RETURN TO SER AR INDEX

State Enhanced Remedy in New Bedford South Terminal

Submitted by the Massachusetts Department of Environmental Protection

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State Enhanced Remedy in New Bedford, South Terminal

The Massachusetts Department of Environmental Protection (the Department) submits the following materials in support of its request that the US Environmental Protection Agency (EPA) approve a CDF at the location known as the South Terminal as a component of the State Enhanced Remedy (SER) in New Bedford harbor[1]. The goal of the proposed action is to provide storage and handling capacity necessary to accommodate navigation and clean-up dredging and to beneficially use a portion of the dredged material to construct a multi-purpose marine terminal.

Organization

The materials are organized to be consistent with EPA guidance, as follows:

1. Introduction
2. Project Purpose
3. Explanation of why New Bedford is the preferred location for the terminal and the storage and handling facility
4. Discussion of the sites in New Bedford that satisfy the Project Purpose with the least impacts and demonstration that South Terminal is the least environmentally damaging practicable alternative that meets the Project Purpose
5. Detailed impact assessment
6. Mitigation alternatives proposed for unavoidable impacts

[1] The EPA may consider these materials as a scope of work within the meaning of the Memorandum of Understanding between EPA and DEP dated January, 2005.

1. Introduction

The Massachusetts Department of Environmental Protection (the Department) recently requested that EPA include an expansion of the State Enhanced Remedy allowing the construction of three confined disposal facilities (CDFs) in a forthcoming Explanation of Significant Differences that EPA is planning to issue for the New Bedford Harbor Superfund Site[2]. In response to the Department's initial request, EPA provided guidance regarding the information required to conduct its review, stating that if the proposal was incorporated in the SER and CERCLA 121(e) permit exemptions were therefore applicable, the proposed projects must still meet all substantive requirements and evaluations that would normally be conducted for this proposal as part of the regulatory review and permitting process.[3] EPA subsequently verbally notified the Department that EPA considers the proposed South Terminal CDF to be covered by the Record of Decision[4] and that it could be included in the SER without need for inclusion in the ESD, and provided additional guidance regarding the information EPA requires to review the proposed South Terminal project. These materials therefore are specific to the request to move forward with the South Terminal in the immediate future, as a time-sensitive element of the Department's overall request.

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[2] Letter dated January 20, 2010 to Mr. Curtis Spalding, Regional Administrator, EPA Region 1, from Mr. Gary Moran, Deputy Commissioner, MADEP.

[3] Letter dated February 11, 2010, from Mr. Curtis Spalding, Regional Administrator, EPA Region 1, to Mr. Gary Moran, Deputy Commissioner, MADEP.

[4] Record of Decision, EPA Region 1, September, 1998

Summary of Basis for the Department's Request

After serious consideration and research, EPA has recently determined it is preferable to utilize Confined Aquatic Disposal Cells for disposal of a significant quantity of Superfund sediment (approximately 300,000 cubic yards). EPA has requested that the City of New Bedford reserve space for the 300,000 cubic yards of material within the next CAD Cell (anticipated to be named CAD Cell #3) and is currently preparing an Explanation of Significant Differences (ESD, a minor amendment to the Record of Decision) that will allow for disposal of Superfund material into City of New Bedford constructed and operated CAD Cells. It is currently anticipated that the construction of the EPA CAD Cell volume can be timed with the next phase of navigational dredging, which is anticipated to be approximately 220,000 cubic yards. Therefore, the anticipated storage volume for CAD Cell #3 is anticipated to be 520,000 cubic yards (300,000 + 220,000 = 520,000).

Two previous CAD Cells (CAD Cell #1 and CAD Cell #2) have currently been constructed within New Bedford Harbor for the purposes of storing contaminated sediment dredged during Navigational Dredging projects. CAD Cell #1 and CAD Cell #2 created storage of 85,000 cubic yards and 92,000 cubic yards, respectively. CAD Cell #3 is multiple times larger than CAD Cells #1 and #2; CAD Cell #3 presents a major impediment associated with disposal and reuse of clean sediment generated during CAD Cell #3 construction.

During construction of the first two CAD Cells, a significant quantity of clean sand has been generated, which has already presented a significant problem for disposal. A number of potential disposal or reuse options have been evaluated during the construction of the first two CAD Cells, including: capping of completed CAD cells, beach nourishment, subaqueous capping of contaminated sediments, open ocean disposal, construction projects located within the coastal

zone, construction projects located upland, and upland disposal. Many of these options have had inherent problems:

- Beach nourishment, capping of completed CAD Cells, and construction projects located within the coastal zone require a staging area to store clean sand, in order to be properly implemented, as the demand for the material cannot be adequately timed with the construction of the CAD Cell.
- Subaqueous capping of contaminated sediments is only useful at pre-screened locations where capping will be beneficial to the environment, and will not impact recreational, commercial, or industrial navigation.
- Construction projects located upland and upland disposal are virtually infeasible due to the problems associated with reuse of marine soils in upland locations (the salt they carry can impact freshwater groundwater resources).

As a result, open ocean disposal has been utilized as a primary disposal methodology for construction of the first two CAD Cells. In contrast, CDF construction will not only allow utilization of clean material to be stored within the CDF, but will also allow the creation of a staging location to store clean sand, which will allow implementation of storage of clean material on top of the CDF during construction of future CAD Cells, which will eliminate the timing issues for beach nourishment, capping of completed CAD Cells, and construction projects located within the coastal zone as disposal/reuse alternatives.

If the CDF is not constructed, then other alternatives for clean sand disposal/reuse will have to be implemented. As outlined above, without a staging area, it is likely that all (or almost all) of the clean sand will go offshore for disposal for this CAD Cell and for future CAD Cells

until a staging area is either located or created. The total future anticipated volume of sand to be generated via CAD Cell construction is 1.8 million cubic yards. Over 20 years, since its construction in 1990, the Cape Cod Bay Disposal Site has accepted only 951,000 cubic yards of dredge material. The clean sand anticipated to be generated during construction of future CAD Cells within New Bedford Harbor is likely to triple the amount disposed at that location, which could instigate the siting of a new open ocean disposal location by the US Army Corps of Engineers. The Department believes that offshore disposal of clean sand in that quantity is not preferable and would rather see reuse of the material at the site.

Due to the PCB impacts to sediment within New Bedford Harbor, in order to construct a CAD Cell, the top of the CAD Cell (the top first few feet of sediment) must first be removed and placed within a previous CAD Cell before the removal of the clean sand may begin. The anticipated size of the top of CAD Cell #3 is approximately 75,000 cubic yards. The existing storage capacity within currently constructed CAD cells is approximately 45,000 cubic yards. Removal and disposal of PCB impacted sediment outside of CAD Cell disposal is extremely cost-prohibitive and difficult to implement due to bans on PCB disposal above 2 ppm within Commonwealth of Massachusetts landfills.

The most economic methodology for disposing of the remaining 30,000 cubic yards of CAD Cell #3 cap would be to construct a "transitional" CAD Cell (i.e. a CAD Cell that is constructed solely for disposing of the cap of another CAD Cell). There are a number of reasons why constructing a transitional CAD Cell is unfavorable:

- Construction of a transitional CAD Cell will generate additional contaminated material as the top of the transitional CAD Cell will need to be removed and disposed of as well. Therefore, an additional 10,000-15,000 cubic yards of PCB contaminated

sediment (85,000 to 90,000 cubic yards total) will need to be accommodated by the existing CAD Cell capacity and the transitional CAD Cell instead of the original 75,000 cubic yards.

- Construction of a transitional CAD Cell will generate additional clean sand that will have to be disposed. Therefore, instead of 520,000 cubic yards of clean sand, 550,000 cubic yards of clean sand will need to be disposed of.
- Space for CAD Cell construction within the DMMP designated area for CAD Cells is limited. Construction of multiple smaller CAD Cells is more expensive and takes up more space than construction of larger CAD Cells.
- Construction of large CAD Cells creates a much lower ratio of impact to resource area vs. cubic yard of material disposed than construction of smaller CAD Cells.

The Proposed South Terminal Extension CDF will allow for the 30,000 cubic yards of contaminated sediment from the cap of CAD Cell #3 to be disposed of within the CDF, in a manner that will prevent the need for construction of a transitional CAD Cell, which will preserve space within the DMMP area for future CAD Cell construction.

2. Project Purpose

Based on consultation with EPA, the project purpose is: *To develop a multipurpose marine terminal that will provide, among other things, essential infrastructure to serve offshore renewable energy facilities, and at the same time facilitate the remediation of New Bedford Harbor and manage the sediment generated from the maintenance of navigational channels within the Harbor.*

The Project Purpose has been defined to meet three objectives each of which will generate environmental and economic benefits to the New Bedford Harbor and the Commonwealth. The first objective is to develop a multi-purpose marine terminal that will provide, among other things, essential infrastructure to serve offshore renewable energy facilities. The second objective is to facilitate the on-going Superfund remediation of the Harbor. The third objective is to cost effectively manage the dredge sediment generated from navigational channel maintenance and improvement.

Multi-purpose Terminal Capable of Supporting Offshore Renewable Energy Projects

Plans for the development of major offshore wind energy generation are under development in most of the Atlantic coastal states. Projects are expected to be under development in Massachusetts and Rhode Island in the near term, and the states have identified areas in federal waters off their coasts for further evaluation for development in the mid-term, and both states (and many of the Atlantic coastal states) are working closely with the Minerals Management Service to initiate the offshore leasing process. A key component of developing offshore wind energy generation is the shore-side infrastructure necessary to support construction, assembly and transshipment of foundation and turbine components. Without a well-positioned, marine-industrial terminal to receive store, stage, assemble, and maintain wind turbine components and their supporting infrastructure, the development of off-shore wind facilities cannot be accomplished. As described in detail below, such facilities have specific operational requirements associated primarily with the scale of the turbine and foundation components: factors such as proximity to the offshore facilities, horizontal and vertical clearances, laydown area, and access to both deep water navigation and rail lines constitute 'hard

criteria' site requirements. This would also be case for tidal or wave energy projects should those technologies become viable in the long term.

Harbor Remediation

Polychlorinated Biphenyl (PCB) contaminated oils and byproducts made their way into the Harbor through sewer lines and other outfalls, contaminating the sediments on the bottom of the Harbor. By the 1970s, sediment sampling and testing conducted by environmental officials revealed that significant concentrations of metals and PCBs existed in the Harbor bottom sediments. In September 1998, the United States Environmental Protection Agency (EPA) issued a Record of Decision (ROD) that set forth the selected remedial action for the Upper and Lower Harbors of the New Bedford Harbor Superfund Site in New Bedford, Massachusetts, developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. Sections 9601 et. seq. and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as amended, 40 C.F.R. Part 300.

The cleanup standards varied depending upon the location of the contamination: 50 parts per million (ppm or mg/kg) was designated for deeper water areas, where direct contact was not likely; 10 ppm was designated for mudflat and shallow water areas accessible at low tide; 25 ppm was designated for beach combing shoreline areas; and 1 ppm was designated for residential shoreline areas. This designation effectively split the Harbor into two categories: those areas with sediments exceeding the cleanup standards where contaminated sediments would be removed by the EPA; and those sediments with PCB concentrations below the cleanup standards that would be left in place. It is estimated that the Superfund Clean Up Plan will require the remediation of 900,000 cy of sediment covering 270 acres.

The use of Confined Aquatic Disposal (CAD) is under consideration by EPA as an alternative to remediate the PCB contaminated sediment through processing and upland disposal. CAD construction requires appropriate materials management of the PCB contaminated top layer of silt (Top of CAD), the layer of uncontaminated sand and gravel removed to create the CAD (clean excavate) and the clean sand to cap the completed CAD and restore the benthic habitat.

It is currently estimated that approximately 300,000 cubic yards of Superfund contaminated sediment needs to be addressed. It is the method successfully used to dispose of the contaminated dredge spoils generated during the three phases of navigational dredging. Adoption of the CAD methodology is anticipated to produce significant cost and time savings to achieve the Superfund remediation goals. The reasonable likelihood is that the construction of a single CAD cell to dispose of the next phases of Superfund contaminated sediment and navigational dredging sediment could achieve further cost and time reductions and result in less impact to the aquatic environment.

In addition to the areas of the Harbor contaminated to Superfund Clean-up levels, there remain substantial areas of the Harbor which are contaminated with PCB and metals at lower concentrations. These contaminated areas continue to degrade the benthic habitat and constrain the residents of New Bedford and Fairhaven from fully enjoying and utilizing the Harbor. Consistent with promoting environmental justice, the Project can be designed to remediate areas not within Superfund jurisdiction through capping contamination in situ with clean excavate, eliminating PCB contact with the marine species and improving the overall environmental health of the Harbor. Clean sediment generated during construction of CAD Cell #1 was used to cap portions of OU-3, located immediately outside of the Hurricane Barrier.

Navigational Dredged Material Management

New Bedford Harbor is a vital economic and recreational asset. The Port serves as the City's greatest natural resource and most critical asset to stimulate investment, attract new industry, create jobs and sustain and grow the local economy. Over 4,400 people are employed by the commercial port. The lack of an effective contamination remediation program has resulted in an inability to conduct the navigational dredging necessary to maintain and improve the navigational channels essential to the near and long term viability of the Harbor.

EPA approved a State Enhancement to the Remedy pursuant to the ROD under which navigational channels can be maintained and improved in order to allow the Harbor to continue to serve its industrial, commercial and recreational functions. Three phases of dredging have already been completed. At the conclusion of Phase 1 approximately 75,000 yards of contaminated sediment was dredged from the area to the south of the State Pier and the fairways leading there-to. The material was dewatered and stabilized with a lime and cement mixture, and was placed on the CSX Rail Site next to New Bedford Harbor.

The Phase II Dredge Project included the design and construction of a transitional Confined Aquatic Disposal (CAD) Cell located within the Borrow Pit as well as the design and construction of CAD Cell #1, located adjacent to the Borrow Pit. The NBHDC completed Phase II harbor maintenance dredging in January 2006, removing more than 156,000 cubic yards (cy) of material from sites in New Bedford and Fairhaven.

Phase III Dredge Project began in September 2006 and included a new CAD Cell to accommodate the dredged material – CAD Cell #2. The New Bedford Harbor Phase III Dredge Project was completed in four parts: the removal of the top of CAD Cell #2 (with the placement

of the material within CAD Cell #1), the dredging of clean sediment from within CAD Cell #2 (with disposal of some material at the Cape Cod Bay Disposal Site and some material used as a pilot cap for the Borrow Pit CAD Cell), the dredging of areas north of the Coggeshall Street Bridge (Phase III Navigational Dredge – Part B), and the dredging of areas south of the Coggeshall Street Bridge (Phase III Navigational Dredge – Part A).

Phase IV is under-development, and its scope and timing is being evaluated contingent on funding and the availability of CAD capacity.

In total, it is anticipated that individual components of a comprehensive navigational dredging plan will be implemented over the next two decades and generate a total need for 1.8 million cy of disposal and/or management capacity.

3. Preferred Location Within the Region for a Facility that Meets the Project Purpose

A. Marine Terminal

Industrial ports in Massachusetts have been evaluated for their potential suitability to accommodate a terminal that can serve a variety of functions, including but not limited to supporting offshore renewable energy development. Ports reviewed include Gloucester, Salem, Boston, Quincy, Fall River, and New Bedford. In addition, ports in Maine, New Hampshire, Rhode Island, Connecticut, New York, New Jersey and Pennsylvania were more generally characterized for the capacity to support some level of construction and/or operations and maintenance services for offshore wind energy facilities. See Appendix 1 for a detailed characterization of port facilities.

Based on specifications developed in consultation with port managers, the marine construction industry, and offshore wind energy developers, port facilities were screened for

their consistency with the following 'hard criteria' – i.e., those basic requirements without which a facility could not support a renewable energy terminal. Specifications included:

- Sheltered harbor (protected from bad weather by means of a barrier);
- Unobstructed vertical (overhead) clearance;
- Minimum horizontal clearance greater than 40 m (approximately 150 feet);
- Minimum low tide navigational channel depth of 7.3 m (24 feet);
- 24/ hour/day and 7 days/week operational availability;
- Exclusive use of the staging facility;
- Minimum berth length of 138 m (approximately 450 feet);
- Minimum berth water depth of 7.3 m (24 feet);
- Lay down storage and assembly backland area larger than 4 hectares (10 acres); and
- Proximity to likely offshore wind farm site.

Based on these criteria, Boston and New Bedford were identified as the two ports capable of accommodating a renewable energy terminal. (See Appendix 2, Table 6-1, Massachusetts Port Criteria Evaluation Matrix and associated discussion.) Out-of-state ports were reviewed for relative practicability, first for their ability to efficiently serve likely near-term development sites, and then, with the Massachusetts ports, for their ability to meet the combined elements of the Project Purpose.

Because the proximity of the port facility to the construction site significantly affects operational logistics, risks, and costs, all out-of-state ports except for Quonset Point in Rhode Island were removed from consideration. As illustrated in Appendix 3, Table 3-14, Distances

from Regional Ports to Proposed Wind Farms, Quonset Point is generally similar to New Bedford in distance to likely development sites when compared to distances from other ports. Therefore, the short list of ports determined appropriate for review under the Project Purpose includes Boston, New Bedford, and Quonset Point.

Each of the three shortlisted ports has the capacity to meet the first component of the Project Purpose, to support development of a marine terminal that will provide essential infrastructure to serve offshore renewable energy facilities. Note that Quonset Point is proposed for redevelopment by Rhode Island to serve just that purpose. But from the outset, it is important to consider as context for this review that the basic logistical and operational framework for the offshore wind energy industry is only beginning to be formally planned. Key issues related to manufacturing capacity for foundations, turbine towers, nacelles, and ancillary equipment, workforce availability, landside transportation and infrastructure requirements, and other issues are all under consideration as the industry moves forward: with no marine facilities under construction or in operation, this is very much a new process.

The emerging consensus among states and the industry is that it is unlikely that any one state will be able to exclusively serve a geographic region in which offshore wind energy facilities are located. Quonset Point, for example, is not likely to have the capacity to comprehensively service multiple development projects simultaneously; moreover, as the logistical requirements of near-term projects off Massachusetts and Rhode come into clearer focus, capacity to support individual elements of the manufacturing, assembly, installation, and operations and management train will be apportioned geographically to maximize economic efficiencies based on ports' respective ability to provide these services. Therefore, while Rhode Island is actively pursuing Quonset Point for development that meets the first component of the

Project Purpose, both facilities will be necessary to support offshore wind energy development in the region. This review assumes that Boston, New Bedford and Quonset Point can each support development of a marine terminal that will provide essential infrastructure to serve offshore renewable energy facilities.

B. Facilitate Harbor Remediation

These three ports were therefore reviewed for their ability to meet the other two components of the Project Purpose, to facilitate the remediation of New Bedford harbor and manage sediment generated from the maintenance of navigational channels within the harbor. In practice, this will require that materials dredged to create CAD capacity for both clean-up and navigational dredging, and the navigational material itself, be managed within the immediate confines of New Bedford to achieve the logistical and economic benefits on which the Department's request is predicated, as follows.

An analysis was conducted comparing cost and logistical considerations of shipping CAD material to off-site locations for staging. A scenario was evaluated whereby re-use potential for non-impacted material generated through CAD Cell construction was shipped to two alternative locations for staging prior to potential re-use. In keeping with the theme that Offshore Wind Energy Staging locations are reasonable areas also for the staging of CAD material prior to potential re-use, two scenarios were evaluated: 1) the transport of CAD material to Quonset Point in Rhode Island for staging prior to potential re-use; and 2) the transport of CAD material to the Port of Boston for staging prior to potential re-use. The relevant distances and travel considerations from New Bedford to the two alternate locations considered are included in the Table below:

Travel Logistics and Costs	
Distance and Fuel	• Distance between NBH and Quonset Point – 46 miles/40 nautical miles • Distance between NBH and Boston – 90miles/78 nautical miles • Average push speed for a tug is 10 knots/11.5 mph • Average Fuel consumption for a EMD 12-567C 1,200 HP (average scow pushing tug) is 68 Gallons/Hour • Price today for fuel at Sea Fuels in NBH is $2.83/gallon
New Bedford Harbor to Quonset	• Trip from NBH to Quonset Point – One way at an average of 10 knots • Trip would take approximately 6 hours (including preparation for push mode), • Travel time in and out of harbor- (abiding wake zones etc.), • One way trip would use 408 gallons of fuel costing $1,154.64. • A crew of 4 members would cost approximately $928.00 at prevailing wage. • Total for fuel and crew one way from NBH to Quonset Point = $2083.00 • Round trip including 3 hours for dumping or offloading = $5,210.00 • Equipment cost for 9-hour trip = estimated to be $9,000. • Total Fuel and Transport Estimate (each Scow) = $14,210.
New Bedford	• Trip from NBH to Boston – One way at an average of 10 knots • Trip would take approximately 12 hours (including preparation for push mode), • Travel time in and out of harbor- (abiding wake zones etc.),

Harbor to Quonset (One Way)	• One way trip would use 816 gallons of fuel costing $2,310.00 • A crew of 4 members would cost approximately $1856.00 at prevailing wage. • Total for fuel and crew one way from NBH to Boston = $4170.00 • Round trip including 3 hours for dumping or offloading = $10,415.00 • Equipment cost for 9-hour trip = estimated to be $9,000. • Total Fuel and Transport Estimate (each Scow) = $19,415

Based on the travel and logistical considerations noted, the round trip additional expense for each scow of material for transportation alone is approximately:

- $14,210 for the round trip to Quonset Point in Rhode Island; and
- $19,415 for the round trip to Boston.

Additionally, any round trip transportation to Boston would involve passage through the Cape Cod Canal, which limits the timing of transportation of such barges due to tidal considerations and direction of flow through the Canal.

Based upon these estimates, and based upon the assumption that industry standard 2,000 cubic yard scows, each of which can hold approximately 1,700 cubic yards of material safely on an open ocean voyage, it is anticipated that the additional cost per yard to move material from New Bedford Harbor to the two alternate sites evaluated is approximately $7 per yard for Quonset and $10 per yard for Boston, for fuel and equipment, man-hour time alone.

Once the material has been received at these two locations, it would need to be unloaded and staged in a dewatering area, where it could sit and dewater prior to beneficial re-use. Unloading of the material would involve the use of cranes at the receiving facility, as well as

heavy equipment to push the material into piles and cordon the area off and install a water collection and treatment system. Based upon previous cost assessments conducted for these types of operations on dredge projects in the Northeast, the on-loading and staging cost of the material typically costs between $20 and $30 per cubic yard of material.

A composite estimate then of the cost to stage CAD material at other Ports (Providence, RI or Boston, MA) indicates that the raw cost for transportation and handling would add approximately between $27 and $40 per yard of material. This would effectively nearly double the anticipated cost for CAD Cell creation per cubic yard. For the 550,000 cubic yard CAD Cell project anticipated for the EPA Superfund (300,000 cubic yards) and Phase IV Navigational Dredging (250,000 cubic yards), the per cubic yard cost of between $27 and $40 per yard for transport to one of the two offsite staging areas would add between $14.85M and $22M to the overall project. For the EPA 300,000 cubic yard project alone, the cost *increase* over retaining the material in the Port of generation (New Bedford) would be approximately $8.1M and $12M. For the Navigational/SER Dredge 250,000 cubic yard project, the cost *increase* over retaining the material in the Port of generation (New Bedford) would be approximately $6.75M and $10M. These increases are significant enough to call into question the base assumptions that CAD Cells are the most economically viable method of disposing of contaminated sediments associated with the New Bedford Harbor cleanup. Additionally, the loss-of-opportunity cost at the two alternative locations has not been calculated as that information is difficult to assess. It is likely that the receiving facilities would charge a fee for the storage of the material. This could add significantly to those costs already assessed.

In contrast, the economic cost to the EPA project (300,000 cubic yards) and the Phase IV Navigational/SER Dredge Project to retaining material at a CDF constructed at South Terminal

would be minimal (the cost to transport the material within the Harbor to the construction site at south Terminal, as the cost for the CDF construction infrastructure would be borne by others. As such, the analysis indicates that the cost to stage significant quantities of CAD material at alternate locations in Ports other than New Bedford, are significant enough to render those alternatives impracticable, and all ports other than New Bedford were therefore eliminated from further consideration.

4. Preferred Location Within New Bedford for a Project that Meets the Project Purpose and Determination of Least Environmentally Damaging Alternative

Locations within New Bedford harbor were reviewed for their ability to meet the three elements of the Project Purpose. Potentially practicable locations were then reviewed for relative environmental impacts and the least environmentally damaging practicable alternative was determined.

The Project Purpose elements associated with facilitating the Harbor Clean up and managing the sediment from navigational dredging can be optimized by a practicable alternative that encourages the functional reuse of dredged sediment over the consumption of off-shore disposal capacity. This alternative also provides the least net environmental impact. Massachusetts state agencies have established a strong regulatory and policy preference for reuse of dredged sediment over disposal. The Department of Environmental Protections regulation governing 401 Water Quality Certifications for Discharge of Dredged or Fill Material requires the dredged material not be disposed if a feasible alternative exists that involves the reuse or recycling. 310 CMR 9.07(e). The Coastal Zone Management's Port Policy #1 states that the Commonwealth's

goal is to manage dredged material as a resource and to dispose of it as a waste only when no beneficial use is practicable. The reuse options include:

- Confined Disposal Facilities
- Capping of Completed CAD Cells
- Beach Nourishment
- Subaqueous Capping of Contaminated Sediment
- Construction Projects Located within the Coastal Zone
- Construction Project Located Upland

As discussed in further detail below, the establishment of a CDF is a critical pre-condition to implementation of the upland and coastal reuse alternatives. The disposal options include:

- Upland Disposal
- Off-shore disposal

No-Action Alternative

In this alternative, no future CAD Cells would be constructed and therefore no clean sand would be generated. However, this option would also result in 1.8 million cubic yards of PCB impacted sediment that would remain in contact with benthic and marine life within New Bedford Harbor. No disposal or re-use alternatives would need to be evaluated if CAD Cell construction was halted; but, no further navigational dredging could take place within New Bedford Harbor (without a massive allocation of resources, which is currently not anticipated). Use of CAD Cells by EPA (which is currently being considered under a pending Explanation of Significant Differences) could not take place; a result of which would be the elimination of a significant cost savings to the Superfund remedy (as well as a major acceleration of the remedy).

The USACE maintenance dredge of the federal navigational channel, turning basins, and anchorages could also not take place, as there would be no suitable location for PCB impacted sediment disposal. If navigational dredging is halted within New Bedford Harbor, the harbor will gradually fill with sediment. As sediment builds within the Harbor, the available draft for navigation of commercial and industrial vessels will be restricted, and water-dependent industrial and commercial activity within New Bedford will be severely limited. CAD Cell construction is therefore essential to the EPA Superfund cleanup and navigational dredging; halting CAD Cell construction would ultimately eliminate a major source of revenue and jobs for the City of New Bedford and Town of Fairhaven, and would also have a significant negative impact to large commercial vessels that utilize New Bedford Harbor.

Confined Disposal Facilities within New Bedford Harbor

This alternative involves the use of clean sand generated during construction of CAD Cells within the creation of Confined Disposal Facilities within New Bedford Harbor. It is currently anticipated that at least 420,000 cubic yards of clean sand could be disposed of within several potential CDFs within New Bedford Harbor. In addition to the disposal of clean sand, contaminated material would also anticipated to be disposed within CDFs. Confined Disposal Facilities are filled structures adjacent to the shoreline, bounded by sheet piling or earthen berms, and (typically) capped with asphalt or concrete. As these areas are immediately adjacent to the shoreline, transportation of sand to the facilities during construction would not require multiple handling of the sediment (although it would require more handling of the sediment than open-ocean dumping). Transportation costs would be minimized, as the facilities would be nearby. The CDFs would allow reuse of the sediment within the area of impact (New Bedford/Fairhaven

Harbor), immediately adjacent to the New Bedford Superfund Site. Additionally, the feasibility of implementing CDFs has already been assessed by EPA during its Superfund feasibility study process, and two CDFs (the Sawyer Street de-sanding facility and the Herman Melville Boulevard EPA dewatering facility have already been constructed).

Storing contaminated material within CDFs would allow flexibility in the size of CAD Cells; future CAD Cell sizes would not be restricted by the available disposal volume within previously-constructed CAD Cells: the top of future CAD Cells could be placed within CDFs. As discussed earlier, the availability of a CDF would avoid the need for a transitional CAD whose sole purpose would be to dispose of the top of CAD contaminated sediment in preparation for the next CAD. CDFs also offer the flexible capacity to store or stage clean excavate in a manner that would allow it to be available for all the other reuse opportunities on a schedule that coincides with the demand for the material. CDFs would then serve a crucial component in facilitating the other reuse alternatives.

Capping of Completed CAD Cells

This alternative involves the use of clean sand generated during construction of CAD Cells to cap older, filled CAD Cells within the DMMP at New Bedford Harbor, the capping of which is required in order to complete closure of the CAD cells. CAD Cell capping is anticipated to be one of the primary re-uses of some clean sand generated from CAD Cell construction potentially utilizing up to 500,000 cubic yards of clean sand. The caps will involve placement of 2 to 3 feet of clean sand that will be generated during CAD Cell construction. A pilot capping project at the Borrow Pit CAD Cell (located immediately northwest of Pope's Island, north of Route 6) was conducted during Phase III and was very successful; therefore, the techniques for

cap placement have been established and cap placement is a feasible technology. As the areas to be capped are within New Bedford Harbor, immediately adjacent to the anticipated construction location of future CAD Cells, transportation of sand to the areas during construction would not require multiple handling of the sediment (although it would require more handling of the sediment than open ocean dumping as the material may need to be placed utilizing pocket scows in specific locations or, alternately, may need to be placed by bucket or hydraulically). Transportation costs would be minimized, as the CAD Cells would be nearby. Capping would allow reuse of the sediment within the area of impact (New Bedford/Fairhaven Harbor). CAD Cell capping would present no additional environmental impact, as CAD Cell construction would already have removed an area of benthic habitat. However, it is anticipated that once CAD Cell construction is complete, that the cap can quickly be re-colonized by benthic vertebrates and invertebrates (as shown at OU-3 after capping of PCB impacted sediment with clean sand from CAD Cell #1).

CAD Cells cannot be capped immediately after they are filled, as it takes time for consolidation of sediment within the CAD Cells to create a volume of material strong enough to support the weight of the cap. USACE experiments with capping of CAD Cells within Boston Harbor indicated that it takes a minimum of 12-15 months for sediment to consolidate such that the sediment will support placement of a cap. Typically, the top of the CAD Cell under construction is slated to be disposed of within a previous CAD Cell. As a 12-15 month delay between top of CAD Cell construction and bottom of CAD Cell Construction is generally considered infeasible (typically CAD Cell construction is funded on a full-construction basis) and early placement of a cap is inadvisable, as the cap may fail and sink to the bottom of the CAD Cell, it would likely be necessary to store clean sand to be used for capping at some

location until it could be utilized. Unless a CDF is available to store clean material during the period when the CAD is being constructed that material will be disposed of off-shore requiring clean, compatible sand to be imported to cap the CADs.

Subaqueous Capping of Contaminated Sediments

This alternative involves the use of clean sand generated during construction of CAD Cells to cap PCB impacted sediments within New Bedford Harbor.

This alternative is projected to potentially utilize up to 350,000 cubic yards of clean sand to cap contaminated sediments that will not be otherwise dredged within New Bedford Harbor as part of the Superfund remedy. Since the Superfund cleanup standards range from 10 to 50 parts per million (ppm or mg/kg) and the maximum concentration of PCB impacted sediments that can be disposed of within a Commonwealth of Massachusetts landfill is 2 parts per million, concentrations of PCBs in sediment after the Superfund remedy is complete will (in many cases) be higher than concentrations that the Department typically allows to be left in place. Additionally, PCB contaminated sediment will continue to be exported from New Bedford Harbor into Buzzard's Bay via tidal action and sediment entrainment. One remedy to isolate PCB impacted sediment from the rest of the aquatic environment is to cap the sediment with 2 to 3 feet of clean sand that will be generated during CAD Cell construction. A pilot capping project at OU-3 (located immediately outside of the Hurricane Barrier) was conducted during Phase II and was very successful; therefore, the techniques for cap placement have been established and cap placement is a feasible technology. As the areas to be capped are within New Bedford Harbor, transportation of sand to the areas during construction would not require multiple handling of the sediment (although it would require more handling of the sediment than open

ocean dumping as the material would likely need to be placed hydraulically). Transportation costs would be minimized, as the capping areas would be nearby.

Capping would allow reuse of the sediment within the area of impact (New Bedford/Fairhaven Harbor). Subaqueous capping presents a short-term environmental impact by covering benthic creatures and damaging open-ocean habitat; however, as was shown by EPA at the OU-3 location, the cap can quickly be re-colonized by benthic vertebrates and invertebrates and can be utilized as (non-PCB impacted) habitat in the future. Additional subaqueous capping is currently required at OU-3, located outside of the Hurricane Barrier. Unfortunately, capping is limited to only certain areas in the Harbor because of water depths needed in front of CSOs/storm drains as well as navigation. Some areas between the Route 195 Bridge and the Route 6 Bridge may potentially be capped. Also, the area north of the Coggeshall Street bridge (after completion of dredging by EPA) could potentially be capped as well, to minimize the exposure and risk to residual sediments that EPA does not plan to remove; however the area north of the Coggeshall Street bridge (the Upper Harbor) is anticipated to be utilized for recreational boating in the future, and any capping would need to consider the depth required for this activity. As use of clean sand within the Upper Harbor will need to wait until EPA completes its remedy, and completion of EPA's remedy is at least 15 years in the future, it would likely be necessary to store clean sand at a CDF or some location until it could be utilized for this purpose.

Beach Nourishment, Upland Capping Projects and Coastal Capping Project

All these alternatives are conceptually available, but are not practicable alternatives to effectively manage the volume of clean excavate from the CADs or dredging, particularly in the

absence of a CDF. The salinity content of the sediment also precludes reuse in many upland locations. Communities are reluctant to accept Harbor generated sand for beach nourishment because of fear of residual contamination. There are substantial, practicable limitations to accurately aligning the real time generation and compatibility of clean excavate with potential reuse offers. The lack of certainty significantly increases the inability to accurately scope the scale and timing of dredge project leading to increased costs. The problem of aligning the generation and market for reuse can be significantly ameliorated if a CDF is functioning to provide storage of clean excavate.

Beach Nourishment

This alternative involves the use of the clean sand as beach nourishment at a beach. This alternative encompasses reuse of the material at a number of potential beach locations, such as: New Bedford, Fairhaven, Cuttyhunk Island, Mattapoisett, Dartmouth, or other coastal beach locations. This alternative assumes that the sieve size analysis for the clean sand generated during CAD Cell construction is similar to that of beach areas at which nourishment would be performed. One of the issues that has been identified with this alternative is what is currently referred to as the "New Bedford Effect". "The New Bedford Effect" is the perception that any sediment that is generated within New Bedford is contaminated with PCBs. Although the material that is generated during CAD Cell construction is dredged from an elevation far below that at which PCB impacts have been detected, the perception that all sediment from New Bedford is impacted has frustrated attempts to utilize the material for beach nourishment in the past. Although this alternative may be difficult to implement on a wide scale (due to the "New Bedford Effect"), it is likely that it could be implemented in specific locations (such as within

New Bedford itself). Beach nourishment projects would typically need to be timed to avoid completing the projects while the beaches were being utilized (typically the summer months). As this may be extremely difficult, it would likely be necessary to store clean sand at some location until it could be utilized.

