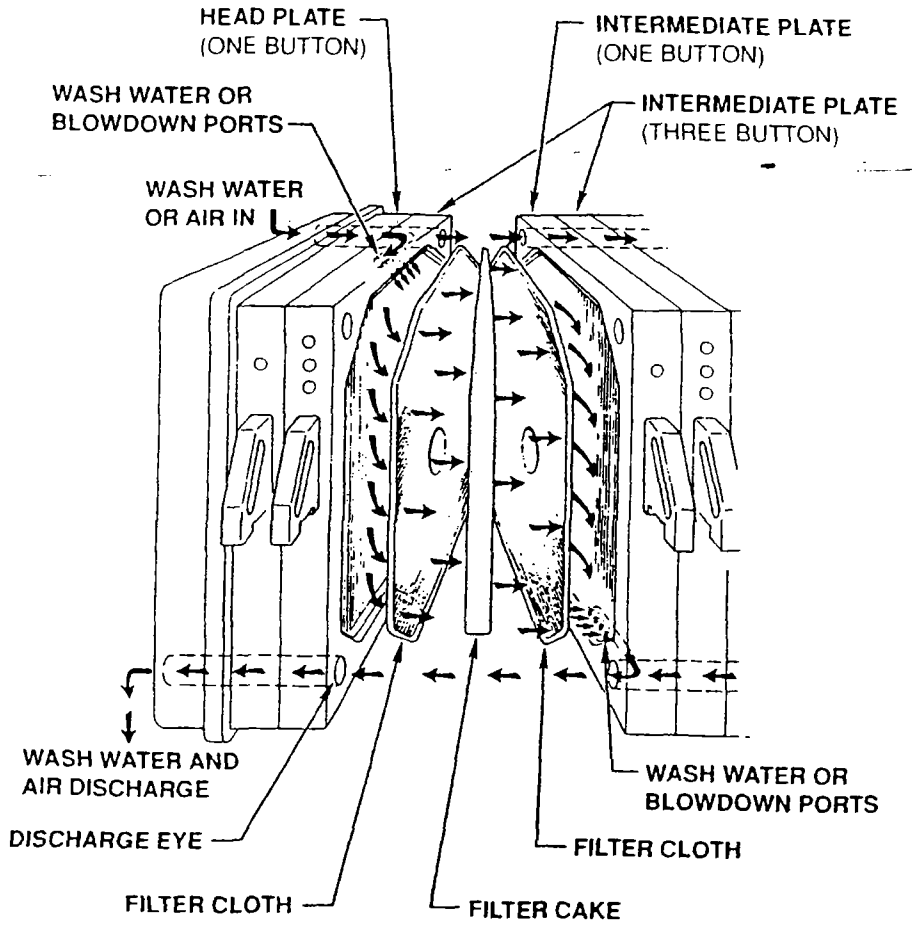


Fig. 4-15. Air Blow Down Diagram

7.5 Cake Wash (refer to figure 4-16)

7.5.1 Cake washing is a post filtration operation that may be used to treat the filter cake prior to discharge from the filter press. The type of treatment will depend upon the nature of the solids but various cake washing examples include pH adjustment, removal of soluble salts, and the purging of entrained mother liquor. Included in the manifold are extra valving and a wash liquor inlet connection to allow for thorough washing of the filter cakes by introducing the wash liquor into alternating, lower filtrate discharge ports, forcing it to pass through the cake and discharge out the alternating opposite side filtrate discharge ports (refer to figure 4-15).

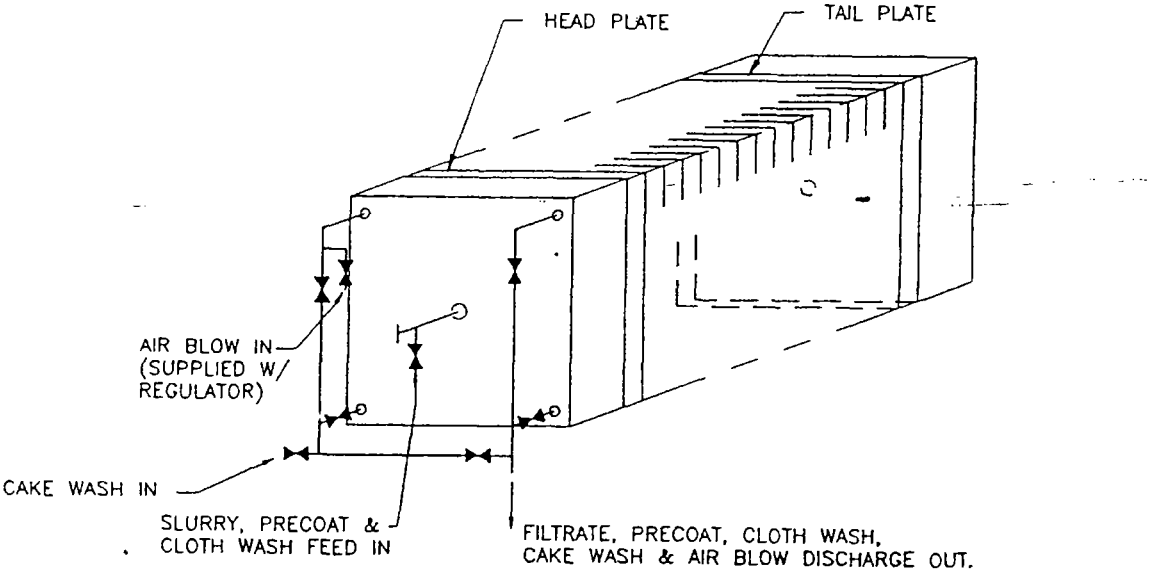


Fig. 4-16. Air Blow Down/Cake Wash/Precoat/Cloth Wash Manifold Diagram

7.6 Core Blow (refer to figure 4-17)

7.6.1 Core blow is a post filtration operation that is performed just prior to cake discharge. It refers to the process of removing excess slurry from the feed eye or feed core of the plate stack after the cake is formed. Compressed air is introduced at the specially-ported, tail plate to force the excess slurry in the core of the press back out of the head end feed inlet pipe.

7.7 Cloth Wash (refer to figure 4-13)

7.7.1 Cloth wash is a post cake discharge operation that is performed on a empty filter press. Some filter clothes become impregnated with particulate which reduce their porosity and thus retard the filtration process. Cloth washing refers to the process of using low pressure and cleaning solutions (usually low concentrations of acid or caustic) to dissolve and purge material trapped in the weave or on the surface of the filter cloths while the press is in the closed position. Included are extra bottom filtrate discharge port valves and an extra center feed inlet connection to allow for introduction of the washing solution through the center feed inlet and out the top filtrate discharge ports.

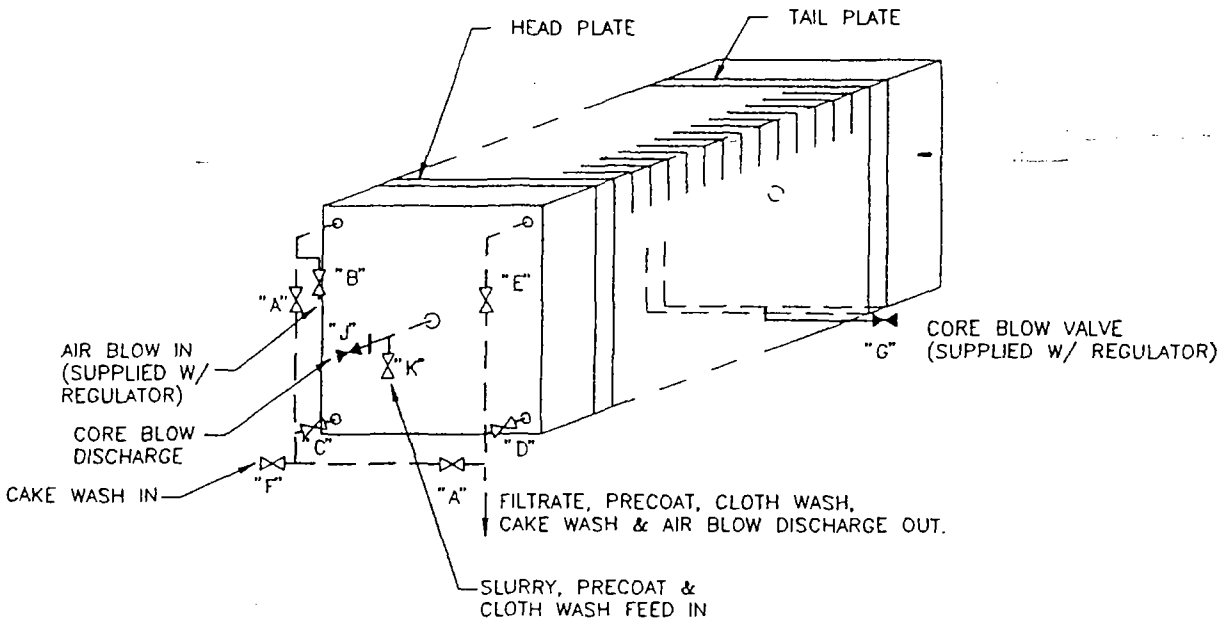


Fig. 4-17. Core Blow Diagram

8.0 FILTER MEDIA

8.1 Choosing the correct filter cloth is crucial to the successful operation of a filter press. Use a cloth that is woven too tight and the cloth may not precoat properly; too porous and an unacceptable quantity of solids will pass through. If the wrong cloth weave is chosen the filter cake will not readily discharge without scraping it off the surface. Filter cloths come in such a wide variety of materials and styles that they are too numerous to mention here. In section 5.0 there are samples of four commonly used filter cloths.

8.2 Filter cloths are classified using five basic parameters.

8.2.1 Material of construction

8.2.1.a Polypropylene is the most prevalent material in use today, but cloths are also available in such materials as polyester, nylon and although rarely used, cotton.

8.2.2 Type of fiber

8.2.2.a Monofilament, multifilament and spun filament fibers are the primary types used in woven cloth. They may be used exclusively in a fabric or they may be mixed. A popular cloth uses a monofilament warp (the lengthwise cord of a fabric) and a multifilament weave or weft (the crosswise filler cord of a fabric).

8.2.2.b Felts are non-woven needled fabrics.

8.2.3 Type of weave

8.2.3.a Types of weaves include satin, twill and basket. While felt is not a weave it falls into this category for purposes of classification.

8.2.4 Weight

8.2.4.a The weight of the cloth as expressed in ozs./yd^2.

8.2.5 Porosity

8.2.5.a Even though these fabrics are used in wet filtration, the porosity of cloth is expressed in air flow rating. The Frazier flow test measures the amount of air which can pass through one square foot of wet filter cloth under one atmosphere of pressure differential. The air flow is expressed in units of SCFM (Nm^3/m^2/min.).

8.3 As with so many aspects of filter press filtration there is very little definitive experimental documentation on the proper selection of filter cloths. Laboratory testing is always the preferred method of determining the correct filter cloth for a particular application. But in the absence of testing some basic guidelines can assist in the selection process. A filter cloth should be chosen for:

a. The optimum cake release properties.

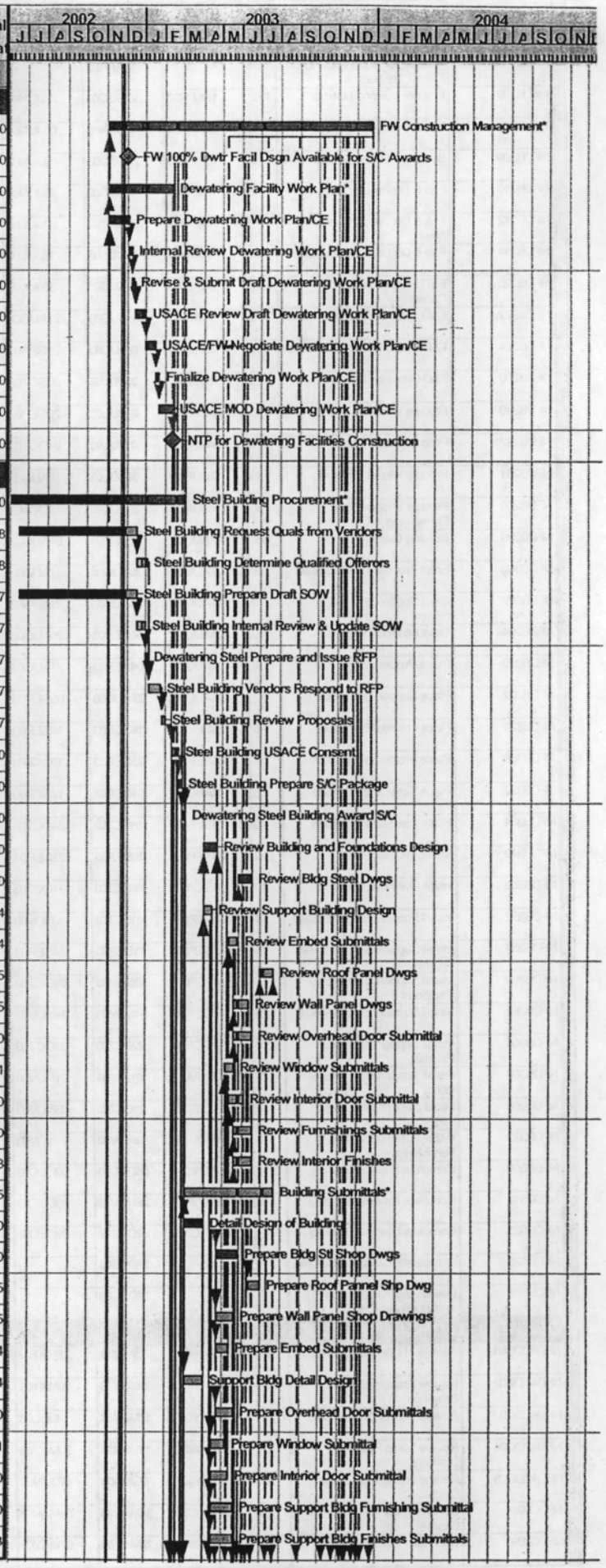
b. Desired degree of filtrate clarity or particle retention.

c. Chemical compatibility.

Appendix I

Draft Project Schedule

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Late Start	Late Finish	Total Float
DEWATERING FACILITIES CONSTRUCTION							
FW CONSTRUCTION MANAGEMENT							
C4NFDA101	FW Construction Management*	286*	04NOV02A	22DEC03	04NOV02A	22DEC03	0
C4NFDA102	FW 100% Dwtr Facil Dsgn	0		02DEC02		27FEB03	60
C4NFDA103	Dewatering Facility Work Plan*	68*	04NOV02A	11FEB03	04NOV02A	11FEB03	0
C4NFDA105	Prepare Dewatering Work	15	04NOV02A	04DEC02	04NOV02A	04DEC02	0
C4NFDA110	Internal Review Dewatering	3	05DEC02	09DEC02	05DEC02	09DEC02	0
C4NFDA115	Revise & Submit Draft	4	10DEC02	13DEC02	10DEC02	13DEC02	0
C4NFDA120	USACE Review Draft	10	16DEC02	30DEC02	16DEC02	30DEC02	0
C4NFDA125	USACE/FW Negotiate	10	31DEC02	14JAN03	31DEC02	14JAN03	0
C4NFDA130	Finalize Dewatering Work	5	15JAN03	21JAN03	15JAN03	21JAN03	0
C4NFDA135	USACE MOD Dewatering Work	15	22JAN03	11FEB03	22JAN03	11FEB03	0
C4NFDA140	NTP for Dewatering Facilities	0		11FEB03		11FEB03	0
BUILDING SUBCONTRACT							
B722010201	Steel Building Procurement*	189*	03JUN02A	03MAR03	03JUN02A	03MAR03	0
B722010210	Steel Building Request Quals	10	17JUN02A	17DEC02	17JUN02A	30DEC02	8
B722010215	Steel Building Determine	10	18DEC02	02JAN03	31DEC02	14JAN03	8
B722010220	Steel Building Prepare Draft	9	17JUN02A	17DEC02	17JUN02A	27DEC02	7
B722010221	Steel Building Internal Review	8	18DEC02	30DEC02	30DEC02	09JAN03	7
B722010222	Dewatering Steel Prepare and	3	31DEC02	03JAN03	10JAN03	14JAN03	7
B722010225	Steel Building Vendors	15	06JAN03	24JAN03	15JAN03	04FEB03	7
B722010230	Steel Building Review	5	27JAN03	31JAN03	05FEB03	11FEB03	7
B722010235	Steel Building USACE	6	12FEB03	20FEB03	12FEB03	20FEB03	0
B722010240	Steel Building Prepare S/C	5	21FEB03	27FEB03	21FEB03	27FEB03	0
B722010245	Dewatering Steel Building	2	28FEB03	03MAR03	28FEB03	03MAR03	0
NFDA2DB01	Review Building and	15	01APR03	21APR03	01APR03	21APR03	0
NFDA2DB02	Review Bldg Steel Dwgs	15	28MAY03	17JUN03	28MAY03	17JUN03	0
NFDA2DB03	Review Support Building	10	01APR03	14APR03	19MAY03	02JUN03	34
NFDA2DB05	Review Embed Submittals	10	13MAY03	27MAY03	19MAY03	02JUN03	4
NFDA2DB06	Review Roof Panel Dwgs	14	02JUL03	22JUL03	10JUL03	29JUL03	5
NFDA2DB07	Review Wall Panel Dwgs	15	20MAY03	10JUN03	28MAY03	17JUN03	5
NFDA2DB08	Review Overhead Door	20	20MAY03	17JUN03	28AUG03	25SEP03	70
NFDA2DB09	Review Window Submittals	10	06MAY03	19MAY03	15SEP03	26SEP03	91
NFDA2DB10	Review Interior Door Submittal	15	13MAY03	03JUN03	03OCT03	23OCT03	100
NFDA2DB11	Review Furnishings Submittals	20	20MAY03	17JUN03	12SEP03	09OCT03	80
NFDA2DB12	Review Interior Finishes	20	20MAY03	17JUN03	22JUL03	18AUG03	43
NFDB099	Building Submittals*	99*	04MAR03	22JUL03	04MAR03	29JUL03	5
NFDB100	Detail Design of Building	20	04MAR03	31MAR03	04MAR03	31MAR03	0
NFDB120	Prepare Bldg Stl Shop Dwgs	25	22APR03	27MAY03	22APR03	27MAY03	0
NFDB132	Prepare Roof Pannel Shp Dwg	15	11JUN03	01JUL03	18JUN03	09JUL03	5
NFDB134	Prepare Wall Panel Shop	20	22APR03	19MAY03	29APR03	27MAY03	5
NFDB140	Prepare Embed Submittals	15	22APR03	12MAY03	28APR03	16MAY03	4
NFDB150	Support Bldg Detail Design	20	04MAR03	31MAR03	21APR03	16MAY03	34
NFDB160	Prepare Overhead Door	20	22APR03	19MAY03	31JUL03	27AUG03	70
NFDB162	Prepare Window Submittal	15	15APR03	05MAY03	22AUG03	12SEP03	91
NFDB164	Prepare Interior Door Submittal	20	15APR03	12MAY03	05SEP03	02OCT03	100
NFDB170	Prepare Support Bldg	25	15APR03	19MAY03	07AUG03	11SEP03	80
NFDB175	Prepare Support Bldg Finishes	25	15APR03	19MAY03	16JUN03	21JUL03	43



Start Date	01MAR94	Early Bar	
Finish Date	06JUL11	Progress Bar	
Data Date	25NOV02	Critical Activity	

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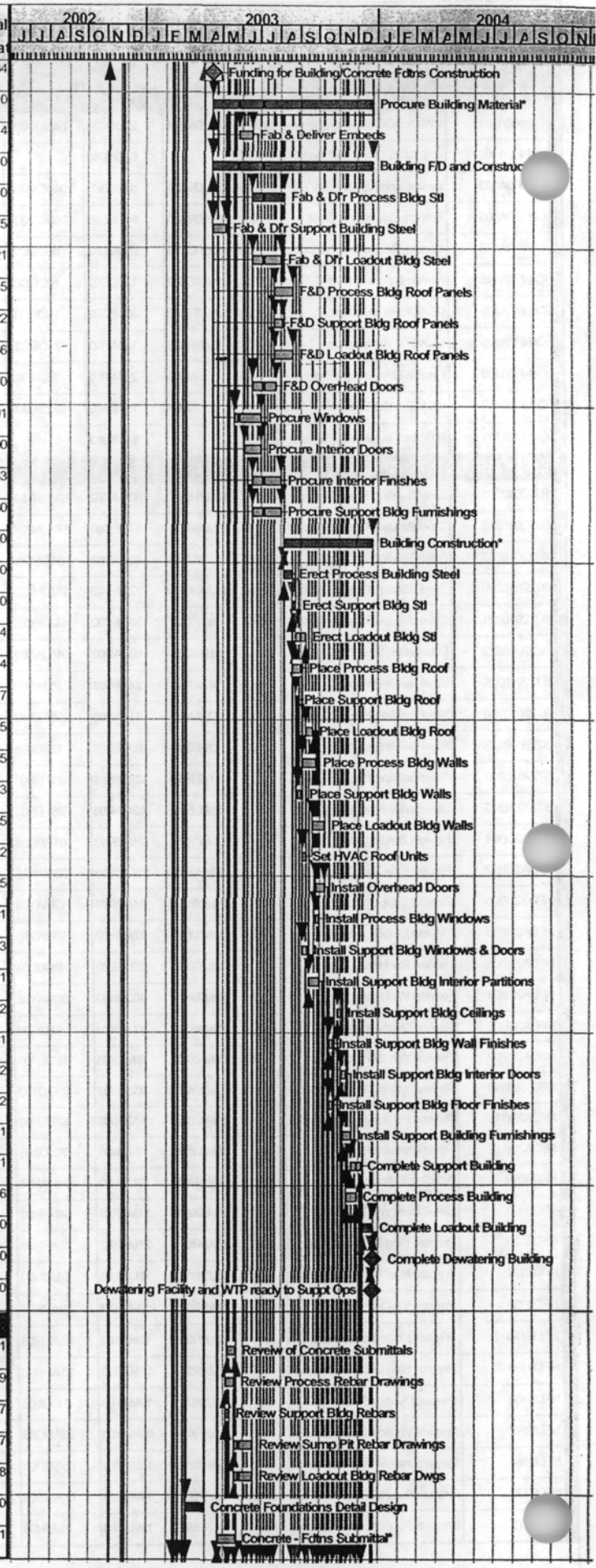
U.S. ARMY CORPS OF ENGINEERS
Dewatering Facility - Detail