Construction Projects Located Upland

This alternative would re-use clean sand within upland projects. There are often projects that need clean sand, and there are also brokers available that would appreciate the material (which would not have to be mined and could be delivered to the receiving facility). Unfortunately, the construction projects that typically drive the use of material (in asphalt, concrete, or as fill material) are currently significantly reduced due to the current recession in the construction industry; however, it is unlikely that the construction industry will be depressed for an extended period of time. Another potential problem with upland reuse of material is the costs involved in handling the material multiple times. The material would need to be dredged, dewatered, then loaded onto trucks and delivered to an upland location. The most important problem with reuse of the material at an upland location is the salinity of the sand. Implementation of Section 401 of the Clean Water act prevents the reuse of sediment with high salinity in freshwater locations, due to the potential for degradation of groundwater. As a result, there are extremely limited locations (if any) at which the sand could be transported and reused. Construction of CAD Cells would need to be timed to make sure that the clean sand was available when construction projects required it. As this may be extremely difficult, it would likely be necessary to store clean sand at some location until it could be utilized.

Construction Projects Located Within the Coastal Zone

This alternative would re-use clean sand within projects located within the Coastal Zone. This alternative is very similar to alternative "Construction Projects Located Upland", except that the projects would be located in areas adjacent to the shoreline, where the salinity of the native sediment would already be high, and therefore, use of the clean sand would not be restricted by Section 401 of the Clean Water Act. Unfortunately, projects adjacent to the shoreline are not always ongoing, and therefore construction of the CAD Cell would need to be timed to meet the construction schedule by which the clean sand would be required, in addition to gaining acceptance from the receiving facility, which would make use of this material at a coastal facility difficult. Should there be a location within the Coastal Zone to store the clean sand, it could then be brokered to coastal zone construction projects, as needed. Unfortunately, such a facility with adequate storage space does not currently exist; however, construction of such a facility is proposed under the alternative "Confined Disposal Facilities Within New Bedford Harbor". Although the exact coastal zone use of the clean sand is currently unspecified, it is assumed that use of the clean sand for this alternative would result in the permanent loss of flood storage capacity. Construction of CAD Cells would need to be timed to make sure that the clean sand was available when construction projects required it. As this may be extremely difficult, it would likely be necessary to store clean sand at some location until it could be utilized.

Upland Disposal

This alternative would dispose of clean sand within an upland landfill. Landfills often require material that is used for daily cover of refuse. Upland disposal of material would

increase the already potentially high costs associated with upland re-use by including a disposal cost that is typically charged by upland landfill facilities. Additionally, landfills are typically more widely spaced than potential re-use facilities (at least re-use staging facilities at gravel pits), and therefore, the trucking costs would also be much higher. The salinity of the sediment may also present a problem for disposal. It is very likely that the salinity would prevent disposal of material at an unlined landfill. Lined landfill disposal would be significantly more costly. As landfill demand for clean sand fluctuates depending upon the construction cycle of the landfill as well as its typical capping needs, construction of CAD Cells would need to be timed to make sure that the clean sand was available when landfills required it. As this may be extremely difficult, it would likely be necessary to store clean sand at some location until it could be utilized.

Open Ocean Disposal

This alternative involves disposal of the clean sand at the Cape Cod Bay Disposal Site or one of a number of other available open ocean disposal locations. Although this can be an economical method for disposing of sand, the Department and CZM has indicated that 1.8 million cubic yards of material is an unacceptable quantity of material to dispose of within the ocean, and that the Department prefers that the material be reused onsite (or within the region) where possible. Ocean disposal would typically need to be timed to avoid impacting Right Whales. As this may be difficult, it may be necessary to store clean sand at a CDF until it could be utilized, depending upon the time of CAD Cell construction.

Initial Environmental Impact Screening

An initial screening of the disposal/reuse alternatives described above was conducted in order to determine which alternatives were unsuitable for evaluation. Although some alternatives are considered very expensive or technically infeasible in all but a few circumstances, it was determined that no alternatives should be eliminated during the initial screening. Therefore, the remaining construction options that were identified in the initial screening are the following, discussed below:

- No CAD Cell Construction
- Open ocean disposal.
- Capping of Completed CAD Cells
- Beach Nourishment
- Construction Projects Located Upland
- Construction Projects Located Within the Coastal Zone
- Upland Disposal
- Confined Disposal Facilities Within New Bedford Harbor
- Subaqueous Capping of Contaminated Sediments

Environmental impacts anticipated by the various alternatives are generally divided into temporary impacts (such as dredging of the harbor floor, entrainment of sediment into the water column, smothering of fish eggs and benthic organisms by resettlement of disturbed sediment) and permanent environmental impacts (such as the permanent loss of coastal wetlands or 100-year flood storage capacity). Currently, it is difficult to quantify exact resource area impacts

associated with many of the alternatives listed below; nevertheless, general categories of resource area impacts are listed for each option, and some assumptions are made to create a quantitative basis by which comparison between the various options can be made.

No CAD Cell Construction

This alternative would result in no clean sand to reuse or dispose of, and thus would result in no environmental impact. However, this option would also result in 1.8 million cubic yards of PCB impacted sediment that would remain in contact with benthic and marine life within New Bedford Harbor. Transport of this PCB impacted sediment into Buzzard's Bay and beyond will also result in PCB impacts to marine life. Inaction would also leave a significant environmental justice issue unresolved

Project Statistics:

Net Fill Added: 0 cubic yards

Impervious Surfaces Created: 0 acres.

Loss of 100-Year Flood Storage Capacity – 0 MG (million gallons).

Loss of Coastal Wetlands – 0 acres

Loss of Land Under Ocean (and thus Fish Runs, EFH and shellfish habitat) – 0 acres.

Open Ocean Disposal

Open ocean disposal would impact marine resources at the disposal site. These impacts are already assumed when the facility is designed; therefore, placement of additional material should not specifically impact the Cape Cod Bay Disposal site. However, as the disposal site fills to capacity, additional disposal sites would need to be sited to accommodate the additional

material. The Cape Cod Bay Disposal Site is approximately 3.42 kilometers (approx. 855 acres) in size. Therefore, if a new facility would need to be sited due to the filling of the Cape Cod Bay Disposal Site from clean sand removed within New Bedford Harbor from CAD Cell Creation, the potential impact to Land Under the Ocean would be 855 acres. The majority of other impacts associated with this alternative will have to do with the disturbed sediment and benthic substrates during disposal. It is anticipated that disturbed areas would re-colonize relatively quickly.

Project Statistics:

Net Fill Added: 1.8 million cubic yards

Impervious Surfaces Created: 0 acres.

Loss of 100-Year Flood Storage Capacity - 0 MG (million gallons).

Loss of Coastal Wetlands – 0 acres

Loss of Land Under Ocean (and thus Fish Runs, EFH and shellfish habitat) – 855 acres (assumes new disposal facility would need to be sited due to volume of New Bedford clean sand added to Cape Cod Bay Disposal Site).

Capping of Completed CAD Cells

This alternative would have a minimum of impact as a completed CAD Cell will already have been impacted during its construction. CAD Cells are designed such that the cap will come to the approximate elevation of the harbor floor prior to its design (and in some cases the final elevation of the top of the cap will be significantly lower than the initial elevation of the harbor floor. Therefore, no net fill is anticipated. No fill will be above mean high water; therefore, no flood storage loss is anticipated.

Project Statistics:

Net Fill Added: 500,000 cubic yards

Impervious Surfaces Created: 0 acres.

Loss of 100-Year Flood Storage Capacity - 0 MG (million gallons).

Loss of Coastal Wetlands – 0 acres

Loss of Land Under Ocean (and thus Fish Runs, EFH and shellfish habitat) – 0 acres

Beach Nourishment

This alternative would have a relatively low environmental impact. Most beach areas need to be nourished periodically to reverse the impacts of long-term erosion caused by storms and by normal wave action. The quantity of fill utilized at the site as well as the loss of 100-year flood storage capacity will vary depending upon the beach nourishment location. If nourishment takes place below the high tide mark, no flood storage will be lost during the project, and nourishment will take places slowly as tidal action moves material onto the beach. Fill and loss Depending upon the location, it is possible that some environmental receptors, such as piping plovers could be impacted by beach nourishment; however if these issues are taken into account when planning the nourishment project, the impacts can be minimized.

Project Statistics:

Net Fill Added: Quantity depends upon needs at nourishment site.

Impervious Surfaces Created: 0 acres.

Loss of 100-Year Flood Storage Capacity - 0 MG (million gallons).

Loss of Coastal Wetlands – 0 acres

Loss of Land Under Ocean (and thus Fish Runs, EFH and shellfish habitat) – 0 acres

Construction Projects Located Upland

This alternative would utilize material away from the shoreline, which would minimize impact to coastal resources. It is possible that the use of the material could impact inland wetland resources at numerous locations on a small scale; however, the use of such material within an inland location that could impact wetland resources would be subject to individual permitting under the Massachusetts Wetlands Protection Act or other federal, state, or local permitting.

Project Statistics:

Net Fill Added: 0 cubic yards

Impervious Surfaces Created: 0 acres.

Loss of 100-Year Flood Storage Capacity - 0 MG (million gallons).

Loss of Coastal Wetlands – 0 acres

Loss of Land Under Ocean (and thus Fish Runs, EFH and shellfish habitat) – 0 acres

Construction Projects Located Within the Coastal Zone

This alternative would reuse material within the Coastal Zone, which would impact coastal environmental resources. It is likely that some proportion of whatever material is utilized for projects within the Coastal Zone would result in a loss of flood storage. It is likely that some material would be used to fill below the high water line for some projects; however, it is currently unclear what those projects would be. It is possible that the use of the material could impact coastal wetland resources at numerous locations on a small scale; however, the use of

such material that could impact wetland resources would be subject to individual permitting under the Massachusetts Wetlands Protection Act or other federal, state, or local permitting.

Project Statistics:

Net Fill Added: Quantity depends upon specific projects.

Impervious Surfaces Created: Area depends upon needs at nourishment site.

Loss of 100-Year Flood Storage Capacity - Quantity depends upon needs at nourishment site.

Loss of Coastal Wetlands – Area depends upon needs at nourishment site

Loss of Land Under Ocean (and thus Fish Runs, EFH and shellfish habitat) – Area depends upon needs at nourishment site

Upland Disposal

This alternative would dispose of material away from the shoreline, which would minimize impact to coastal resources.

Project Statistics:

Net Fill Added: 0 cubic yards

Impervious Surfaces Created: 0 acres.

Loss of 100-Year Flood Storage Capacity - 0 MG (million gallons).

Loss of Coastal Wetlands – 0 acres

Confined Disposal Facilities Within New Bedford Harbor

This alternative would utilize clean sand generated during CAD Cell construction to fill specified areas. Fill would be both below and above the water line. Much above the water line

would result in a loss of 100-year flood storage capacity. Some coastal wetlands (primarily coastal bank and coastal dune) would be impacted from the construction of the CDFs.

Project Statistics:

Net Fill Added: 420,000 cubic yards

Impervious Surfaces Created: 33.8 acres.

Loss of 100-Year Flood Storage Capacity - 84.8 MG (million gallons).

Loss of Coastal Wetlands – 4.88 acres (Primarily Coastal Bank and Coastal Dune)

Loss of Land Under Ocean– 16.4 acres

Subaqueous Capping of Contaminated Sediments

This alternative would cap areas located below mean high water. As a result, all material utilized for this option would be net fill added. The fill would permanently cover existing shellfish resources; however, it is anticipated that the resources would re-colonize the areas in a relatively short period of time. No loss of flood storage capacity is anticipated due to this alternative.

Project Statistics:

Net Fill Added: 350,000 cubic yards

Impervious Surfaces Created: 0 acres.

Loss of 100-Year Flood Storage Capacity - 0 MG (million gallons).

Loss of Coastal Wetlands – 0 acres

Loss of Land Under Ocean (and thus Fish Runs, EFH and shellfish habitat) – 0 acres.

Detailed Evaluation

Each reuse/disposal alternative that passed the initial screening was evaluated using standardized criteria, selected in order to help prioritize logistical, engineering, cost, and environmental qualities of the alternatives. The criteria are grouped into the following categories: Effectiveness, Timeliness, Benefits, Risk, Non-Pecuniary Issues, Difficulty in Implementation, Short-Term Environmental Impacts/Benefits, Long-Term Environmental Impacts/Benefits, and Cost. Each of the categories has been given equal weighting in order to compare the desirability of each alternative. The resulting formula assigns a score for each construction alternative based on the following formula where an alternative with a higher score is a more desirable option and an alternative with a lower score is a less desirable option:

$$[\#] = E + T + B + R + N + I + S + P + C$$

Where:

E is Effectiveness	I is Difficulty in Implementation
T is Timeliness	S is Short-Term Environmental Impacts/Benefits
B is Benefits	P is Long-Term Environmental Impacts/Benefits
R is Risk	C is Cost
N is Non-Pecuniary Issues	

Within each of the criteria, the alternatives were assigned a relative ranking for comparative purposes. The relative ranking was given a range of [1 to 10] for each category, with [10] being the most desirable and [1] being the least desirable rank for each category.

The alternatives which passed initial screening were assigned a relative rank for each of the criteria based on site-specific information, engineering judgment, and practical experience at other sites. Each alternative was generally given an intermediate rank [5 or 6] within the respective criteria unless there was a characteristic or condition that indicated a better [7 to 10] or worse [1 to 4] ranking compared with the other alternatives. The following subsections briefly discuss the basis used to assign alternatives rankings in each of the categories.

Effectiveness (E)

The effectiveness criterion takes into account the ability of the alternative to meet the Project Purpose. This criteria involves the ability of the alternative to meet facilitate the Superfund Cleanup and navigational dredging by accept clean sand for re-use and disposal, and the creation of a marine terminal to meet the needs of the wind energy industry. This criterion also ranks whether the alternative reuses material at the site or within the region (i.e. nearby the generation point for the material), or whether the option requires transportation of the clean sand to a remote location.

Alternative No CAD Cell Construction was given a rank of [1] since it does not utilize clean sand. Alternatives Open Ocean Disposal, Construction Projects Located Upland and Upland Disposal were given a rank of [3] due to the distance by which the clean sand will have to be transported before it can be utilized, reducing the efficiency and effectiveness of the alternative, and the absence of a marine terminal being constructed. Alternative Construction

Projects Located Within the Coastal Zone, Capping of Completed CAD Cells, Subaqueous Capping of Contaminated Sediments and Beach Nourishment received a [5], due to the assumed use of material closer to New Bedford Harbor, but also did not produce a marine terminal. Alternatives Confined Disposal Facilities Within New Bedford Harbor received a [10] due to its fulfillment of the Project Purpose through its reuse of clean sand within New Bedford Harbor via the creation of a multipurpose marine terminal and the terminal's potential promotion of the wind energy industry and facilitating the implementation of other Alternatives that may be more time-dependent, requiring storage of clean sand for periods of time to allow efficient re-use.

Timeliness (T)

The timeliness criteria evaluate the potential to be able to coordinate the implementation of the alternative during construction of a CAD Cell.

Alternative Construction Projects Located within the Coastal Zone received a [2], due to the difficulty permitting and locating suitable projects, especially due to a lack of a facility at which the material could be stored in order to overcome timeliness limitations. Alternatives Open Ocean Disposal, Beach Nourishment, Construction Projects Located Upland and Upland Disposal all received a [5] due to seasonal limitations, project-specific limitations, and the lack of a facility at which material could be stored, in order to overcome timeliness limitations. Capping of Completed CAD Cells also received a [5] due to limitations on how long a CAD Cell must consolidate before it can be capped, which often means that an open, filled CAD Cell cannot be capped during construction of the subsequent CAD Cell. Alternatives No CAD Cell Construction, Confined Disposal Facilities Within New Bedford Harbor, and Subaqueous

Capping of Contaminated Sediments all received a [10] due to the ease at which timing of the projects could be initiated with that of CAD Cell construction.

Benefits (B)

The benefits criteria evaluates the potential benefits associated with the alternative, including avoided costs associated with the non-implementation (or reduced implementation) of other alternatives. This criteria does not evaluate environmental benefits, which are included within the *Short-Term Environmental Impacts/Benefits* and *Long-Term Environmental Impacts/Benefits* criteria evaluations.

Alternative No CAD Cell Construction received a [1] due to its elimination of CAD Cells as a methodology for sequestering PCB contaminated sediments that currently impact New Bedford Harbor. Alternative Open Ocean Disposal and Upland Disposal received a [5], as the projects aid the State Enhanced Remedy, but provide no additional benefit. Alternative Construction Projects Located Upland provides an additional marginal benefit to upland projects (where the material can be utilized) and therefore received a [6]. Alternatives Construction Projects Located Within the Coastal Zone, Beach Nourishment and Subaqueous Capping of Contaminated Sediments each provide a more substantial benefit (two due to anticipated stimulus of coastal economic development, and the other due to additional isolation of impacted sediment), and therefore received an [8]. Capping of completed CAD Cells and Confined Disposal Facilities Within New Bedford Harbor each received eight points due to the benefits from reuse of sediment with each of those options, and the Confined Disposal Facility received an additional two points due to the public benefit of a new marine terminal, for a total of [10].

Risk (R)

The risk criteria evaluates on-site and off-site risks to human health, public health, fish and shellfish, navigation, safety and the environment during construction and post-completion for the alternative.

Alternative No CAD Cell Construction received a [1] due to its elimination of CAD Cells as a methodology for sequestering PCB contaminated sediments that currently impact New Bedford Harbor. Subaqueous Capping of Contaminated Sediments received a [3] as the capping of impacted areas will result in an increase in the elevation of the bathymetry within the Harbor. Alternatives Upland Disposal and Construction Projects Located Upland would involve risks associated with transportation of a very large number of trucks over highways; because of the significant amount of truck traffic, the risks of motor vehicle accidents would increase. Alternatives Confined Disposal Facilities Within New Bedford Harbor and Construction Projects Located Within the Coastal Zone received an [8] as some risk is involved in construction projects of this nature and double handling of the material. Alternatives Open Ocean Disposal, Beach Nourishment, and Capping of Completed CAD Cells each received a [10] due to reduced risk of transporting sediment over water rather than land and only one handling of the material.

Non-Pecuniary Interests (N)

The non-pecuniary interest ranking allows evaluation of more subjective qualities of an alternative, such as environmental justice and aesthetics or other parameters, which cannot be assigned a monetary value.

Alternative No CAD Cell Construction received a [1] due to the significant environmental justice concerns and aesthetic byproducts of the PCB impacts to sediment within New Bedford Harbor. Alternative Upland Disposal also received a [1] due to the poor aesthetics involved in utilizing a landfill for storage of material. Alternatives Open Ocean Disposal received a [5] due to the opinion that The Department and CZM has expressed regarding their policy objections for disposal of all of the clean sand at this location. Subaqueous Capping of Contaminated Sediment also received a [6] since it needs to balance the environmental justice of a more comprehensive remediation with the potential to restrict future dredging and navigation in areas to be capped. Alternative Construction Projects Located Upland also received a [6] due to the potential for the clean sand to impact groundwater resources with its salinity. Alternative Construction Projects Located within a Coastal Zone received a [7] as it is likely that these projects will stimulate economic activity and employment. Alternatives Capping of Completed CAD Cells, Beach Nourishment, and Confined Disposal Facilities Within New Bedford Harbor all received a [10] for the following reasons: CAD Cell capping will allow future mooring of vessels in deeper water, which will increase satisfaction of recreational boaters, beach nourishment will allow continued use of recreational beaches, and Confined Disposal Facility construction will allow the construction of new Marine Terminals, which will create jobs and stimulate economic activity, and is essential to the implementation of off-shore wind energy facilities. Additionally, CDFs will facilitate the implementation of other alternatives for disposal/reuse of clean sand as it will allow a location to store the sand to reduce timeliness issues. Finally by allowing disposal of contaminated material, CDFs will facilitate the sizing of future CAD Cells, which are currently limited in size by the quantity of available space within previously constructed CAD Cells for disposal of the tops of future CAD Cells.

Difficulty in Implementation (I)

The implementation criteria takes into account the complexity of the alternative, the availability of necessary resources or locations, expertise needed by the receiving locations and physical or regulatory restrictions to utilization of the alternative.

Alternative No CAD Cell Construction received a [1] as CAD Cell Construction is an already selected remedy for disposing of impacted sediment dredged in association with the State Enhanced Remedy and therefore Difficulty in Implementation of No CAD Cell Construction is not applicable. Alternatives Construction Projects Located Upland, Construction Projects Located within the Coastal Zone, and Upland Disposal all also received a [1] due to the time-consuming dewatering process necessary prior to transport of the material offsite. Beach Nourishment received a [7] due to design issues associated with site-specific placement of material at each beach location, as well as the potential for endangered species to limit application of material. Open Ocean Disposal, Capping of Completed CAD Cells, Confined Disposal Facilities Within New Bedford Harbor and Subaqueous Capping of Contaminated Sediment all received a [10] either due to the reduced number of times that the material needed to be handled, or due to the extreme proximity of the reuse/disposal locations to the CAD Cells.

Short-Term Environmental Impacts/Benefits (S)

The short-term environmental impact ranking evaluates impacts such as noise, sediment entrainment within the water column, disturbance of the benthic substrate, and the potential for environmental releases.

Alternatives No CAD Cell Construction, Construction Projects Located Upland, Construction Projects Located Within the Coastal Zone, Upland Disposal and Confined Disposal Facilities Within New Bedford Harbor received a [10] due to either the absence of material, or reuse of material outside of the resource areas or (in the case of Confined Disposal Facilities) isolated from the resource areas by means of sheet piling. Alternatives Open Ocean Disposal, Capping of Completed CAD Cells, Beach Nourishment, and Subaqueous Capping of Contaminated Sediments all received a [8] to account for entrainment of sediment within the water column due to implementation of these alternatives, which could result in impacts to fish and other marine resources.

Long-Term Environmental Impacts/Benefits (P)

The long-term environmental impact ranking evaluates impacts such as permanent loss of environmental resources, destruction of shellfish, reduction in essential fish habitat, permanent decreases in anthropogenic contaminants, and removal of contaminated sediment from contact with the environment.

Alternatives Capping of Completed CAD Cells, Upland Disposal and Beach Nourishment each received a [10] due to the minimal (or no) long-term impact on environmental resources while maximizing long-term environmental benefits by removing PCB impacted sediment from contact with the environment. Alternatives Construction Projects Located Upland and Construction Projects Located within the Coastal Zone each received a [9] by maximizing long-term environmental benefits by removing PCB impacted sediment from contact with the environment while anticipating the potential for long-term environmental damage when the material is re-used upland or disposed at a landfill. Alternative Open Ocean Disposal received a

[5] due to the potential for a very large quantity of material to require the design of a new open-ocean disposal facility, which would impact a large section of open-ocean floor. Alternatives Confined Disposal Facilities Within New Bedford Harbor and Subaqueous Capping of Contaminated Sediments each received a [4] due to filling of existing environmental resources (while generating benefits from removal of PCB impacted sediment and resources from the environment). Alternative No CAD Cell Construction received a [1] due to the long-term environmental impact anticipated from allowing PCB impacted sediment to remain in contact with the environment.

Cost (C)

The cost criteria evaluate all costs associated with the alternative. The cost estimates are based upon published information and industry experience, and are generally considered conservative.

Alternative No CAD Cell Construction received a [10] due no cost for implementation. Alternative Open Ocean disposal received an [8] due to it being a relatively inexpensive disposal option, while hampered with timing issues that would likely increase costs marginally. Alternatives Capping of Completed CAD Cells, Subaqueous Capping of Contaminated Sediment, and Beach Nourishment all received a score of [6] due to timing issues and logistical issues associated with proper placement of material, which may need to be hydraulically placed to ensure success. Alternatives Confined Disposal Facilities Within New Bedford Harbor received a [4] due to the costs associated with construction of a facility to hold the clean sand indefinitely. Alternatives Construction Projects Located Upland, Construction Projects Located Within the Coastal Zone, and Upland Disposal all received a [1] due to the expensive dewatering

process necessary prior to transport of the material offsite, as well as disposal and transportation costs associated with these alternatives.

Matrix Table

The following table shows the alternatives, the evaluation criteria, each alternative's ranking for its respective criteria, and the total score for each alternative. Alternatives are ranked by total score (highest score indicates the most preferred alternative).

Alternative Matrix Table

Alternative	**E**	**T**	**B**	**R**	**N**	**I**	**S**	**P**	**C**	**Total**
No CAD Cell Construction	1	10	1	1	1	1	10	1	10	**36**
Open Ocean Disposal	3	5	5	10	5	10	8	5	8	**59**
Capping of Completed CAD Cells	5	5	10	8	10	10	8	10	6	**72**
Beach Nourishment	5	5	8	10	10	7	8	10	6	**69**
Construction Projects Located Upland	3	5	6	4	6	1	10	9	1	**45**
Construction Projects Located Within the Coastal Zone	5	2	8	8	7	1	10	9	1	**51**
Upland Disposal	3	5	5	4	1	1	10	10	1	**40**
Confined Disposal Facilities Within New Bedford Harbor	10	10	10	8	10	10	10	4	4	**76**
Subaqueous Capping of Contaminated Sediments	5	10	8	3	6	10	8	4	6	**60**

Where:

E is Effectiveness

T is Timeliness

B is Benefits

R is Risk

N is Non-Pecuniary Issues

I is Difficulty in Implementation

S is Short-Term Environmental Impacts

P is Long-Term Environmental Impacts

C is Cost

Comparison of Alternatives

The alternatives evaluated are listed below in descending order of preference as determined by the Alternative Matrix Table:

Ranking (Total Score)	**Alternative**	**Reasoning**
#1 (76 points)	Confined Disposal Facilities Within New Bedford Harbor	This is the only alternative that addresses all three Project Purposes in allowing for a significant quantity of re-use/disposal of clean sand. This alternative would also serve as a storage facility and would help implement many of the other alternatives that require significant handling times or have dewatering requirements. The facilities could accept contaminated material, which would help reduce the reliance of CAD Cell

		sizing on the available volume left in previously-constructed CAD Cells. The facilities are close in proximity to the CAD Cell area, and timing if these projects with CAD Cell creation can be easily completed. Costs to construct the facilities are higher than some other disposal option; however, these higher costs are offset by the enormous benefits to the local economy that will generate tax revenue over time and allow the relocation of new, green industries to New Bedford Harbor. Once a facility is built some resource areas and flood storage will be lost. However, much of the resource areas are impacted by PCBs, reducing their value, and this alternative will cap those PCB impacted resources in place. NBHDC had committed to a mitigation in consultation with all involved parties. This alternative is clearly the best option for reuse of clean sand generated from CAD Cell construction.
#2 (72 points)	Capping of Completed CAD Cells	This alternative utilizes clean sand efficiently to meet an already existing need for CAD Cell construction. Due to consolidation, there are some timing limits on when a CAD Cell can be capped. The benefits of capping the CAD Cells are to permanently isolate PCB impacted sediment from the harbor, and there are relatively low risks to capping CAD Cells. The non-pecuniary benefits are high, and capping CAD Cells has been shown to be technically feasible. Short-term environmental impacts have been shown to be no greater than other in-water alternatives, and there are no additional long-term environmental impacts. Unfortunately, the maximum volume of clean sand that could be utilized for CAD Cell capping will

		only consume a fraction of the quantity clean sand that will be generated over time. As a result, other alternatives must be considered for clean sand material reuse/disposal.
#3 (69 points)	Beach Nourishment	This alternative utilizes clean sand efficiently to meet an already existing need. Beach Nourishment scores above average in every criterion except for timeliness, because of time windows within which Beach Nourishment can take place. Fortunately, weathering, erosion, and storm activity will ultimately demand additional Beach Nourishment multiple times at the same locations; however, the primary issue with this option is that the maximum volume of clean sand that could be utilized for Beach Nourishment will only consume a fraction of the quantity clean sand that will be generated over time.

Ranking (Total Score)	Alternative	Reasoning
#4 (60 points)	Subaqueous Capping of Contaminated Sediments	This alternative, while meeting or exceeding in many of the selected evaluation criteria, and providing a potential possible re-use for a relatively large quantity of clean sand, poses serious problems with regard to future navigation as well as potential interference with the future use plans of the harbor. Many areas in the Harbor that have been identified as potential locations for capping of contaminated sediments have depth requirements for vessel navigation that will not be met post-capping. Few locations are suitable for this option; however, some locations may be considered (such as OU-3). Before this option could be implemented, these questions would need to be addressed and answered, and it is possible that the subsequent volume required may be much lower than the 350,000 cubic yard volume listed within this document. However, it should be noted that where this option can be utilized to cap contaminated sediments that would otherwise be left in place after either the Superfund or SER dredge projects are complete, the option becomes significantly more attractive in that it then becomes part of the Enhancement to the Remedy. For those special cases, this element would score in the #3 ranking, in front of Beach Nourishment.

#5 (59 points)	Open Ocean Disposal	Open Ocean Disposal is an economic alternative for disposal of clean sediment that has already been utilized for CAD Cell material disposal. This option has relatively few environmental impacts on a small scale, but relative large impacts on a large scale (should a new ocean disposal site be required). The Department has indicated that large-scale use of this option is not preferred where reuse option area available and that timeliness restrictions on the use of this alternative reduce its utility. There is considerable concern that if other alternatives are not identified and implemented for the New Bedford dredging, that the offshore disposal sites could reach capacity much quicker than their assumed useable life, forcing the creation of additional offshore disposal facilities.
#6 (51 points)	Construction Projects Located Within Coastal Zone	This alternative has potential to utilize clean sand; however, due to timing issues, implementation of this option will be very difficult without a staging facility. It is often difficult to identify and coordinate with local construction projects. Limiting those projects to the coastal zone will result in a very few projects through which to coordinate and distribute the clean sand. As a result, it is crucial to be able to have a facility at which to stage this material in order to be able to have the material on hand when the projects require it.

		Required dewatering procedures and their associated costs for transport and disposal make it very difficult to execute. The risk involved with the increased amount of trucking in an already heavily trucked area (Northeast US) could prove to be dangerous to the general public. It is also unlikely that coastal projects could accommodate the volume of clean sand that will be generated.
#7 (45 points)	Construction Projects Located Upland	This alternative will be very difficult to utilize due to the problems associated with utilizing marine sediment in upland locations, and the potential risk to groundwater resources. Required dewatering procedures and their associated costs for transport and disposal make it very difficult to execute. The increased amount of trucking in an already heavily trucked area (Northeast US) would increase the risk of motor vehicle accidents.

Ranking (Total Score)	Alternative	Reasoning
#8 (40 points)	Upland Disposal	This alternative will likely be the most expensive of any of the considered alternatives. Removal of the material from the harbor, dewatering of the material and transportation of the materials will already be expensive (as noted in the upland and coastal zone re-use alternatives), however the disposal tipping fee will make this option completely non-viable. Salinity of the sands may also result in the requirement that the material not be utilized in unlined landfills. Lined landfills will include a much higher cost. Finally, there is likely no available space within existing landfills for the quantity of clean sand discussed herein.
#9 (36 points)	No CAD Cell Construction	This alternative is not a viable option for New Bedford Harbor. While it scores well in three criteria (timeliness, short term environmental impacts, and costs) the underlying truth is that No CAD Cell Construction means the halt of the cleanup of PCB impacted sediment from New Bedford Harbor. In addition, while short term environmental impacts are rated high, the resultant long term environmental impacts (of leaving PCB contaminated sediment in place) make this option unreasonable.

Sequence of Preferred Alternatives

CAD Cells have been chosen as the preferred methodology for disposal of PCB contaminated sediment within New Bedford Harbor associated with the State Enhanced Remedy. It is currently anticipated that approximately 1.8 million cubic yards of clean sand will be generated during construction of the future CAD Cells. The Department has stated that use of the clean sand within CDFs as well as use of clean sand as capping material is preferable to Open Ocean Disposal. As a result of a detailed analysis, the following potential re-use and disposal alternatives were evaluated and ranked (shown in order of preference):

1. Confined Disposal Facilities Within New Bedford Harbor
2. Capping of Completed CAD Cells
3. Beach Nourishment
4. Subaqueous Capping of Contaminated Sediments
5. Open ocean disposal.
6. Construction Projects Located Within the Coastal Zone
7. Construction Projects Located Upland
8. Upland Disposal
9. No CAD Cell Construction

The purpose of this analysis was not to promote one disposal/re-use option over all others, but rather to evaluate all options and rank each accordingly, to provide a number of

potential, feasible options for utilization. It is currently anticipated that no one option will be capable of accommodating 1.8 million cubic yards of material.

Based upon the results of this analysis, it is currently anticipated that a combination of Confined Disposal Facilities Within New Bedford Harbor, Capping of Completed CAD Cells, Subaqueous Capping of Contaminated Sediments, Open Ocean Disposal, Beach Nourishment, Construction Projects Located Upland, and Construction Projects Located Within the Coastal Zone should be utilized to re-use/dispose of clean material generated during CAD Cell construction.

Alternatives Beach Nourishment, Construction Projects Located Upland, and Construction Projects Located Within the Coastal Zone will require a staging area to store clean sand, in order to be properly implemented. A staging facility currently does not exist; however, one of the benefits for implementing Alternative Confined Disposal Facilities within New Bedford Harbor is that it will create a location at which material can be stored before it is utilized.

Alternatives Capping of Completed CAD Cells and Subaqueous Capping of Contaminated Sediments have limitations on the extent of their usefulness, due to potential limitations on the quantity of clean sand that could be utilized.

Alternatives Construction Projects Located Upland, Upland Disposal, and No CAD Cell Construction are unfavorable alternatives due to either their technical infeasibility or their cost.

Therefore, implementation of Confined Disposal Facilities within New Bedford Harbor takes on a large role of importance on the scale of suitability among other Alternatives since it not only will accommodate a significant quantity of clean sand and disposal of sufficient contaminated material to facilitate the construction of CAD Cells, but will also allow the storage of clean sand at a facility within New Bedford Harbor, that will subsequently allow utilization of that material at within a number of other potential alternatives.

CDF Location Analysis

Central to meeting the Project Purpose is finding re-use and disposal alternatives for clean sand generated during CAD Cell construction, which will enhance the remedy for the New Bedford Superfund site and facilitate navigational dredging within New Bedford Harbor; however, it is not possible to utilize one alternative for the entire volume of clean sand anticipated to be generated. There is a need for a combination of alternatives to jointly reuse and dispose of the clean sand. As a result of a detailed Alternatives Analysis, the following potential re-use and disposal alternatives are evaluated and ranked (shown in order of preference):

1. Confined Disposal Facilities Within New Bedford Harbor
2. Capping of Completed CAD Cells
3. Beach Nourishment
4. Subaqueous Capping of Contaminated Sediments
5. Open ocean disposal.
6. Construction Projects Located Within the Coastal Zone
7. Construction Projects Located Upland

8. Upland Disposal
9. No CAD Cell Construction

Many alternatives will require a staging area to store clean sand, in order to be properly implemented. A staging facility currently does not exist; however, one of the benefits for implementing Confined Disposal Facilities is that it will create locations at which material can be stored before it is utilized. A precedent for Confined Disposal Facility creation to facilitate contaminated sediment disposal already exists, as EPA constructed two CDFs (one at Sawyer Street and one at North Terminal) to facilitate implementation of the Record of Decision for the Superfund cleanup. Confined Disposal Facilities take on a large role of importance on the scale of suitability among other Alternatives since they will not only accommodate a significant quantity of clean sand and disposal of sufficient contaminated material to facilitate the construction of CAD Cells, but will also allow the storage of clean sand, which will subsequently allow utilization of that material within a number of other potential alternatives.