Date	Revision	Checked	Approved

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Late Start	Late Finish	Total Float
NFDB195	Funding for Building/Concrete Fdtns Construction	0		14APR03		02JUN03	34
NFDB199	Procure Building Material*	175*	15APR03	22DEC03	03JUN03	22DEC03	0
NFDB200	Fab & Deliver Embeds	15	28MAY03	17JUN03	03JUN03	23JUN03	4
NFDB209	Building F/D and Construction*	175*	15APR03	22DEC03	03JUN03	22DEC03	0
NFDB210	Fab & Dfr Process Bldg Stl	35	18JUN03	06AUG03	18JUN03	06AUG03	0
NFDB212	Fab & Dfr Support Building Steel	15	15APR03	05MAY03	31JUL03	20AUG03	75
NFDB214	Fab & Dfr Loadout Bldg Steel	30	18JUN03	30JUL03	18JUL03	28AUG03	21
NFDB220	F&D Process Bldg Roof Panels	20	23JUL03	19AUG03	30JUL03	26AUG03	5
NFDB222	F&D Support Bldg Roof Panels	9	23JUL03	04AUG03	22AUG03	04SEP03	22
NFDB224	F&D Loadout Bldg Roof Panels	20	23JUL03	19AUG03	26SEP03	23OCT03	46
NFDB230	F&D OverHead Doors	25	18JUN03	23JUL03	26SEP03	30OCT03	70
NFDB240	Procure Windows	30	20MAY03	01JUL03	29SEP03	07NOV03	91
NFDB242	Procure Interior Doors	20	04JUN03	01JUL03	24OCT03	20NOV03	100
NFDB244	Procure Interior Finishes	30	18JUN03	30JUL03	19AUG03	30SEP03	43
NFDB250	Procure Support Bldg Furnishings	30	18JUN03	30JUL03	10OCT03	20NOV03	80
NFDB299	Building Construction*	95*	07AUG03	22DEC03	07AUG03	22DEC03	0
NFDB300	Erect Process Building Steel	10	07AUG03	20AUG03	07AUG03	20AUG03	0
NFDB302	Erect Support Bldg Stl	3	21AUG03	25AUG03	21AUG03	25AUG03	0
NFDB304	Erect Loadout Bldg Stl	10	25AUG03	08SEP03	29AUG03	12SEP03	4
NFDB320	Place Process Bldg Roof	10	21AUG03	04SEP03	27AUG03	10SEP03	4
NFDB322	Place Support Bldg Roof	2	26AUG03	27AUG03	05SEP03	08SEP03	7
NFDB324	Place Loadout Bldg Roof	8	09SEP03	18SEP03	16SEP03	25SEP03	5
NFDB330	Place Process Bldg Walls	15	05SEP03	25SEP03	10OCT03	30OCT03	25
NFDB332	Place Support Bldg Walls	5	28AUG03	04SEP03	17SEP03	23SEP03	13
NFDB334	Place Loadout Bldg Walls	15	19SEP03	09OCT03	24OCT03	13NOV03	25
NFDB340	Set HVAC Roof Units	3	05SEP03	09SEP03	23SEP03	25SEP03	12
NFDB350	Install Overhead Doors	10	26SEP03	09OCT03	31OCT03	13NOV03	25
NFDB352	Install Process Bldg Windows	4	26SEP03	01OCT03	10NOV03	13NOV03	31
NFDB354	Install Support Bldg Windows & Doors	5	05SEP03	11SEP03	24SEP03	30SEP03	13
NFDB360	Install Support Bldg Interior Partitions	10	16SEP03	29SEP03	01OCT03	14OCT03	11
NFDB362	Install Support Bldg Ceilings	5	29OCT03	04NOV03	14NOV03	20NOV03	12
NFDB364	Install Support Bldg Wall Finishes	5	16OCT03	22OCT03	31OCT03	06NOV03	11
NFDB366	Install Support Bldg Interior Doors	5	05NOV03	11NOV03	21NOV03	01DEC03	12
NFDB368	Install Support Bldg Floor Finishes	4	16OCT03	21OCT03	03NOV03	06NOV03	12
NFDB370	Install Support Building Furnishings	10	06NOV03	19NOV03	21NOV03	08DEC03	11
NFDB500	Complete Support Building	10	20NOV03	05DEC03	09DEC03	22DEC03	11
NFDB510	Complete Process Building	10	13NOV03	26NOV03	09DEC03	22DEC03	16
NFDB520	Complete Loadout Building	10	09DEC03	22DEC03	09DEC03	22DEC03	0
NFDB525	Complete Dewatering Building	0		22DEC03		22DEC03	0
NFDB526	Dewatering Facility and WTP ready to Suppt Ops	0		22DEC03		22DEC03*	0
CONCRETE FOUNDATION SUBCONTRACT							
NFDA2DC01	Reveiw of Concrete Submittals	10	09MAY03	22MAY03	27MAY03	09JUN03	11
NFDA2DC02	Review Process Rebar Drawings	10	06MAY03	19MAY03	19MAY03	02JUN03	9
NFDA2DC03	Review Support Bldg Rebars	5	06MAY03	12MAY03	14JUL03	18JUL03	47
NFDA2DC04	Review Sump Pit Rebar Drawings	20	20MAY03	17JUN03	30MAY03	26JUN03	7
NFDA2DC05	Review Loadout Bldg Rebar Dwgs	20	20MAY03	17JUN03	02JUN03	27JUN03	8
NFDC090	Concrete Foundations Detail Design	20	04MAR03	31MAR03	04MAR03	31MAR03	0
NFDC099	Concrete - Fdtns Submittal*	23*	22APR03	22MAY03	07MAY03	09JUN03	11



Start Date	01MAR94	Early Bar	
Finish Date	06JUL11	Progress Bar	
Data Date	25NOV02	Critical Activity	

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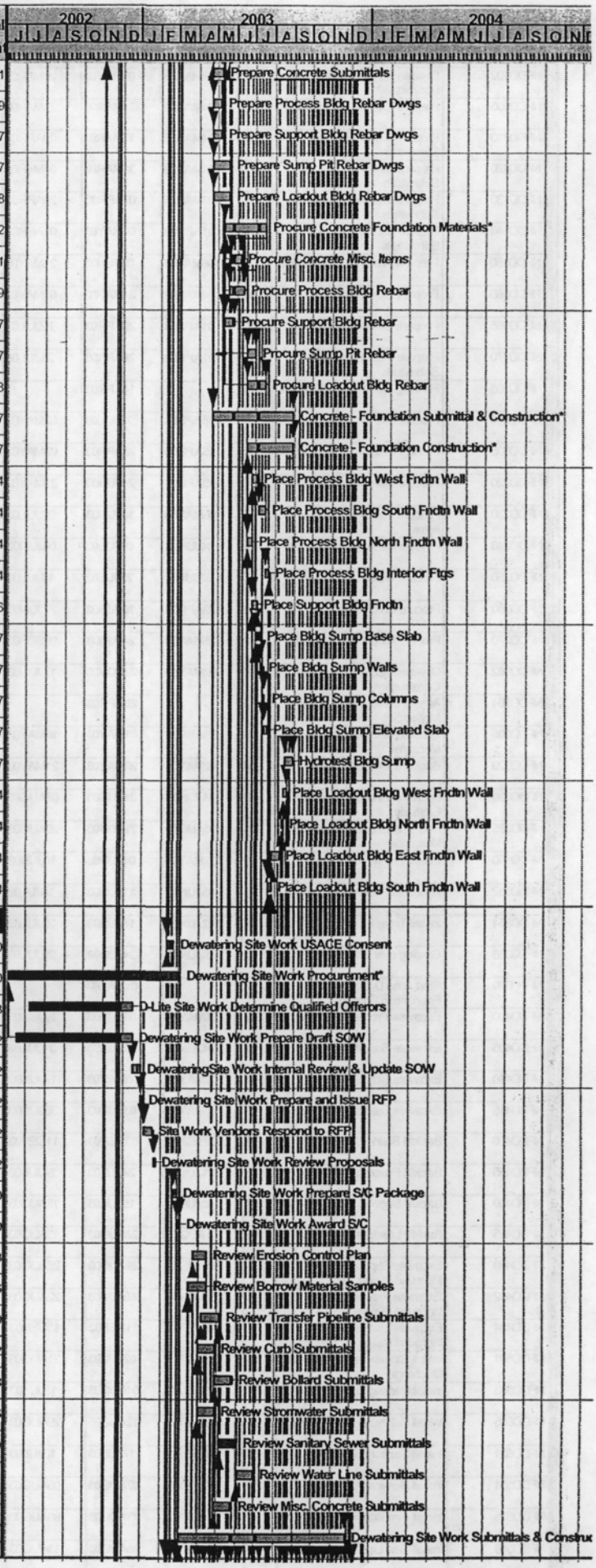
Dewatering Facility - Detail

Date	Revision	Checked	Approved

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Late Start	Late Finish	Total Float
NFDC100	Prepare Concrete Submittals	13	22APR03	08MAY03	07MAY03	23MAY03	11
NFDC110	Prepare Process Bldg Rebar	10	22APR03	05MAY03	05MAY03	16MAY03	9
NFDC112	Prepare Support Bldg Rebar	10	22APR03	05MAY03	27JUN03	11JUL03	47
DC114	Prepare Sump Pit Rebar Dwgs	20	22APR03	19MAY03	01MAY03	29MAY03	7
DC116	Prepare Loadout Bldg Rebar	20	22APR03	19MAY03	02MAY03	30MAY03	8
NFDC200	Procure Concrete Foundation	45*	13MAY03	16JUL03	03JUN03	01AUG03	12
NFDC205	Procure Concrete Misc. Items	10	23MAY03	06JUN03	10JUN03	23JUN03	11
NFDC210	Procure Process Bldg Rebar	15	20MAY03	10JUN03	03JUN03	23JUN03	9
NFDC212	Procure Support Bldg Rebar	10	13MAY03	27MAY03	21JUL03	01AUG03	47
NFDC214	Procure Sump Pit Rebar	10	18JUN03	01JUL03	27JUN03	11JUL03	7
NFDC216	Procure Loadout Bldg Rebar	20	18JUN03	16JUL03	30JUN03	28JUL03	8
NFDC304	Concrete - Foundation	92*	22APR03	29AUG03	07MAY03	10SEP03	7
NFDC305	Concrete - Foundation	52*	18JUN03	29AUG03	24JUN03	10SEP03	7
NFDC310	Place Process Bldg West	6	26JUN03*	03JUL03	02JUL03	10JUL03	4
NFDC312	Place Process Bldg South	7	07JUL03	15JUL03	11JUL03	21JUL03	4
NFDC314	Place Process Bldg North	6	18JUN03	25JUN03	24JUN03	01JUL03	4
NFDC316	Place Process Bldg Interior	5	16JUL03	22JUL03	22JUL03	28JUL03	4
NFDC320	Place Support Bldg Fndtn	5	26JUN03	02JUL03	04AUG03	08AUG03	26
NFDC330	Place Bldg Sump Base Slab	3	02JUL03	07JUL03	14JUL03	16JUL03	7
NFDC332	Place Bldg Sump Walls	4	08JUL03	11JUL03	17JUL03	22JUL03	7
NFDC333	Place Bldg Sump Columns	1	14JUL03	14JUL03	23JUL03	23JUL03	7
NFDC336	Place Bldg Sump Elevated	4	15JUL03	18JUL03	24JUL03	29JUL03	7
NFDC339	Hydrotest Bldg Sump	10	18AUG03	29AUG03	27AUG03	10SEP03	7
NFDC350	Place Loadout Bldg West	2	15AUG03	18AUG03	21AUG03	22AUG03	4
NFDC352	Place Loadout Bldg North	4	11AUG03	14AUG03	15AUG03	20AUG03	4
C354	Place Loadout Bldg East Fndtn	10	28JUL03	08AUG03	01AUG03	14AUG03	4
NFDC356	Place Loadout Bldg South	3	23JUL03	25JUL03	29JUL03	31JUL03	4
SITE WORK SUBCONTRACT							
B720010335	Dewatering Site Work USACE	6	12FEB03	20FEB03	12FEB03	20FEB03	0
B722010301	Dewatering Site Work	189*	03JUN02A	03MAR03	03JUN02A	03MAR03	0
B722010315	D-Lite Site Work Determine	10	08JUL02A	17DEC02	08JUL02A	21JAN03	23
B722010320	Dewatering Site Work Prepare	9	18JUN02A	17DEC02	18JUN02A	06JAN03	12
B722010321	DewateringSite Work Internal	8	18DEC02	30DEC02	07JAN03	16JAN03	12
B722010322	Dewatering Site Work Prepare	3	31DEC02	03JAN03	17JAN03	21JAN03	12
B722010325	Site Work Vendors Respond to	10	06JAN03	17JAN03	22JAN03	04FEB03	12
B722010330	Dewatering Site Work Review	5	20JAN03	24JAN03	05FEB03	11FEB03	12
B722010340	Dewatering Site Work Prepare	5	21FEB03	27FEB03	21FEB03	27FEB03	0
B722010345	Dewatering Site Work Award	2	28FEB03	03MAR03	28FEB03	03MAR03	0
NFDA2DD01	Review Erosion Control Plan	15	25MAR03	14APR03	11APR03	01MAY03	13
NFDA2DD02	Review Borrow Material	20	18MAR03	14APR03	23APR03	20MAY03	26
NFDA2DD03	Review Transfer Pipeline	20	08APR03	05MAY03	04JUN03	01JUL03	40
NFDA2DD04	Review Curb Submittals	20	01APR03	28APR03	30MAY03	26JUN03	42
NFDA2DD05	Review Bollard Submittals	20	29APR03	27MAY03	19AUG03	16SEP03	78
NFDA2DD06	Review Stromwater Submittals	20	01APR03	28APR03	23APR03	20MAY03	16
NFDA2DD07	Review Sanitary Sewer	20	06MAY03	03JUN03	06MAY03	03JUN03	0
NFDA2DD08	Review Water Line Submittals	20	04JUN03	01JUL03	19JUN03	17JUL03	11
DA2DD09	Review Misc. Concrete	20	29APR03	27MAY03	18AUG03	15SEP03	77
D101	Dewatering Site Work	187*	04MAR03	24NOV03	21MAR03	22DEC03	18



Start Date	01MAR94	Early Bar	
Finish Date	06JUL11	Progress Bar	
Data Date	25NOV02	Critical Activity	

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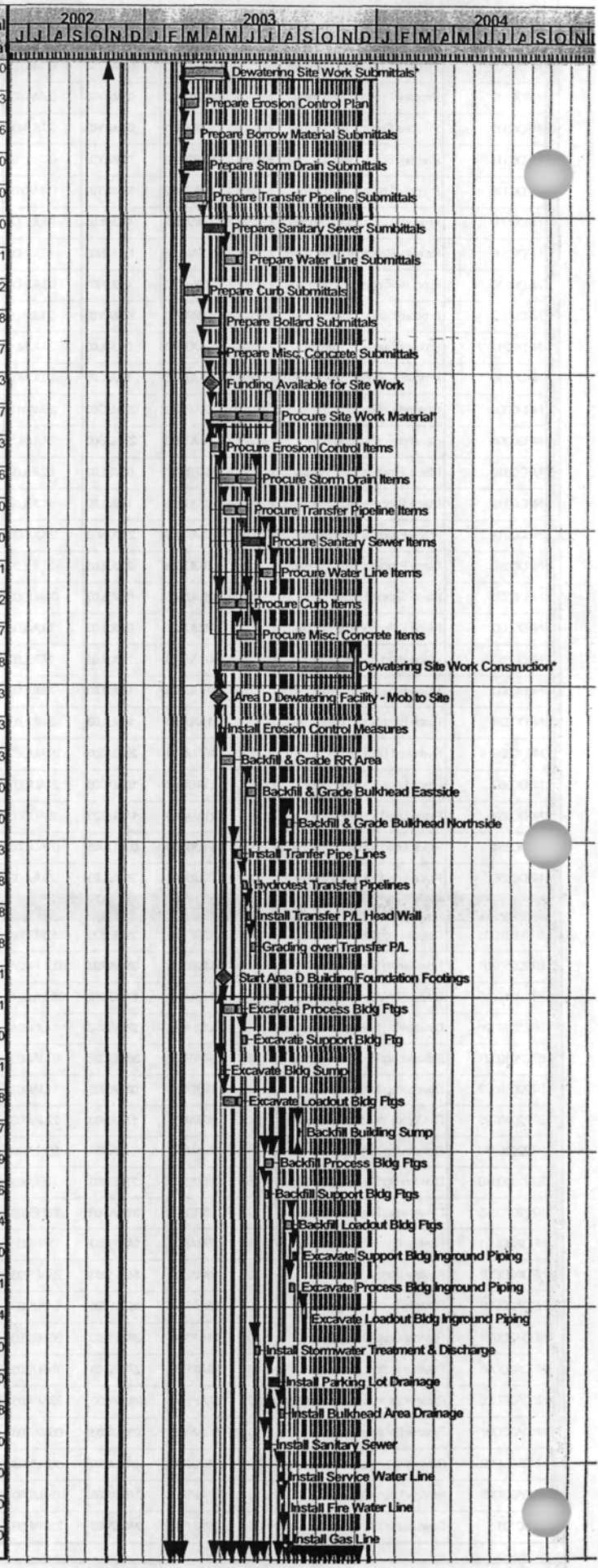
Date	Revision	Checked	Approved

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Late Start	Late Finish	Total Float
NFDD102	Dewatering Site Work Submittals*	45*	04MAR03	05MAY03	21MAR03	01JUL03	40
NFDD105	Prepare Erosion Control Plan	15	04MAR03	24MAR03	21MAR03	10APR03	13
NFDD110	Prepare Borrow Material Submittals	10	04MAR03	17MAR03	09APR03	22APR03	26
NFDD120	Prepare Storm Drain Submittals	20	04MAR03	31MAR03	04MAR03	31MAR03	0
NFDD130	Prepare Transfer Pipeline Submittals	25	04MAR03	07APR03	29APR03	03JUN03	40
NFDD140	Prepare Sanitary Sewer Sumbittals	25	01APR03	05MAY03	01APR03	05MAY03	0
NFDD150	Prepare Water Line Submittals	20	06MAY03	03JUN03	21MAY03	18JUN03	11
NFDD160	Prepare Curb Submittals	20	04MAR03	31MAR03	01MAY03	29MAY03	42
NFDD165	Prepare Bollard Submittals	20	01APR03	28APR03	22JUL03	18AUG03	78
NFDD170	Prepare Misc. Concrete Submittals	20	01APR03	28APR03	21JUL03	15AUG03	77
NFDD195	Funding Available for Site Work	0		14APR03		01MAY03	13
NFDD200	Procure Site Work Material*	70*	15APR03	23JUL03	02MAY03	13OCT03	57
NFDD205	Procure Erosion Control Items	10	15APR03	28APR03	02MAY03	15MAY03	13
NFDD220	Procure Storm Drain Items	40	29APR03	24JUN03	21MAY03	17JUL03	16
NFDD230	Procure Transfer Pipeline Items	25	06MAY03	10JUN03	02JUL03	06AUG03	40
NFDD240	Procure Sanitary Sewer Items	25	04JUN03	09JUL03	04JUN03	09JUL03	0
NFDD250	Procure Water Line Items	15	02JUL03	23JUL03	18JUL03	07AUG03	11
NFDD260	Procure Curb Items	30	29APR03	10JUN03	27JUN03	08AUG03	42
NFDD270	Procure Misc. Concrete Items	20	28MAY03	24JUN03	16SEP03	13OCT03	77
NFDD302	Dewatering Site Work Construction*	144*	02MAY03	24NOV03	17JUN03	22DEC03	18
NFDD304	Area D Dewatering Facility - Mob to Site	0		28APR03		15MAY03	13
NFDD305	Install Erosion Control Measures	3	29APR03	01MAY03	16MAY03	20MAY03	13
NFDD320	Backfill & Grade RR Area	13	02MAY03	20MAY03	21MAY03	09JUN03	13
NFDD330	Backfill & Grade Bulkhead Eastside	10	11JUN03	24JUN03	07AUG03	20AUG03	40
NFDD335	Backfill & Grade Bulkhead Northside	5	15AUG03	21AUG03	29AUG03	05SEP03	10
NFDD350	Install Tranfer Pipe Lines	10	21MAY03	04JUN03	10JUN03	23JUN03	13
NFDD352	Hydrotest Transfer Pipelines	5	05JUN03	11JUN03	16JUL03	22JUL03	28
NFDD354	Install Transfer P/L Head Wall	4	12JUN03	17JUN03	23JUL03	28JUL03	28
NFDD358	Grading over Transfer P/L	5	18JUN03	24JUN03	29JUL03	04AUG03	28
NFDD399	Start Area D Building Foundation Footings	0		05MAY03		18JUN03	31
NFDD400	Excavate Process Bldg Ftgs	20	06MAY03	03JUN03	19JUN03	17JUL03	31
NFDD405	Excavate Support Bldg Ftg	5	04JUN03	10JUN03	31JUL03	06AUG03	40
NFDD410	Excavate Bldg Sump	2	02MAY03	05MAY03	17JUN03	18JUN03	31
NFDD415	Excavate Loadout Bldg Ftgs	20	06MAY03	03JUN03	30JUN03	28JUL03	38
NFDD450	Backfill Building Sump	2	02SEP03	03SEP03	11SEP03	12SEP03	7
NFDD455	Backfill Process Bldg Ftgs	10	11JUL03	24JUL03	24JUL03	06AUG03	9
NFDD460	Backfill Support Bldg Ftgs	4	10JUL03	15JUL03	15AUG03	20AUG03	26
NFDD465	Backfill Loadout Bldg Ftgs	10	11AUG03	22AUG03	15AUG03	28AUG03	4
NFDD480	Excavate Support Bldg Inground Piping	4	26AUG03	29AUG03	26AUG03	29AUG03	0
NFDD482	Excavate Process Bldg Inground Piping	5	21AUG03	27AUG03	22AUG03	28AUG03	1
NFDD484	Excavate Loadout Bldg Inground Piping	3	09SEP03	11SEP03	15SEP03	17SEP03	4
NFDD501	Install Stormwater Treatment & Discharge	6	25JUN03	02JUL03	21AUG03	28AUG03	40
NFDD503	Install Parking Lot Drainage	12	18JUL03	04AUG03	18JUL03	04AUG03	0
NFDD505	Install Bulkhead Area Drainage	6	05AUG03	12AUG03	29AUG03	08SEP03	18
NFDD521	Install Sanitary Sewer	6	10JUL03	17JUL03	10JUL03	17JUL03	0
NFDD531	Install Service Water Line	3	05AUG03	07AUG03	05AUG03	07AUG03	0
NFDD535	Install Fire Water Line	3	08AUG03	12AUG03	08AUG03	12AUG03	0
NFDD540	Install Gas Line	3	13AUG03	15AUG03	13AUG03	15AUG03	0



Start Date	01MAR94	Early Bar	
Finish Date	06JUL11	Progress Bar	
Data Date	25NOV02	Critical Activity	