Currently there are three (3) locations that have been considered for CDF construction in New Bedford Harbor. These locations have been advanced as a result of multiple evaluations, including the Feasibility Study for the Superfund Remedy and subsequent studies related to Remedial Alternatives for the Superfund Project, the Enhancement to the Remedy requested by the The Department, and evaluations conducted as part of the SER Navigational Dredge program and the New Bedford/Fairhaven Harbor Plan (2003 and 2009 versions). The three potential CDF locations within the Harbor that have been advanced by The Department and the City and Town include:

1. The *North Terminal CDF*, located off of Herman Mellville Boulevard between the EPA Dewatering Facility and the northern border of the property currently housing Tisbury Towing (Packer Fuels);
2. The *South Terminal CDF*, located to the south of the existing South Terminal in the southern portion of the Port of New Bedford; and
3. The *Popes Island CDF*, located on Popes Island in the Harbor between Fairhaven and New Bedford.

The following represents a summary of the characteristics of the three potential CDF locations currently under consideration within the Harbor[5].

North Terminal CDF

- Encompasses approximately 24.8 acres of area;
- Impacts approximately 7.63 acres of resource area;
- CDF would Incorporate approximately 8 acres of environmentally impaired and/or degraded property, to include subaqueous PCB and metals contaminated sediments that exist to the east of the current shoreline;
- Is currently industrial property;
- Land is currently owned by the HDC, but leased to multiple water-dependent and non-water-dependant users; and
- Requires the relocation of up to 5 users, including: Tisbury Towing/Packer Fuels; Evergreen Construction; ABCO; New Bedford Welding; and Marine Hydraulics.

[5] Note: Bulleted items indicate characteristics related to remediation/navigation purposes, starred items indicate renewable energy characteristics

- CDF would allow for the incorporation (and permanent disposal) of approximately 225,000 cubic yards of sediment disposal.
- CDF would allow for future storage of a large amount of clean sand from CAD cells as a transient storage holding area until other uses can be found for the material.
- Is located north of the Route 6 swing bridge, which currently restricts vessel size to the Terminal. Future planned bridge upgrades should alleviate this problem, though planned upgrades are unlikely in the next 5-years;
- Is located adjacent to an unimproved navigation channel that will require significant dredging to fully utilize the CDF Terminal;
- Timing of Implementation: will require at least five–ten years of preparation, user relocation, and bridge rehabilitation.
- Long term potential industrial use for renewable energy or Intermodal and Short Sea Shipping Terminal, with an adjacent rail terminal, potential direct rail access, and nearby highway access.

South Terminal CDF

- Encompasses approximately 20 acres of area;
- Impacts approximately 6.61 acres of resource area;
- CDF would Incorporate approximately 10 acres of environmentally impaired and/or degraded property, to include subaqueous PCB and metals contaminated sediments that exist to the east of the current shoreline, and contaminated urban fill areas upland, and paved and filled areas upland;
- Is currently industrial and industrially impacted property;

- Land is currently owned by the HDC, but leased to non-water-dependant users; and
- Does not require the relocation of any users;
- CDF would allow for the incorporation (and permanent disposal) of approximately 220,000 cubic yards of sediment disposal;
- CDF would allow for future storage of a large amount of clean sand from CAD cells as a transient storage holding area until other uses can be found for the material;
- Reflects ideal future potential industrial use as an Alternative Energy Industrial Marine Park, potential direct rail access, and nearby highway access;
- Is located south of the Route 6 swing bridge, and has no restriction on vessel size nor timing;
- Timing of Implementation: can be implemented immediately. No relocation or other maritime restrictions;
- Is located adjacent to an improved navigation channel that will require dredging to maximize utilization of the CDF Terminal;
- Timing of Implementation: can be implemented immediately. No relocation or other maritime restrictions.

Popes Island CDF

- Encompasses approximately 25 acres of area;
- Impacts approximately 15 acres of resource area;
- CDF would Incorporate approximately 10 acres of environmentally impaired and/or degraded property, to include subaqueous PCB and metals contaminated sediments that exist to the north of the current shoreline;

- Has no adjacent rail terminal, no potential direct rail access, and poor highway access;
- Is currently industrial/commercial property;
- Land is not currently owned by the HDC, but leased to multiple water-dependent and non-water-dependant users; and
- Will require the relocation of more than 10 users, including: Niemiec Marine, A recently renovated Bait and Tackle shop, Retail shops, West Marine, Dunkin Donuts, Fairhaven TrueValue Hardware, Skip's Outboards.
- CDF would allow for the incorporation (and permanent disposal) of approximately 200,000 cubic yards of sediment disposal.
- CDF would allow for future storage of a moderate amount of clean sand from CAD cells as a transient storage holding area until other uses can be found for the material.
- Is located north of the Route 6 swing bridge, which currently restricts vessel size to the Terminal. Future planned bridge upgrades should alleviate this problem, though planned upgrades are unlikely in the next 5-years;
- Is located adjacent to adjacent to existing Confined Aquatic Disposal Cells which permanently restrict channel depths, and prevent full utilization of the CDF Terminal.

In order to assess the relative advantage of the three considered CDF locations within the Harbor, a matrix of characteristics was devised, and a comparative ranking system developed. The matrix below incorporates the logistical and environmental attributes of each of the proposed CDF locations.

The Matrix below is presented in two parts:

1) The attributes that reflect the various CDF benefits or impacts from the perspective of the Superfund and Navigational/SER Dredging and
2) The attributes that reflect the various CDF benefits or impacts from the perspective of the Offshore Renewable Energy Utility. The matrix is color-coded with green indicating the attributes associated with the EPA Cleanup/NavigationalSER Dredging, and pink indicating the attributes associated with the near term Offshore Wind Energy and long term potential transport Utility. It should be noted that some of the attributes overlap between the Project Purposes, and that the attributes were grouped based upon which Project Purpose the attribute showed the strongest relevance. Also note that the *Basis for Ranking* is set up so that the most advantageous situation will result in the highest score (for instance the amount of impacted area – because less impact is desired, the ***smaller*** the impacted area, then the ***higher*** the score).

	Basis for Ranking (1-5)	North Terminal CDF	South Terminal CDF	Popes Island CDF
Attributes Associated with the Superfund Cleanup and Navigational/SER Dredging:				
Current Property Use	**1 = residential 2.5 = commercial/retail 5 = Industrial**	**5**	**5**	**2.5**
Property Ownership	**1 = All Privately Owned 5=All HDC or Acquirable**	**5**	**5**	**1**
Relocations	**1 = 6+ relocations 2.5 = 1 to 6 relocations 5 = no relocations**	**2.5**	**5**	**1**
Amount of Impacted Resource Area	**1 = >10 acres 5 = <7 acres**	**3**	**5**	**1**
Amount of				

Environmentally Degraded Area Capped and Improved	**1 = < 5 acres** **2.5 = 5 to 10 acres** **5 = 10+ acres**	**2.5**	**5**	**5**
Disposal Capacity	**1 = < 100,000cy** **5 = > 250,000cy**	**4**	**4**	**2**
Future Transient Sand Storage Potential	**1=small (<50k yds)** **5=large (>100k yds)**	**5**	**5**	**3**
Attributes Associated with Offshore Renewable Energy Utility and SSS Use:				
Relative Future Utility for Alternative Energy and Transport	**1 = low utility** **2.5 = utility for SSS** **5 = utility for SSS & ORE (ORE=Offshore Renewable Energy)**	**2.5**	**5**	**1**

Facility Size	**1 = <5 acres** **5 = 20+ acres**	**5**	**5**	**5**
Post-Construction Restrictions to Navigation (eg, bridge, shallows, etc)	**1 = bridge and shallows** **2.5 = bridge restriction** **5 = no restrictions**	**2.5**	**4**	**1**
Access to Navigation Channels	**1 = Poor Access** **2.5 = Nearby Access** **5 = Direct Access**	**2.5**	**5**	**2.5**
Timing of Implementation	**1 = 6+ years** **2.5 = 3 to 6 years** **5 = immediate**	**2.5**	**5**	**1**
TOTALS:		**42**	**58**	**26**

The ranking indicates that by far the most viable near-term option for locating a CDF in New Bedford Harbor is the South Terminal. The individual ranking for remediation/navigation and renewable energy and the combined ranking places South Terminal as the lead alternative. This does not mean that North Terminal CDF or the Popes Island CDF will not make valuable contributions to the Project as the analysis of potential disposal capacity indicates that all three CDFs will eventually be needed if a maximum efficiency is to be obtained for all of the Project Purpose. The ranking does indicate a relative sequence and timing for construction of CDFs in the Harbor, and indicates a relative order of:

1. South Terminal CDF
2. North Terminal CDF
3. Popes Island CDF

Note that the analysis was conducted with current information. The ranking of the #2 and #3 spots could change in the future if the conditions change. The ranking for the #1 alternative is not expected to change as the time to implementation is immediate.

Currently, there are limitations with regard to space within New Bedford Harbor. There are three potential locations that have sufficient space for a new CDF within New Bedford Harbor: North Terminal, South Terminal, and Pope's Island. North Terminal and Pope's Island both have issues associated with relocation of existing land holders and/or tenants; Pope's Island is particularly problematic due to the fact that is currently privately owned (the HDC owns North Terminal, but would have to displace tenants during construction). North Terminal and Pope's Island are also located north of the Route 6 Bridge, which could potentially limit the types of marine traffic that could utilize these locations for water-dependant industrial or commercial activity. The proposed North Terminal CDF is anticipated to fill more

than twice the area of land under water than the proposed South Terminal CDF. Additionally, as discussed earlier, an in-depth study has recently been completed by the Massachusetts Clean Energy Center; the report determined that a proposed expansion of South Terminal within the Port of New Bedford represents the best opportunity for a Massachusetts port facility to accommodate assembly and installation of offshore wind energy projects. It is due to these (and some other) criteria, that South Terminal has emerged as the preferred option for CDF construction within New Bedford Harbor.

5. Environmental Condition and Resource Impact Assessment of South Terminal[6]

The proposed South Terminal CDF is a filled structure adjacent to the shoreline, bounded by sheet piling or an earthen berm, currently planned to be capped by crushed stone. It is currently anticipated that 220,000 cubic yards of clean sand from CAD Cell construction would be incorporated into the construction of the facility. The estimated size of the facility is currently anticipated to be approximately 20 acres.

Resource area mapping was performed on the site in April of 2010. The resources were delineated using field identification methods in conjunction with photogrammetry, and land surveying techniques. Areas where wetland plant species were identified, were further investigated using shallow hand dug test pits to check for the presence of hydric soils within eighteen inches of the surface. Confirmed areas of wetlands were identified with surveyor's flagging, and located using a theodolite. Elevations of the property were recorded during the land survey and referenced to New Bedford Harbor Mean Lower Low Water datum, and were used to determine the limits of Land Subject to Flooding as well as the limit of High and Low

[6] Please see Appendix 4, Functions and Values Assessment; Appendix 5, Shellfish Survey Results; and Appendix 6, Essential Fish Habitat and Endangered Species Assessment.

tides. During the course of wetland resource delineation, it was discovered that a large portion of the properties to be included in the South Terminal Expansion footprint had been covered with Urban Fill. The fill on the site consisted of angular stone, soil, brick, gravel, asphalt, tar, concrete, steel, automobile and truck tires and inner-tubes, automobile and truck parts, plastic, and glass.

Please note that the sub and inter-tidal wetland resources identified are impacted by PCBs and other contaminants, including heavy metals associated with the New Bedford Superfund Site. Much of these resource areas are severely impacted and will require remediation; therefore, the resources will be impacted regardless of whether South Terminal CDF construction is chosen as an alternative or not. The upland portion of the site has a long history of industrial use, and the facility shows clear indications of having been filled historically. An environmental site assessment conducted on one of the proposed site parcels for the Shuster Company, in 2006 found residual industrial contaminants above regulatory limits within the areas of urban fill. Contaminants consisted of Benzo(a)anthracene , Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, and Benzo(g,h,i)perylene, in concentrations varying between 0.7 and 14 ppm.

The existing resources have a severely limited value due to the existing PCB impacts; thus, capping of these impacted resource areas will have an environmental benefit by removing the PCB impacted sediment from contact with the environment. The flood storage loss created by the completion of the South Terminal CDF would have a minimal overall impact on New Bedford Harbor, as noted within the document entitled Hydrology of Floods, New Bedford Massachusetts, produced by the Hydrologic Engineering Section of the U.S. Army Corps of Engineers in September 1987.

As sections of New Bedford Harbor are designated as a Designated Port Area, the land in question has historically been utilized for industrial purposes. Much of the land consists of fill material that has been transported to this location. Use of the site for water-dependent industrial activity would be in compliance with Commonwealth of Massachusetts Waterways Regulations. Additionally, a CDF would create positive economic benefits to the area by facilitating new water-dependent industrial activity. Although CDF creation represents a major change of portions of the shoreline of New Bedford Harbor, CDF creation has already been vetted through a public process within the New Bedford/Fairhaven Harbor Plan process during 2009.

South Terminal CDF creation will result in long-term impacts to environmental resources due to filling of wetland areas, specifically:

- Loss of 2.99 acres of Land Containing Shellfish/Land Under the Ocean.
- Loss of 1.27 acres of Coastal Beach, and Land Containing Shellfish.
- Loss of 0.34 acres of Coastal Beach, and Land Subject to Flooding.
- Loss of 0.58 acres of Coastal Beach.
- Loss of 0.26 acres of Coastal Bank and Land Subject to Flooding.
- Loss of 0.05 acres of Coastal Bank.
- Loss of 1.03 acres of Land Subject to Flooding.
- Loss of 0.71 acres of Isolated Wetlands.
- Loss of 0.24 acres of Saltmarsh.

It is noted that the wetland areas in question are impacted by PCBs and other contaminants, especially heavy metals associated with the New Bedford Superfund Site. These resource areas are severely impacted and will require remediation; therefore, the resources will

be damaged regardless of whether South Terminal CDF construction is chosen as an alternative or not. The site has a history of industrial use, and the facility shows clear indications of having been filled historically.

Summary

The existing resources have a severely limited value due to the existing PCB impacts; thus, capping of these impacted resource areas will have an environmental benefit by removing the PCB impacted sediment from contact with the environment. The flood storage loss created by the completion of the South Terminal CDF would have a minimal overall impact on New Bedford harbor, as noted within the document entitled Hydrology of Floods, New Bedford Massachusetts, produced by the Hydrologic Engineering Section of the U.S. Army Corps of Engineers in September 1987, due to the enormous flux of harbor water that is able to flush in and out of New Bedford Harbor as it is adjacent to Buzzard's Bay.

As sections of New Bedford Harbor are designated as a Designated Port Area, the land in question has historically been utilized for industrial purposes. Much of the land consists of fill material that has been transported to this location. Use of the site for water-dependent industrial activity would be in compliance with Commonwealth of Massachusetts Waterways Regulations. Additionally, a CDF would create positive economic benefits to the area by facilitating new water-dependent industrial activity. Although CDF creation represents a change of portions of the shoreline of New Bedford Harbor, CDF creation has already been vetted through a public process within the New Bedford/Fairhaven Harbor Plan process during 2009.

South Terminal is the only alternative that will meet the marine termmal infrastructure purpose within a timeframe that will achieve the Project's purpose of providing marine

infrastructure to support off shore renewable energy projects. Offshore renewable project proponents in the Commonwealth and the other southern New England states are proceeding forward on accelerated timelines that are incompatible with a site not being ready to operate within the reasonably predictable timelines. Both the North Terminal and Popes Island Terminals have constrained navigational access due to their being located north of the Route 6 swing bridge. That condition is not anticipated to be resolved for at least 5 years. Both these locations also have current users which will require their relocation, a process that is likely to consume a substantial amount of time and financial assistance. Also, EPA has expressed significant reservations to including the North Terminal or Popes Island alternatives in the ESD significantly reducing the likelihood that these alternatives will be moving forward in the foreseeable future.

As further analyzed in the matrix at page 62, the South Terminal will impact fewer acres of resource area than the other two alternatives. The ability of the South Terminal to be constructed in 2011 will also avoid the construction of a transitional CAD necessary in order to implement Phase IV dredging and provide an opportunity to use a single CAD for navigational dredging and Superfund remediation, rather than separate CADs. The elimination of two additional CADs will avoid significant construction related habitat impacts and accelerate the restoration of the benthic habitat.

Evaluation of Opportunities to Minimize Impacts Through Project Design

The proposed CDF was evaluated for opportunities to minimize environmental impact by modifying the structural and decking design, and/or the overall configuration of the facility.

While the marine terminal is intended to serve multiple purposes, one of the purposes is to support offshore wind facilities. Thus, the size and shape of the proposed South Terminal extension CDF takes into account the size and space requirements of the Offshore Wind Energy industry. The following is a list of basic guidelines that drive the configuration of the facility, based upon the current status and anticipated future direction of the off-shore wind industry.

Offshore wind developments involve the shipment, staging, and assembly of wind turbines. Wind turbines are broken down into several base component parts for shipment: Wind Blades, Nacelle, Tower Section, and Hub. Generally, each wind turbine has three wind blades, one nacelle, one hub, and at least three tower sections. One potential wind turbine type that meets the anticipated power and size requirements for the Offshore Wind Energy Industry in the New England area is Vestas V112-3.0MW (many different types of manufacturers produce wind turbines of this size and power structure; this brand is presented only for guidance purposes). The following is a summary of important information associated with the portions of this wind turbine:

Part	**Length**	**Width/Diameter**	**Number/Turbine**
Wind Blade	180 feet	13 feet	3
Nacelle	46 feet	13 feet	1
Hub	13 feet	11 feet	1
Tower Length	107 feet	14 feet	3

Based on discussions with representatives from the Offshore Wind Energy industry, for a large scale offshore wind project, it is currently anticipated that parts for approximately 130 wind

turbines will need to be stored onsite at least temporarily in order to stage the project. The maximum amount of storage space required simply for raw storage of each part is calculated by taking the dimensions of the parts (length times width) times the number of parts required for each turbine, times one hundred thirty turbines. The raw value for the space required for storage of the total number of wind turbines is 1,593,150 square feet (36.57 acres). It is unlikely that delays in construction will require storage of 100% of the parts onsite at any one time; additionally, there are stacking procedures for wind blades and some other parts that allow more efficient storage of the materials; for both of these reasons, it is clear that less than 36.57 acres is required to be provided for raw storage space.

In addition to raw storage space, the facility will need space for facility operations, which includes: space for turbine assembly, loading and unloading space for cranes, space for an operational building (for office space and for interior work space), and parking for the facility. Additionally, space will be required between the parts themselves in order to allow space for machinery (mobile cranes) to operate within the storage area, moving parts to organize and sort them, as well as space to load and unload the parts onto trucks, trains or marine vessels and to allow for space between the parts to prevent damage. This extra required space could demand up to an additional 12-16 acres.

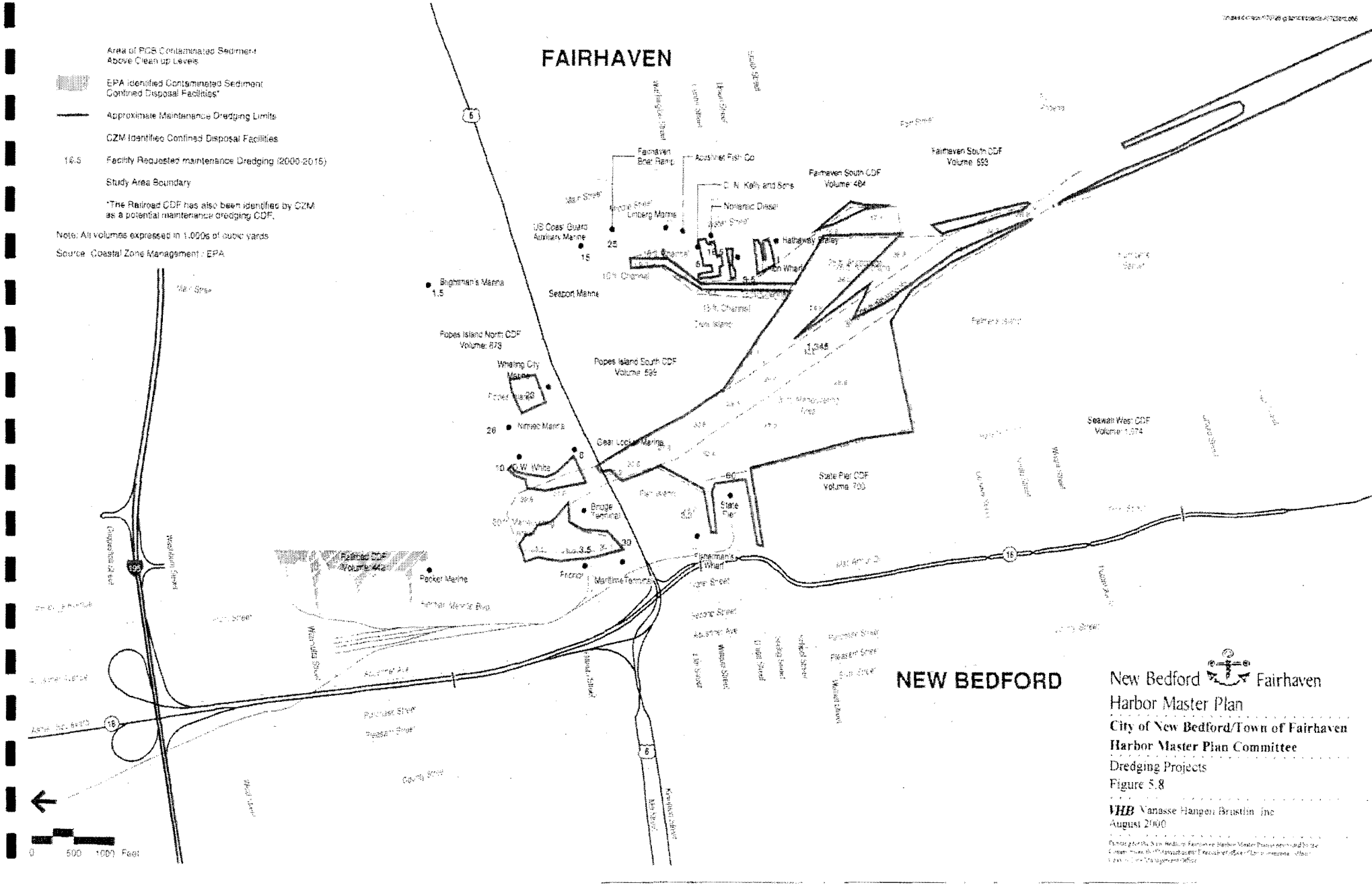
Discussions with representatives from the Offshore Wind Energy industry have made it clear that an ideal facility would have as much storage space as possible (the above calculations make plain that even a 50 acre facility would be well utilized by the Offshore Wind Energy Industry.

When outlining a plan for determining the exact configuration for the Proposed South Terminal Extension CDF, historic research was conducted in order to determine what the previous proposals have been for a CDF in this location. Early configurations of a South Terminal Extension CDF were proposed during the 2002 New Bedford/Fairhaven Harbor Planning process. Figure 1 is an excerpt from the final 2002 Harbor Plan that shows the configuration of a proposed CDF that extended far into New Bedford Harbor. This CDF would extend the South Terminal footprint to the south to the Hurricane Barrier, and would extend it over to Palmer's Island.

The 2002 proposed South Terminal CDF was anticipated to accept up to 1,974,000 cubic yards of material and was anticipated to encompass 70 acres. This proposal would create an ideal location for the Offshore Wind Energy Industry and would encompass a very large quantity of clean sand generated from CAD Cell construction; however, a number of existing businesses would need to be permanently relocated and existing facilities, including fish processing equipment of significant value, would need to be destroyed or relocated, which would result in a significant loss of economic activity and jobs for the City of New Bedford. If the footprint were revised to allow existing businesses within the footprint to remain, the footprint would encompass 50 acres, still large enough to create an ideal facility for the Offshore Wind Energy Industry; however, 31 acres of the 50 acre facility would be wetland resource areas that would need to be capped and permanently impacted from the construction of the facility.

The City of New Bedford has worked with representatives from the Offshore Wind Energy industry in order to determine the minimum space requirements necessary in order to operate an Offshore Wind Energy support facility to reduce the size of the proposed facility. It is anticipated that some wind turbine components can be stacked on-site, that not all of the 130

FIGURE 1


Area of PCB Contaminated Sediment Above Clean up Levels
EPA Identified Contaminated Sediment Confined Disposal Facilities*
Approximate Maintenance Dredging Limits
CZM Identified Confined Disposal Facilities
14.5 Facility Requested maintenance Dredging (2000-2015)
Study Area Boundary
*The Railroad CDF has also been identified by CZM as a potential maintenance dredging CDF.
Note: All volumes expressed in 1,000s of cubic yards
Source: Coastal Zone Management ; EPA
FAIRHAVEN
NEW BEDFORD
Fairhaven Boat Ramp
Acushnet Fish Co
D. N. Kelly and Sons
Fairhaven South CDF Volume: 484
Fairhaven South CDF Volume: 553
Noreastic Diesel
Hathaway Bailey
US Coast Guard Auxiliary Marine
Limberg Marine
Brightman's Marina
Seaport Marine
Popes Island North CDF Volume: 873
Popes Island South CDF Volume: 596
Whaling City Marine
Nemec Marine
Clear Lochs Marina
K.W. White
Brugge Terminal
State Pier CDF Volume: 700
State Pier
Seawall West CDF Volume: 1,074
Railroad CDF Volume: 442
Packer Marine
Maritime Terminal
Fishermans Wharf
0 500 1000 Feet
New Bedford Fairhaven Harbor Master Plan
City of New Bedford/Town of Fairhaven
Harbor Master Plan Committee
Dredging Projects
Figure 5.8
VHB Vanasse Hangen Brustlin Inc
August 2000

turbines will be onsite at any one time (although some buffer is needed to account for delays in construction), and some areas can be used for multiple functions (such as pre-assembly that could take place in the loading zone). As a result of these negotiations, it currently appears that the *minimum* facility size required for the Proposed South Terminal Extension CDF is 20 acres. A conceptual layout of a 20-acre facility at South Terminal was created showing the amount of land needed by an Offshore Alternative Energy Developer that would be creating between a 100 and 130 offshore turbine wind farm (see Figure 2). The layout presumes that components for the wind towers will be brought in to the Port for assembly and shipping to the wind farm site. The layout shows space for components (monopoles, nacelles, blades) to assemble between 8 and 10 wind towers at a time. If a wind project were to require 130 wind towers (for example), then approximately 14-17 cycles of component staging, assembly, and shipping would be employed. Over a projected 18 month construction cycle for the offshore erection component of such a project, each assembly cycle would be approximately 1 month in duration, a reasonable (though tight) timeframe for such activity.

Figure 3 shows the available parcels of land that could be utilized to construct the Proposed South Terminal Extension CDF, as well as a projection of the extension of the bulkhead to the south from the existing South Terminal. Although multiple configurations to reach the 20 acre minimum area were attempted, it quickly became clear that it was not possible to create the facility without the bulkhead extending into New Bedford Harbor. It is currently anticipated that having the bulkhead extension parallel to the existing South Terminal bulkhead will help vessels dock more easily. The length of the bulkhead (800 linear feet) was chosen to keep the length of impacted coastline to a minimum. If the bulkhead were moved closer to shore

FIGURE 2

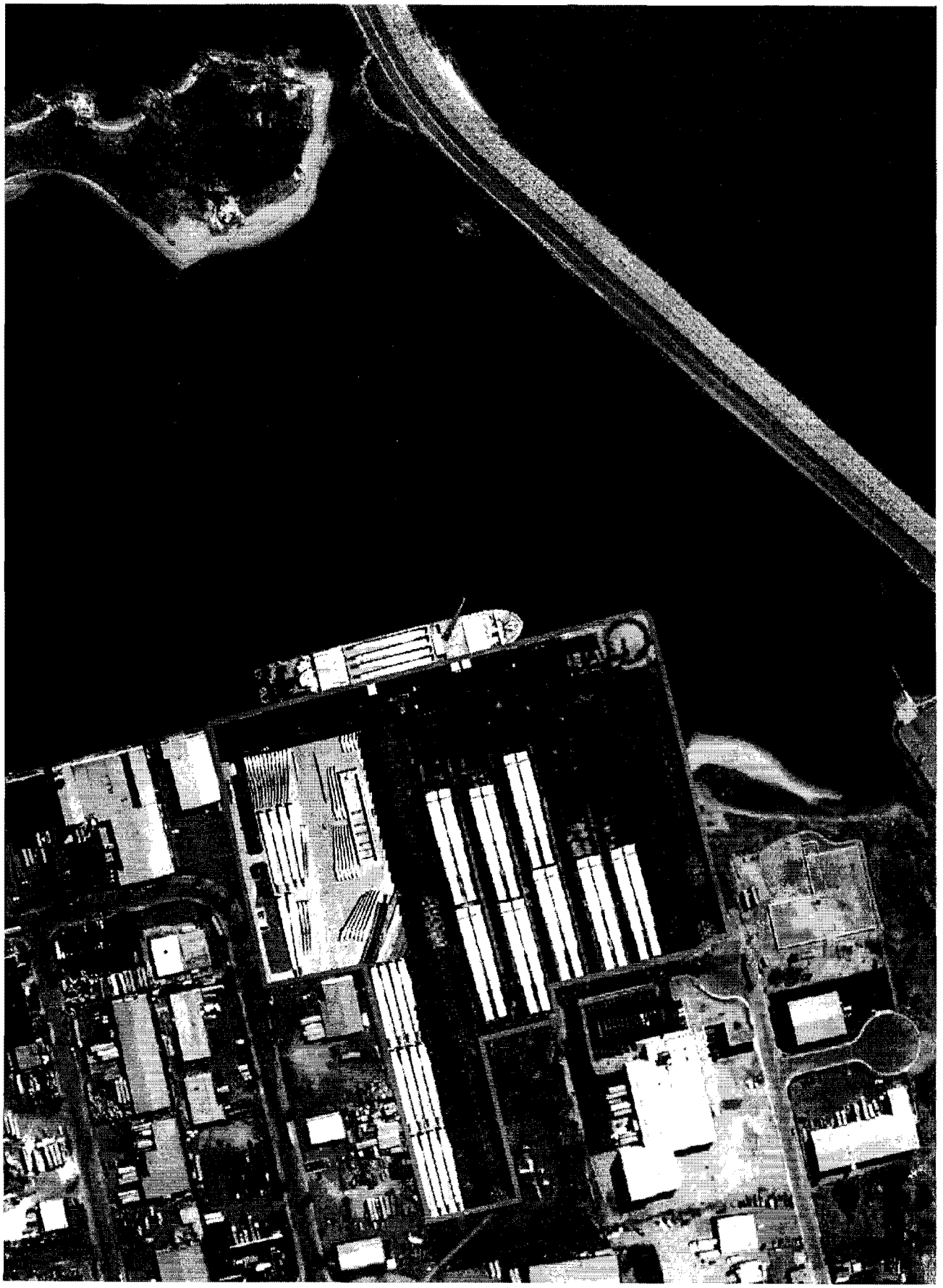
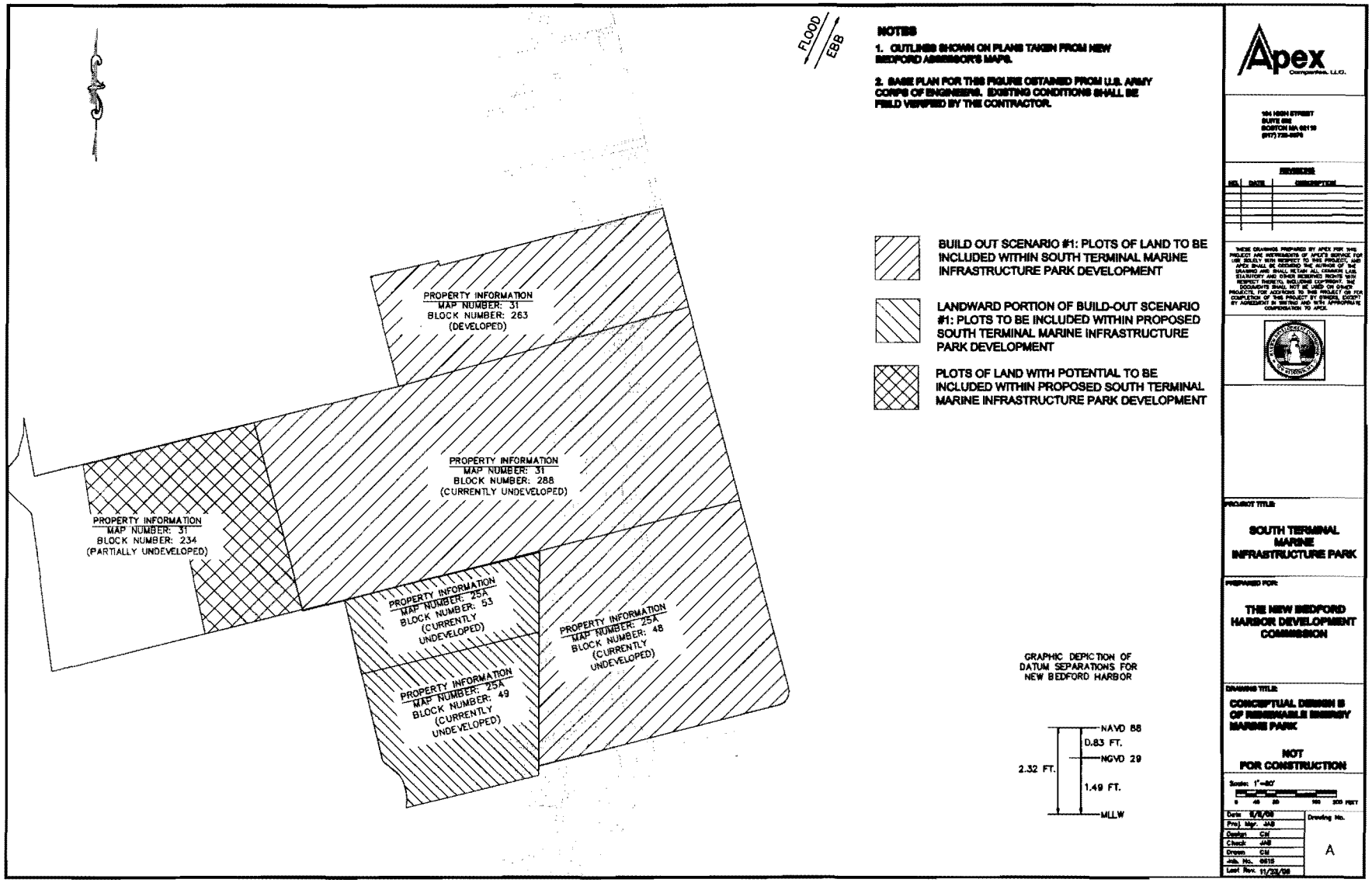


FIGURE 3


FLOOD
EBB
NOTES
1. OUTLINES SHOWN ON PLANS TAKEN FROM NEW BEDFORD ASSESSOR'S MAPS.
2. BASE PLAN FOR THIS FIGURE OBTAINED FROM U.S. ARMY CORPS OF ENGINEERS. EXISTING CONDITIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR.
BUILD OUT SCENARIO #1: PLOTS OF LAND TO BE INCLUDED WITHIN SOUTH TERMINAL MARINE INFRASTRUCTURE PARK DEVELOPMENT
LANDWARD PORTION OF BUILD-OUT SCENARIO #1: PLOTS TO BE INCLUDED WITHIN PROPOSED SOUTH TERMINAL MARINE INFRASTRUCTURE PARK DEVELOPMENT
PLOTS OF LAND WITH POTENTIAL TO BE INCLUDED WITHIN PROPOSED SOUTH TERMINAL MARINE INFRASTRUCTURE PARK DEVELOPMENT
PROPERTY INFORMATION
MAP NUMBER: 31
BLOCK NUMBER: 263
(DEVELOPED)
PROPERTY INFORMATION
MAP NUMBER: 31
BLOCK NUMBER: 288
(CURRENTLY UNDEVELOPED)
PROPERTY INFORMATION
MAP NUMBER: 31
BLOCK NUMBER: 234
(PARTIALLY UNDEVELOPED)
PROPERTY INFORMATION
MAP NUMBER: 25A
BLOCK NUMBER: 53
(CURRENTLY UNDEVELOPED)
PROPERTY INFORMATION
MAP NUMBER: 25A
BLOCK NUMBER: 49
(CURRENTLY UNDEVELOPED)
PROPERTY INFORMATION
MAP NUMBER: 25A
BLOCK NUMBER: 48
(CURRENTLY UNDEVELOPED)
GRAPHIC DEPICTION OF DATUM SEPARATIONS FOR NEW BEDFORD HARBOR
NAVD 88
0.83 FT.
NGVD 29
2.32 FT.
1.49 FT.
MLLW
Apex
SOUTH TERMINAL MARINE INFRASTRUCTURE PARK
THE NEW BEDFORD HARBOR DEVELOPMENT COMMISSION
CONCEPTUAL DESIGN B OF RENEWABLE ENERGY MARINE PARK
NOT FOR CONSTRUCTION
A

or angled, it would need to extend further to the south to maintain the minimum 20 acre facility size.

The construction basis of the proposed South Terminal extension CDF as a filled terminal takes into account two primary factors: the physical loading requirements of the Offshore Wind Energy industry, and fulfillment of the Project Purpose.

The loading requirements at an Offshore Wind Energy support facility are extremely demanding. The entire wind turbine weighs approximately 77 tons, although some of this weight is distributed unevenly between the portions of the wind turbine. These heavy pieces of equipment need to be loaded and unloaded at least twice: unloaded once when the pieces are delivered to the facility initially for storage and pre-assembly, and a second time when the pieces need to be then off-loaded into smaller vessels that deliver the pre-assembled pieces to the wind farm construction location. According to sources within the Offshore Wind Energy industry, an offshore facility will require the use of 600 ton crawler cranes to unload and load vessels, as well as to move equipment around the facility. 600 ton cranes are enormous pieces of equipment that deliver extremely large point loads onto the underlying structure that they operate upon. Sources in the Offshore Wind Energy industry indicate that the facility will need to support loads up to 4000 pounds per square foot. Further, the industry typically demands that the surface upon which the work is completed is a crushed-stone type surface since the cranes tend to destroy asphalt or concrete surfaces as they work. It is unlikely that a pile-supported structure could be constructed economically that could support these loads; even if it were possible, the structure would regularly undergo a significant amount of strain due to the wear-and-tear that these cranes would place upon the concrete deck surface that would be needed to support operations between the pilings. Should the facility be constructed as a pile supported structure (if physically

possible), the cranes would begin to destroy the concrete decking immediately upon the start of work, which would ultimately shorten the lifetime of the facility dramatically, resulting in frequent shut down and rehabilitation of the facility. The loading requirements and the type of activities required to be performed on the surface of the facility simply do not support the construction of a pile-supported facility; a filled structure is required.

The Project Purpose for the Proposed South Terminal Extension CDF is to develop a marine terminal that will provide essential infrastructure to serve offshore renewable energy facilities, facilitate the remediation of the New Bedford Harbor and manage the dredge sediment generated from the maintenance of navigational channels within the Harbor. In order to facilitate the remediation of the New Bedford Harbor and manage the dredge sediment generated from the maintenance of navigational channels within the Harbor, the Proposed South Terminal Extension CDF will need to accept clean sand from CAD Cell construction. This will not be possible if the facility is constructed utilizing a pile-supported type of construction.

6. Mitigation

We address mitigation comprehensively in the report attached as Appendix 7. For the reasons explained above, we believe that the South Terminal project is itself environmentally beneficial, as it enhances the remediation of the harbor and beneficially uses clean sand. However, if EPA believes that mitigation is needed, the attached report presents a number of mitigation options and analyzes their respective benefits.

5.0 INVENTORY OF PORTS

The following sections provide an overview and general description of Massachusetts ports, as well as regional ports that could support offshore wind development activities. This section also provides an overview of the capability of East Coast and Gulf Coast shipyards to construct new vessels, modify existing vessels, provide support vessels, and provide repair services.

5.1 Profiles of Port Facilities in Massachusetts

The Commonwealth of Massachusetts has a varied mix of marine activities in its five key port areas, with connections to both international and domestic markets. Primarily, these ports serve as transition points where cargo moves to and from marine modes including ship and barge to land-based modes, in particular truck or rail. Appendices F and G provide more detail on these ports and modes of transportation.

Massachusetts has a number of ports that, because of their existing or proposed marine terminals, geographic location, proximity to regional commercial activity, and access to land-based transport to more distant inland markets, already have substantial marine activity including a wide range of freight activity. The Commonwealth has one major tonnage and diversified seaport and five smaller niche ports that operate within the marine network. The major Commonwealth seaport is Boston, and the five niche ports include Gloucester, Salem, the Fore River Shipyard, Fall River, and New Bedford. From north to south, profiles of these Massachusetts ports and their potential for expanded marine industrial activity are presented below.

5.1.1 Gloucester, Massachusetts

Background

The Port of Gloucester is located on Cape Ann and is approximately 22.6 nm (26 miles) north of Boston. Cape Ann is located adjacent to the main shipping routes between Southern and Northern New England. The port is historically known for its fishing industry. See Appendix E for the extent of the Gloucester Designated Port Area (DPA).

Gloucester still has a large fishing industry and the potential to develop an all water ferry connection to the Province of Nova Scotia in Canada. The port has some land area available to develop a new marine facility for commercial activities. It has a readily available skilled work force and diverse marine service sector. It also has a rail line that would provide access to the national rail system, and the Route 128 corridor provides excellent highway connections to the New England highway network.

Facilities

The primary marine industrial facilities in the port are within the Industrial Port (see Figure 5-1). The principal businesses are fishing, fish processing, recreational boating, marine repair and supply, and a fledgling cruise ship business. The Industrial Port has become the city's primary marine industrial area with 98% of the land and pile-supported area within this district dedicated to industrial and accessory-to-industrial uses. It has recently experienced several significant changes, including the opening of the Gloucester Seafood Display Auction, modernization of Americold's and Gorton's waterfront infrastructure, and significant expansion of facilities on the

State Fish Pier. Most recently, the development of the Gloucester Marine Terminal at Rowe Square offers important new opportunities for the port (Garcia et al. 2009). The Gloucester Marine Terminal, the cruise ship facility, is accessed via the North Channel of Gloucester Inner Harbor and can accommodate vessels up to 152.4 m (500 feet) in length and drawing up to 5.5 m (18 feet). The facility is owned by the City of Gloucester and is limited to tourism activities. Larger vessels up to 244 m (800 feet) in length and drawing up to 7.9 m (26 feet) can be accommodated inside the breakwater at Gloucester Harbor.

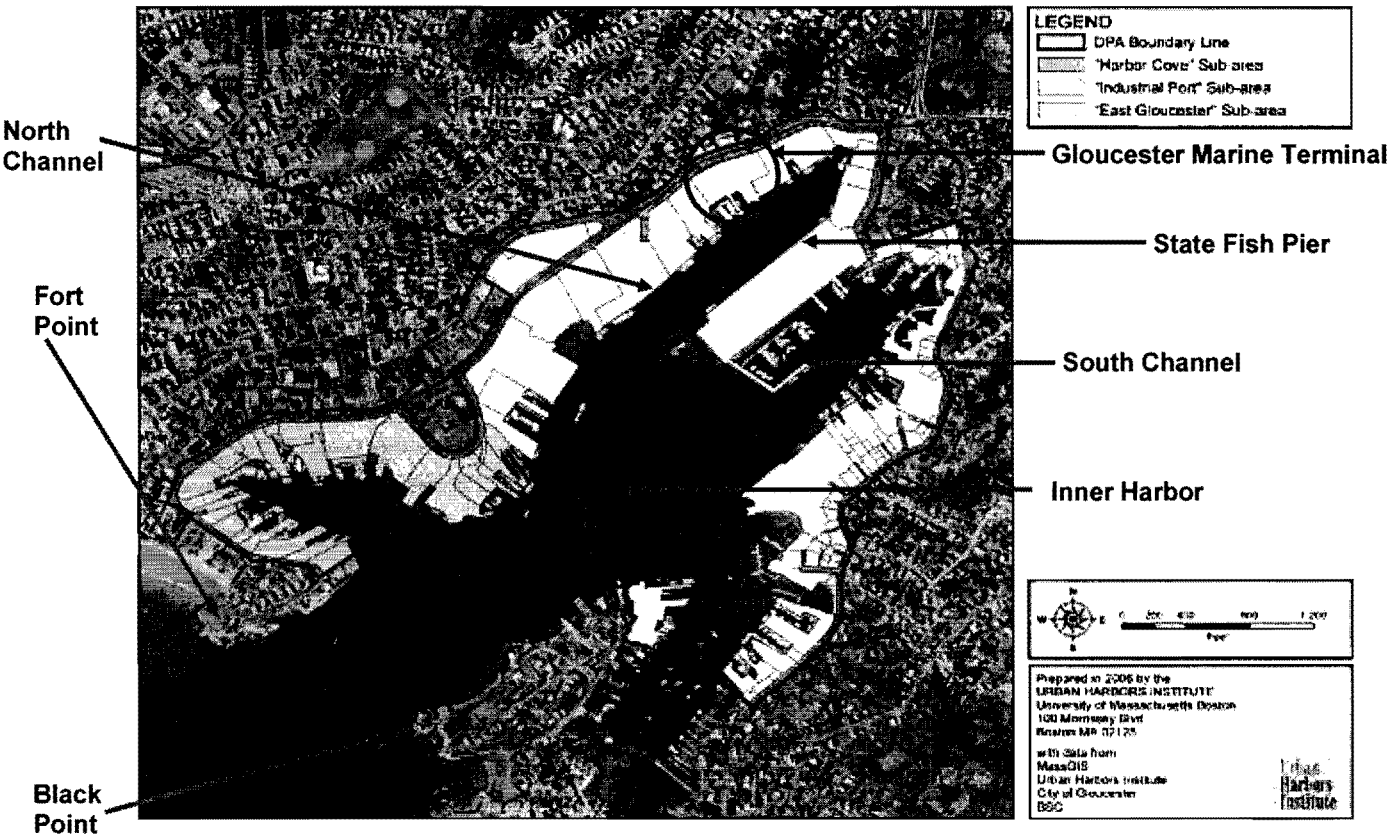


Figure 5-1 Layout of the Inner Harbor at the Port of Gloucester
(Source: City of Gloucester Harbor Plan and Designated Port Area Master Plan 2009)

The largest facility is the State Pier, which is dedicated to fishing activities. The 3.1 hectares (7.8 acre) facility has a 410 m^2 (approximately 4,400 sf) wharf with 425 m (approximately 1,400 feet) of berthing with depths of between 5.2 and 6.1 m (17 and 20 feet) at mean low water (MLW). A dredged channel of 6.1 m (20 feet) at MLW provides access to the pier.

There are several buildings that support the fishing industry onsite, and a number of businesses that support marine activities, including several small boat marinas. There are also a number of repair yards and associated businesses. There is little capability at existing facilities for ROWEI staging.

Harbor Profile

Gloucester Harbor is a well protected harbor with an easily navigable entrance and broad inner harbor located on the south shore of Cape Ann. The entrance to the port is close to the pilot station located in Massachusetts Bay.

The outer harbor has a protective breakwater that extends from the east side of the harbor entrance at Easter Point. Primary access is on the western side of the harbor entrance. The harbor becomes progressively shallower from about 5.5 to 15.8 m (18 to 52 feet) outside the entrance to 7.6 to 9.1 m (25 to 30 feet) within the harbor to less than 4.5 to 7.3 m (15 to 24 feet) in the inner reaches. The channel entrance is approximately 365 m (approximately 1,200 feet) wide with depths of 11.6 to 14.3 m (38 to 47 feet) into the outer harbor.

Tidal range is about 2.65 m (approximately 8.7 feet) average, and currents within the harbor are nominal. Parts of the harbor entrance are difficult to traverse due to breaking waves in severe weather and a number of shoals and submerged obstacles. There is a dredged anchorage for vessels with up to 4.9 m (16 feet) of draft about 275 m (approximately 900 feet) southwest of the State Fish Pier.

The inner harbor is defined by a line between Fort Point and Black Point. The approaches to the inner harbor have water depths ranging from 6.7 to over 12.2 m (22 feet to over 40 feet). Water depths range from 4.72 to 5.8 m (15.5 to 19 feet) in the inner harbor. The lateral clearance is approximately 61 to 76 m (approximately 200 to 250 feet). Gloucester harbor has inner areas known as the Western Harbor (which is closest to the town center) and Southeast Harbor (which is closest to the entrance) (see Figure 5-2). Shoreline areas in the Western Harbor and Southeast Harbor have very shallow water depths. There are shallow channel (6.1 m (20 feet) at MLW) accesses to the State Fish Pier, Gloucester Marine Terminal and East Gloucester.

Advantages

The port is well sheltered and has support mechanisms in place for commercial and industrial activities. No overhead clearance constraints were identified in the approaches to the Port of Gloucester. The port has both rail and highway access which supports the traffic associated with the fish processing industry. There is a waterfront commercial roadway connecting to Route 128.

Disadvantages

Water depth and lateral clearance are the most significant constraints for the inner harbor at the Port of Gloucester (see Figure 5-2). The harbor entrance is narrow and deep, but becomes shallow quickly. There is little deep water access to shore areas for large vessels, but access is suitable for barges Turbine installation vessels should be able to navigate the Port of Gloucester, but turbine import vessels most likely would not be able to call at this port. The lateral clearance limits turbine load-outs in the fore-aft bunny ear configuration. The immediate area in and around the shoreline is congested and has mixed traffic flow. Although there is rail service to the City, it is limited at this time to commuter rail.

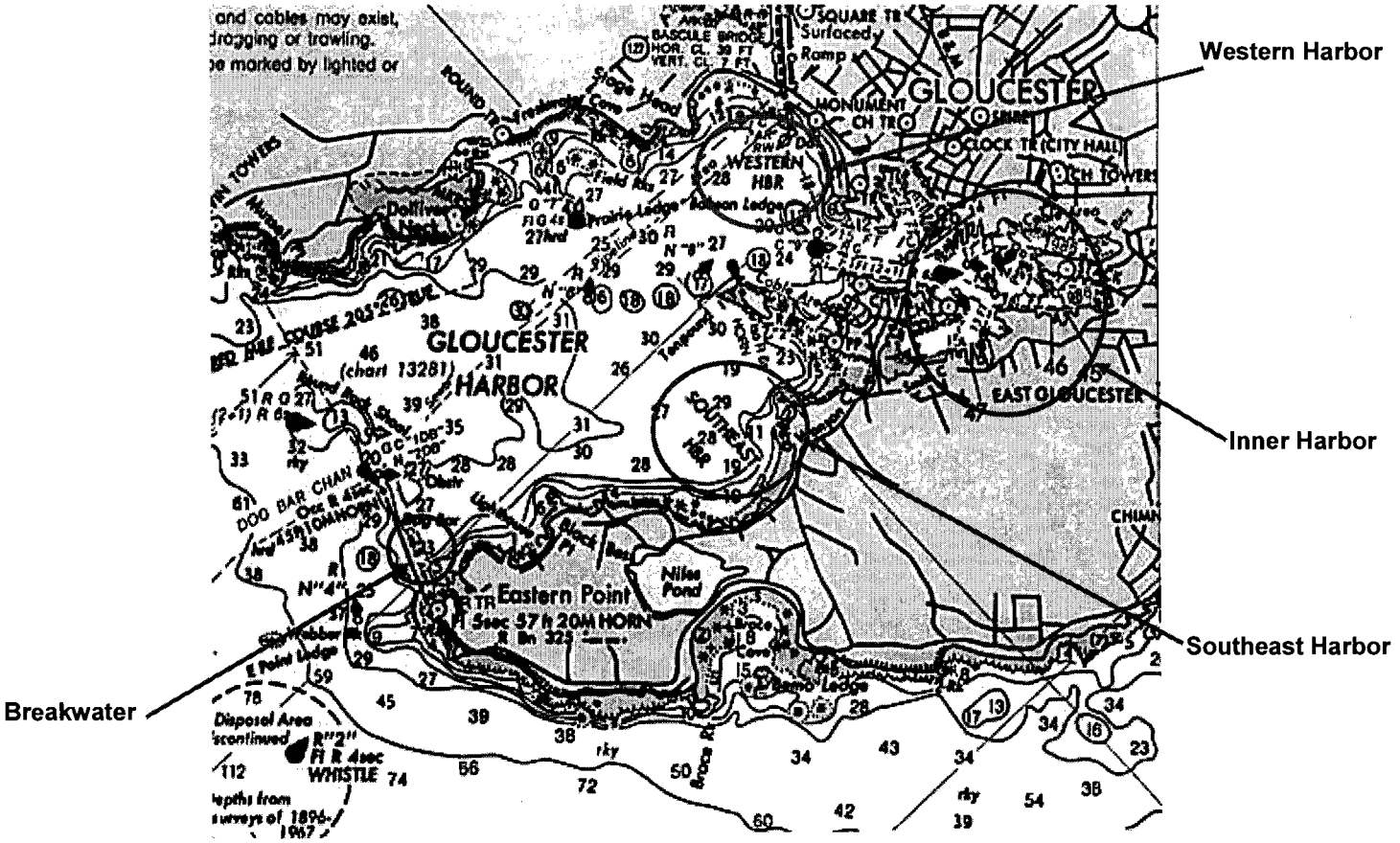


Figure 5-2 Gloucester Harbor and Shoreline Areas
(Source: MARPRO Associates International 2009)

Potential

There are limited areas for industrial growth adaptable to ROWEI staging. It is unlikely that a suitable location within the port of sufficient size could be identified to handle processing and assembly. To take advantage of existing water depth, highway connections and other access issues, any facility should be located on the west side of the harbor.

5.1.2 Salem, Massachusetts

Background

The Port of Salem is located 9.6 nm (11 miles) southwest of Cape Ann and is approximately 10.4 nm (12 miles) northeast of Boston. It is a small harbor, part of an irregular indentation in the shoreline of Massachusetts Bay (see Figure 5-3). The watershed area also includes Manchester, Beverly and Marblehead Harbors. The port is primarily known for its recreational and yachting industry. It also has a deepwater oil facility and commuter passenger service connecting to Boston. See Appendix E for the extent of the Salem DPA.

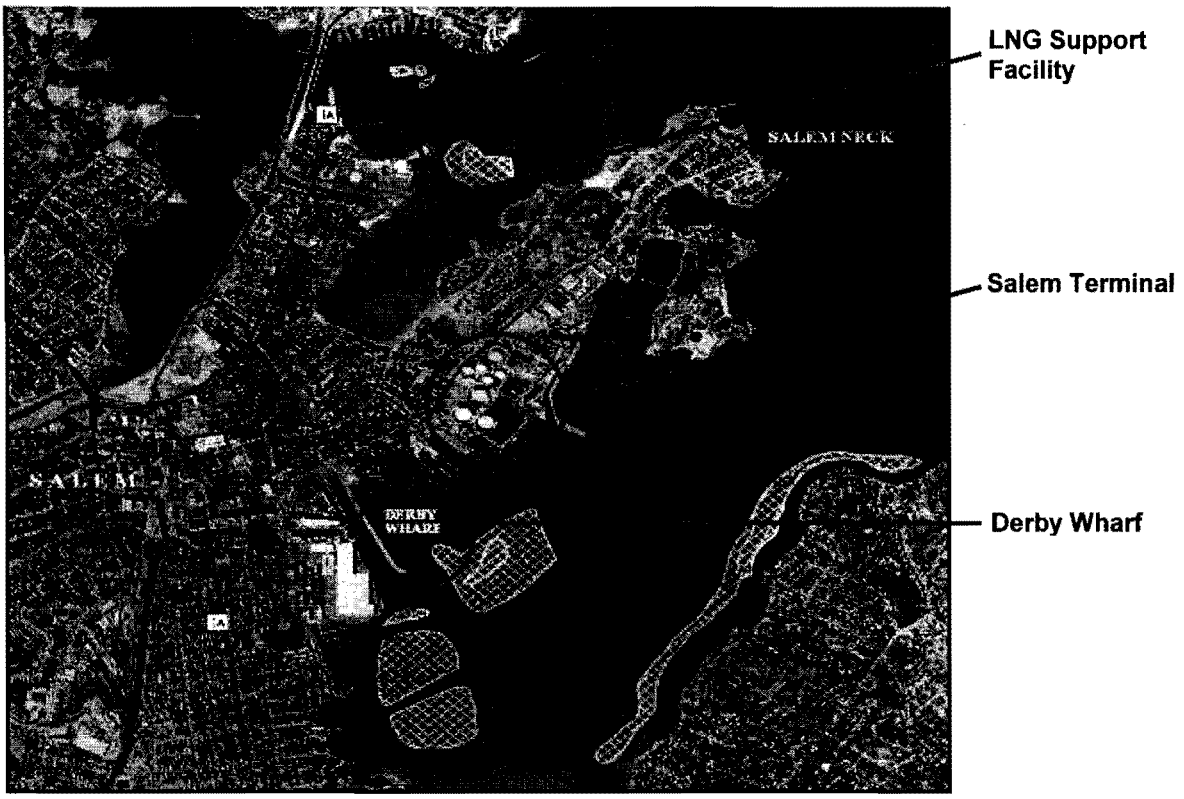


Figure 5-3 Aerial View of Salem Harbor
(Source: MARPRO Associates International 2009)

Facilities

The principle deepwater facility in Salem Harbor, Salem Terminal, is located at the head of the harbor. The facility handles petroleum for the 27 hectares (approximately 67 acre) New England Power Company plant owned by Dominion Energy. In addition, Key Span Energy operates the adjacent 6 hectares (15 acre) support facility for an offshore liquefied natural gas handling platform. The port has a 0.8 hectares (approximately 2 acre) commuter ferry facility with connecting service to Boston. There are several fishing and recreational boat slips in the harbor, and the National Park Service has a 244 m (800 foot) berth that is used for historic vessels.

The port has fuel, water, provisions, and general marine services available, including several small machine shops that mostly service smaller craft. There are no dry-dock or shipyard facilities in the port for large commercial craft.

Salem has limited potential for substantial expanded marine industrial activities. The Salem Waterfront is shallow and has poor road connections to the waterfront. The port already provides supplemental marine support for the expanding petroleum and gas network in New England. The port's only deepwater commercial terminal is situated at the head of the harbor, and there are several former rail rights-of-way that connect to inland points. The expansion of pipeline connections from the terminal into the gas and petroleum network was first identified in the study conducted in 1994 by the Governor's Commission on Commonwealth Port

Development (MARPRO Associates International 2009). While the terminal is primarily used to supply the needs of the Salem Power Plant, it has the capacity to handle additional marine operations, including ROWEI staging. The port, however, does not have enough of a transportation network to meet a wide range of industrial needs, which would require adequate waterfront property, deep water access, unencumbered road access, and direct highway and rail connections. It does have the potential for other water based activities not dependant on road or rail connectivity.

Harbor Profile

Salem Harbor is a well protected harbor with three main channels that serve the watershed area. The Salem Channel, which is 9.4 m (approximately 31 feet) deep, is the primary access channel for deep draft vessels and passes through Salem Sound for approximately 3 nm (see Figure 5-4). The channel connects to a turning basin at the west side of the harbor at the Salem Terminal Wharf. The turning basin has a controlling depth of 8.2 m (approximately 27 feet). The harbor also has a special anchorage area. The harbor extends to the Salem Waterfront where the National Park Service's recreational and fishing piers and ferry terminal are located. Depth in most cases at the Salem Waterfront is less than 5.5 to 6.1 m (18 to 20 feet).

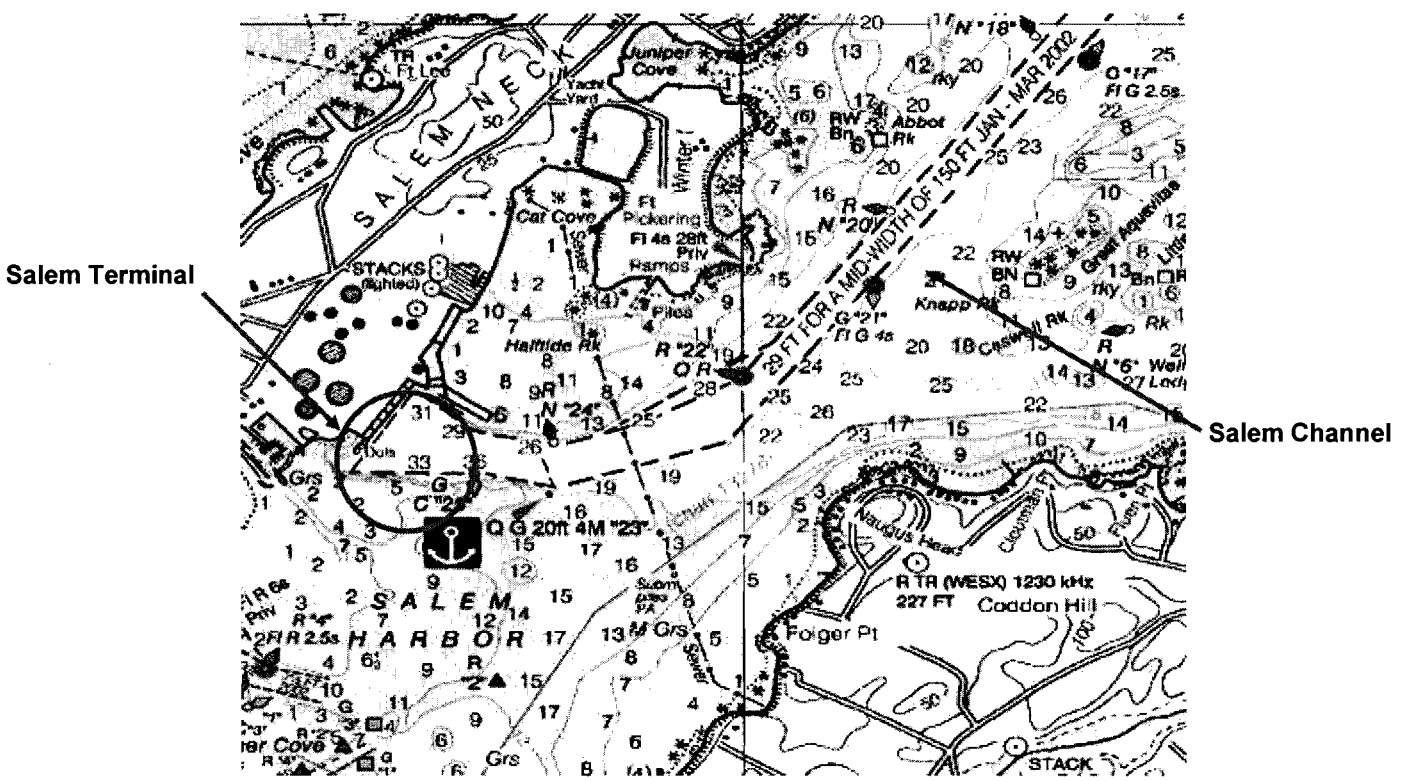


Figure 5-4 Salem Harbor and Shoreline Areas
(Source: MARPRO Associates International 2009)

The overall range of the tide in the harbor is between 2.6 and 2.75 m (8.5 and 9 feet). Within the harbor the current has minimal velocity. There is ice buildup at the head of the harbor during

very cold winter months, mostly in January and February. Tug services are available out of Boston, and Salem is a U.S. Customs Port of Entry.

Advantages

The port is well sheltered and has some commercial vessel activity. The Salem Terminal site is underutilized and may be adaptable for some ROWEI staging activities. No overhead or lateral clearance constraints were identified in the approaches to the Port of Salem.

Disadvantages

The community is a popular tourist destination, and the surrounding waterfront communities have significant recreational vessel activities that have hindered industrial waterfront development. A potential focus of Salem Harbor is developing the emerging pocket cruise ship industry.

Water depth is a constraint. There is little deep water access to shore areas near the center of the waterfront. There is also very little area outside of Salem Terminal where large vessels can handle ROWEI components. The immediate area in and around the waterfront is congested, has poor capacity for high volume traffic flow, and does not have adequate and acceptable truck access. Although there is rail service to the City of Salem, it is limited at this time to commuter rail. The rail does not extend to the harbor areas, but there are former rail rights of way that connect to the harbor area. There is little space around the harbor for the development of additional freight activities other than what is currently handled at Salem Terminal.

Potential

The main area for commercial growth lies with the tourism-based cruise business. The community is well known and has good growth opportunity in marine based tourism activities. There is limited capacity for ROWEI staging or fabrication.

5.1.3 Boston, Massachusetts

Background

The Port of Boston is located north of Cape Cod and is adjacent to the main shipping routes between Southern and Northern New England. Within New England, the Port of Boston is the second largest tonnage port (after the Port of Portland, Maine,) the largest container port, the largest international passenger port and the largest oil port in Massachusetts. The port is historically known for its diverse maritime mix. The port has two shipyard facilities, hosts several commuter ferry operations, marine research activities, marinas, and the largest U.S. Coast Guard facility in New England (see Figure 5-5). While in recent years some segments of the port's activities have declined, notably fishing, the Port of Boston remains the largest of the Commonwealth's five major seaports. See Appendix E for the extent of the Boston DPA.

Boston is the largest and most prominent freight port in the Commonwealth. It has the most diversified port mix and handles the largest volume of containers in New England and the second largest amount of petroleum cargo. The port mix includes containers, general cargo, automobiles, scrap metal, road salt, project cargo, refined petroleum products, liquefied natural gas, international port of call and homeport cruise passengers, and domestic commuter and outer harbor ferry operations. Including liquid bulk cargo, the Port of Boston handled over

13.6 million mt (approximately 15 million tons) of cargo in 2007. Only the Port of Portland handled more, approximately 22.7 million mt (25 million tons) of cargo, mostly crude oil bound for Canada. Of the Port of Boston's total tonnage, 1.54 million mt (1.7 million tons) were containerized cargo representing 216,434 intermodal shipping container TEUs. With 4 container cranes, the annual port throughput averages 5,288 containers per hectare (2,140 containers per acre). The port hosted over 1,000 vessel calls in 2007.

Figure 5-5 Aerial View of Boston Harbor
(Source: http://www.mappingboston.org/html/map20-a.htm)

Boston has some critical key advantages and some distinct disadvantages for potential growth (see Figure 5-6). The port is situated within one of New England's largest market areas for products and commodities, and there is a significant amount of related port business, a wide range of diversity in the port operational mix, and a strong commitment to expanding activities. The port also has numerous terminals, deep water access, full marine services, and a large and skilled work force. The port has enhanced the economies of scale at its two major freight

terminals, Conley and Moran Terminals, by consolidating container operations at Conley Terminal in South Boston, nearest the open seas and deep water areas, and shifting auto import and processing operations to Moran Terminal in Charlestown. This has resulted in lower overall operating costs and has enhanced the Moran Terminal operating authority's ability to attract and retain auto carrier and processing services. This trade suits the terminal's draft limitations and longer port transit.

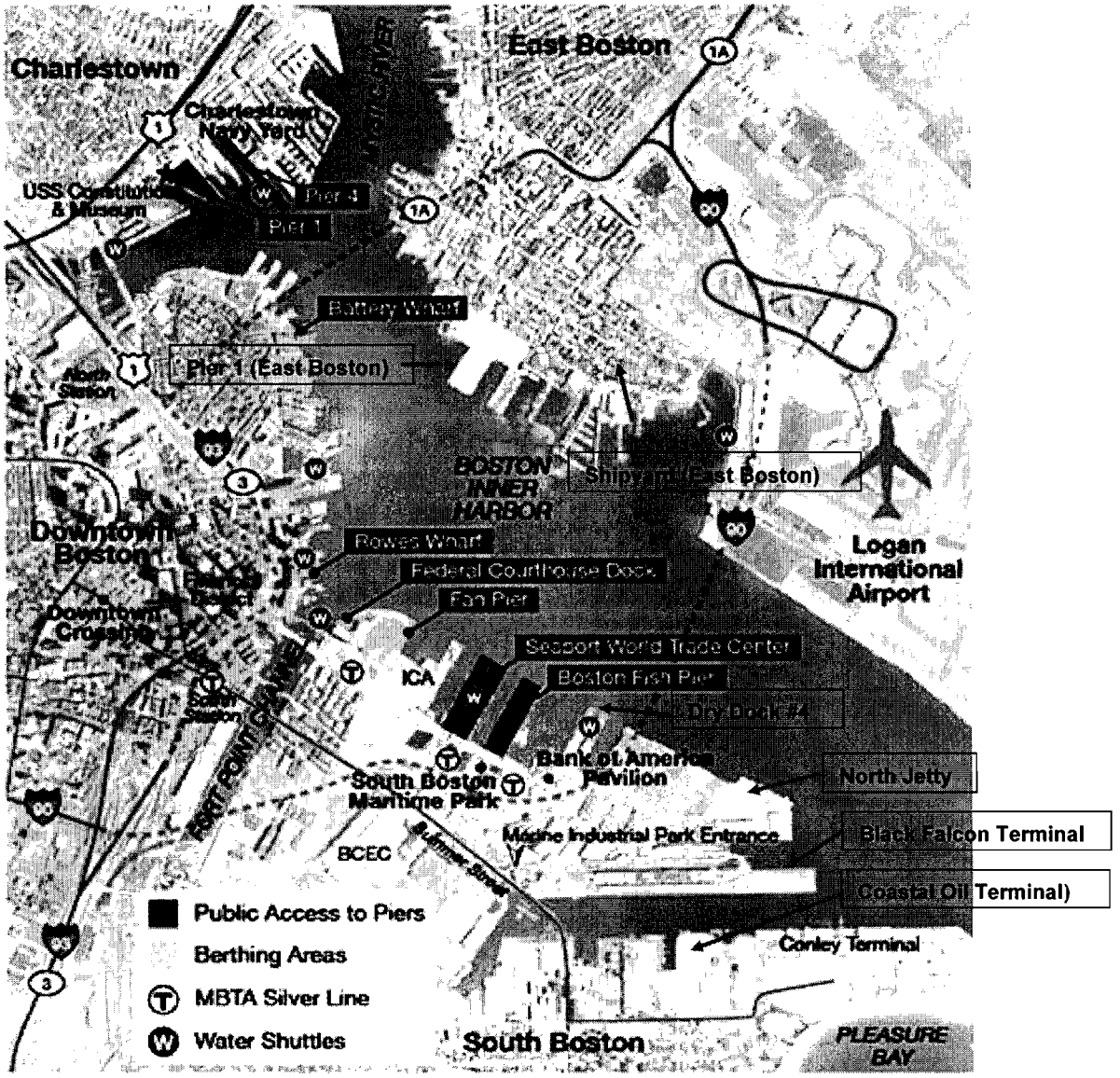


Figure 5-6 Massport Facilities
(Source: http://www.massport.com/business/pic/c_haarborwide.pdf)

Boston has been limited in its ability to take full advantage of significant industrial growth. A series of development projects has gentrified port areas, which has created choke points for the marine terminals. South Boston, for exarnple, had been developed by the railroads for the

handling of freight at numerous piers, but most of the original infrastructure has been replaced by new and non-related commercial and residential development. The result is that most of the rail infrastructure has been removed and direct rail connections to the waterfront are gone. Roadways are congested and direct street connections between the terminal and highway connectors are inefficient. The nearest major rail terminal is located at Allston Yard, some 14 miles from the port, which would make transport and transfer of turbine components or ancillary material expensive.