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U.S. ARMY CORPS OF ENGINEERS
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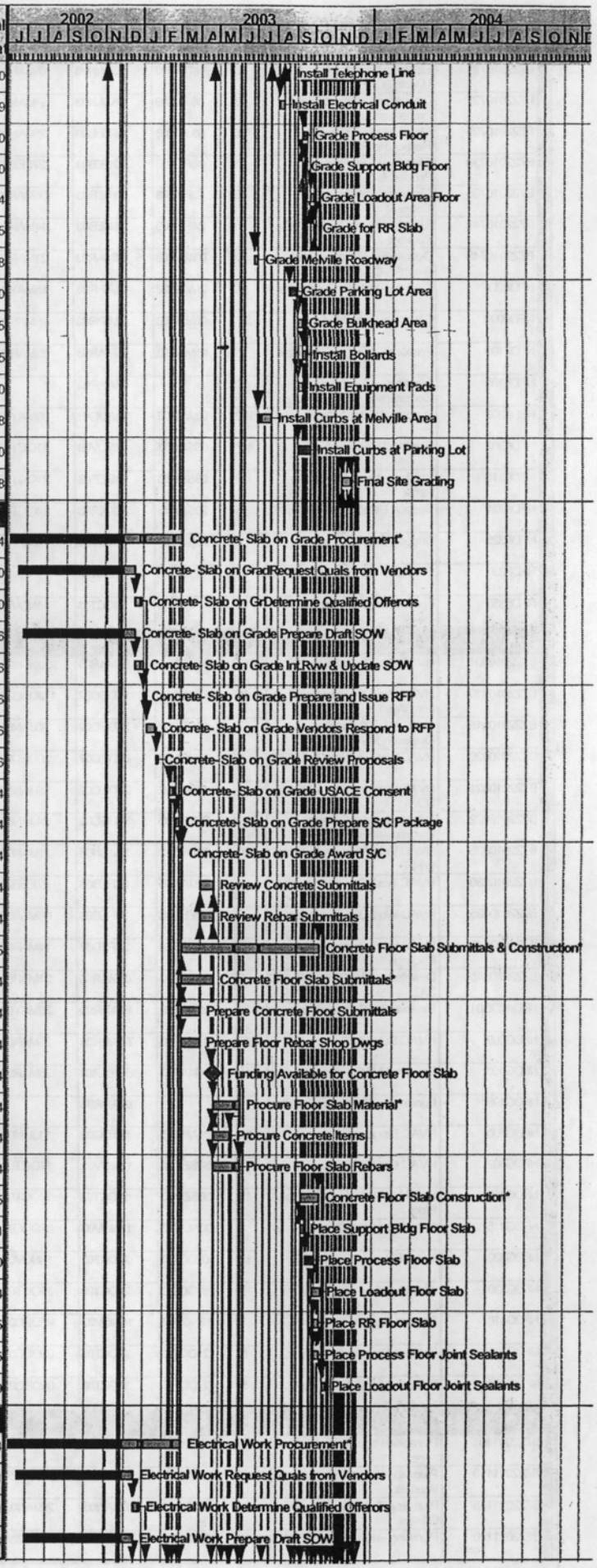
Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Late Start	Late Finish	Total Float
NFDD550	Install Telephone Line	2	18AUG03	19AUG03	18AUG03	19AUG03	0
NFDD560	Install Electrical Conduit	5	05AUG03	11AUG03	14OCT03	20OCT03	49
NFDD601	Grade Process Floor	5	11SEP03	17SEP03	11SEP03	17SEP03	0
DD603	Grade Support Bldg Floor	2	09SEP03	10SEP03	09SEP03	10SEP03	0
NFDD604	Grade Loadout Area Floor	5	22SEP03	26SEP03	26SEP03	02OCT03	4
NFDD607	Grade for RR Slab	3	29SEP03	01OCT03	06OCT03	08OCT03	5
NFDD621	Grade Melville Roadway	4	25JUN03	30JUN03	05AUG03	08AUG03	28
NFDD623	Grade Parking Lot Area	8	20AUG03	29AUG03	20AUG03	29AUG03	0
NFDD625	Grade Bulkhead Area	6	02SEP03	09SEP03	09SEP03	16SEP03	5
NFDD650	Install Bollards	4	10SEP03	15SEP03	17SEP03	22SEP03	5
NFDD670	Install Equipment Pads	5	02SEP03	08SEP03	14OCT03	20OCT03	30
NFDD701	Install Curbs at Melville Area	15	01JUL03	22JUL03	11AUG03	29AUG03	28
NFDD703	Install Curbs at Parking Lot	15	02SEP03	22SEP03	02SEP03	22SEP03	0
NFDD800	Final Site Grading	10	11NOV03	24NOV03	09DEC03	22DEC03	18
CONCRETE FLOOR SLAB SUBCONTRACT							
B722010601	Concrete- Slab on Grade	189*	03JUN02A	03MAR03	03JUN02A	16JUN03	74
B722010610	Concrete- Slab on	15	17JUN02A	17DEC02	17JUN02A	25APR03	90
B722010615	Concrete- Slab on GrDetermine	7	18DEC02	27DEC02	28APR03	06MAY03	90
B722010620	Concrete- Slab on Grade	9	24JUN02A	17DEC02	24JUN02A	21APR03	86
B722010621	Concrete- Slab on Grade	8	18DEC02	30DEC02	22APR03	01MAY03	86
B722010622	Concrete- Slab on Grade	3	31DEC02	03JAN03	02MAY03	06MAY03	86
B722010625	Concrete- Slab on Grade	10	06JAN03	17JAN03	07MAY03	20MAY03	86
B722010630	Concrete- Slab on Grade	5	20JAN03	24JAN03	21MAY03	28MAY03	86
B722010635	Concrete- Slab on Grade	6	12FEB03	20FEB03	29MAY03	05JUN03	74
B722010640	Concrete- Slab on Grade	5	21FEB03	27FEB03	06JUN03	12JUN03	74
22010645	Concrete- Slab on Grade Award	2	28FEB03	03MAR03	13JUN03	16JUN03	74
NFDA2DE01	Review Concrete Submittals	15	01APR03	21APR03	16JUL03	05AUG03	74
NFDA2DE02	Review Rebar Submittals	15	01APR03	21APR03	16JUL03	05AUG03	74
NFDE098	Concrete Floor Slab Submittals	154*	04MAR03	08OCT03	17JUN03	29OCT03	15
NFDE099	Concrete Floor Slab	35*	04MAR03	21APR03	17JUN03	05AUG03	74
NFDE100	Prepare Concrete Floor	20	04MAR03	31MAR03	17JUN03	15JUL03	74
NFDE110	Prepare Floor Rebar Shop	20	04MAR03	31MAR03	17JUN03	15JUL03	74
NFDE195	Funding Available for Concrete	0		21APR03		05AUG03	74
NFDE199	Procure Floor Slab Material*	30*	22APR03	03JUN03	06AUG03	17SEP03	74
NFDE200	Procure Concrete Items	20	22APR03	19MAY03	20AUG03	17SEP03	84
NFDE202	Procure Floor Slab Rebars	30	22APR03	03JUN03	06AUG03	17SEP03	74
NFDE302	Concrete Floor Slab	20*	11SEP03	08OCT03	26SEP03	29OCT03	15
NFDE310	Place Support Bldg Floor Slab	3	11SEP03	15SEP03	26SEP03	30SEP03	11
NFDE320	Place Process Floor Slab	10	18SEP03	01OCT03	18SEP03	01OCT03	0
NFDE330	Place Loadout Floor Slab	10	29SEP03	10OCT03	03OCT03	16OCT03	4
NFDE340	Place RR Floor Slab	6	02OCT03	09OCT03	09OCT03	16OCT03	5
NFDE410	Place Process Floor Joint	5	02OCT03	08OCT03	23OCT03	29OCT03	15
NFDE430	Place Loadout Floor Joint	5	13OCT03	17OCT03	07NOV03	13NOV03	19
ELECTRICAL SUBCONTRACT							
B722010701	Electrical Work Procurement*	190*	03JUN02A	04MAR03	03JUN02A	24MAR03	14
B722010710	Electrical Work Request Quals	15	17JUN02A	17DEC02	17JUN02A	17JAN03	21
22010715	Electrical Work Determine	7	18DEC02	27DEC02	20JAN03	28JAN03	21
722010720	Electrical Work Prepare Draft	9	01JUL02A	17DEC02	01JUL02A	08JAN03	14



Start Date	01MAR94	Early Bar	
Finish Date	06JUL11	Progress Bar	
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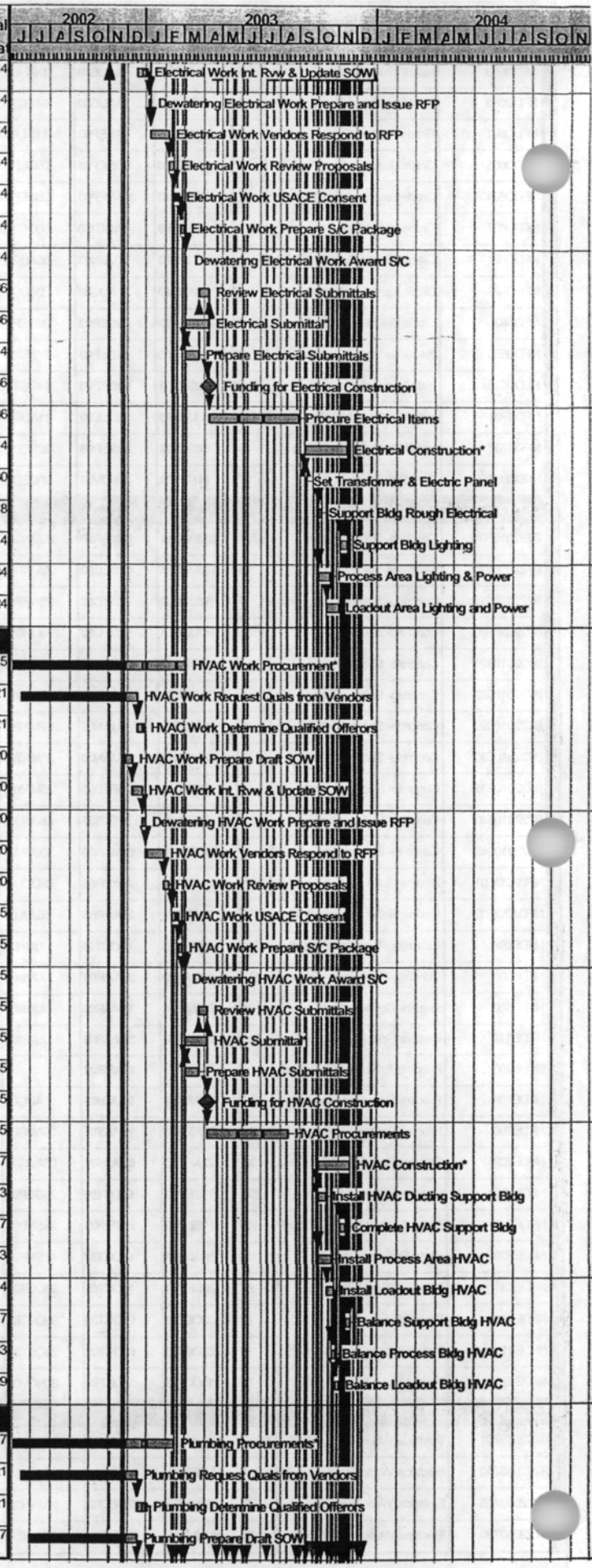
B722010721	Electrical Work Int. Rvw & Update SOW	8	18DEC02	03JAN03	09JAN03	23JAN03	14
B722010722	Dewatering Electrical Work Prepare and Issue RFP	3	06JAN03	08JAN03	24JAN03	28JAN03	14
B722010725	Electrical Work Vendors Respond to RFP	20	09JAN03	05FEB03	29JAN03	26FEB03	14
B722010730	Electrical Work Review Proposals	5	06FEB03	12FEB03	27FEB03	05MAR03	14
B722010735	Electrical Work USACE Consent	6	13FEB03	21FEB03	06MAR03	13MAR03	14
B722010740	Electrical Work Prepare S/C Package	5	24FEB03	28FEB03	14MAR03	20MAR03	14
B722010745	Dewatering Electrical Work Award S/C	2	03MAR03	04MAR03	21MAR03	24MAR03	14
NFDA2DF	Review Electrical Submittals	10	26MAR03	08APR03	15MAY03	29MAY03	36
NFDF099	Electrical Submittal*	25*	05MAR03	08APR03	25MAR03	29MAY03	36
NFDF100	Prepare Electrical Submittals	15	05MAR03	25MAR03	25MAR03	14APR03	14
NFDF195	Funding for Electrical Construction	0		08APR03		29MAY03	36
NFDF200	Procure Electrical Items	100	09APR03	28AUG03	30MAY03	20OCT03	36
NFDF302	Electrical Construction*	49*	09SEP03	14NOV03	21OCT03	08DEC03	14
NFDF310	Set Transformer & Electric Panel	3	09SEP03	11SEP03	21OCT03	23OCT03	30
NFDF321	Support Bldg Rough Electrical	5	30SEP03	06OCT03	24OCT03	30OCT03	18
NFDF325	Support Bldg Lighting	8	05NOV03	14NOV03	25NOV03	08DEC03	14
NFDF330	Process Area Lighting & Power	12	02OCT03	17OCT03	19NOV03	08DEC03	34
NFDF350	Loadout Area Lighting and Power	15	13OCT03	31OCT03	14NOV03	08DEC03	24
HVAC SUBCONTRACT							
B722010801	HVAC Work Procurement*	189*	03JUN02A	03MAR03	03JUN02A	24MAR03	15
B722010810	HVAC Work Request Quals from Vendors	15	17JUN02A	17DEC02	17JUN02A	17JAN03	21
B722010815	HVAC Work Determine Qualified Offerors	7	18DEC02	27DEC02	20JAN03	28JAN03	21
B722010820	HVAC Work Prepare Draft SOW	9	25NOV02	09DEC02	26DEC02	08JAN03	20
B722010821	HVAC Work Int. Rvw & Update SOW	8	10DEC02	24DEC02	09JAN03	23JAN03	20
B722010822	Dewatering HVAC Work Prepare and Issue RFP	3	26DEC02	30DEC02	24JAN03	28JAN03	20
B722010825	HVAC Work Vendors Respond to RFP	20	31DEC02	28JAN03	29JAN03	26FEB03	20
B722010830	HVAC Work Review Proposals	5	29JAN03	04FEB03	27FEB03	05MAR03	20
B722010835	HVAC Work USACE Consent	6	12FEB03	20FEB03	06MAR03	13MAR03	15
B722010840	HVAC Work Prepare S/C Package	5	21FEB03	27FEB03	14MAR03	20MAR03	15
B722010845	Dewatering HVAC Work Award S/C	2	28FEB03	03MAR03	21MAR03	24MAR03	15
NFDA2DG01	Review HVAC Submittals	10	25MAR03	07APR03	28MAY03	10JUN03	45
NFDG099	HVAC Submittal*	25*	04MAR03	07APR03	25MAR03	10JUN03	45
NFDG100	Prepare HVAC Submittals	15	04MAR03	24MAR03	25MAR03	14APR03	15
NFDG195	Funding for HVAC Construction	0		07APR03		10JUN03	45
NFDG200	HVAC Procurements	90	08APR03	13AUG03	11JUN03	16OCT03	45
NFDG302	HVAC Construction*	36*	30SEP03	18NOV03	17OCT03	15DEC03	17
NFDG310	Install HVAC Ducting Support Bldg	11	30SEP03	14OCT03	17OCT03	31OCT03	13
NFDG315	Complete HVAC Support Bldg	5	05NOV03	11NOV03	02DEC03	08DEC03	17
NFDG320	Install Process Area HVAC	13	02OCT03	20OCT03	18NOV03	08DEC03	33
NFDG330	Install Loadout Bldg HVAC	10	13OCT03	24OCT03	31OCT03	13NOV03	14
NFDG410	Balance Support Bldg HVAC	5	12NOV03	18NOV03	09DEC03	15DEC03	17
NFDG420	Balance Process Bldg HVAC	5	21OCT03	27OCT03	09DEC03	15DEC03	33
NFDG430	Balance Loadout Bldg HVAC	5	27OCT03	31OCT03	09DEC03	15DEC03	29
PLUMBING SUBCONTRACT							
B722011101	Plumbing Procurements*	179*	03JUN02A	14FEB03	03JUN02A	12MAR03	17
B722011110	Plumbing Request Quals from Vendors	15	17JUN02A	17DEC02	17JUN02A	17JAN03	21
B722011115	Plumbing Determine Qualified Offerors	10	18DEC02	02JAN03	20JAN03	31JAN03	21
B722011120	Plumbing Prepare Draft SOW	9	01JUL02A	17DEC02	01JUL02A	13JAN03	17