Facilities

The public marine passenger and cargo facilities in the Port of Boston are managed by the Massachusetts Port Authority (Massport). Massport is an independent public authority that develops, promotes and manages Massachusetts' airports, seaport and transportation infrastructure. Massport owns, operates and leases approximately 202 hectares (500 acres) of property in Charlestown, East Boston, and South Boston. Most of the properties are located within the Commonwealth's regulated DPAs, which are restricted to maritime industrial activities. These facilities include the Boston Autoport located at the combined Mystic River Piers and Moran Terminal in Charlestown and East Boston Pier 1 and adjacent properties in East Boston. Massport also owns the Paul W. Conley Container Terminal, the Black Falcon International Cruiseport, the North Jetty cargo facility, and the Boston Fish Pier all located in South Boston.

The 41 hectares (101 acre) Paul W. Conley Container Terminal South Boston is the largest marine facility in the harbor and is utilized for cargo container operations. The facility has 610 m (approximately 2,000 linear feet) of berthing with depths of between 12.2 and 13.7 m (40 and 45 feet). The terminal is equipped with four, low profile gantry cranes capable of 30 moves an hour, and the terminal can handle vessels up to an average of 5,000 TEUs, considered mid-size in the current vessel market. The container terminal handled nearly 220,000 TEUs in 2007, up 10% from 2006. The North Jetty is located on the waterfront in the Marine Industrial Park next to the Black Falcon Cruise Terminal. It offers 245 m (approximately 800 feet) of berthing space with a depth of 12.2 m (40 feet) at MLW (Massport website accessed February 2010). The North Jetty facility in South Boston is underutilized and adaptable to ROWEI assembly.

Boston Autoport in Charlestown is primarily used for automobile import, processing and distribution and has capacity for approximately 50,000 cars per year. It is also the location for the Wind Technology Testing Center (WTTC), a joint project with the U.S. Department of Energy to build a large wind turbine blade testing facility. There is some covered storage for high-value automobiles on site in the former Mystic Pier transit shed. The property encompasses approximately 20.2 hectares (50 acres) of land, not all of which is actively utilized and is consequently potentially suitable for ROWEI staging. The facility is also equipped with a shore-side gantry crane. The Boston Autoport is upstream of the Tobin Bridge and, therefore, is subject to vertical navigational constraints.

Another Massport facility in Charlestown is the former Revere Sugar site, now known as the Medford Street Terminal, which comprises approximately 5.7 hectares (14 acres) of waterfront industrial property with deepwater access. The Medford Street Terminal is being utilized for some storage and has good potential for ROWEI assembly. This terminal is upstream of the Tobin Bridge, which imposes a vertical constraint of approximately 41 m (135 feet). This

restriction makes navigation marginal for jack up vessels and limits turbine load-outs in the star configuration.

The East Boston Shipyard is located on Marginal Street in East Boston between Piers Park and the site of the former Navy Fuel Pier. The shipyard is the only ship repair facility in Boston Harbor equipped to serve mid-sized commercial vessels. Features include: 3.6 hectares (9 acres) of backland, including 4 piers and approximately 8.1 hectares (20 acres) of water sheet, 18,580 m^2 (200,000 square feet) of commercial office and industrial building area in 12 structures, and 762 m (approximately 2,500 linear feet) of commercial berthing space (Massport website accessed February 2010).

Moran Terminal has rail access through Sullivan Square, and Massport owns the freight rail line from Sullivan Square into the Terminal. Conley Terminal does not have rail access and there are no identified plans for extending rail service into the facility. There is a proposed rail line connection that would provide access from the North Jetty for bulk, project and other cargos. Most of the roadway system in and around Massport's South Boston and Charlestown facilities is heavy weight rated for handling oversized loads up to 45.4 mt (approximately 100,000 pounds or 50 tons). The port has handled a number of project cargos using specialized tri-axle road trailers and has received State permits for transportation out of the terminal areas. Massport and the Boston Redevelopment Authority, which would have a approximately 15.25 m (50 foot) wide right-of-way and would eliminate some potential limitations with local utility infrastructure for very large component pieces. The roadway would provide better and unencumbered access to the Central Artery/Tunnel connections in South Boston. Massport also has proposed the extension of Cypher Street and the reconstruction of E Street as part of the freight roadway system with adequate turning curvatures and heavyweight access up to State authorized permit levels.

Harbor Profile

Boston Harbor is the largest physical harbor in New England and is well protected with a wide and easily navigable entrance and large inner harbor with deep water access. The entrance to the harbor has numerous shoals and islands. There are two dredged channels and two traffic separation schemes which define the approaches to and into the harbor for deep draft vessels. The entrance is well marked by navigational aids, and the entrance to the port is close to the pilot station located in Massachusetts Bay.

Boston's Main Ship Channel extends from the harbor entrance to the mouths of the Mystic and Chelsea Rivers and to the Charlestown Bridge on the Charles River. The Federal project channel depth is 12.2 m (40 feet) deep from the harbor entrance to the mouth of the Mystic River and is 10.6 m (35 feet) in areas near the south side of the harbor to just seaward the location of the Third Harbor. The Boston Harbor Deep Draft Navigation Improvement Project proposes to deepen the existing channel (USACE 2008). There are several deep draft ship anchorages in the harbor with the anchorage on the north side of President Roads used most frequently for ships and barges. Tidal range is around 2.75 to 2.9 m (9 to 9.5 feet) with two highs and two lows per day. Harbor currents are generally less than 1 knot.

Table 5-1 below summarizes the navigational constraints in the Port of Boston and their operational implications. This report focuses on the port facilities in South Boston, Charlestown, and East Boston discussed above. Other facilities on the Chelsea River currently are not

considered feasible for ROWEI staging due to lateral and overhead restrictions, which are shown in Table 5-1, and are not discussed further.

Table 5-1
Summary of Navigational Constraints in Boston

Staging Port	Potential Obstructions	Lateral Clearance	Overhead Clearance	Controlling Water Depth	Feasible Turbine Load-Outs	Jack-Up Feasible ?
South Boston (all ports)	Logan Airport	over 152 m (500')	report air draft to airport traffic control	12.2 m (40')	all	yes
Charlestown / East Boston (inner harbor ports)	Logan Airport	over 152 m (500')		12.2 m (40')	all	yes
Medford Street Terminal and Mystic River	Tobin Memorial Bridge	over 152 m (500')	41 m (135')	7.6 – 10.7 m (25'-35')	star	marginal
Chelsea River (west of Chelsea St. Bridge)	Andrew McArdle Bridge	53.3 m (175')	none	8.8 – 12.2 m (29'-40')	fore-aft bunny ear	yes
Chelsea River (east of Chelsea St. Bridge)	Chelsea St. Bridge	28.3 m (93')	25.3 m (83')	8.8 – 12.2 m (29'-40')	rotor disassembled	no

Advantages

The port is well sheltered and has significant support mechanisms in place for commercial vessel activity and ROWEI assembly. There are numerous roadway connections to most of the main marine terminals which are heavily used. The port is the largest support center for marine activities in New England with a diversified mix of services and associated businesses.

Disadvantages

Boston is a typical metropolitan port, with gentrification pressures and limited ability to expand marine activities. The Port of Boston is affected by air traffic at Logan Airport. While maritime operations are not restricted, according to the Coast Pilot®[6], all vessels with air draft greater than approximately 25.9 m (85 feet) must advise air traffic control of their presence (U.S. Department of Commerce, National Oceanic and Atmospheric Administration and National Ocean Service 2009). South Boston facilities do not have significant navigational constraints. All turbine load-out configurations (i.e., bunny ear fore-aft, bunny ear lateral, and star) can be accommodated. Jack-up vessels can navigate between these ports and the sea. Long-term staging operations in South Boston should be evaluated in the context of the vertical limitations due to proximity to Logan airport and related FAA regulations.

While there are numerous road connections to terminals, many are congested and pass through residential areas creating potential conflicts with pedestrian and automobile traffic. Rail connectivity is very limited in several areas including South Boston, Charlestown and East

[6] The United States Coast Pilot® consists of a series of nautical books that cover a variety of information important to navigators of coastal and intracoastal waters and the Great Lakes. Coast Pilot 1 covers the coasts of Maine, New Hampshire, and part of Massachusetts, from West Quoddy Head in Maine to Provincetown in Massachusetts. Major ports are at Portsmouth, NH and Boston, MA.

Boston. Boston's container and auto terminals have no direct access to the nation's doublestack (Gen2) rail network. Boston is considered to be a high cost port due to existing labor agreements and work rules, expensive infrastructure and limited volume capacity. The marine terminals, particularly Conley Terminal, have limited area to expand their property boundaries, which would affect utilization for other activities. Vessel access to the inner harbor, specifically, Charlestown and Chelsea Creek is draft and length limited.

Potential

There is adjacent property that can be purchased and added to the existing terminal footprints to allow for expanded yard area allowing for dedicated ROWEI processing. Roadway connections to the terminals in most cases also need to be improved to provide appropriate capability.

Boston's industrial marine growth is tied to three major areas to expand marine activities. These include:

- Expansion of terminal size;
- Improvement of roadway connections to main highways that avoid the inner city roadways; and
- Creation of a better connection to the national rail network.

5.1.4 Fore River Shipyard

Background

Fore River Shipyard is less than 10 miles south of Boston. This approximately 45 hectares (111 acre) site is situated partially in both Quincy (2/3) and Braintree (1/3) (see Figure 5-7). Fore River Shipyard was once a prominent shipyard in the United States, producing ships for World War II (WWII), peaking with approximately 50,000 employees during this time. In the 1970s, the 1,200 ton "Goliath" crane (since removed in 2008) was built specifically to place aluminum spheres (pressure vessels) on the LNG vessels constructed there. Recently, Fore River Shipyard has served as the Central Receiving Point for new car delivery to local dealerships. See Appendix E for the extent of the Fore River (Weymouth, Quincy and Braintree) DPA.

The site is currently undergoing an initial planning process to determine potential new uses for the site, including marine-related, residential, retail, office, and entertainment. Current planning goals are to create a mixed-use, working waterfront development at the site. At this time, the Shipyard is actively seeking industrial tenants for both indoor and outdoor space. The Fore River which flows directly into Boston Harbor has recently been dredged by the Army Corps of Engineers, and can accept "Panamax" class vessels (i.e., vessels of a maximum size to fit through the existing Panama Canal).

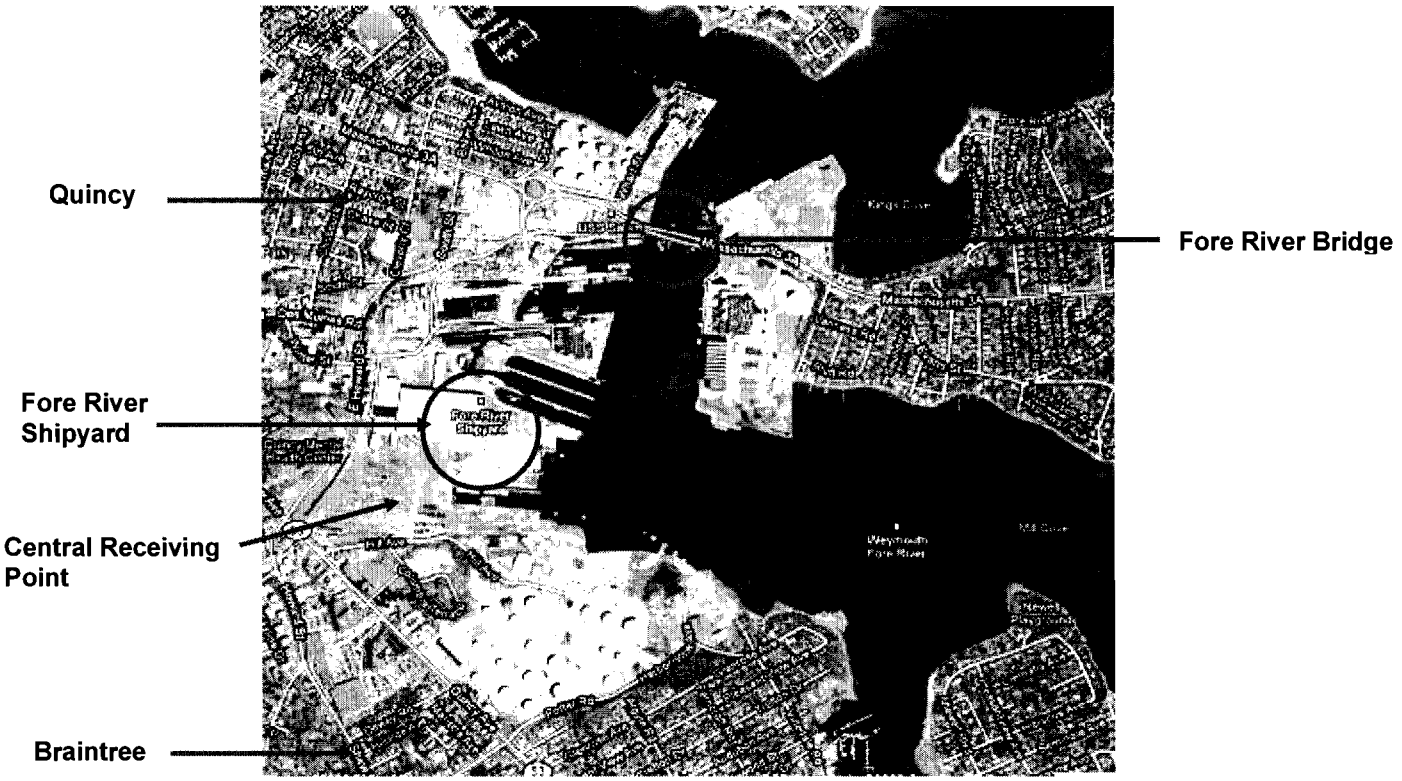


Figure 5-7 Aerial View of Fore River Shipyard
(Source: Google Earth, Fore River Shipyard, 2010)

Facilities

The site is currently owned by Daniel Quirk, a local auto dealer, and is used as the Central Receiving Point for new car delivery. The port area also contains a ferry terminal for commuter boats to Boston and Hull that is run by Harbor Express for the Massachusetts Bay Transportation Authority (MBTA). The yard also is used by Jay Cashman, Inc., for heavy construction and marine equipment services, the Massachusetts Water Resources Authority, as a sewage sludge heat-drying and pelletizing facility, and by the Fore River Transportation Corporation for short line freight rail service to CSXT South Braintree (discussion with Daniel Quirk).

The site currently features rail and roadway access, a 41,800 m^2 (450,000 square foot) open floor building, a 9,290 m^2 (100,000 square foot) open floor building, and additional buildings for a total of 55,740 m^2 (600,000 square feet). The site also includes a 11,150 m^2 (120,000 square foot) Wet Basin with a current 6.1 m (20 foot) draft that can be dredged to deeper than 9.1 m (approximately 30 feet).

Shipyard Profile

The Shipyard is located in a well protected area with adequate draft to accept "Panamax" class vessels. The entrance to the Shipyard is narrow, restricted by the Fore River Bridge, which currently has a 53.3 m (175 foot) vertical clearance and a 53.3 m (175 foot) horizontal

clearance. This bridge is a temporary lift bridge and plans are not yet finalized as to whether the replacement bridge will be a lift style or bascule style drawbridge. North and East of the bridge, the approach channel ranges from 41 to 183 m (136 feet to 600 feet) wide and is approximately 9.75 m (32 feet) deep. South of the bridge, the channel opens to 122 m (400 feet) wide. Channel depth is 9.75 m (32 feet). Tidal range is around 3 to 3.1 m (9.8 to 10.2 feet).

Advantages

The port is well sheltered and has significant support mechanisms in place for commercial vessel activity. There are numerous roadway connections and an active railroad line.

Disadvantages

The entrance to the Shipyard is laterally and vertically constrained by the Fore River Bridge. Additionally, the site is currently undergoing an initial planning process to determine new potential uses for the site, including marine-related, residential, retail, office, and entertainment. Currently, the site is serving as the Central Receiving Point for new car delivery to local Quirk car dealerships. Much of the infrastructure is significantly aged.

Potential

New bridge design for the Fore River Bridge is yet to be finalized. Additionally, improvements could include the following:

- Improvement of roadway connections to main highways that avoid the inner city roadways;
- Creation of a better connection to the national rail network; and
- Facilities to support secondary functions associated with offshore wind deployments.

5.1.5 Fall River, Massachusetts

Background

The Port of Fall River is located at the mouth of the Taunton River at the head of Mount Hope Bay, at the northeast side of Narragansett Bay, near the Massachusetts-Rhode Island border. The port is approximately 18 nm from the south entrance of Narragansett Bay, which flows into Rhode Island Sound, 17 nm west of the Cape Cod Canal and approximately 90 nm south of Boston. It is geographically located about 74 kilometers (km) (46 miles) south of Boston, 26 km (16 miles) southeast of Providence, RI and 19 km (12 miles) west of New Bedford. The port is historically known for its manufacturing and distribution and has developed an active break-bulk trade. Cargo operations have included handling mostly break-bulk cargoes such as bananas, wallboard, heavy equipment, automobiles, wood pulp, chemicals, newspaper and seafood. See Appendix E for the extent of the Mount Hope Bay (Fall River and Somerset) DPA.

The Port encompasses the waterfronts of Fall River and Tiverton, Rhode Island on the east side of the Taunton River and the waterfront of Somerset, MA on the west side of the river. The port has good highway access and is served by U.S. Route 6, Routes 24, 79 and 138 and Interstate 195 that connects to Providence, RI with Cape Cod. There are rail freight activities through CSX connecting to several industrial sites in Fall River. In addition to freight activities, there are

several cruise ship visits each year and a number of recreational vessels activities supported by marina facilities at several locations.

Fall River is also an active niche port serving several international markets. The area is ringed with liquid bulk terminals and has the potential for expanded industrial activities at the State Pier. The State Pier has available storage and land area for operations but is used for both industrial and tourism based activities. One way of enhancing Fall River's ability to handle more marine industrial operations is to remove tourism-based activities from the State Pier. The port has good highway access and a rail corridor that requires additional infrastructure improvements.

Facilities

The port has a number of active private facilities and one principal public facility (see Figure 5-8). The Borden and Remington Corporation Wharf is 116 m (380 feet) long with a water depth of 8.5 m (28 feet) alongside. The pier is currently used for handling of latex and caustic soda, is owned by the Tillotson Co., and is operated by the Borden and Remington Corp.

The primary marine facility for the City of Fall River is the State Pier and is located on the site of the former Fall River Line Pier, which was a major steamship operator in New England. The State-owned general marine terminal provides two deep-water berths, a 120 m (398 foot) berth with a depth of 4.5 to 10.7 m (15 to 35 feet) alongside, and a 189 m (620 foot) berth with a 10.7 m (35 foot) water depth alongside. There is also a 7,900 m^2 (85,000 sf) terminal and roll-on/roll-off facility, as well as 2.8 hectares (7 acres) of open storage yards. The terminal is equipped with an approximately 24 m (80 foot) roll-on/roll-off ramp and a 45 mt (50 ton) truck scale. There are three rail spurs, which provide direct on-dock rail connections, but only one is currently operable. The State Pier handles break-bulk and containers. This cargo comes primarily from the Cape Verde Islands, and vehicles and equipment from Angola. The port also handles frozen fish, totaling approximately 680 mt (750 tons) per year, from a fish processing vessel as well as petroleum products at several private terminals. The State Pier represents the best alternative for ROWEI staging.

Just north of the State Pier is the *USS MASSACHUSETTS* Battleship Memorial where a number of former naval vessels are berthed. The Memorial is an active museum that is open to the public and cannot be utilized for marine industrial activities. Two miles above the State Pier is the former Shell Oil Company Wharf that has a 213 m (700 foot) berth with a 9.1 m (30 foot) water depth alongside. Shell Oil discontinued the petroleum products operations in the 1990s, and it is now owned by Fall River Marine, LLC. This site, which is the proposed location of the Weaver's Cove LNG Terminal, could be adaptable for ROWEI staging if it is abandoned by Weaver's Cove. The Mt. Hope, Braga and Brightman Street bridges would impose navigational restrictions. The Mt. Hope and Braga bridges each have a 41.1 m (135-foot) vertical clearance and a 121.9 m (400-foot) horizontal clearance. The Old Brightman Street Bridge has a 29.9 m (98-foot) horizontal clearance but no vertical restriction, and the New Brightman Street Bridge has a 18.3 m (60-foot) vertical and 61 m (200-foot) horizontal clearance.

On the west side of the Taunton River is the Brayton Point Station Dock which has a 310 m (1,017 foot) berth with a 10.6 m (34 foot) water depth alongside. The facility is designed to handle fuel oil and coal and is owned by New England Power Company. Montaup Electric

Company owns and operates a wharf with a 197 m (645 foot) berth and an alongside depth of 10.6 m (34 feet). The facility is designed for handling fuel oil and coal.

The rail line that serves New Bedford also serves Fall River and extends to the State Pier facility in the harbor. Wind turbine components could be delivered to Fall River via road or rail as long as they do not exceed dimension and weight limitations.

Harbor Profile

The main access to the Port of Fall River is from the shipping lanes of the Atlantic Ocean, into Narragansett Bay, through Mount Hope Bay, and down the Taunton River. The harbor is a medium deep-water harbor with a 10.7 m (35 foot) deep federal channel through Mount Hope Bay to about 0.9 nm (approximately 1 mile) above the Brightman Street Bridge (See Figure 5-8). There are additional deep dredged channels near the north Tiverton waterfront with between 6.1 and 10.1 m (20 and 33 feet) of water depth. The harbor has no designated anchorages.

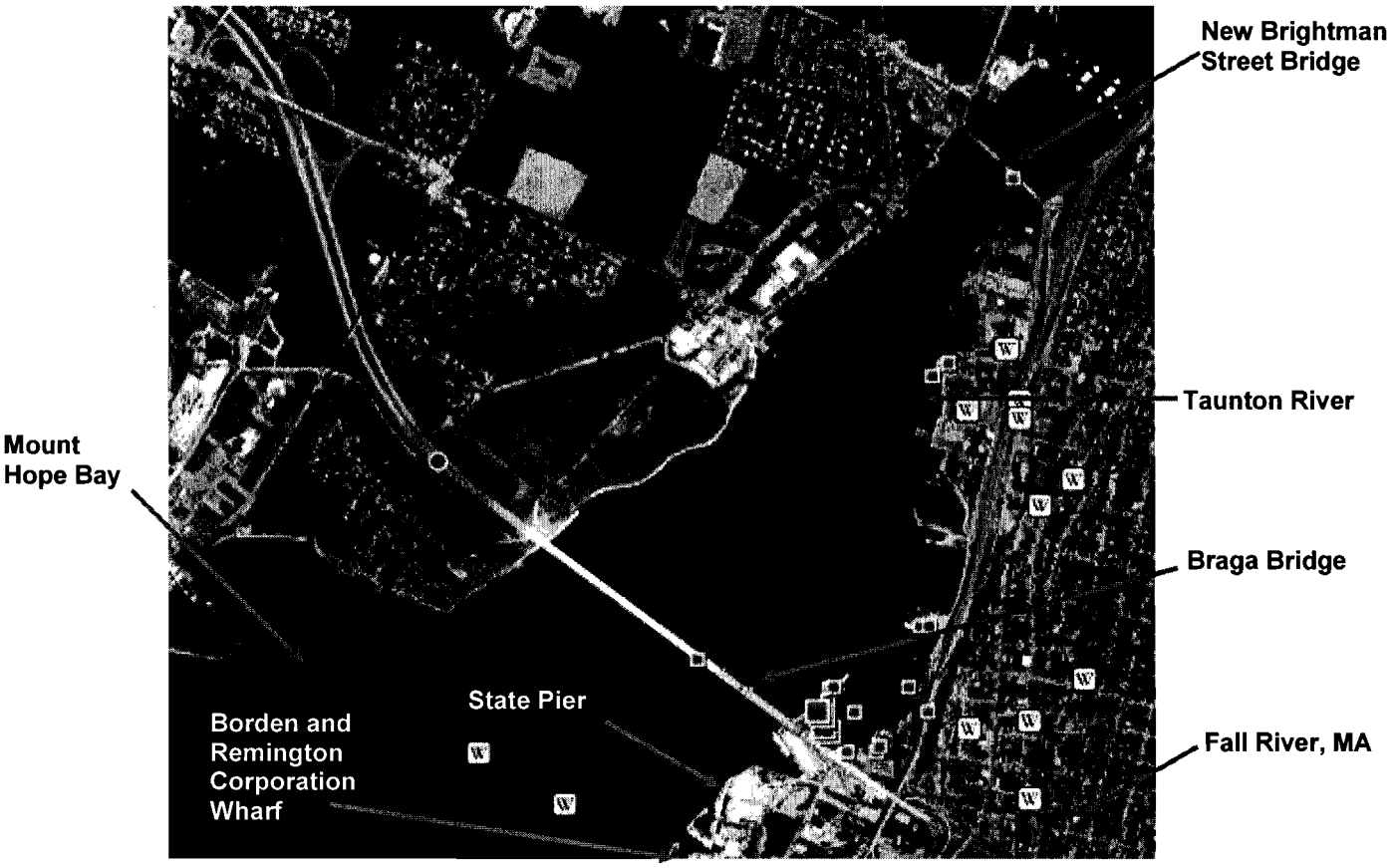


Figure 5-8 Aerial View of Fall River Harbor
(Source: Google Earth, Fall River, MA, 2010)

There are two bridges which cross the Taunton River. They include a fixed bridge at the State Pier with an air draft clearance of approximately 41 m (135 feet). The second bridge is a bascule style bridge with a 18.3 m (60 foot) clearance about 1.1 nm (approximately 1.3 miles)

the bascule style New Brightman Street Bridge with a 18.3 m (60 foot) clearance about 1.1 nm (approximately 1.3 miles) above the fixed bridge. There are additional bridges upstream on the Taunton River but outside of the deepwater port.

Tidal currents are generally not a problem for navigation. The mean range of the tide is around 1.4 m (4.5 feet). Pilotage is compulsory for foreign and U.S. vessels under register of 356 mt (392 tons) or more. Pilotage is provided by Northeast Marine Pilots. The Port has U.S. Customs port of entry capability through New Bedford. Tug services are available in the port from Providence, RI. There are some repair services but no dry-docking capability. There are two small shipyards in the port on the west side of the harbor that provide skilled workforce capability for wind projects.

Advantages

The port is well protected and has support mechanisms in place for commercial vessel activity, including ROWEI assembly and staging. There is cargo storage and handling capacity that can be utilized for fabrication, and the area is supported by good road and reasonable rail access. The port has a roll-on/roll-off facility at the State Pier, which can be used for handling wheel-based industrial components. There is also capacity at some of the private terminals for new industrial development. Water depth is not a significant constraint for Fall River, as dredged channels have water depth in excess of 9.1 m (30 feet). The lateral clearance at the Braga and Mt. Hope Bridges is 122 m (400 feet).

Disadvantages

Vertical clearance is the most significant navigational constraint for the Port of Fall River with respect to deployment configurations for offshore wind turbines and assemblies. The Braga Bridge and Mt. Hope Bridge each impose a height restriction of approximately 41 m (135 feet). This restriction makes navigation marginal for jack-up vessels and limits turbine load-outs in the star configuration. Vessel draft is limited to a 10.7 m (35 foot) overall depth that restricts large vessel access. The State Pier can only handle small cargo ships. The warehouse space at the terminal is unheated and provides only temporary storage, but does provide weather protection for project assembly. Most of the critical infrastructure in the port is aging and in need of repairs and improvements.

The port's commercial and industrial expansion is also hindered by gentrification and a focus on tourism-based activities on the Fall River waterfront. There have been a number of proposals for expanded industrial development, including a proposal for developing an LNG import facility that has been met with significant local opposition.

Potential

There are several main areas for industrial growth well suited to ROWEI staging. Its proximity to the major shipping route near the Cape Cod Canal places the Port of Fall River in a position to facilitate ROWEI staging using smaller ships and barges.

One of the most significant opportunities is the stalled construction of a LNG facility in the port. If not completed, this could potentially provide a parcel of available land for ROWEI staging. However, the Mt. Hope, Braga, and New Brightman Street Bridges, all seaward of the LNG

terminal, have vertical and horizontal clearance restrictions that could preclude certain turbine import and installation vessels and load-out configurations.

Required Improvements

The State Pier requires additional investment to bring it up to industry standards for expanded cargo handling, and there are several other facilities that require infrastructure improvements, including bulkheads, piers and wharves. The site needs to be expanded, and there is an unused salt storage area near the State Pier that could be annexed to create increased capacity. The rail line needs to be restored in some areas and the trackage improved to accommodate increased cargo shipments. An estimated $15 million is required for State Pier improvements (MARPRO Associates International 2009).

5.1.6 New Bedford, Massachusetts

Background

The Port of New Bedford is located on the northwestern side of Buzzard's Bay and is approximately 83 miles south of Boston. The port, encompassing the City of New Bedford and the Town of Fairhaven (see Figure 5-9), is historically known for its fishing industry connections but has developed a significant break-bulk trade. The harbor, considered to be small geographically, is located at the mouth of the Acushnet River, and has direct access into Buzzards Bay, Vineyard Sound and the Atlantic Ocean. The harbor entrance is approximately 10 nm from the beginning of the south entrance of the Cape Cod Canal. See Appendix E for the extent of the New Bedford - Fairhaven DPA.

Figure 5-9 Aerial View of New Bedford Harbor
(Source: MassGIS, 2001)

The Port of New Bedford is a deepwater port and is one of the nation's major fishing ports. The fishing fleet includes more than 500 vessels operating out of the port. The Port of New Bedford also supports a diverse market of cargo transport. Barge operations move aggregate and break-bulk cargo to the Islands of Martha's Vineyard and Nantucket. Shipments of break-bulk cargo consisting primarily of house goods are exported to Cape Verde and Angola. The Port of New Bedford has the largest throughput tonnage of break-bulk perishable commodities in New England.

The port hosts reefer (refrigerated) vessels that handle fresh fruit and fresh and frozen fish. The labor force consists of approximately 30 International Longshoreman's Association personnel for vessel operations and 20 Teamsters for warehouse operations. The port currently handles around 25 freighters per year (MARPRO Associates International 2009).

New Bedford is already an active freight seaport and is a major logistical connection for agricultural products entering the New England market. Highway connections are good, and the port could benefit from expanded and improved rail connections to meet freight needs. New Bedford is a small niche port that can continue to expand activities with some infrastructure improvements and investment. It has sufficient deep water access for the size and type of vessel common to most break-bulk and project cargo and has available property for expansion.

Facilities

The New Bedford waterfront has a number of large and small piers and wharves that are primarily used by the commercial cargo and fishing industry (see Figure 5-10). Most facilities have good highway connections as well as rail connections. Harbor regulations and berthing limits, except berthing for private terminals, are enforced by the Harbor Development Commission (HDC) and the Port Maritime Security Unit.

New Bedford South Terminal Wharf has a 488 m (approximately 1,600 foot) berth with 9.1 m (30 feet) of water depth and serves as the major off-loading center for fish product. The wharf has 7,080 m^3 (250,000 cubic feet) of refrigerated storage on site and handles primarily seafood. The southernmost portion of the facility has the potential to build out a 122 m (400 foot) solid fill bulkhead. The site currently has 4.0 hectares (approximately 10 acres) of backland.

Sprague Terminal just North of South Terminal has a 225 m (740 foot) berth with an 8.2 m (27 foot) water depth alongside. The pier primarily handles petroleum products, but was originally part of the operations of a defunct electric power plant (the building is still standing on site.)

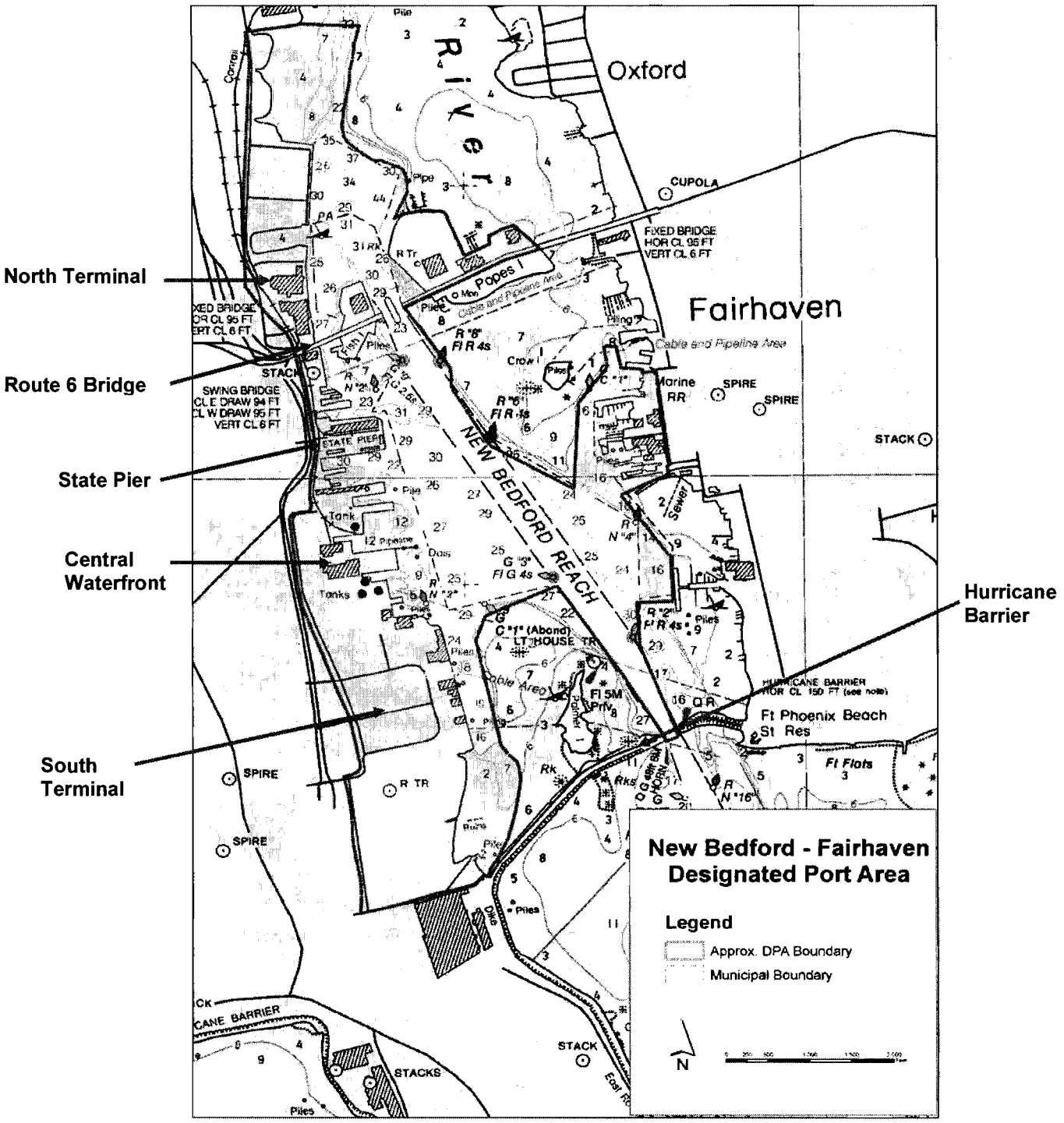


Figure 5-10 Navagational Map of New Bedford Harbor

The State Pier Terminal at the center of the Inner Harbor has three berths measuring 137 m (450 feet), 183 m (600 feet), and 236 m (775 feet) with a 9.1 m (30 foot) water depth alongside. There are 11,610 m^2 (125,000 square feet) of covered storage for general cargo. The facility can support freighter service and store over 135 containers. American Cruise Lines operates out of the facility with a minimum of 20 ports of call on an annual basis and up to 89 passengers per trip. Ferry services also operate out of the State Pier, including passenger and cargo service to Cuttyhunk Island and passenger service to Martha's Vineyard. Ferry service brings over 115,000 passengers through the port annually. The Quick Start Ferry facility on the State Pier allows intermodal transfers of waterborne freight and freight carried by truck and rail. This terminal features an 8.2 m (27 foot) pier depth, roll on/roll off capability, offsite cold storage, and easy access to the interstate highway system. The ramp is approximately 30.5 m (100 feet) long and 5.5 m (18 feet) wide and will hold up to 182 mt (approximately 200 tons). The State Pier requires a significant amount of investment to bring it up to industry standards for cargo handling (see Section 7).

Above the Route 6 Bridge are the Maritime Terminal, Bridge Terminal and North Terminal. The Maritime Terminal Wharf, operated by Maritime Terminal International, has a 183 m (600 foot) berth with a 9.5 m (31 foot) water depth alongside. The facility has 84,960 m^3 (3 million cubic feet) of refrigerated storage and is one of the largest U.S. Department of Agriculture-approved cold treatment centers on the East Coast for use with controlled imported agricultural products. The terminal receives approximately 25 vessels a year, each carrying between 1,362 and 3,630 mt (1,500 and 4,000 tons) of fish or, approximately 1,816 to 2,723 mt (2,000 to 3,000 tons) of fruit.

The Bridge Terminal Wharf, on the northeast side of the harbor, is 137 m (450 feet) long with a 8.5 m (28 foot) water depth alongside. The wharf has a 14,160 m^3 (500,000 cubic foot) refrigerator warehouse and handles frozen and chilled food products. The facility is owned and operated by Bridge Terminal Inc.

American Pride Seafood is a private facility operating out of the North Terminal and one of the world's leading seafood product processors. The bulkhead supporting this operation is 177 m (580 feet) long with a 7.6 m (25 foot) water depth alongside. The facility has 5,890 m^2 (63,400 square feet) of refrigerated warehouse space, 5,342 m^2 (57,500 square feet) of freezer space and 3,224 m^2 (34,700 square feet) of covered warehouse space.

Within the New Bedford North Terminal Wharf are commercial properties managed by the HDC. These properties cover 10.1 hectares (approximately 25 acres) of land. Tenants include the seafood processors Eastern Fisheries and Seawatch International, barge operators, ship repair facilities, and other maritime service businesses. A 0.8 hectares (2 acre) terminal site is proposed to come on-line over the next 5 years. This facility is currently operated by the EPA as part of the superfund clean-up will revert back to the City of New Bedford in the next few years. The facility has rail connections that lead directly to the water's edge.

The port is considered a full service port with associated maritime industries include vessel maintenance and repair conducted at dockside or at repair facilities in New Bedford or in Fairhaven. The port has two moderate size shipyards, and equipment and provisions to support commercial and recreational vessels.

New Bedford is served by a rail line operated by CSX. Roadway bridge constraints prohibit doublestack (Gen2) access to the port. However, this is not a problem limited to New Bedford. An application has been submitted for TIGER Grant money to extend the rail line to the State Pier, but further extension to the proposed South Terminal Development site is unrealistic. The port has handled overweight and oversized project cargo in the range of 45.4 mt (approximately 50 tons) out of the northern part of the harbor. Wind farm components could be moved by road into New Bedford as long as the loaded units do not exceed permit requirements for oversized loads, including weight and overall dimensions. The highway system accessing New Bedford conforms to federal standards that allow a minimum vertical clearance under overhead structures of 4.88 m (16 feet) in rural areas and 4.27 m (14 feet) in urban areas. Routes into New Bedford include US I-195 and Route 18 which connects the west and south port areas to the main highways system.

The Port of New Bedford is considered a moderately deep-water port with overall depths of 9.1 m (30 feet). The harbor is protected by a hurricane barrier (see Figures 5-9 and 5-10) that is constructed across the harbor entrance and is equipped with an opening that can be closed during hurricane conditions and severe coastal storms. The port is considered a harbor of refuge for vessels in the region.

The harbor approach is characterized by a number of ledges and shoals. The approach channel allows for safe navigation and avoids most of the obstructions. The hurricane barrier entrance is 45.7 m (approximately 150 feet) wide and opens up to a 107 m (350 foot) wide channel, at a depth of 9.1 m (30 feet), extending to a turning basin approximately 305 m (1,000 feet) above the New Bedford-Fairhaven Bridge. The range of the tide is 1.1 to 1.2 m (3.5 to 4.0 feet), and harbor currents are overall considered weak. Maximum ebb and flood tide currents are under an average of 2.5 knots.

There are vessel limitations due to the hurricane barrier and the Route 6 highway bridge in the Inner Harbor (see Figure 5-10). The hurricane barrier opening width is 45.7 m (approximately 150 feet) and the Route 6 New Bedford–Fairhaven Bridge is 28.0 m (approximately 92 feet) wide. All vessel transit to and from northern portion of the harbor (upstream of the Route 6 Bridge) is subject to daylight only restrictions for vessels with overall length above 121 m (400 feet) and/or beam above 18 m (59 feet) and to wind velocity restrictions

Advantages

The port is well protected by the hurricane barrier and has support mechanisms in place for commercial and industrial vessel activity, including ROWEI staging. The port is has good road and rail access, and adaptable warehouse capacity is significant. The port has several opportunities for expansion to accommodate ROWEI assembly.

The harbor is challenged by a significant pollution problem due to local industries which up until the 1970s discharged wastes containing polychlorinated biphenyls (PCBs) and toxic metals into New Bedford Harbor. There are high levels of contamination throughout the waters and sediments of the harbor that extend into Buzzards Bay. This contamination led to New Bedford Harbor being designated as a Superfund Site. Since 2004 the EPA has been dredging to remove the PCBs in contaminated sediments. The EPA is expected to explore new technologies (confined aquatic disposal) that will reduce the demand for land-side facilities. This

could accelerate the process of bringing the terminal facility under City control and opening other waterfront parcels up for development.

As a result of the contamination, no maintenance dredging has occurred for over 50 years. The port faced the loss of waterfront business unless maintenance dredging could be implemented. In 2005, the first navigational maintenance dredging was conducted restoring portions of the harbor to useable depths. This has allowed business to increase and larger commercial vessels to return to the harbor.

The navigational draft within the Port of New Bedford is sufficient for turbine installation and import vessels. As turbine components are relatively lightweight for their size, import vessels are space-limited, rather than weight-limited. As such, they would be able to enter New Bedford Harbor with a draft of less than 9.1 m (30 feet). No overhead clearance constraints were identified in the approaches to the Port of New Bedford.

Disadvantages

While advantageous to port safety, the hurricane barrier however is a significant navigational constraint for the southern section (i.e., seaward of the swing bridge) of the Port of New Bedford (see Figure 5-10). The lateral (horizontal) clearance is 45.7 m (150 feet), which restricts turbine load-outs in the fore-aft bunny ear configuration. The Route 6 New Bedford–Fairhaven Bridge has a lateral clearance of 28 m (92 feet), which makes turbine transport above (i.e., upstream of) the swing bridge marginal. The Route 6 Bridge not only imposes lateral constraints for vessels transiting to and from the northern section of the harbor but also is outmoded and causes delays in travel time. The turning basin can only handle small cargo ships.

Potential

There are several port areas adaptable for marine terminal expansion capable of supporting ROWEI staging. The State Pier requires a significant amount of investment to bring it up to industry standards for cargo handling. However, there are several other facilities, including the South Terminal that could accommodate ROWEI staging with infrastructure improvements. The rail corridor needs to be extended and trackage improved to accommodate increased and oversized shipments. Commuter rail improvements are being planned, and the engineering of the commuter rail should include upgrades for freight transport. Development and of staging areas for trucks is also critical for increased activity in the port.

The South Terminal is convenient to the mouth of the harbor. Expansion of, and repairs to, the South Terminal would create a multi-use manufacturing and shipping facilitate suitable for ROWEI staging. Dredging along the bulkhead, improvements to the pier structure, and an extension of the existing bulkhead would allow for larger deeper-draft vessel berthing and expanded use of the South Terminal facility.

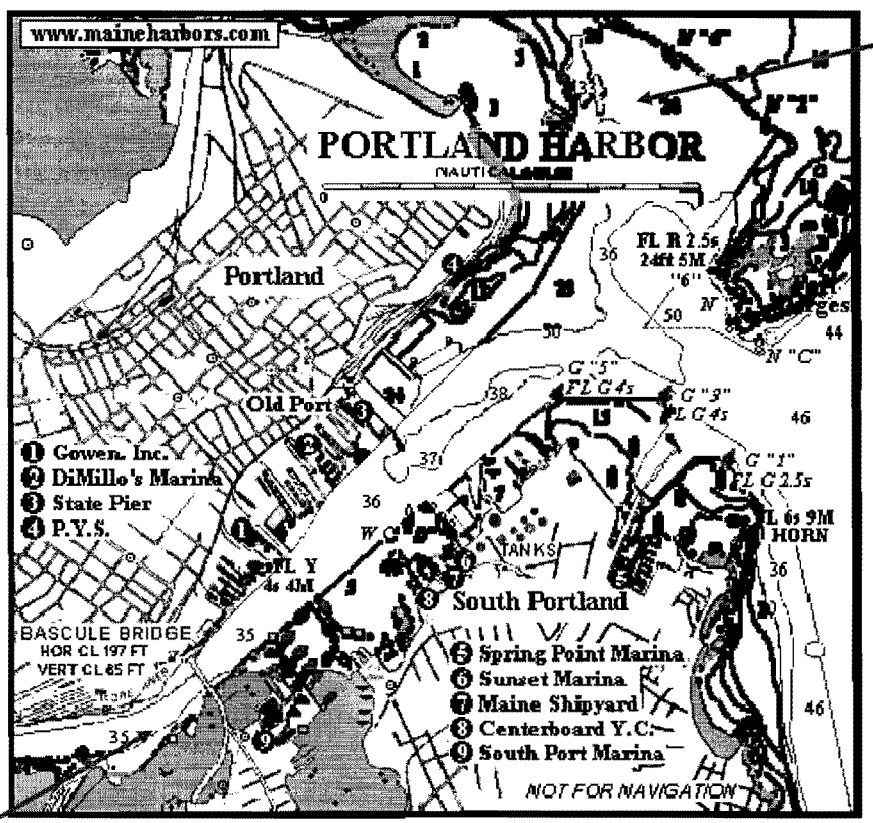
The North Terminal can be improved for handling of ROWEI fabrication and staging. Terminal facilities should be equipped with a versatile mobile harbor crane and ground support equipment. This equipment can be used for both cargo handling and wind farm components. Additional dredging to provide better access to all deepwater berths could be completed, and the turning basin could be lengthened to accommodate longer, higher tonnage cargo vessels. Improvements to the Route 6 Bridge are critical to the passage of vessels to North Terminal and maximizing vessel access.

5.2 Profiles of East Coast Ports Outside of Massachusetts

The other East Coast ports that were evaluated in this study are described briefly below.

5.2.1 Portland, Maine

Portland Harbor, at the western end of Casco Bay, is the most important port on the coast of Maine (see Figure 5-11). The ice-free harbor offers secure anchorage to deep draft vessels in all weather. The harbor is home to significant domestic and foreign commerce in petroleum products, paper, wood pulp, scrap metal, coal, salt and containerized goods. It is also the Atlantic terminus pipeline for shipments of crude oil to Montreal and Ontario. In 1998, Portland became the largest port in the Northeast based on throughput tonnages.



Casco Bay

Fore River

Figure 5-11 Portland Harbor and Shoreline Areas
(Source: www.maineharbors.com)

Portland is served by Pan Am Railways and the St. Lawrence and Atlantic Railroad, connecting the Port to a national network that also reaches into Canada. Passenger and freight ferries serve the nearby islands. Three scheduled airlines operate from the airport, and charter and air taxi service is available. Numerous truck lines serve the greater Portland area with interstate and intrastate service.

Although Portland is equipped to handle above-water hull and engine repairs of deep-draft vessels, major repairs to large vessels are typically made in Boston or, to a lesser extent, in

Bath. Deepwater facilities at Portland include seven petroleum terminals, one general cargo terminal, and one international ferry terminal. All have highway connections and most have railroad connections.

The channel from the sea to Fort Gorges has a depth of 13.7 m (45 feet), continuing at 10.7 m (35 feet) in the Inner Harbor and Fore River to a turning basin seaward of the railroad/highway bridge. The harbor includes two well-protected deepwater anchorages. Casco Bay Bridge, approximately 1.3 nm (approximately 1.5 miles) above the entrance to the Fore River, has a bascule span with a clearance of approximately 16.7 m (55 feet).

5.2.2 Portsmouth, New Hampshire

Portsmouth Harbor, located approximately 3 nm inland of the mouth of the Piscataqua River, is the only harbor of refuge for deep-draft vessels between Portland, ME and Gloucester, MA (see Figure 5-12). The harbor has sufficient depth to accommodate large deep-draft ships and is open throughout the year. The north side of the river, on Seavey Island in Kittery, ME, is occupied by the U.S. Navy and the Portsmouth Naval Shipyard. Foreign trade includes petroleum products, gypsum, frozen fish, fish products, and salt. Oil shipments in tankers drawing as much as 10.7 m (35 feet) arrive frequently in the fall, winter, and spring. The Division of Ports and Harbors of the Pease Development Aurhority oversees the maintenance, development and use of the port.

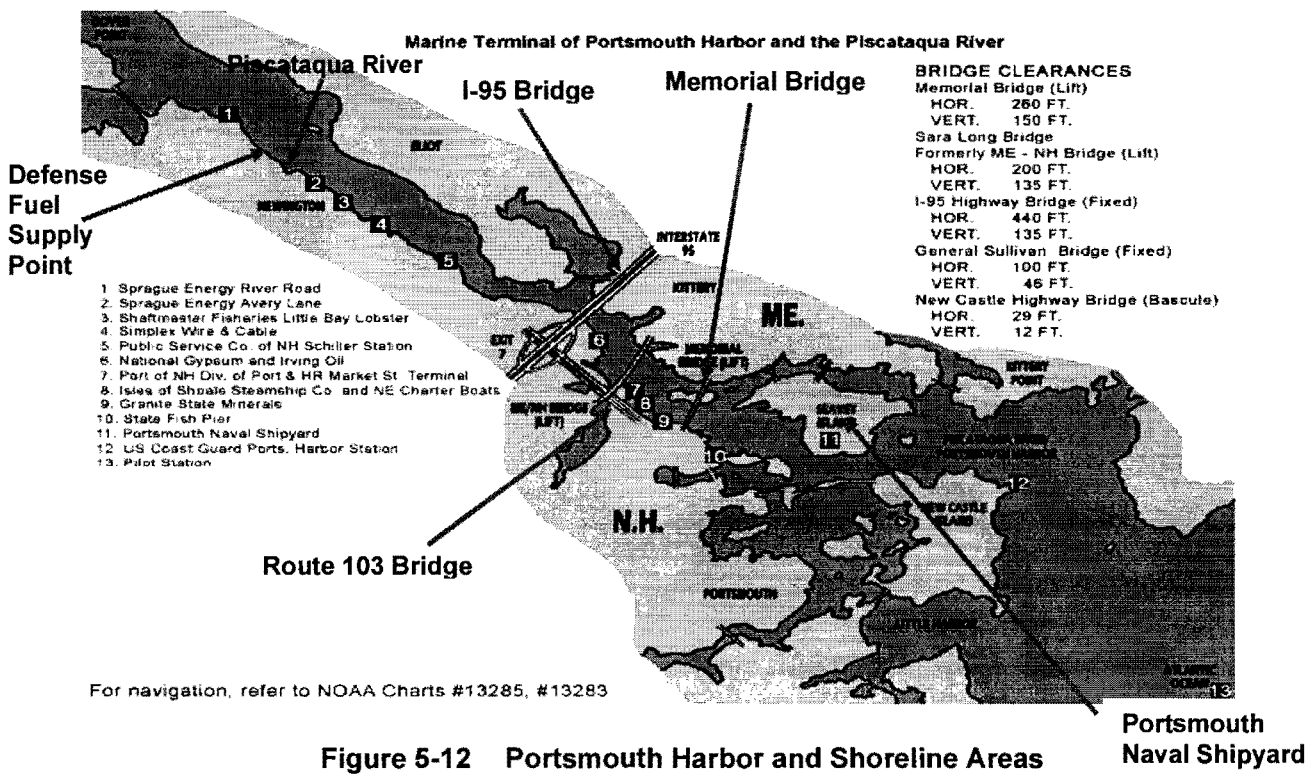


Figure 5-12 Portsmouth Harbor and Shoreline Areas

The port is served by a freight branch of the Boston and Maine Railroad, local and interstate highways, and is located within a mile of the International Airport on the Pease International Trade Port (formerly the Pease Air Force Base). There are no facilities for dry-docking deep-draft vessels in Portsmouth Harbor (the nearest for large vessels is Boston). However, local machine shops can make minor repairs to machinery, and several boatyards are capable of hauling out boats up to approximately 26 m (85 feet) in length.

All active commercial deep-draft facilities are located on the south bank of the Piscataqua River between the first bridge, Memorial Highway Bridge, and Dover Point and have highway connections, and all except the Defense Fuel Support Point Newington Dock have rail connections. Deepwater facilities at Portsmouth include seven petroleum terminals and 3 general cargo terminals.

Depths of about 10.3 m (34 feet) are present in the marked channel through Portsmouth Harbor to the Memorial (U.S. Route 1) Highway Bridge. From this bridge, a dredged marked channel with a depth of 7.9 m (26 feet) leads for about 3.0 nm (3.5 miles) to a turning basin about 0.35 nm (0.4 mile) above Frankfurt Island in the Piscataqua River. The controlling depth in the turning basin is 10.7 m (35 feet).

The principal bridges in Portsmouth Harbor are Memorial (U.S. Route 1) Highway Bridge, which has a lift span with clearances of 5.8 m (19 feet) down and 45.7 m (150 feet) up, and the combined U.S. Route 1 Bypass highway and Boston and Maine railroad bridge, which also has a lift span with clearances of 3 m (10 feet) down and 41 m (135 feet) up.

5.2.3 Providence, Rhode Island

Providence is located at the head of navigation on the Providence River, approximately 6 nm (7 miles) above the junction of the Seekonk River, which empties into the head of Narragansett Bay between Nayatt Point and Conimicut Point. The port's chief waterborne commerce includes petroleum products, cement, lumber, steel scrap metal, general cargo, and automobiles. Providence is served by rail, highway, and air.

The piers and wharves of the Port of Providence are located along both sides of the Providence River below Fox Point. Deepwater facilities at Providence include six petroleum terminals, one LNG terminal, and six general cargo terminals. The alongside water depths range from 8.5 to 12.2 m (28 to 40 feet) with berth lengths ranging from 152 to 396 m (approximately 500 feet to 1,300 feet). All the facilities described have highway connections, and most have rail connections.

The port contains 42.5 hectares (105 acres) of on-dock rail, open storage areas and covered warehouses, and is a fully licensed, bonded deep water port specializing in dry, liquid bulk, and break-bulk commodities (see Figure 5-13). Among the principal products moving through the port are chemicals, heavy machinery, lumber, coal, scrap metal and steel products. The Providence and Worcester Railroad's on-dock rail facilities allow direct vessel to rail transfer, indoor rail for warehouse loading, and a rail line alongside 8.1 hectares (20 acres) of open lay down area. The Providence and Worcester rail line connects to all major rail carriers offering service from the Providence area to anywhere in the contiguous U.S. and Canada.

Figure 5-13 Port of Providence
(Source: http://www.provport.com)

The East Passage, the principal passage in Narragansett Bay, has a depth of about 18.3 m (60 feet) for approximately 9.6 nm (11 miles) up the marked channel to the entrance of the dredged channel to Providence. The Newport Bridge, a fixed highway suspension bridge, crosses East Passage about 3.1 nm (3.6 miles) above the entrance. Vertical clearance through the 457 m (1,500 foot) wide center span is 64.9 m (213 feet) at the center, with lower clearances towards the outside of the center span.

The Providence River has a 12.2 m (40 foot) deep channel from just below Prudence Island Light to Fox Point near the junction of Providence and Seekonk Rivers. A hurricane barrier crosses the Providence River about 183 m (600 feet) above Fox Point. The hurricane barrier has a group of three large movable gates that span the Providence River. Each of the three gates is 12 m (40 feet) wide. The narrow gates prohibit large ships from passing into the inner downtown harbor. However, modern ocean-going vessels now dock at the Port of Providence, located south of the barrier (Schachterle et al 2010). There are no bridges over Providence River between the mouth and the principal wharves.

5.2.4 Quonset Point / Davisville, Rhode Island

Situated between New York and Boston and at the entrance of Narragansett Bay, the Port of Davisville in Rhode Island provides one of the best deep water ocean ports on the east coast. Major cargo arriving at the port includes automobiles, quarried stone, and general cargo. The port has three major piers with over 2,073 m (approximately 6,800 linear feet) of deep water dockage and onsite rail tracks. The Port of Davisville is operated by the Rhode Island Economic Development Corporation (see Figure 5-14).

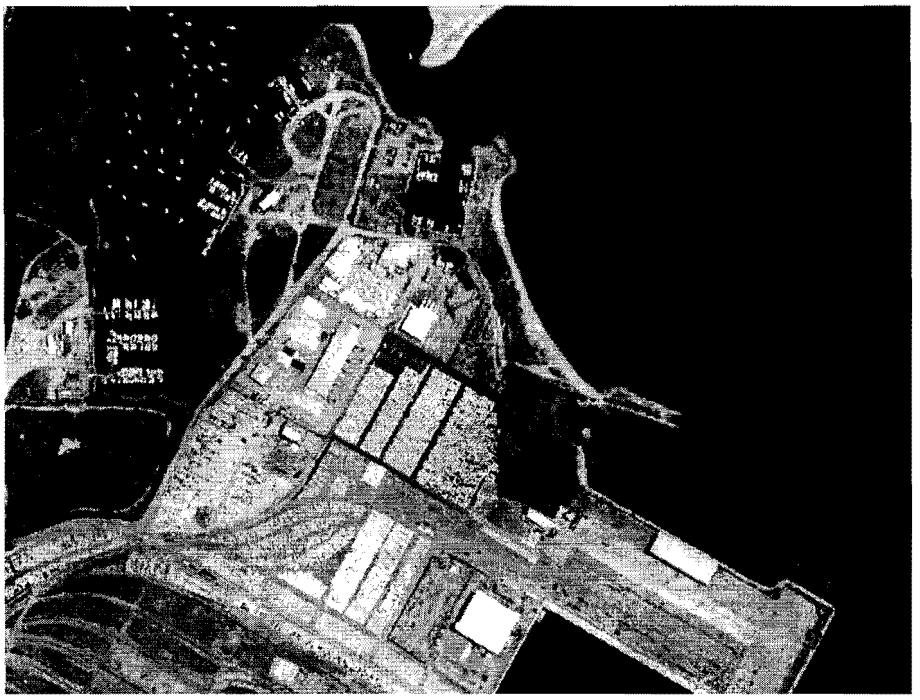


Figure 5-14 Quonset Business Park
(Source: RI Department of Environmental Management)

Quonset Point is located on the north side of Wickford Harbor, with Quonset Point Business Park located near the eastern end of the point. The site of two former U.S. Naval installations, Quonset Business Park comprises over 1,214.1 hectares (3,000 acres) of land. This land is currently administered by the Quonset Development Corporation (QDC), a subsidiary of the Rhode Island Economic Development Corporation. Land uses within the Park currently consist of mixture of industrial (light, heavy, and waterfront), office uses and public amenities, in addition to the Port of Davisville. The Port of Davisville offers 1,371.6 m (4,500 feet) of berthing space, consisting of two Piers (each 365.8 m [1,200 feet] in length), a bulkhead, 8.8 m (29-foot) channel draft, on-dock rail and a 5.7 hectare (14 acre) lay down area (Quonset Development Corporation website). Currently under construction at the Business Park is a mixed-use project with hotel, retail, restaurant, and office space. The piers at Quonset Point and Davisville are usually approached from East Passage and through a buoyed dredged channel with a depth of 10 m (33 feet) to a turning basin with depths between 9.75 and 10.7 m (32 and 35 feet), from which a channel leads to the piers at Davisville.

Rail service, provided daily by the Providence & Worcester (P&W) Railroad, consists of approximately 14 miles of track in two branches. The P&W rail network allows access to the entire United States and Canadian rail system. The railroad offers double-stack intermodal transportation services and provides a custom-house broker, shipping agent and forwards foreign freight for its customers. Interstate Routes 95, 195 and 295 allow access to regional and national markets. Direct trucking service is available to every state, Mexico, and most of the Canadian Provinces.

5.2.5 New Haven, Connecticut

New Haven Harbor, an important harbor of refuge, is located about 59 nm (68 miles) from New York, 155 nm (179 miles) from Boston via the Cape Cod Canal, and 149 nm (171 miles) from the Nantucket Shoals Lighted Whistle Buoy N (LNB). It is the largest deep water port in Connecticut and comprises all the tidewater northward of breakwaters constructed across the mouth of the bay, including the navigable portions of the West, Mill, and Quinnipiac Rivers. The inner harbor, northward of Sandy Point and Fort Hale, is shallow for the most part, except where the depths have been increased by dredging. Waterborne commerce in the harbor consists of petroleum products, scrap metal, lumber, automobiles, gypsum, paper and pulp products, steel products, chemicals, rock salt, and general cargo.

The main channel has a depth of 10.7 m (35 feet) and a width of 122 to 244 m (400 to 800 feet) to a point just below the junction of Mill River and Quinnipiac River (see Figure 5-15). This channel depth is sufficient for accommodating ships in the range of 18,156 to 36,312 mt (approximately 20,000 to 40,000 deadweight tons). Tomlinson Bridge, at the head of the main harbor at the confluence of Mill and Quinnipiac Rivers, is a vertical lift span with a horizontal clearance of 73.1 m (240 feet) and a vertical clearance of 4.0 m (13 feet) down and 18.6 m (61 feet) up. Just above this bridge is a fixed highway bridge with a clearance of 18.3 m (60 feet).

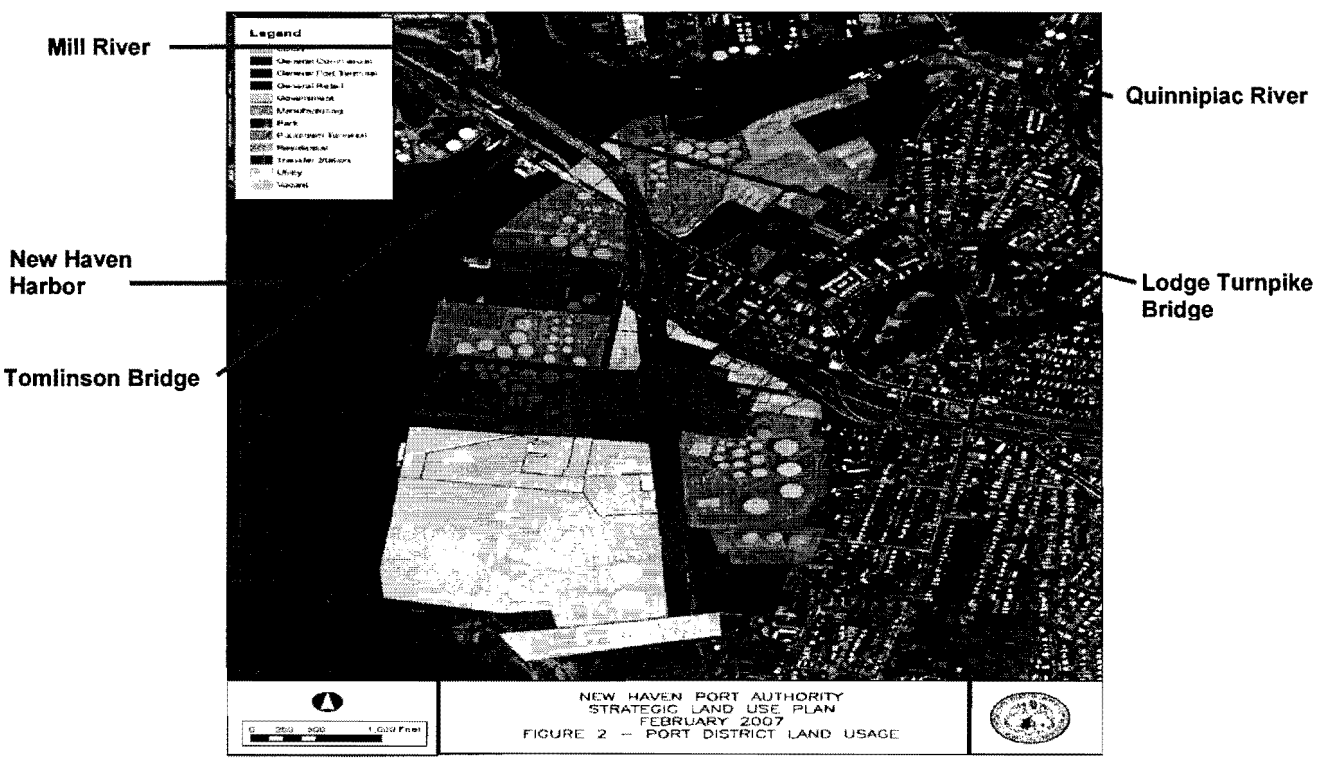


Figure 5-15 Aerial View of New Haven Harbor
(Source: http://www.cityofnewhaven.com/PortAuthority)

The deep draft facilities at the Port of New Haven are along the north and east sides of the inner portion of New Haven Harbor. Facilities for smaller vessels and barges are along the sides of the harbor and in Mill, Quinnipiac, and West Rivers. All deep draft facilities have direct highway connections, and most have railroad connections. The port is proximate to the regional highway network and I-95. Rail service is being restored to the port along with a series of siding tracks proposed for the private terminals. Rail service is provided by the P&W Railroad, and, although not serving the port directly, CSX provides rail freight service in the New Haven area.

New Haven has no facilities for making major repairs or for dry-docking deep draft vessels. However, machine shops in the area can make limited repairs to machinery and boilers and fabricate shafts and other pieces of equipment.

5.2.6 New York and New Jersey

New York Harbor is the principal entrance by water to New York City and the surrounding ports. The harbor is divided by The Narrows into Lower Bay and Upper Bay. The Battery, the southern tip of Manhattan, is at the junction of East River and Hudson River. The main channel from the sea to the deep water terminals in the Hudson River has a depth of 13.7 m (45 feet).

The Verrazano-Narrows Bridge between the Lower Bay and the Port of New York and New Jersey has vertical clearances of between 55.8 and 66.5 m (183 feet and 215 feet). There also are three fixed bridges with vertical clearances ranging from 127 feet to 135 feet.

The Port of New York and New Jersey (see Figure 5-16) has over 1,100 waterfront facilities. Most of these facilities are privately owned and operated, and the rest are owned or operated by either the railroads serving the port, the Port Authority of New York and New Jersey, the City of New York, the States of New York or New Jersey, the Federal Government, or other municipalities. This bi-state port includes terminals in New York City and across New York Harbor in Elizabeth, NJ and Newark, NJ. The port has a major steamship passenger terminal, containership terminals, break-bulk general cargo terminals, and petroleum and other liquid cargo facilities. Most of the waterfront facilities throughout the port have highway and railroad connections. The Port Authority is undertaking a $600 million ExpressRail project to build or expand on-dock and near-dock rail terminals. The Port of New York and New Jersey is served by three trunk line railroads and one short-line railroad, numerous trucking firms engaged in long-haul and short-haul freight service, and several bus companies. Elizabeth, NJ offers the only double-stack intermodal rail access to the port.

Figure 5-16 Terminal Areas at the Port of New York and New Jersey
(Source: http://www.panynj.gov/port)

5.2.7 Philadelphia, Pennsylvania

Philadelphia is one of the chief ports of the United States and is located at the junction of the Delaware and Schuylkill Rivers (see Figure 5-17). Philadelphia's seaport focuses on several areas of international trade, such as the importing of perishable cargoes from South America and high-quality paper products from Scandinavia. Philadelphia has both container and break-bulk terminals, along with good rail and highway connections. It is especially strong as a Northeast departure point for carriers in the Caribbean islands trades, and for inbound fruit shipments (from Latin America) and meats (from Australia). There have been efforts for years to create a bi-state port with the Port of South Jersey across the Delaware River in Camden, NJ.

The main channel from the sea to the Philadelphia Naval Shipyard has a depth of 12.2 m (40 feet), with the other channels through Philadelphia Harbor having varying depths. The Port of Philadelphia is in the process of deepening the main channel to 13.7 m (45 feet). There are four bridges between Delaware Bay and the Port of Philadelphia with vertical clearances ranging from 39 to 57.9 m (128 feet to 190 feet).