Start Date	01MAR94	Early Bar	
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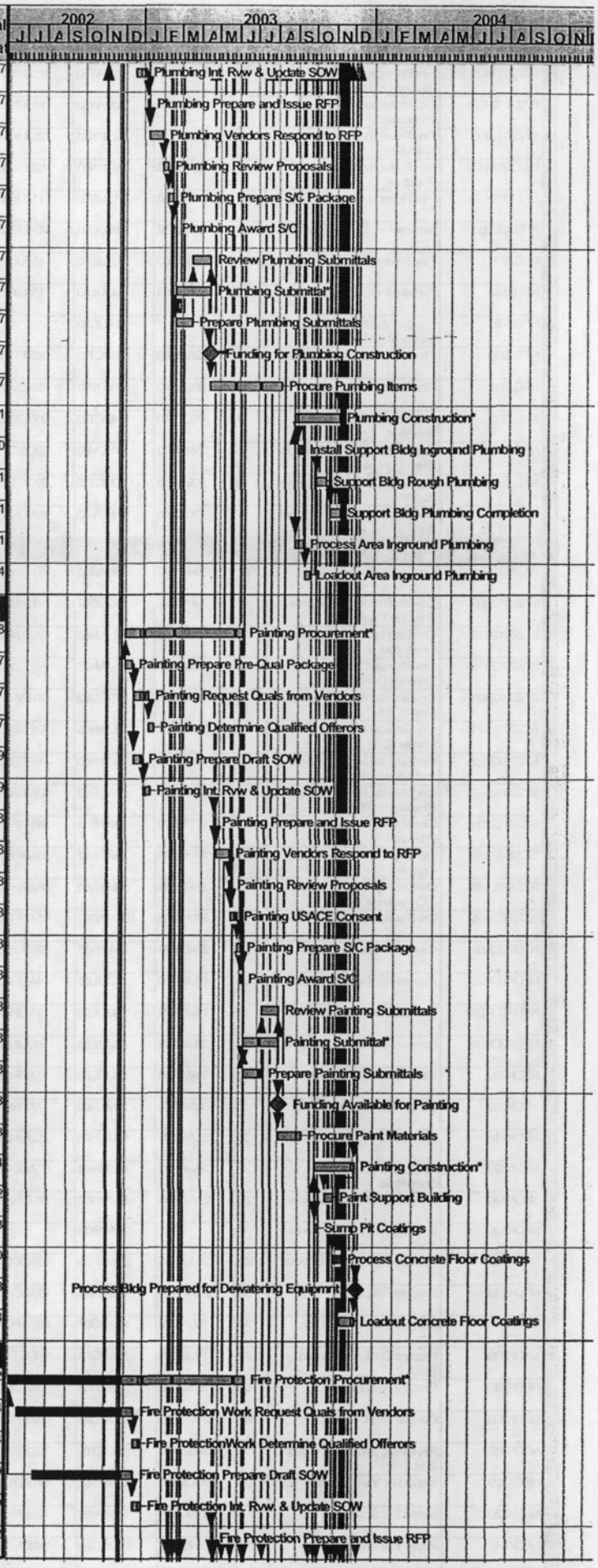
Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Late Start	Late Finish	Total Float
B722011121	Plumbing Int. Rvw & Update SOW	8	18DEC02	03JAN03	14JAN03	28JAN03	17
B722011122	Plumbing Prepare and Issue RFP	3	06JAN03	08JAN03	29JAN03	31JAN03	17
B722011125	Plumbing Vendors Respond to RFP	15	09JAN03	29JAN03	03FEB03	24FEB03	17
22011130	Plumbing Review Proposals	5	30JAN03	05FEB03	25FEB03	03MAR03	17
22011140	Plumbing Prepare S/C Package	5	06FEB03	12FEB03	04MAR03	10MAR03	17
B722011145	Plumbing Award S/C	2	13FEB03	14FEB03	11MAR03	12MAR03	17
NFDA2DH01	Review Plumbing Submittals	20	18MAR03	14APR03	10APR03	07MAY03	17
NFDH099	Plumbing Submittal*	40*	18FEB03	14APR03	13MAR03	07MAY03	17
NFDH100	Prepare Plumbing Submittals	20	18FEB03	17MAR03	13MAR03	09APR03	17
NFDH195	Funding for Plumbing Construction	0		14APR03		07MAY03	17
NFDH200	Procure Plumbing Items	80	15APR03	06AUG03	08MAY03	29AUG03	17
NFDH302	Plumbing Construction*	49*	28AUG03	05NOV03	29AUG03	20NOV03	11
NFDH310	Install Support Bldg Inground Plumbing	5	02SEP03	08SEP03	02SEP03	08SEP03	0
NFDH312	Support Bldg Rough Plumbing	12	30SEP03	15OCT03	15OCT03	30OCT03	11
NFDH315	Support Bldg Plumbing Completion	10	23OCT03	05NOV03	07NOV03	20NOV03	11
NFDH340	Process Area Inground Plumbing	8	28AUG03	09SEP03	29AUG03	10SEP03	1
NFDH360	Loadout Area Inground Plumbing	6	12SEP03	19SEP03	18SEP03	25SEP03	4
PAINTING SUBCONTRACT							
B722011201	Painting Procurement*	131*	02DEC02	06JUN03	05MAY03	31JUL03	38
B722011205	Painting Prepare Pre-Qual Package	10	02DEC02*	13DEC02	05MAY03	16MAY03	107
B722011210	Painting Request Quals from Vendors	15	16DEC02	07JAN03	19MAY03	09JUN03	107
B722011215	Painting Determine Qualified Offerors	7	08JAN03	16JAN03	10JUN03	18JUN03	107
B722011220	Painting Prepare Draft SOW	9	16DEC02	27DEC02	21MAY03	03JUN03	109
B722011221	Painting Int. Rvw & Update SOW	8	30DEC02	09JAN03	04JUN03	13JUN03	109
B722011222	Painting Prepare and Issue RFP	3	22APR03	24APR03	16JUN03	18JUN03	38
2011225	Painting Vendors Respond to RFP	15	25APR03	15MAY03	19JUN03	10JUL03	38
B722011230	Painting Review Proposals	2	16MAY03	19MAY03	11JUL03	14JUL03	38
B722011235	Painting USACE Consent	6	20MAY03	28MAY03	15JUL03	22JUL03	38
B722011240	Painting Prepare S/C Package	5	29MAY03	04JUN03	23JUL03	29JUL03	38
B722011245	Painting Award S/C	2	05JUN03	06JUN03	30JUL03	31JUL03	38
NFDA2DI01	Review Painting Submittals	20	08JUL03	04AUG03	29AUG03	26SEP03	38
NFDI009	Painting Submittal*	40*	09JUN03	04AUG03	01AUG03	26SEP03	38
NFDI100	Prepare Painting Submittals	20	09JUN03	07JUL03	01AUG03	28AUG03	38
NFDI195	Funding Available for Painting	0		04AUG03		26SEP03	38
NFDI200	Procure Paint Materials	25	05AUG03	09SEP03	29SEP03	31OCT03	38
NFDI302	Painting Construction*	44*	30SEP03	02DEC03	02DEC03	08DEC03	4
NFDI310	Paint Support Building	9	16OCT03	28OCT03	03NOV03	13NOV03	12
NFDI340	Sump Pit Coatings	5	30SEP03	06OCT03	02DEC03	08DEC03	43
NFDI350	Process Concrete Floor Coatings	10	30OCT03	12NOV03	30OCT03	12NOV03	0
NFDI351	Process Bldg Prepared for Dewatering Equipmnt	0		05DEC03		21NOV03*	-8
NFDI360	Loadout Concrete Floor Coatings	15	10NOV03	02DEC03	14NOV03	08DEC03	4
FIRE SAFETY SUBCONTRACT							
B722012401	Fire Protection Procurement*	260*	03JUN02A	11JUN03	03JUN02A	14JUL03	22
B722012410	Fire Protection Work Request Quals from Vendors	15	17JUN02A	17DEC02	17JUN02A	15MAY03	104
B722012415	Fire ProtectionWork Determine Qualified Offerors	7	18DEC02	27DEC02	16MAY03	27MAY03	104
B722012420	Fire Protection Prepare Draft SOW	9	12JUL02A	17DEC02	12JUL02A	09MAY03	100
2012421	Fire Protection Int. Rvw. & Update SOW	8	18DEC02	30DEC02	12MAY03	21MAY03	100
2012422	Fire Protection Prepare and Issue RFP	3	22APR03	24APR03	22MAY03	27MAY03	22