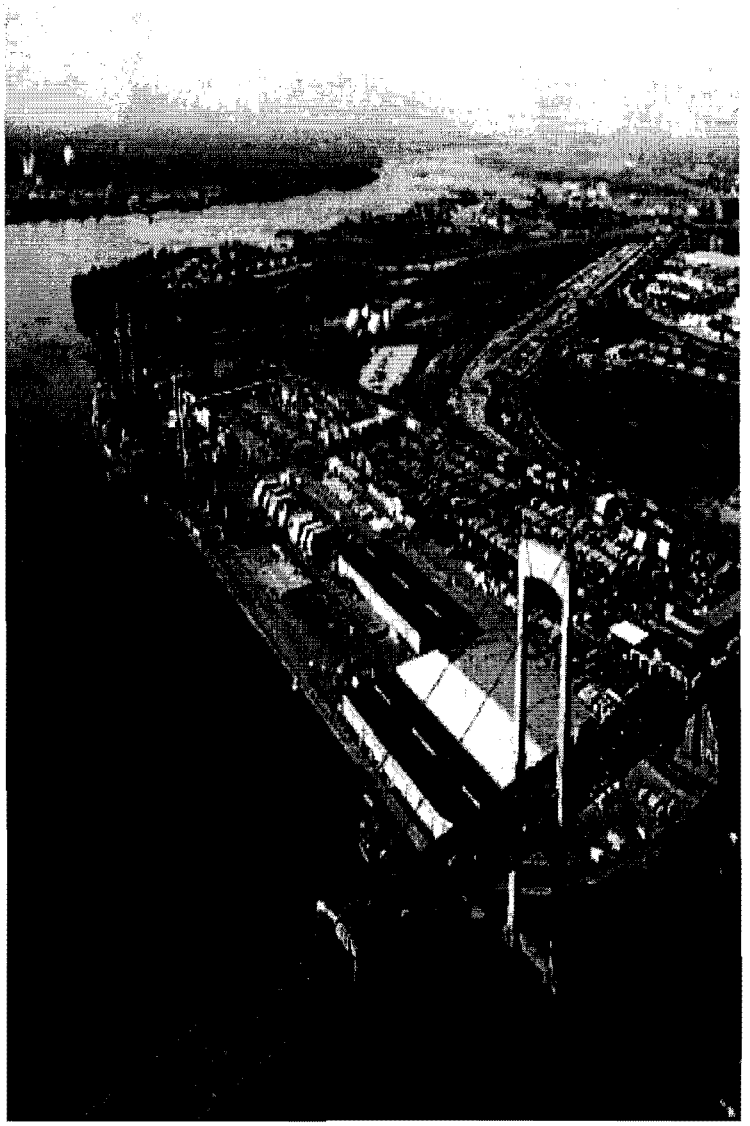


Figure 5-17 Port of Philadelphia
(Source: http://aapa.files.cms-plus.com/SeminarPresentations/07_OPSAFIT_Walsh_Jim.pdf)

The Port of Philadelphia is operated by the Philadelphia Regional Port Authority. Philadelphia has more than 45 deep water piers and wharves along its Delaware River waterfront and along the Schuylkill River. Port facilities can be accessed by vessel, rail and highway. The port facilities are serviced by three railroads. Norfolk Southern provides double-stack intermodal service between Philadelphia and major Midwest destinations. Terminal facilities are located in close proximity to interstate highways.

5.2.8 Baltimore, Maryland

The Port of Baltimore is located at the head of tidewater navigation on the Patapsco River. Baltimore Harbor consists of the entire Patapsco River and its tributaries. While part of the waterfront lies outside the municipal limits of Baltimore, by state law the port is within the

jurisdiction of the Maryland Port Administration. When compared to other East Coast ports, Baltimore has a logistical disadvantage as it is 109 nm (125 miles) inland from the ocean, up the Chesapeake Bay.

The main channel between the Virginia Capes and Fort McHenry, Baltimore has a depth of 15.2 m (50 feet), and other channels in the harbor have depths ranging from 12.2 to 15.2 m (approximately 40 to 50 feet). The main channel between the Delaware Capes and Baltimore via the Chesapeake and Delaware Canal is 10.7 m (35 feet) deep.

Principal imports include general cargo, petroleum products, coke of coal, iron ore, aluminum manganese, inorganic chemicals, salt, gypsum, lumber, motor vehicles, fertilizers and sugar; exports are chiefly: general cargo, coal, automobiles and machinery. Most of the piers and wharves in Baltimore Harbor have direct connections with mainline railroads. CSX offers double-stack intermodal service at the 28.3 hectares (70 acre) Seagirt Marine Terminal. More than 100 steamship companies connect Baltimore with principal U.S. and foreign ports. About 150 motor truck carriers service the port.

Baltimore is well equipped to make major repairs to large vessels. The largest graving dock and the largest floating dry-dock in the area are located at the Bethlehem Steel Sparrows Point yard. Marine railways can haul out vessels up to approximately 38 m (125 feet) and up to 270 mt (approximately 300 tons). A plan to dredge the port's berths to 15.2 m (50 feet), the same depth as the main channel, is under consideration (see Figure 5-18).

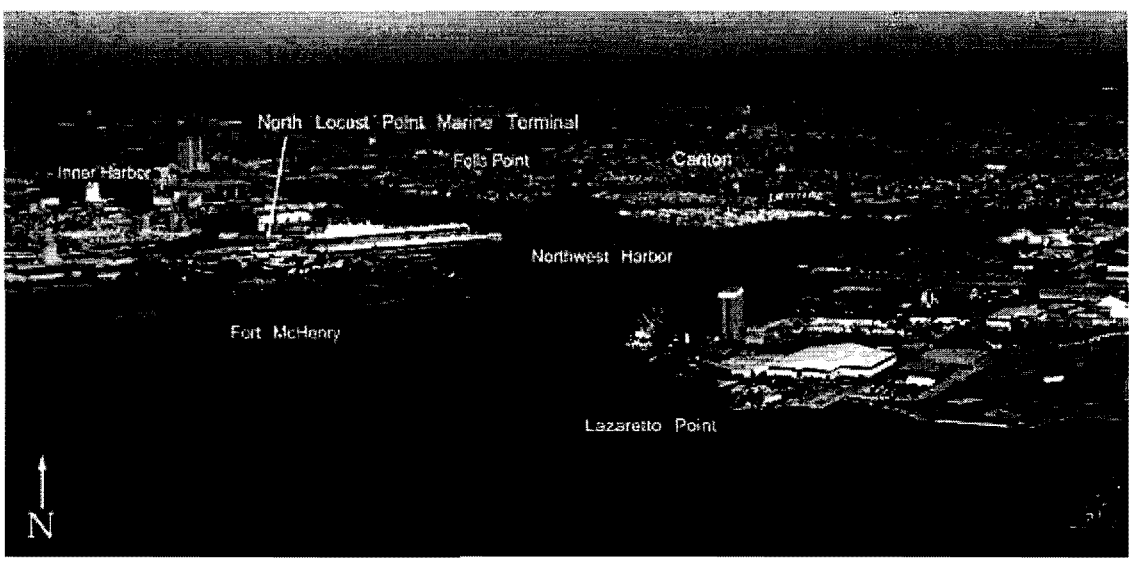


Figure 5-18 Port of Baltimore
(Source: http://en.wikipedia.org/wiki/File:Baltoport.jpg)

5.2.9 Wilmington, Delaware

The Port of Wilmington is a full-service deep water port and marine terminal handling over 400 vessels per year. This port has an annual import/export cargo tonnage of over 3.63 million mt (4 million tons). Today, Delaware's port is the busiest terminal on the Delaware River. Located at the confluence of the Delaware and Christina Rivers, 56.5 nm (65 miles) from the

Atlantic Ocean, the port is owned and operated by the Diamond State Port Corporation (see Figure 5-19). The Port of Wilmington has wharves that support barge traffic as well as deep water facilities. The Port facilities include seven deep water general cargo berths, a tanker berth, a floating berth for roll on/roll off vessels on the Christina River, and an automobile and roll on/roll off berth on the Delaware River. The Port of Wilmington has the nation's largest dock-side cold storage facility.

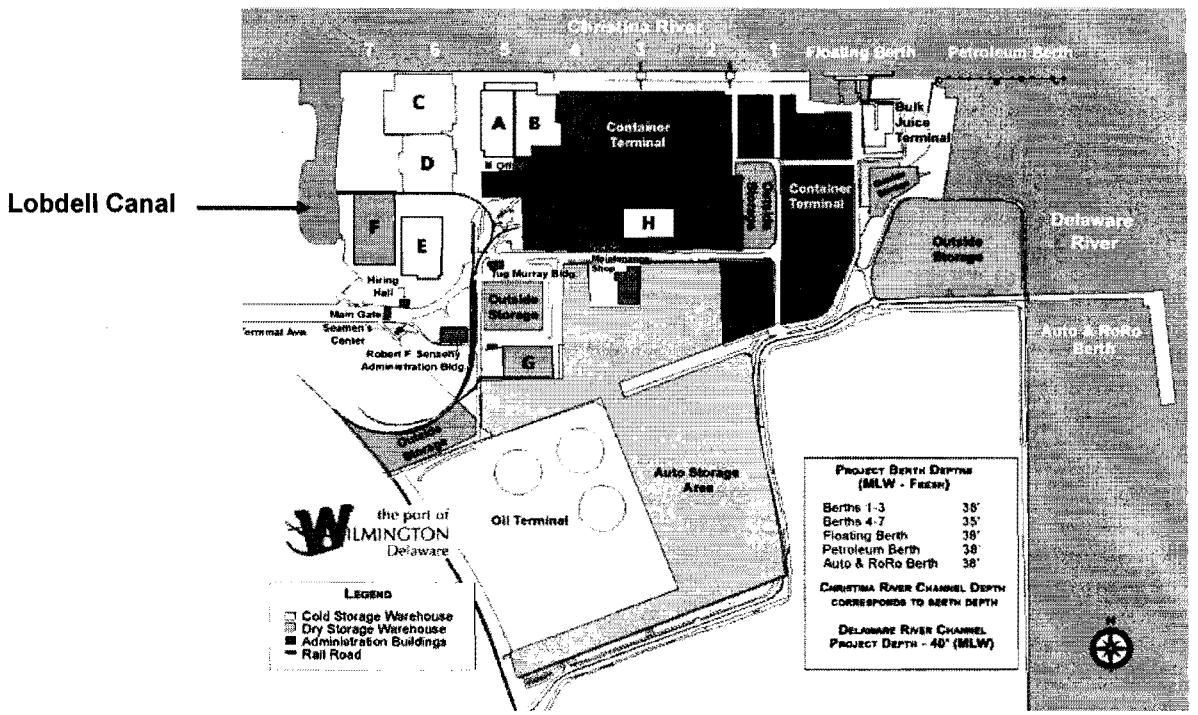


Figure 5-19 Terminal Areas at the Port of Wilmington
(Source: http://dedo.delaware.gov)

There are no bridges or overhead power cables over the deep water section of the Christina River. The Delaware Memorial Bridge has twin suspension spans over the main channel with a clearance of 57.3 m (188 feet). There is a 10.7 m (35 foot) channel from the Delaware River to Lobdell Canal and a 11.6 m (38 foot) deep turning basin opposite the Wilmington Marine Terminal.

Since it was founded in 1923, the Port of Wilmington has been a major Mid-Atlantic import/export gateway for a wide variety of maritime cargoes and trade. Future expansion is planned to provide more storage capacity for existing and future commercial businesses. Rail access to the port is available via Norfolk Southern and CSX Transportation, with railcar loading docks located next to terminal warehouses.

5.2.10 Virginia Port Authority

Chesapeake Bay, the largest inland body of water along the Atlantic coast of the United States, is 146 nm (168 miles) long with a width of 20 nm (23 miles). The bay is the approach to Norfolk, Newport News, Baltimore, and many lesser ports. Deep-draft vessels use the Atlantic entrance, which is about 8.7 nm (10 miles) wide between Fisherman's Island on the north and Cape

Henry on the south. Medium-draft vessels can enter from Delaware Bay on the north via Chesapeake and Delaware Canal, and light-draft vessels can enter from Albemarle Sound on the south via the Intracoastal Waterway. The Port of Virginia has the advantage of being served by the deepest ice-free channels on the East Coast. When the harbor is dredged to a 15.2 m (50 foot) depth, Norfolk will be the first East Coast port able to accommodate a fully loaded 8,000-TEU ship, which means the port would be able to accommodate large purpose-built offshore wind vessels (see Figure 5-20).

Figure 5-20 Port of Virginia
(Source: Google Earth)

Hampton Roads, at the southwest corner of Chesapeake Bay, is entered 13.9 nm (16 miles) westward of the Virginia Capes. It includes the Port of Norfolk and the Port of Newport News. Hampton Roads is the world's foremost bulk cargo harbor. Coal, petroleum products, grain, sand and gravel, tobacco, and fertilizer constitute more than 90 percent of the cargo handled at Hampton Roads ports. Hampton Roads ports are served by a terminal beltline, several large railroads, and by more than 50 motor carriers. In addition, over 90 steamship lines connect Hampton Roads with the principal U.S. and foreign ports.

Norfolk Harbor comprises a portion of the southern and eastern shores of Hampton Roads and both shores of the Elizabeth River. Norfolk Harbor has numerous wharves and piers of all types, the majority of which are privately owned and operated. All have freshwater connections and access to highways and railroads.

The Virginia Port Authority is expanding capacity to meet increased demand for terminal space. When this renovation is complete, it will be home to eight of the largest cranes in the world and the wharf will be a state-of-the-art facility capable of handling the heaviest cargo in the world. In addition, Maersk Sealand plans to invest a total of $450 million for a new terminal on approximately 100 hectares (250 acres) of Virginia Port Authority property in nearby Portsmouth, Virginia, the first major privately developed terminal in the United States.

Hampton Roads has extensive facilities for dry-docking and making major repairs to large deep-draft vessels. The shipyard at Newport News has one of the largest and best equipped graving docks in the United States. There are many other yards that are especially equipped to handle medium-sized and small vessels.

The approach to Hampton Roads is through the 16.7 m (55 foot) Thimble Shoal Channel. There are natural depths of 6.1 to 24.2 m (20 to 80 feet) in the main part of Hampton Roads, but the harbor shoals to less than 3 m (10 feet) toward the shores. Dredged channels lead to the principal ports. Two main Federal channels, marked by buoys, lead through Hampton Roads.

5.3 U.S. East and Gulf Coast Shipyard Construction and Repair Capacity

The construction of new tonnage and repair of marine equipment in both the propelled and non-propelled market has become an issue in recent years because of shifting shipyard capacity throughout the world. While new capacity in other parts of the world has replaced lost capacity in the U.S., declining domestic demand has reduced the number of available shipyards in this country for new construction or repair of large vessels. At the same time, recent regulations such as the Jones Act, require vessels in domestic service or operating in domestic waters to be built and serviced in U.S. yards. As the number of yards available for new construction or repair decreases due to declining demand, the number of yards able to comply with Jones Act requirements also decreases. This is particularly evident in the Northeast U.S. where shipyards able to handle large tonnage vessels, including deep water cargo ships, tankers and specialty vessels such as offshore delivery and support vessels, have dramatically decreased.

While yards that handle large tonnage vessels have decreased, the demand has remained relatively stable for yards that handle smaller vessels such as tugs, offshore service vessels and barges. Current and anticipated demand for commercial construction of cargo and petroleum vessels has been addressed by fewer facilities that have increased their size and capability in some cases.

Specialty wind farm vessels have unique construction and servicing requirements. For the purpose of this analysis, a purpose-built vessel with a length overall (LOA) of 143 m (470 feet) and a width (beam) of 39.6 m (130 feet) was selected to establish the largest dimensions for representative turbine import and installation vessels. Smaller service vessels including offshore supply boats (that can be readily adapted for serving offshore wind farm equipment) and tug and barges also were considered as they are employed regularly in offshore activities. Whereas installation and service vessels handling offshore wind turbine components within the territorial waters of the U.S. would be subject to the Jones Act, import/delivery vessels could be foreign flagged if their operation were limited to equipment delivery at a single U.S. port.

The following analysis assesses construction capacity and repair capacity at U.S. shipyards. See Appendix H for more detail.

6.0 SHORT-LISTING OF PORTS FOR FURTHER EVALUATION

Based on the evaluation criteria developed in Section 4 and analysis, the Team has concluded that New Bedford and Boston Harbor have the best potential to support the assembly and deployment of the planned and prospective offshore wind energy projects. The process by which these two short-listed ports were identified is described below.

6.1 Massachusetts Port Criteria Evaluation Matrix

As described in Section 4, the Team identified a broad set of direct requirements and highly desirable characteristics of port facilities relative to supporting offshore wind farm construction and operation. This list was further distilled down to a smaller set of criteria that could be used to differentiate the candidate port facilities based on the potential of that port to support offshore wind energy development. These criteria included some "hard" criteria that had minimum quantitative measures with which to judge the feasibility or suitability of a port relative to that consideration. Those ports that failed to meet the majority of our hard criteria (recognizing that modifications, upgrades or work arounds could potentially be made to ports relative to one or two characteristics to allow them to achieve the minimum threshold criteria) were eliminated from the evaluation process. This screening resulted in the selection of six Massachusetts ports (located in DPAs) for further consideration. The Massachusetts Port Criteria Evaluation Matrix (see Table 6-1) clearly demonstrates how these six Massachusetts ports compare against each other with respect to our established "hard" criteria. Application of the identified "soft" criteria was reserved for only the short-listed ports and is discussed later in this report.

Table 6-1
Massachusetts Port Criteria Evaluation Matrix

PARAMETERS		PORTS					
Criteria	**Recommended Values/Ranges**	**Boston**	**New Bedford**	**Fall River**	**Gloucester**	**Salem**	**Fore River**
First Tier Harbor Navigational Access							
Protected Harbor	Sheltered from Weather Conditions	Yes	Yes	Yes	Yes	Yes	Yes
Shipping Vessel Channel Depth	Minimum 7.3 m (24')	12.2 – 13.7 m (40' - 45')	9.1 m (30')	10.7 m (40')	4.9 - 5.8 m (16' - 19')	9.4 m (31')	9.8 m (32')
Overhead Clearance	No Vertical Obstruction	NVO, but FAA approval required	NVO	41 m (135')	NVO	NVO	53.3 m (175')
Horizontal Clearance	40 m (130') (beam plus overhang)	131 m (430')	45.7 m (150')	122 m (400')	61 m (200')	85.3 m (280')	53.3 m (175')
24/7 Operational Ability	24/7 operations	Yes	Yes	Yes	No	Yes	Yes
Exclusive Use of Port Facility	Ability to Offer Exclusive Use	Yes	Yes	No	No	No	Yes
Comments				Mt Hope Bridge height restriction	Navigational constraints	Salem DPA in full use by power plant	Fore River Bridge height restriction
Second Tier Port Facilities							
Berth Length	Minimum 138 m (450')	549 m (1,800')	488 m (1,600')	189 m (620')	427 m (1,400')	177 m (580')	244 m (800')
Shipping Vessel Water Depth	Minimum 7.3 m (24')	12.2 – 13.7 m (40' - 45')	9.1 m (30')	10.7 m (40')	4.9–5.8 m (16'-19')	9.4 m (31')	9.8 m (32')

Table 6-1
Massachusetts Port Criteria Evaluation Matrix

PARAMETERS		PORTS					
Criteria	**Recommended Values/Ranges**	**Boston**	**New Bedford**	**Fall River**	**Gloucester**	**Salem**	**Fore River**
Total Wharf and Yard Upland Area	4.0 hectares (10 ac)	5.7 – 6.9 hectares (14-17 ac)	4.0+ hectares (10+ ac)	2.8 hectares (7 ac)	3.2 hectares (7.8 ac)	NA	44.9 hectares (111 ac)
Rail Access	Rail Access	Limited	Limited	Yes	Yes	No	Yes
Highway Access	Highway Access	Yes	Yes	Yes	Yes	No	No
Comments				State Pier can only accommo date small cargo vessels.	Limited adaptable area	Insufficie nt work area; additional focus on tourism	Multiple berths/ rough estimate; plans for mixed-use waterfront development

Legend NVO = No vertical obstruction
= Criteria not met
NA = Not available for ROWEI staging

6.2 Implications of Applying the Hard Criteria Relating to Navigational Access and Port Facilities

6.2.1 Evaluation of Each Hard Criterion

Protected Harbor: All of the six Massachusetts ports are in protected harbors. The hurricane barrier in New Bedford adds an additional layer of protection for portside operations during inclement weather.

Shipping Channel Depth and Overhead Clearance: Navigational access to Fall River and Fore River is constrained by the overhead height restrictions of existing bridges (indicated by a shading of the matrix cell in Table 6-1), and the Port of Gloucester does not meet the minimum shipping channel depth of 24 feet. On the other hand, the shipping channels of New Bedford and Boston Harbors meet the minimum depth criterion. New Bedford's navigation channel is 30 feet deep, and the New Bedford HDC is proposing to dredge to extend the 30 foot channel to the planned bulkhead extension at the South Terminal. Navigation channels to Boston Harbor's DPA are between 40 feet and 45 feet deep. Both New Bedford and Boston Harbor have unobstructed overhead clearance. There are no vertical obstructions, such as bridges and/or power lines, which would prohibit offshore wind component delivery and installation vessels, including jack-up vessels, from accessing either harbor. However, as noted previously, FAA approval may be required in Boston Harbor because of the harbor's proximity to Logan International Airport.

Horizontal Clearance: None of the selected ports are restricted by horizontal (lateral) clearances less than 130 feet. The minimum horizontal clearance criterion eliminated facilities in New Bedford upstream of the New Bedford-Fairhaven Bridge (92 feet of lateral clearance). However, the South Terminal at New Bedford Harbor is downstream of the New Bedford-Fairhaven Bridge and upstream of the Hurricane Barrier.

24/7 Operational Ability and Exclusive Use of Port Facility: All ports being evaluated, with the exception of the Port of Gloucester, can operate around the clock and all year. The Ports of Gloucester and Salem also did not have the ability to offer exclusive use of their facilities.

Berth Length and Shipping Vessel Water Depth: Off-shore wind farm construction is associated with multiple berthing operations, including offloading of parts for final assembly or pre-assembly; loading of special barges with the pre-assembled or assembled elements (rotor with blades, foundations or tower sections); mooring of jack-up vessels, crane vessels or any type of specialty purpose-built vessel for service (fuel and maintenance), preparation and deployment; mooring and service of crew boats; emergency response support; and any other activity supporting staging and construction. The established berth length and channel and portside depth criteria reflected minimum requirements for accommodating these operations. The Port of Gloucester failed to meet the depth criterion. All other ports had sufficient length and depth.

Total Wharf and Yard Upland Area: Landside (upland) port facilities provide storage, staging and assembly work areas to facilitate offshore wind farm installation. To fulfill these tasks it is important that landside facilities have adequate acreage, warehouse space, onsite equipment, and high load bearing capacity. Most working ports have existing equipment that could be used or adapted to offload, assemble and load some or all current turbine and foundation components. The Team determined that given sufficient land area, storage, assembly, and load bearing issues could be addressed with improvements to the port. Neither Fall River, Gloucester, nor Salem has sufficient adaptable space for the work area required to support offshore wind farm staging.

Rail Access: None of the Massachusetts ports evaluated for this study has second generation rail access[7]. Existing tracks will not be able to handle the expected size of future generation nacelles and rolled steel components. Existing rail lines could be used primarily for delivery of aggregate and related products rather than turbine or foundation components. Whereas Fall River, Gloucester, and Fore River have existing freight rail lines to the waterfront, Boston and New Bedford currently have limited rail access, and Salem has none. Boston has active rail to the Boston Marine Industrial Park, but not to the North Jetty or Dry Dock #4. Boston has designed the rail extension to the North Jetty and Dry Dock #4, and funding for construction has been requested through a TIGER application[8]. New Bedford has rail access to the waters' edge, and there is a pending TIGER request[9] to connect the existing tracks to the State Pier, but not the South Terminal.

Highway Access: Road connections are important for transport of ancillary material and equipment, as well as personnel. Overweight and large shipment units are subject to state permitting requirements, which also take into account possible roadway infrastructure

[7] First generation rail clearance for container doublestack cargo is 19 feet above the rail (ATR). Second generation doublestack clearance is 22.5 feet ATR.

[8] The Boston Redevelopment Authority has requested a grant of $84 million for expansion of the Black Falcon Cruise Terminal; track improvements to the Boston Marine Industrial Park rail line; improvements to the East, North and South Jetties; and reconstruction of the FID Kennedy West and Access Roads.

[9] The New Bedford HDC has requested a grant of $36.4 million to improve North Terminal infrastructure; rehabilitate the rail line to the State Pier; update and rehabilitate Herman Melville Boulevard; procure cranes and modify terminals for roll on-roll off capability; and develop the southern portion of the South Terminal.

constraints, such as overhead utilities, road lighting, road curvatures and intersections. Neither Salem Harbor nor the Fore River Shipyard has capacity for high volume traffic flow due to local roadway congestion. There is no direct interstate highway access from the City of Salem; the nearest highway access to Route 128 is along Route 114 in neighboring Peabody. Fore River's access to the interstate highway network is via Route 3, a limited-access roadway that is about two miles away from the Shipyard.

6.2.2 Results of the Evaluations

Based on the hard criteria established in Section 4 and displayed in Table 6-1, the ports of Fall River, Gloucester, Salem, and Fore River fell short of the minimum requirements for navigational access and port infrastructure to support offshore wind development activities. The ports of New Bedford and Boston emerged as the two short-listed ports.

6.3 Engineering Cost Analysis of Port Upgrades at Short-Listed Ports

This section provides a further evaluation of the two short-listed ports and rough order of magnitude estimate of the required maintenance and upgrades that would improve the ability of those ports to serve offshore wind farm development.

6.3.1 New Bedford Harbor

The Team identified two possible locations in New Bedford Harbor that might reasonably support offshore wind farm construction. One is the South Terminal area (Figure 6-1) and the other is the State Pier facility (Figure 6-2). Both facilities failed to meet all of the hard criteria discussed above, and demonstrated some level of deficiency in their current physical condition.

6.3.1.1 South Terminal

The City of New Bedford has identified the expansion of the South Terminal (Figure 6-1) as a major priority. The City has applied for a TIGER grant to expand the berth by approximately 245 m (800 feet) and dredge a 9 m (approximately 30 feet) deep channel from the main channel to the new berth. The new facility would have significant backland load bearing capacity. There are between 5.6 and 8.1 hectares (14 and 20 acres) of land adjacent to the berth. The proposed rebuild would utilize a tied-back steel sheet pile bulkhead backfilled with the dredge spoils. The cost of the new bulkhead and dredging is estimated to be approximately $20 million. Table 6-2 presents the cost estimate for the South Terminal expansion.

Additional improvements, including paving, utilities and site equipment (such as a large crane), could add an additional $15 million and would provide a "future" life as a general cargo or container handling facility. The new bulkhead construction would allow the terminal to be designed to a high live load capacity, which will provide a significant number of options for material handling. Immediately adjacent to the site (across the street) there are several warehouses of approximately 930 m^2 (10,000 square feet) or more. There would be ample space to construct a shelter on the site without reducing the outside lay down space.

Staging Port	Potential Obstructions	Lateral Clearance	Overhead Clearance	Controlling Water Depth	Feasible Turbine Load-Out Configurations	Jack-Up Feasible?
Chelsea River (West of Chelsea St. Bridge)	Andrew McArdle Bridge	53 m (175')	No Constraints	8.8-12.2 m (29-40')	fore-aft bunny ear	yes
Chelsea River (East of Chelsea St. Bridge)	Chelsea St. Bridge	28 m (93')	25 m (83')	8.8-12.2 m (29-40')	rotor disassembled	no

Transit distances from potential New England staging ports to the proposed or possible offshore wind farm sites are included in Table 3-14.

Table 3-14
Distances from Regional Ports to Proposed Wind Farms

Staging Location	Ports	Distance (nautical miles)	Alternative Route A [Around Nantucket Island] Distance (nautical miles)	Alternative Route B [Through the Cape Cod Canal] Distance (nautical miles)
Delaware Bay (Deepwater)	Boston, MA	470		330
	Gloucester, MA	445		330
	New Bedford, MA	260		Not Applicable
	Portland, ME	500		400
	Fall River, MA	250		Not Applicable
	Quonset/Davisville, RI	280		Not Applicable
Block Island (Deepwater/Northwind)	Boston, MA	295		120
	Gloucester, MA	270		120
	New Bedford, MA	50		Not Applicable
	Portland, ME	325		190
	Fall River, MA	45		Not Applicable
	Quonset/Davisville, RI	35		Not Applicable
Nantucket Sound (Cape Wind)	Boston, MA	130	270	130
	Gloucester, MA	105	240	120
	New Bedford, MA	60	n/a	Not Applicable
	Portland, ME	160	295	200
	Fall River, MA	75	Not Applicable	Not Applicable
	Quonset/Davisville, RI	70	Not Applicable	Not Applicable
MA OMP Wind Sites (Nomans Land Island)	Boston, MA	260		100
	Gloucester, MA	235		100
	New Bedford, MA	35		Not Applicable
	Portland, ME	290		175
	Fall River, MA	50		Not Applicable
	Quonset/Davisville, RI	40		Not Applicable

APPENDIX 4

DRAFT
Functions and Values Assessment

Proposed South Terminal CDF

May 1, 2010

Submitted on Behalf of:

New Bedford Harbor Development Commission

Prepared by:
Apex Companies, LLC
New Bedford, MA
And
Boston, MA

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 SITE DESCRIPTION 2
3.0 WETLAND IDENTIFICATION 3
3.1 Wetland Identification (Cowardin, et. Al.) 5
3.2 Wetland Identification (Hydrogeomorphic Classification) 6
4.0 FUNCTIONS AND VALUES 6
4.1 Groundwater Recharge/Discharge 6
4.2 Floodflow Alteration (Storage & Desynchronization) 7
4.3 Sediment/Shoreline Stabilization 7
4.4 Fish and Shellfish/Wildlife Habitat 7
4.5 Sediment/Toxicant Retention 8
4.6 Nutrient Removal/Retention/Transformation and Production Export (Nutrient) 8
4.7 Recreation (Consumptive & Non-Consumptive), Educational/Scientific Value, Uniqueness/Heritage, Visual Quality/Aesthetics 9
4.8 Endangered Species 9
4.9 Evaluation of Principal Functions and Values 9

DRAWINGS

Figure 1 – Site Locus Map
Figure 2 - Proposed Project Footprint
Figure 3 – Historic High Water Line Map
Figure 4 – Resource Area Location Map
Figure 5 – USEPA Fishing/Shellfishing/Lobstering Ban Notice

APPENDICES

Appendix A - Apex Wetland Resource Investigation Summary
Appendix B – Wetland Function-Value Evaluation Form

1.0 INTRODUCTION

This report was prepared in order to assess the potential impacts to wetland resource areas due to implementation of a Confined Disposal Facility (CDF) via an extension of South Terminal in New Bedford, Massachusetts.

CAD Cells have been chosen as the preferred methodology for disposal of PCB contaminated sediment within New Bedford Harbor associated with the State Enhanced Remedy to the Record of Decision of the New Bedford Superfund Site. The USEPA is also considering the use of CAD Cells in implementing the Remedy for the Superfund Site. It is currently anticipated that approximately 1.8 million cubic yards of clean sand will be generated during construction of the future CAD Cells. MassDEP has stated that it is preferable to find alternatives to Open Ocean Disposal due to the large volume of material, specifically, alternatives that can be implemented at the site. One of those potential alternatives is to utilize Confined Disposal Facilities (CDFs) within New Bedford Harbor to dispose of the clean sand while constructing a marine terminal, which can subsequently help to store additional clean sand in the future, helping to implement other potential disposal or re-use alternatives. Analysis of the best location in New Bedford Harbor for the first proposed CDF (the preferred Alternative) indicates that the South Terminal CDF is the best candidate for fulfilling the Project Purpose as the Least Environmentally Damaging Alternative, when consideration is given to all factors.

The project site is located adjacent to New Bedford Harbor in New Bedford, Massachusetts, immediately to the south of the existing South Terminal facility. A Site Locus Map is included with this document as **Figure 1**. The latitude of this site is 41.622936. The longitude of this site is 70.915271. The site is located within the Cape Cod Watershed. The Hydrologic Unit Code for this site is 01090002.

Contamination Issues

All sediments in New Bedford Harbor are severely degraded with contamination and contain PCBs and heavy metals. All areas under the high water mark within New Bedford Harbor are part of the New Bedford Superfund Site; so designated due to historic releases of PCBs into the marine environment that have universally impacted sediment within the

Harbor with PCBs (typically fine-grained organic sediments of varying thicknesses). Although the concentration of PCBs in this fine-grained sediment varies depending upon the location within the Harbor, historic sampling results indicate that the concentration of PCBs within the sediment at the subject site is higher than the upper limit allowed within landfills within the Commonwealth of Massachusetts. USEPA has banned fishing and shellfishing within New Bedford Harbor indefinitely due to the presence of PCBs within fish and shellfish. Although it may be possible to depurate the shellfish of PCB impacts, the PCBs are not anticipated to degrade on their own and depuration of the shellfish within a clean area will only transport the PCBs to the clean location at which depuration occurs, thereby transporting Superfund material outside of a Superfund site. Areas at the site (and within New Bedford Harbor as a whole) below the high water mark act as a source of contaminants for the surrounding communities (beginning at Buzzard's Bay), rather than retaining sediment or toxics, as non-impacted wetland areas would be expected to do. Traditional production from within a wetland is provides the opposite effect than what is normally anticipated at wetland sites: the production of food or usable products for humans or other living organisms by the wetland areas are harmful, instead of beneficial to humans, wildlife, fish or the environment.

2.0 SITE DESCRIPTION

The Site is located immediately to the south of South Terminal in New Bedford, Massachusetts. The proposed extension is shown on **Figure 2**. The extension involves the installation of approximately 800 linear feet of sheet piling to the south, aligned with the existing bulkhead. The area behind the bulkhead would be filled with clean sand generated during CAD Cell construction. The surface of the CDF, after filling, is currently anticipated to be crushed stone, to accommodate anticipated uses at the facility. The full facility:

- Encompasses approximately 20 acres of area;
- Would cover and cap subaqueous PCB and metals contaminated sediments that exist to the east of the current shoreline, and cover contaminated urban fill areas upland, and paved and filled areas upland;
- Reflects ideal future potential industrial use as an Alternative Energy Industrial Marine Park, potential direct rail access, and nearby highway access;

- Is currently industrial and industrially impacted property;
- Is located south of the Route 6 swing bridge, and has no restriction on vessel size nor timing;
- Land is currently owned by the HDC, but leased to non-water-dependant users;
- Does not require the relocation of any users; and
- Would allow for future storage of a large amount of clean sand from CAD cells as a transient storage holding area until other uses can be found for the material.

3.0 RESOURCE IDENTIFICATION

Prior to conducting a resource identification at the site in question, historical records of land use were reviewed. A map prepared by the Massachusetts Office of Coastal Zone Management indicates that the historic high water line at the facility is significantly inland of the current coast line. This map is presented as **Figure 3**.

A wetland resource investigation was conducted by Apex Companies, LLC on April 20, 2010. During the course of this investigation, the presence of historic fill was confirmed in all but one of up to nine separate test pit locations dug to investigate the presence of hydric soils. In all but one location, man-made materials (brick, asphalt, trash, etc.) were identified within 15 inches of the surface. This was found to be the case even for areas in which hydric soils were noted within the top 10-15 inches of soil and where wetland indicator species (primarily the invasive species *phragmites australis*) were detected. A written description of the results of the investigation are included as **Appendix A** to this document.