Start Date	01MAR94	Early Bar	
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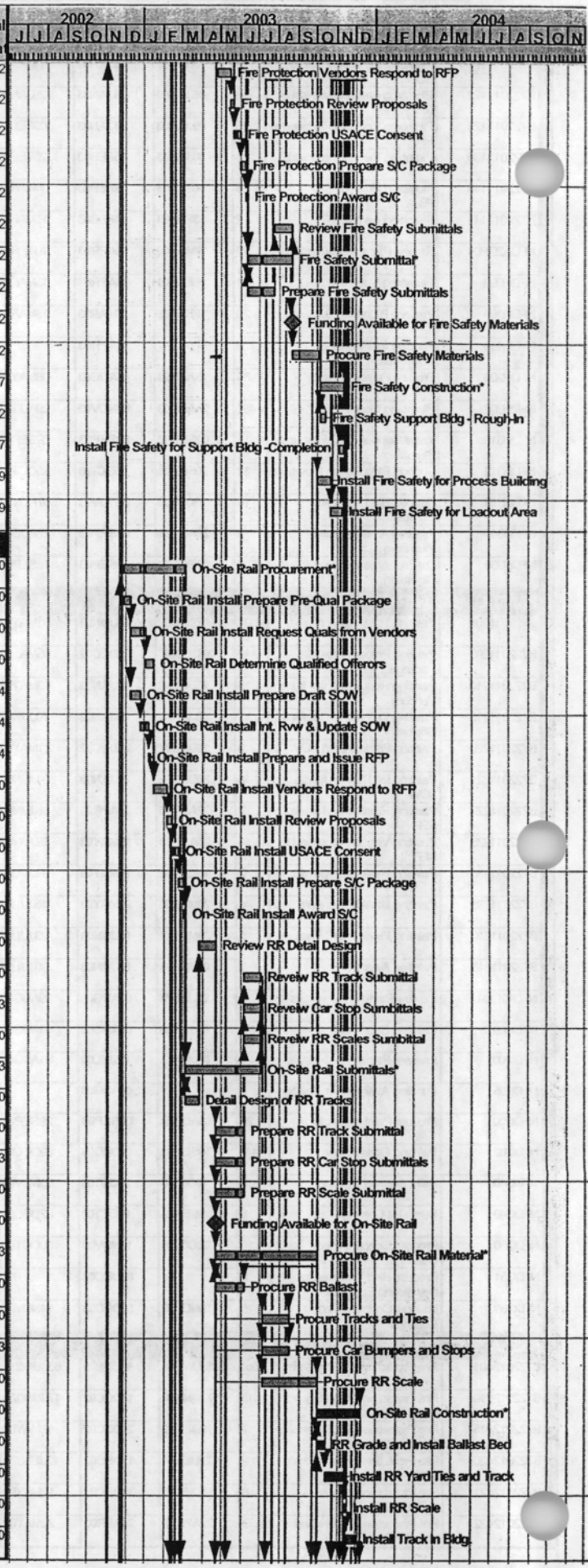
Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Late Start	Late Finish	Total Float
B722012425	Fire Protection Vendors Respond to RFP	15	25APR03	15MAY03	28MAY03	17JUN03	22
B722012430	Fire Protection Review Proposals	5	16MAY03	22MAY03	18JUN03	24JUN03	22
B722012435	Fire Protection USACE Consent	6	23MAY03	02JUN03	25JUN03	02JUL03	22
B722012440	Fire Protection Prepare S/C Package	5	03JUN03	09JUN03	03JUL03	10JUL03	22
B722012445	Fire Protection Award S/C	2	10JUN03	11JUN03	11JUL03	14JUL03	22
NFDA2DJ01	Review Fire Safety Submittals	20	25JUL03	21AUG03	26AUG03	23SEP03	22
NFDJ099	Fire Safety Submittal*	50*	12JUN03	21AUG03	15JUL03	23SEP03	22
NFDJ100	Prepare Fire Safety Submittals	30	12JUN03	24JUL03	15JUL03	25AUG03	22
NFDJ195	Funding Available for Fire Safety Materials	0		21AUG03		23SEP03	22
NFDJ200	Procure Fire Safety Materials	30	22AUG03	03OCT03	24SEP03	04NOV03	22
NFDJ302	Fire Safety Construction*	27*	06OCT03	11NOV03	05NOV03	08DEC03	17
NFDJ312	Fire Safety Support Bldg - Rough-In	7	06OCT03	14OCT03	05NOV03	13NOV03	22
NFDJ315	Install Fire Safety for Support Bldg -Completion	5	05NOV03	11NOV03	02DEC03	08DEC03	17
NFDJ340	Install Fire Safety for Process Building	15	02OCT03	22OCT03	29OCT03	18NOV03	19
NFDJ360	Install Fire Safety for Loadout Area	12	23OCT03	07NOV03	19NOV03	08DEC03	19
RAIL ROAD SUBCONTRACT							
B722012301	On-Site Rail Procurement*	68*	25NOV02	05MAR03	10JAN03	16APR03	30
B722012305	On-Site Rail Install Prepare Pre-Qual Package	10	25NOV02	10DEC02	10JAN03	23JAN03	30
B722012310	On-Site Rail Install Request Quals from Vendors	15	11DEC02	02JAN03	24JAN03	13FEB03	30
B722012315	On-Site Rail Determine Qualified Offerors	10	03JAN03	16JAN03	14FEB03	28FEB03	30
B722012320	On-Site Rail Install Prepare Draft SOW	10	11DEC02	24DEC02	30JAN03	12FEB03	34
B722012321	On-Site Rail Install Int. Rvw & Update SOW	8	26DEC02	07JAN03	13FEB03	25FEB03	34
B722012322	On-Site Rail Install Prepare and Issue RFP	3	08JAN03	10JAN03	26FEB03	28FEB03	34
B722012325	On-Site Rail Install Vendors Respond to RFP	15	17JAN03	06FEB03	03MAR03	21MAR03	30
B722012330	On-Site Rail Install Review Proposals	5	07FEB03	13FEB03	24MAR03	28MAR03	30
B722012335	On-Site Rail Install USACE Consent	6	14FEB03	24FEB03	31MAR03	07APR03	30
B722012340	On-Site Rail Install Prepare S/C Package	5	25FEB03	03MAR03	08APR03	14APR03	30
B722012345	On-Site Rail Install Award S/C	2	04MAR03	05MAR03	15APR03	16APR03	30
NFDA2DK01	Review RR Detail Design	20	27MAR03	23APR03	08MAY03	05JUN03	30
NFDA2DK02	Reveiw RR Track Submittal	20	06JUN03	03JUL03	04AUG03	29AUG03	40
NFDA2DK03	Reveiw Car Stop Sumbittals	20	06JUN03	03JUL03	19SEP03	16OCT03	73
NFDA2DK04	Reveiw RR Scales Sumbittal	20	06JUN03	03JUL03	21JUL03	15AUG03	30
NFDK099	On-Site Rail Submittals*	85*	06MAR03	03JUL03	17APR03	16OCT03	73
NFDK100	Detail Design of RR Tracks	15	06MAR03	26MAR03	17APR03	07MAY03	30
NFDK110	Prepare RR Track Submittal	30	24APR03	05JUN03	20JUN03	01AUG03	40
NFDK120	Prepare RR Car Stop Submittals	30	24APR03	05JUN03	07AUG03	18SEP03	73
NFDK130	Prepare RR Scale Submittal	30	24APR03	05JUN03	06JUN03	18JUL03	30
NFDK195	Funding Available for On-Site Rail	0		23APR03		15AUG03	80
NFDK200	Procure On-Site Rail Material*	110*	24APR03	29SEP03	18AUG03	01DEC03	43
NFDK210	Procure RR Ballast	30	24APR03	05JUN03	18AUG03	29SEP03	80
NFDK220	Procure Tracks and Ties	30	07JUL03	15AUG03	02SEP03	13OCT03	40
NFDK230	Procure Car Bumpers and Stops	30	07JUL03	15AUG03	17OCT03	01DEC03	73
NFDK240	Procure RR Scale	60	07JUL03	29SEP03	18AUG03	10NOV03	30
NFDK302	On-Site Rail Construction*	48*	30SEP03	08DEC03	30SEP03	08DEC03	0
NFDK310	RR Grade and Install Ballast Bed	10	30SEP03	13OCT03	30SEP03	13OCT03	0
NFDK320	Install RR Yard Ties and Track	20	14OCT03	10NOV03	14OCT03	10NOV03	0
NFDK330	Install RR Scale	5	11NOV03	17NOV03	11NOV03	17NOV03	0
NFDK340	Install Track In Bldg.	8	18NOV03	01DEC03	18NOV03	01DEC03	0



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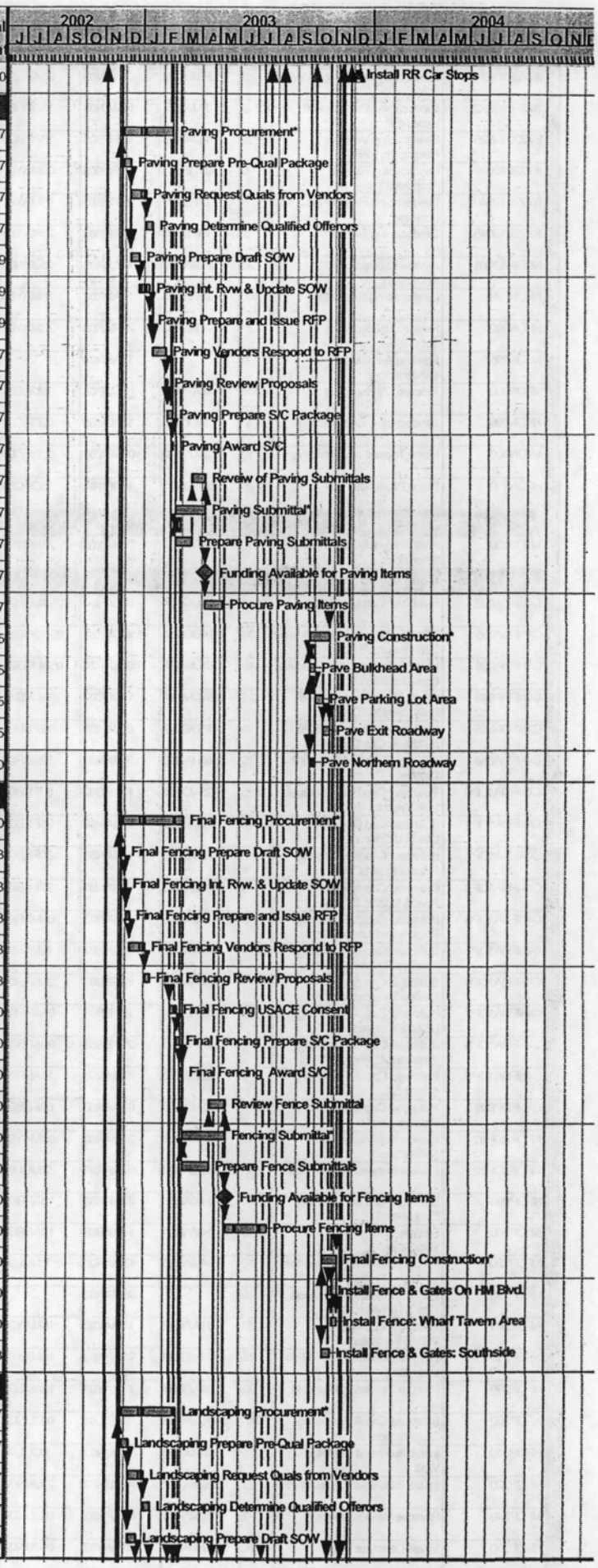
NFDK350	Install RR Car Stops	5	02DEC03	08DEC03	02DEC03	08DEC03	0
PAVING SUBCONTRACT							
B722011001	Paving Procurement*	56*	25NOV02	14FEB03	16APR03	03JUL03	97
22011005	Paving Prepare Pre-Qual	10	25NOV02	10DEC02	16APR03	29APR03	97
722011010	Paving Request Quals from	15	11DEC02	02JAN03	30APR03	20MAY03	97
B722011015	Paving Determine Qualified	7	03JAN03	13JAN03	21MAY03	30MAY03	97
B722011020	Paving Prepare Draft SOW	9	11DEC02	23DEC02	02MAY03	14MAY03	99
B722011021	Paving Int. Rvw & Update SOW	8	24DEC02	06JAN03	15MAY03	27MAY03	99
B722011022	Paving Prepare and Issue RFP	3	07JAN03	09JAN03	28MAY03	30MAY03	99
B722011025	Paving Vendors Respond to	15	14JAN03	03FEB03	02JUN03	20JUN03	97
B722011030	Paving Review Proposals	2	04FEB03	05FEB03	23JUN03	24JUN03	97
B722011040	Paving Prepare S/C Package	5	06FEB03	12FEB03	25JUN03	01JUL03	97
B722011045	Paving Award S/C	2	13FEB03	14FEB03	02JUL03	03JUL03	97
NFDA2DL01	Reveiw of Paving Submittals	15	18MAR03	07APR03	04AUG03	22AUG03	97
NFDL099	Paving Submittal*	35*	18FEB03	07APR03	07JUL03	22AUG03	97
NFDL100	Prepare Paving Submittals	20	18FEB03	17MAR03	07JUL03	01AUG03	97
NFDL195	Funding Available for Paving	0		07APR03		22AUG03	97
NFDL200	Procure Paving Items	20	08APR03	05MAY03	25AUG03	22SEP03	97
NFDL302	Paving Construction*	23*	23SEP03	23OCT03	23SEP03	01DEC03	25
NFDL310	Pave Bulkhead Area	5	23SEP03	29SEP03	28OCT03	03NOV03	25
NFDL320	Pave Parking Lot Area	10	30SEP03	13OCT03	04NOV03	17NOV03	25
NFDL330	Pave Exit Roadway	8	14OCT03	23OCT03	18NOV03	01DEC03*	25
NFDL340	Pave Northern Roadway	5	23SEP03	29SEP03	23SEP03	29SEP03	0
FENCING SUBCONTRACT							
B722012501	Final Fencing Procurement*	66*	25NOV02	03MAR03	08MAY03	09JUL03	90
22012520	Final Fencing Prepare Draft	4	25NOV02	02DEC02	08MAY03	13MAY03	113
B722012521	Final Fencing Int. Rvw. &	3	03DEC02	05DEC02	14MAY03	16MAY03	113
B722012522	Final Fencing Prepare and	3	06DEC02	10DEC02	19MAY03	21MAY03	113
B722012525	Final Fencing Vendors	15	11DEC02	02JAN03	22MAY03	12JUN03	113
B722012530	Final Fencing Review	5	03JAN03	09JAN03	13JUN03	19JUN03	113
B722012535	Final Fencing USACE Consent	6	12FEB03	20FEB03	20JUN03	27JUN03	90
B722012540	Final Fencing Prepare S/C	5	21FEB03	27FEB03	30JUN03	07JUL03	90
B722012545	Final Fencing Award S/C	2	28FEB03	03MAR03	08JUL03	09JUL03	90
NFDA2DM01	Review Fence Submittal	20	15APR03	12MAY03	21AUG03	18SEP03	90
NFDM099	Fencing Submittal*	50*	04MAR03	12MAY03	10JUL03	18SEP03	90
NFDM100	Prepare Fence Submittals	30	04MAR03	14APR03	10JUL03	20AUG03	90
NFDM195	Funding Available for Fencing	0		12MAY03		18SEP03	90
NFDM200	Procure Fencing Items	45	13MAY03	16JUL03	19SEP03	20NOV03	90
NFDM302	Final Fencing Construction*	18*	14OCT03	06NOV03	21NOV03	22DEC03	30
NFDM310	Install Fence & Gates On HM	5	24OCT03	30OCT03	09DEC03	15DEC03	30
NFDM320	Install Fence: Wharf Tavern	5	31OCT03	06NOV03	16DEC03	22DEC03	30
NFDM330	Install Fence & Gates:	10	14OCT03	27OCT03	21NOV03	08DEC03	28
LANDSCAPING SUBCONTRACT							
B722010901	Landscaping Procurement*	59*	25NOV02	20FEB03	05MAR03	27MAY03	67
B722010905	Landscaping Prepare Pre-Qual	10	25NOV02	10DEC02	05MAR03	18MAR03	67
B722010910	Landscaping Request Quals	15	11DEC02	02JAN03	19MAR03	08APR03	67
722010915	Landscaping Determine	7	03JAN03	13JAN03	09APR03	17APR03	67
22010920	Landscaping Prepare Draft	9	11DEC02	23DEC02	21MAR03	02APR03	69



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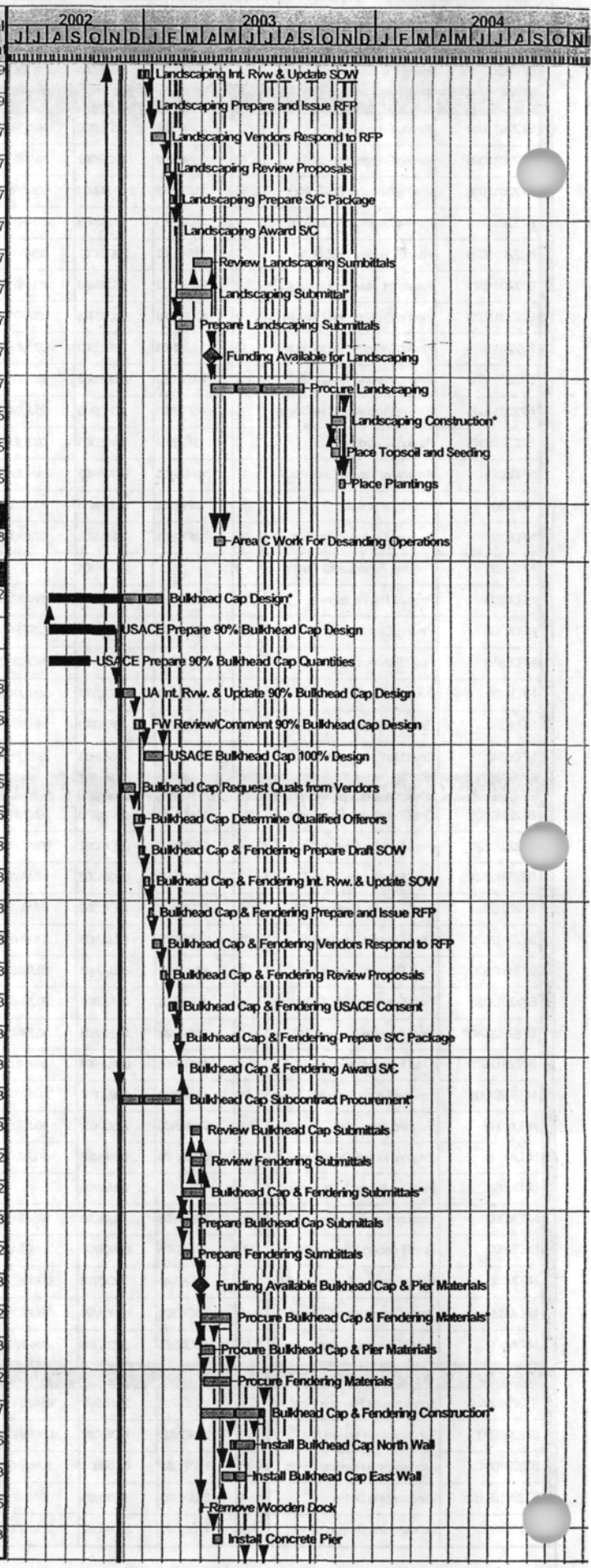
B722010921	Landscaping Int. Rvw & Update SOW	8	24DEC02	06JAN03	03APR03	14APR03	69
B722010922	Landscaping Prepare and Issue RFP	3	07JAN03	09JAN03	15APR03	17APR03	69
B722010925	Landscaping Vendors Respond to RFP	15	14JAN03	03FEB03	18APR03	08MAY03	67
B722010930	Landscaping Review Proposals	5	04FEB03	10FEB03	09MAY03	15MAY03	67
B722010940	Landscaping Prepare S/C Package	5	11FEB03	18FEB03	16MAY03	22MAY03	67
B722010945	Landscaping Award S/C	2	19FEB03	20FEB03	23MAY03	27MAY03	67
NFDA2DN01	Review Landscaping Sumbittals	20	21MAR03	17APR03	25JUN03	23JUL03	67
NFDN099	Landscaping Submittal*	40*	21FEB03	17APR03	28MAY03	23JUL03	67
NFDN100	Prepare Landscaping Submittals	20	21FEB03	20MAR03	28MAY03	24JUN03	67
NFDN195	Funding Available for Landscaping	0		17APR03		23JUL03	67
NFDN200	Procure Landscaping	100	18APR03	09SEP03	24JUL03	15DEC03	67
NFDN299	Landscaping Construction*	15*	24OCT03	13NOV03	02DEC03	22DEC03	25
NFDN300	Place Topsoil and Seeding	10	24OCT03	06NOV03	02DEC03	15DEC03	25
NFDN310	Place Plantings	5	07NOV03	13NOV03	16DEC03	22DEC03	25
AREA C WORK FOR DESANDING							
NFDC000	Area C Work For Desanding Operations	10	24APR03	07MAY03	21NOV03	08DEC03	148
BULKHEAD CAP AND FENDERING							
C4NFDA032	Bulkhead Cap Design*	124*	05AUG02A	30JAN03	05AUG02A	15APR03	52
C4NFDA035	USACE Prepare 90% Bulkhead Cap Design	30	05AUG02A	15NOV02A	05AUG02A	15NOV02A	
C4NFDA036	USACE Prepare 90% Bulkhead Cap Quantities	40	05AUG02A	08OCT02A	05AUG02A	08OCT02A	
C4NFDA040	UA Int. Rvw. & Update 90% Bulkhead Cap Design	20	18NOV02A	17DEC02	18NOV02A	11FEB03	38
C4NFDA045	FW Review/Comment 90% Bulkhead Cap Design	10	18DEC02	02JAN03	12FEB03	26FEB03	38
C4NFDA050	USACE Bulkhead Cap 100% Design	20	03JAN03	30JAN03	19MAR03	15APR03	52
C4NFDA1DP0	Bulkhead Cap Request Quals from Vendors	15	25NOV02	17DEC02	03FEB03	24FEB03	46
C4NFDA1DP1	Bulkhead Cap Determine Qualified Offerors	10	18DEC02	02JAN03	25FEB03	10MAR03	46
C4NFDA1DP2	Bulkhead Cap & Fendering Prepare Draft SOW	5	26DEC02	02JAN03	20FEB03	26FEB03	38
C4NFDA1DP3	Bulkhead Cap & Fendering Int. Rvw. & Update SOW	5	03JAN03	09JAN03	27FEB03	05MAR03	38
C4NFDA1DP4	Bulkhead Cap & Fendering Prepare and Issue RFP	3	10JAN03	14JAN03	06MAR03	10MAR03	38
C4NFDA1DP5	Bulkhead Cap & Fendering Vendors Respond to RFP	10	15JAN03	28JAN03	11MAR03	24MAR03	38
C4NFDA1DP6	Bulkhead Cap & Fendering Review Proposals	5	29JAN03	04FEB03	25MAR03	31MAR03	38
C4NFDA1DP7	Bulkhead Cap & Fendering USACE Consent	6	12FEB03	20FEB03	01APR03	08APR03	33
C4NFDA1DP8	Bulkhead Cap & Fendering Prepare S/C Package	5	21FEB03	27FEB03	09APR03	15APR03	33
C4NFDA1DP9	Bulkhead Cap & Fendering Award S/C	2	28FEB03	03MAR03	16APR03	17APR03	33
C4NFDP009	Bulkhead Cap Subcontract Procurement*	66*	25NOV02	03MAR03	03FEB03	17APR03	33
NFDA2DP01	Review Bulkhead Cap Submittals	10	18MAR03	31MAR03	02MAY03	15MAY03	33
NFDA2DP02	Review Fendering Submittals	15	18MAR03	07APR03	28JUL03	15AUG03	92
NFDP099	Bulkhead Cap & Fendering Submittals*	25*	04MAR03	07APR03	18APR03	15AUG03	92
NFDP100	Prepare Bulkhead Cap Submittals	10	04MAR03	17MAR03	18APR03	01MAY03	33
NFDP120	Prepare Fendering Sumbittals	10	04MAR03	17MAR03	14JUL03	25JUL03	92
NFDP195	Funding Available Bulkhead Cap & Pier Materials	0		31MAR03		15MAY03	33
NFDP201	Procure Bulkhead Cap & Fendering Materials*	35*	01APR03	19MAY03	16MAY03	29SEP03	92
NFDP210	Procure Bulkhead Cap & Pier Materials	15	01APR03	21APR03	16MAY03	06JUN03	33
NFDP240	Procure Fendering Materials	30	08APR03	19MAY03	18AUG03	29SEP03	92
NFDP302	Bulkhead Cap & Fendering Construction*	70*	01APR03	09JUL03	04JUN03	27OCT03	77
NFDP310	Install Bulkhead Cap North Wall	25	20MAY03	24JUN03	11JUL03	14AUG03	36
NFDP320	Install Bulkhead Cap East Wall	25	06MAY03	10JUN03	23JUN03	28JUL03	33
NFDP340	Remove Wooden Dock	3	01APR03	03APR03	04JUN03	06JUN03	45
NFDP350	Install Concrete Pier	10	22APR03	05MAY03	09JUN03	20JUN03	33



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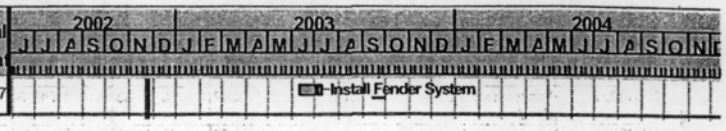
NFDP400	Install Fender System	20	11JUN03	09JUL03	30SEP03	27OCT03	77



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