A resource area location map is included as **Figure 4**. The resource area location map notes the location of the historic high water line as a blue stripe running approximately 200 feet inland and parallel to the existing coastline; the area between the historic high water line and the existing high water line consists of filled tidelands. This map also illustrates an area (in brown) within the upland area and within which urban fill has been confirmed (determined via test pit operations as well as visual indications during Apex's site visit). The areas that contained hydric soils within 10-15 inches of the surface and/or contained wetland indicator species are noted on

the drawing in green; although, please note that these areas have generally been confirmed to be underlain by urban fill as well, and are primarily populated with invasive species *(phragmites australis)*.

The paved area to the southwest of the bulkhead extension is paved (white, striped area). It is Apex's understanding that this area is associated with a release under 310 CMR 40.0000 (The Massachusetts Contingency Plan); the remedy for the release at this site is an asphalt cap. Although a full investigation into the vertical and/or horizontal extent of potential contaminants has not been undertaken at the site, it is likely that other areas of the site are also impacted by hazardous materials, due to the presence of large quantities of historic urban fill.

It should also be noted that any area under the high water mark within New Bedford Harbor is part of the New Bedford Superfund Site; as such, the area is universally impacted with PCB containing sediments (typically fine-grained organic sediments of varying thicknesses). Although the concentration of PCBs in this fine-grained sediment varies depending upon the location within the Harbor, historic sampling results indicate that the concentration of PCBs within the sediment at the subject site is higher than the upper limit allowed within landfills within the Commonwealth of Massachusetts. As a result of the PCB impacts, areas within New Bedford Harbor are banned from fishing, shellfishing, and lobstering by the United States Environmental Protection Agency (a notice promulgated by USEPA on the bans is included as **Figure 5**).

The primary resource areas noted during the field investigation (as categorized via the Commonwealth of Massachusetts' Wetland Protection Act, 310 CMR 10.0000) are: Inland Wetland Areas, Coastal Beach, Land Under the Ocean, Land Subject to Flooding, and Coastal Bank. It is currently understood that the Coastal Beach area are Horseshoe Crab habitat, and that the Land Under the Ocean and the Coastal Beach area are shellfish habitat.

Based upon this delineation completed by Apex, the resource areas anticipated to be impacted by completion of this project are as follows:

- 2.99 acres of Land Under the Ocean/Land Containing Shellfish.
- 1.27 acres of Coastal Beach/Land Containing Shellfish/Horseshoe Crab Habitat.
- 0.34 acres of Coastal Beach/Land Subject to Flooding.
- 0.26 acres of Coastal Bank/Land Subject to Flooding.
- 1.03 acres of Land Subject to Flooding.
- 0.71 acres of Isolated Wetlands.

Which is a total of approximately 6.6 acres of resource area at this facility that will be permanently lost due to completion of this project.

3.1 Wetland Identification (Cowardin, et. Al.)

The following is an assessment of wetland classes at the site that will be effected by the proposed work, in accordance with the system presented by Cowardin, et.al. (1979) "Classification of wetlands and deepwater habitats of the United States," Office of Biological Services, FWS/OBS-79/31, December 1979:

For areas submerged at low tide:

System: Marine
Subsystem: Subtidal
Class: Unconsolidated Bottom
Subclass: Mud

For areas between low tide and high tide:

System: Marine
Subsystem: Intertidal
Class: Unconsolidated Shore
Subclass: Sand

For delineated inland wetland areas:

System: Palustrine
Subsystem: N/A
Class: Emergent Persistent Wetland

3.2 Wetland Identification (Hydrogeomorphic Classification)

The following is an assessment of wetland classes at the site that will be effected by the proposed work, in accordance with the system presented by Brinson, M.M. (1993). "A hydrogeomorphic classification for wetlands", Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A270 053.

For areas below high tide at the site:

Geomorphic Setting: Coastal – Sea Level Location
Water Source: Lateral Surface Flows (tides)
Hydrodynamic Properties: Bi-directional Flows – Astronomical Tides (Regular Flooding)

For delineated inland wetland areas:

Geomorphic Setting: Coastal – Sea Level Location
Water Source: Precipitation and Groundwater Discharge to Wetland
Hydrodynamic Properties: Nearly Constant Water Table at or Near Surface (proximity of harbor to wetlands maintains relatively shallow water table that varies with precipitation and groundwater runoff).

4.0 FUNCTIONS AND VALUES

Apex conducted an evaluation of functions and values for the wetlands present within the work area. Apex completed the Wetland Function-Value Evaluation Form from "The Highway Methodology Workbook Supplement: Wetland Functions and Values, A Descriptive Approach" (the completed form is attached as **Appendix B** of this document). The following sections provide a descriptive evaluation of functions and values for wetland areas within the area of work. A subsequent section summarizes the principal functions/values of the Raceway, and discusses the potential impacts that the proposed work will have on the principal functions/values of the Raceway:

4.1 Groundwater Recharge/Discharge

Groundwater Discharge is one of the principal functions/values of the wetland. The wetland primarily consists of land under the ocean and coastal beach and coastal bank. This is a primary intersection of groundwater and the ocean. Groundwater generated via precipitation and runoff typically intersects with saltwater intrusion and discharges/mixes at this location; therefore,

Groundwater Discharge is one of the Primary Functions. Groundwater recharge does not occur at this location.

4.2 Floodflow Alteration (Storage & Desynchronization)

The wetland area provides storage for flood flows present within the Acushnet River; however, flood storage is not as crucial at the base of the Acushnet River, where New Bedford Harbor intersects with Buzzard's Bay. Reduction of flood storage at this end of the Acushnet River provides less benefit due to the ease at which flood waters drain out through the Hurricane Barrier at the mouth of New Bedford Harbor. Flood flows during storm surges are many orders of magnitude higher than what can be accommodated at properties within New Bedford Harbor; and the New Bedford Hurricane Barrier protects New Bedford Harbor from significant storm surges. Therefore, although flood flow alteration is one of the functions/values of the wetland, it is not a Principal Function.

4.3 Sediment/Shoreline Stabilization

The wetland areas provide a buffer to reduce the energy of the high-velocity waves within New Bedford Harbor. The filling of the wetland areas will reduce the ability of the area to reduce the energy of these waves, which would result in slightly higher energy waves within the Harbor impacting upon other structures, vessels, and natural features. Therefore, sediment/shoreline stabilization is one of the Principal Functions of the wetland areas.

4.4 Fish and Shellfish/Wildlife Habitat

Visual evidence as well as the results of a shellfish survey have indicated that the coastal beach and aquatic areas of the site serve as shellfish habitat. New Bedford Harbor is severely impaired due to the widespread prevalence of PCBs within fine-grained sediment that impacts the benthic substrate of the Harbor, as well as the coastal beach areas and salt marsh areas. The balance of the site is impacted by the presence of urban fill, which has been found to be prevalent throughout much of the balance of the site, particularly within the areas identified as emergent wetland areas. Shellfish and fish that utilize the wetland areas are irreparably impacted by the PCB content of the sediment. USEPA has banned fishing and shellfishing within New Bedford Harbor indefinitely due to the presence of PCBs within fish and shellfish.

Although it may be possible to depurate the shellfish of PCB impacts, the PCBs are not anticipated to degrade on their own and depuration of the shellfish will only transport the PCBs to the location at which depuration occurs. Nevertheless, although the habitat is severely impaired and the shellfish present are irreparably impacted, Fish and Shellfish habitat is one of the Principal Functions of the wetland areas.

The emergent wetland areas are relatively small and do not appear to serve much purpose as wildlife habitat. The areas are surrounded and underlain by urban fill, and the site itself is within a highly industrial area. The most prevalent wildlife found within the wetland areas is avian wildlife that occasionally frequents the shoreline area foraging for shellfish. Avian wildlife has been observed onsite; however, the quality of that habitat is questionable due to the PCB impacts to shoreline sediments as well as the contaminated shellfish that serve as the food source for birds. Therefore, although the site is noted as suitable for wildlife habitat, it is not listed as a Principal Function for wildlife habitat.

4.5 Sediment/Toxicant Retention

Rather than retaining sediment or toxics, the wetland area, as well as New Bedford Harbor as a whole, acts as a source of contaminants for the surrounding environment, such as Buzzard's Bay. The tidal flows, and high velocity waves that periodically impact the shoreline, act to mobilize fine grained sediment, rather than retain it. Fine grained material or sediment are present below the low tide line and are also interspersed within the sand-dominated coastal beach, which results in the elevated concentrations of PCBs in both locations; however, this area of New Bedford Harbor is not one typically that is responsible for sediment retention, and it definitely is not responsible for toxicant retention, and instead serves to export toxicants to un-impacted areas within Buzzard's Bay.

4.6 Nutrient Removal/Retention/Transformation and Production Export (Nutrient)

The capacity of the wetland areas to export production is limited. The wetland areas are man-made, via fill that has been utilized to extend the shoreline to the east over time. The coastal beach and aquatic areas do not serve as a sink for nutrients; although the shellfish technically do consume nutrients during their growth cycles. The flow regime, low

detention time, absence of slowly draining fine-grained material or deep organic/sediment deposits limit the capabilities of the wetland areas to act as a sink for nutrients. As stated before, the sediments within the wetland areas are contaminated with PCBs. The production of food or usable products for humans or other living organisms by the wetland areas are not beneficial to humans, wildlife, fish or the environment. Therefore, the functions/values of Nutrient Removal/Retention/ Transformation and Production Export (Nutrient) are not highly functioning for the wetland areas, and those aspects that are functioning, present a significant risk to the environment.

4.7 Recreation (Consumptive & Non-Consumptive), Educational/Scientific Value, Uniqueness/Heritage, Visual Quality/Aesthetics

The site is an open area, and has a length of coastline that can be viewed from multiple locations. However, the site is strewn with trash, and debris, and is not a popular location for the locals to view. The site is located within New Bedford Harbor, which is an active industrial and commercial Harbor, and the site is located within an area designated by the Commonwealth of Massachusetts as a Designated Port Area; an area that is set aside specifically for industrial development. The site does not have any cultural or heritage significance. The site is not part of a recreation area, is private property, is fenced off, and the public is discouraged from entering. The wetland areas are adjacent to navigation areas, but are not accessible for recreational boaters; a recreational boat ramp and mooring fields are adjacent to the site, and accessible through City of New Bedford-owned facilities. Impacts to the wetland areas will not impact accessibility to New Bedford Harbor. Therefore, the functions/values of Recreation, Educational/Scientific Value, Uniqueness/Heritage, and Visual Quality/Aesthetics are not particularly applicable to the wetland areas.

4.8 Endangered Species

The site is not located within an area identified as estimated habitat or priority habitat for rare or endangered species.

4.9 Evaluation of Principal Functions and Values

As identified above, the principal functions and values identified for the site are:

- Groundwater Recharge/Discharge;
- Sediment/Shoreline Stabilization; and
- Fish and Shellfish Habitat.

It is anticipated that the proposed work will impact two of these three functions and values minimally. The planned cap will be permeable, and thus should not impede groundwater recharge/discharge. Weep holes within the sheet piling will allow groundwater to flow into the Harbor, and will also allow hydrostatic forces built up via tidal intrusion into the upland area to flow back out into the Harbor. The cap will also isolate the impacted sediment within the area of the site, and will prevent it from entraining within the water column and transporting out into Buzzard's Bay; thereby increasing water quality within the Acushnet River and Buzzard's Bay. The sheet piling will provide a barrier for the waves that impact upon it. Although some shoreline stabilization will be lost (as the wave energy may be re-directed rather than dissipated), the decrease in shoreline stabilization should be minimal. The largest impact is anticipated to be due to the impact to shellfish habitat and the loss of the shellfish; however, the shellfish area is severely impacted with PCBs and the shellfish themselves are banned for consumption indefinitely. Therefore, the capping of the shellfish will likely remove PCBs from a food chain that could ultimately effect the human population. Mitigation for the shellfish that introduces clean shellfish to an un-impacted area would can have a much greater positive impact than what is currently present at the site.

Figures

FIGURE 1

SITE LOCUS MAP

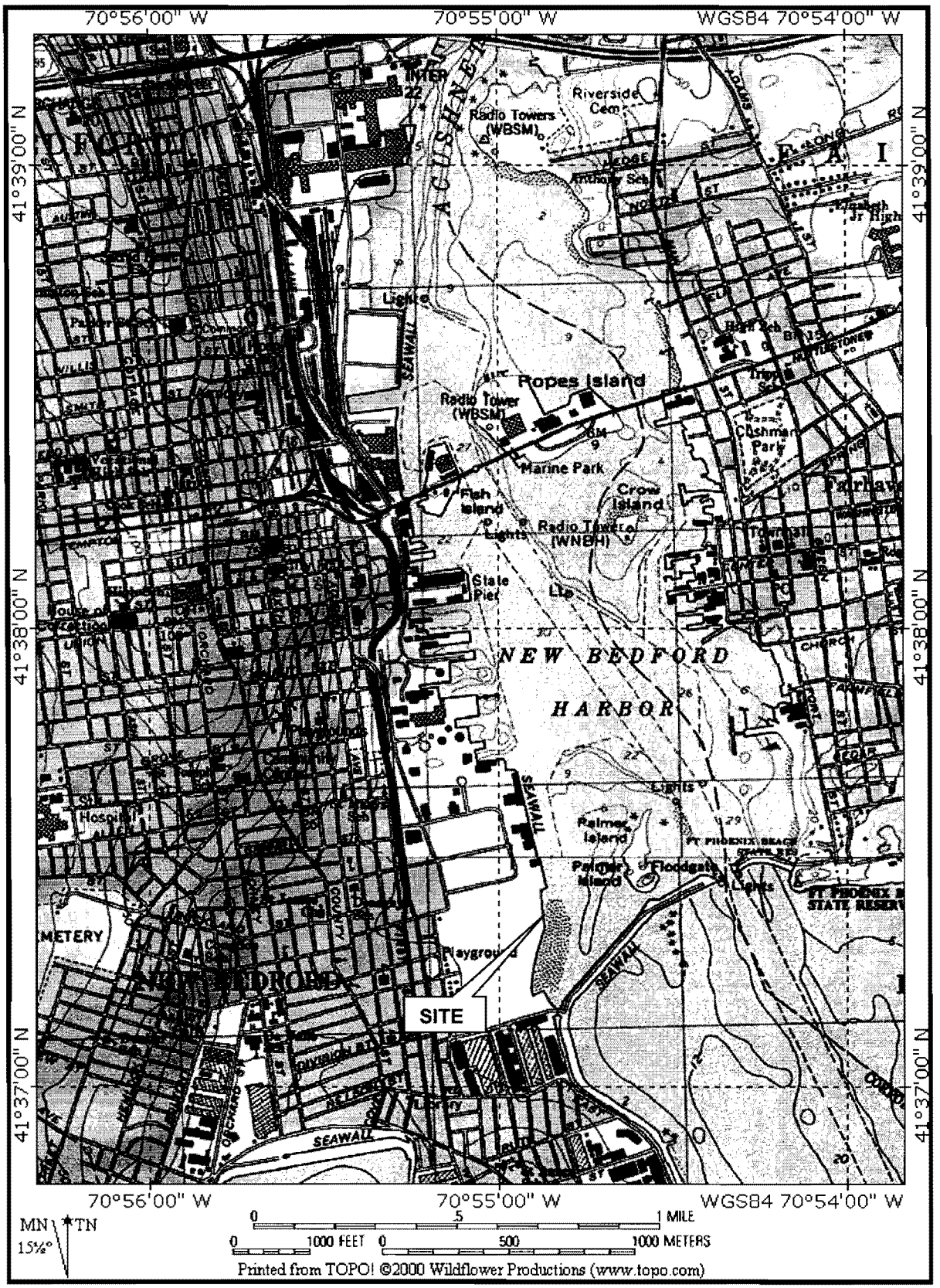


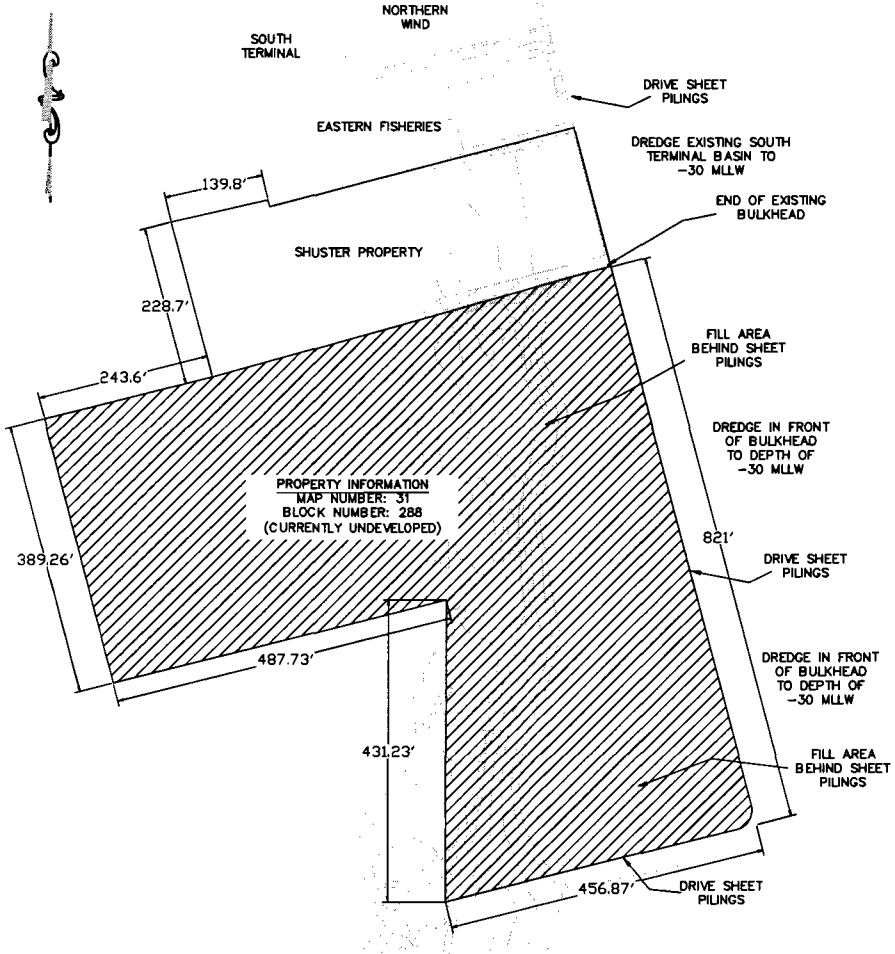
Figure 1: Site Location Map

South Terminal CDF Proposed Location

City of New Bedford, New Bedford, Massachusetts

FIGURE 2

PROPOSED PROJECT FOOTPRINT

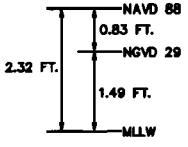


NOTES

[redacted]

HURRICANE BARRIER

GRAPHIC DEPICTION OF DATUM SEPARATIONS FOR NEW BEDFORD HARBOR



Apex Companies, LLC.

[redacted]

[redacted]

[redacted]

PROJECT TITLE:

RENEWABLE ENERGY MARINE PARK

PREPARED FOR:

THE NEW BEDFORD HARBOR DEVELOPMENT COMMISSION

DRAWING TITLE:

CONCEPTUAL DESIGN A OF RENEWABLE ENERGY MARINE PARK

NOT FOR CONSTRUCTION

Scale: 1"=60'

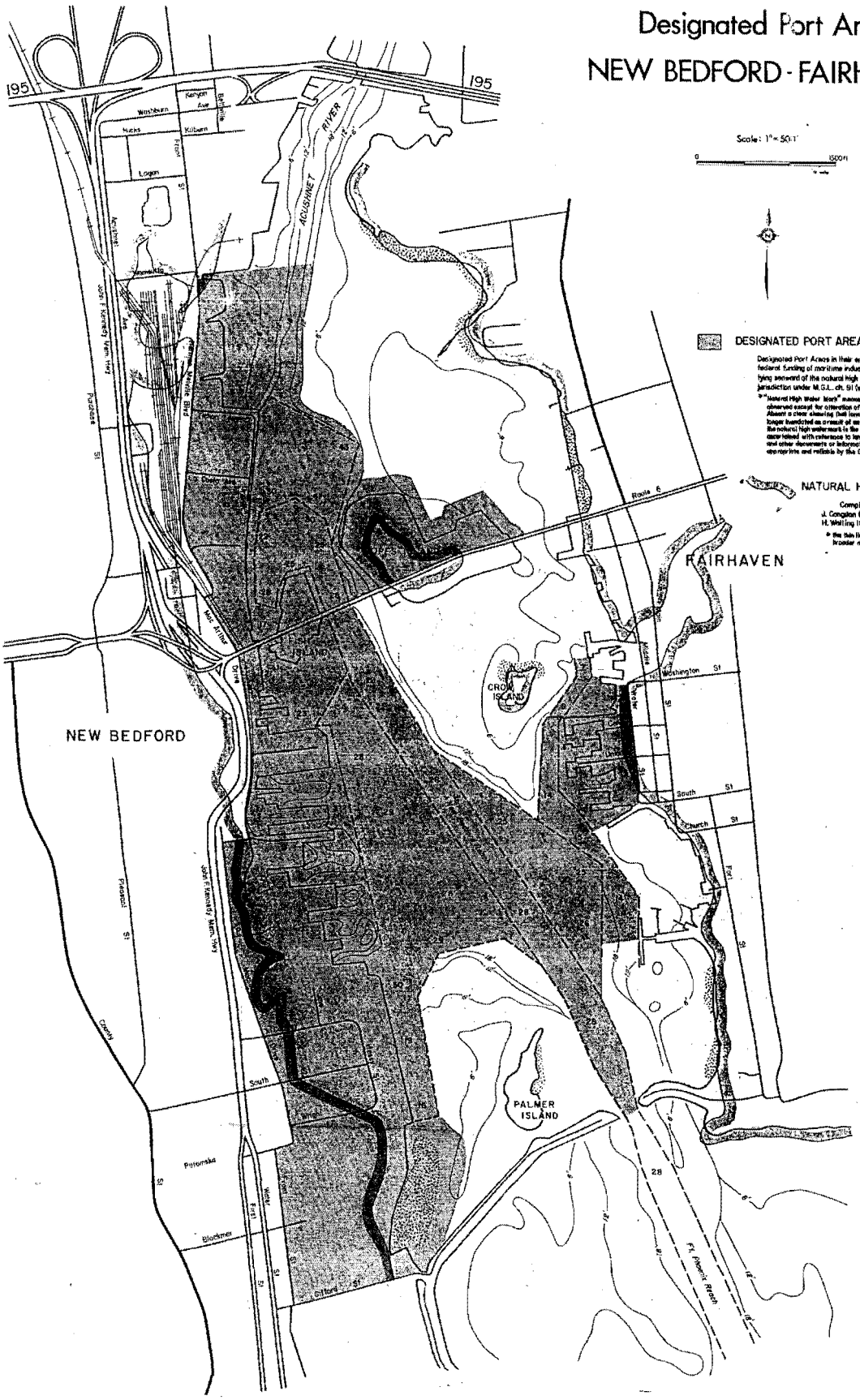
0 40 80 160 320 FEET

Date 9/8/09	Drawing No.
Proj. Mgr. JAB	
Design CM	
Check JAB	
Drawn CM	1
Job. No. 6010	
Last Rev. 11/23/09	

FIGURE 3

HISTORIC HIGH WATER LINE MAP

Designated Port Area:
NEW BEDFORD - FAIRHAVEN



Scale: 1" = 500'

0 1500ft

DESIGNATED PORT AREA

Designated Port Areas in their entirety are priority areas for state and federal funding of maritime industrial uses. In addition, DPA lands and water lying seaward of the natural high water mark* are subject to DEQE jurisdiction under M.G.L. ch. 91 (waterways licensing).

*"Natural High Water Mark" means, for riverside, the tide lines that would be observed except for alteration of the shoreline by filling, dredging, or impounding. Absent a clear showing that lands landward of the proposed high water mark are no longer inundated as a result of entirely natural processes, the DEQE presumes that the natural high water mark is the furthest landward former shoreline that can be ascertained with reference to land surveys or soil logs, Metcalfe maps or charts, and other documents or information sources, or by other methods deemed appropriate and reliable by the Department.

NATURAL HIGH WATER MARK

Compiled from maps by C. Russell 1815, J. Congdon 1834, U.S. Coastal Survey 1846, H. Walling 1851, and R. Ingraham 1857.

* the thin line indicates the actual high water mark, broader shaded line added only for visual emphasis

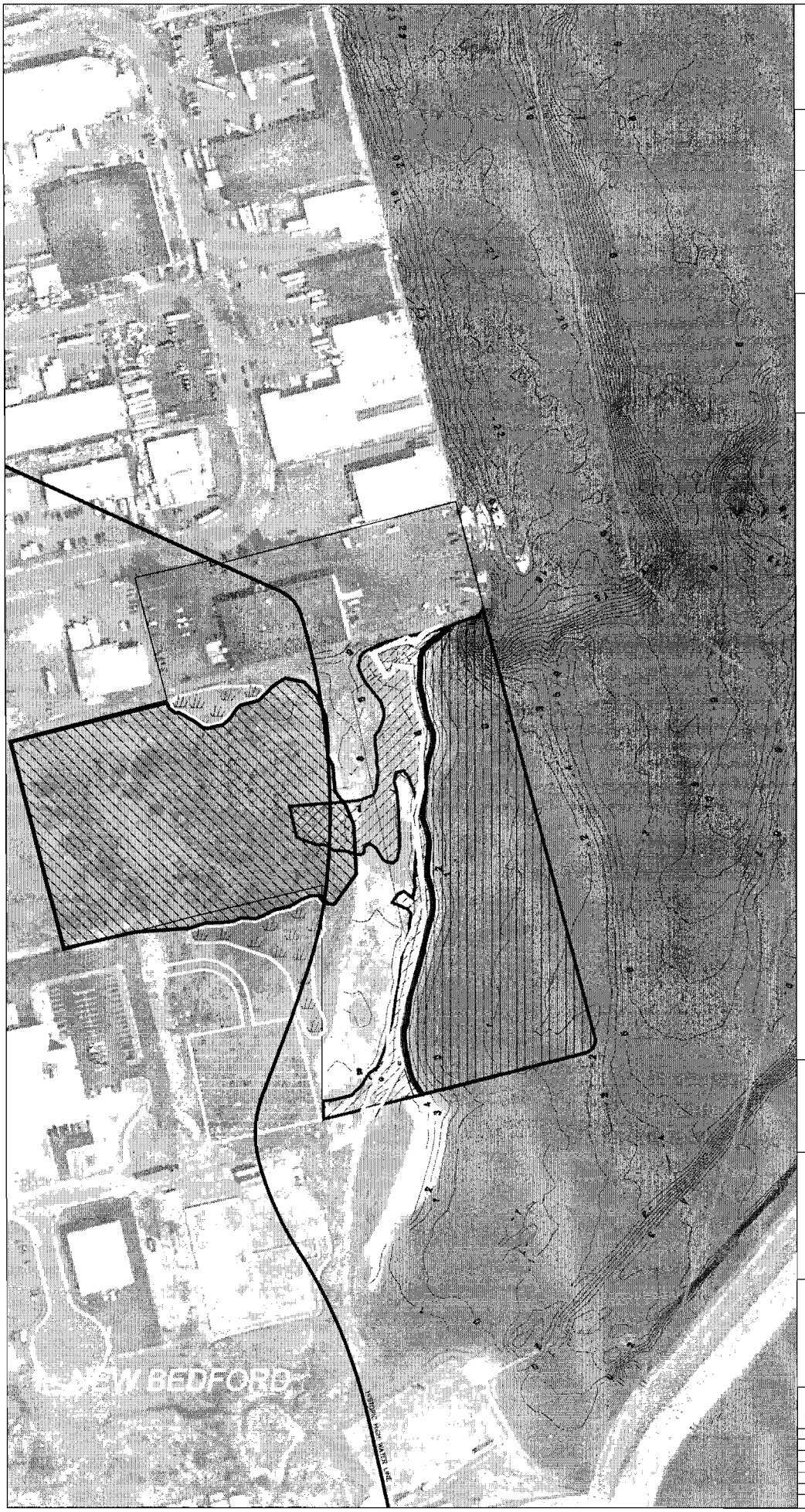
Dept. of Environmental Quality Engineering
Division of Wetlands and Waterways Regulation

Coastal Zone Management

Base map: NOAA Nautical Chart No. 13230, May 1985 Ed., USGS Quad. sheets and local maps.

FIGURE 4

RESOURCE AREA LOCATION MAP



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REVISIONS

NO.	DATE	DESCRIPTION
1.	2/11/10	PRELIMINARY LAYOUT
2.	4/09/10	PRELIMINARY ASSESSMENT
3.	4/15/10	FIELD LOCATION

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SUITABLE SHELLFISH GROWING AREA

LAND SUBJECT TO FLOODING

COASTAL BEACH

COASTAL BANK

WETLAND

PAVED AREA

URBAN FILL

PREPARED FOR:

THE NEW BEDFORD HARBOR DEVELOPMENT COMMISSION AND THE TOWN OF FAIRHAVEN, MASSACHUSETTS

DRAWING TITLE:

SOUTH TERMINAL MARINE INFRASTRUCTURE PARK 2010 RESOURCE AREA ASSESSMENT

Scale: 1"=80'

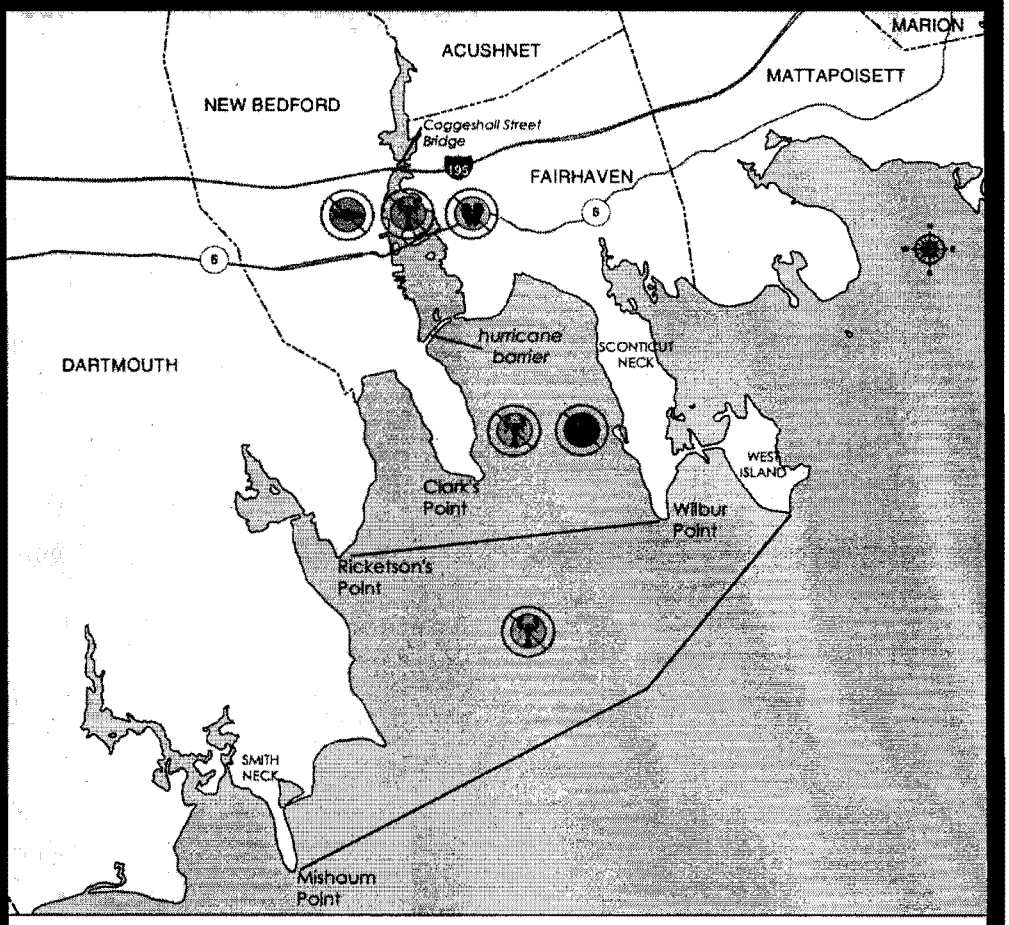
0 40 80 160 240 FEET

Date 3/24/10	Drawing No.
Proj. Mgr.	
Design	
Check CM	P-1
Drawn GCD	
Job. No. 6615	
Last Rev. 4/15/10	

FIGURE 5

USEPA FISHING/SHELLFISHING/LOBSTERING BAN NOTICE

Fish Smart—Use this Chart



Fish Smart-Use this Chart
¡Pesque con cabeza! Utilice esta gráfica
Pesque esperto-Use este mapa

Don't eat any fish
No coma pescado
Não coma peixe

Don't eat any lobster
No coma langosta
Não coma lagosta

Don't eat any shellfish
No coma mariscos
Não coma mariscos

Don't eat any bottom fish:
No coma pescado de fondo:
Não coma peixe de fundo:

- *flounder*
- *lenguado*
- *solha*
- *tautog*
- *tautoga*
- *bodião da ostra*
- *scup*
- *sargo*
- *sargo*
- *eel*
- *anguila*
- *anguila*

Map Produced By The US EPA New England GIS Center
30 May 2003

Appendix A

Wetland Resource Investigation Summary

Appendix A

New Bedford Harbor Development Commission

South Terminal CDF

Field Study of Soils – performed by Edward Pickering, P.E., CPSSc

On April 20, 2010, a field study was performed on the property of the proposed South Terminal Marine Infrastructure Park in New Bedford, MA to evaluate the presence and/or absence of hydric soil indicators in accordance with "*Field Indicators for Identifying Hydric Soils in New England*," Version 3, April 2004 (referred to herein as Field Guide). The gathering of soil information from the field study was intended to assist in the effort to estimate the extent of jurisdictional resource areas at this site, as defined by Wetlands Protection Act Regulations at 310 CMR 10.00, when compiled with observations of the relative abundance of wetland indicator plant species obtained by others. A tile spade was used to dig observation holes and obtain undisturbed soil samples to prepare soil pedon descriptions. These holes were approximately one foot in diameter and were advanced to a depth of up to three feet when possible or, more commonly, shallower depth upon refusal. Up to nine soil observation holes were attempted at selected locations of the subject property; all but the first encountered refusal at a depth of 15 inches or less due to the presence of buried manmade materials.

Access to the shoreline area of the property was obtained on foot by way of Blackmer Street, along a stormwater drain right of way, adjacent to property owned by the Commonwealth of Massachusetts Division of Marine Fisheries (DMF). The DMF property was enclosed by a chain-link fence within which the southern half of the property was developed into an asphalt paved surface, while the northern half remain undeveloped. Entry into the secured fenced-in area was not attempted and direct observation of subsurface soil conditions was not possible.

The first soil observation hole, Apex-1, was dug adjacent to the fencing near the northeast corner of the DMF fence-line, facing the harbor, within a natural beach area. No obstructions were encountered and the hole was advanced to three feet. Hydric soil features were observed at a depth of 13 inches, and the pedon most closely matched the description of hydric soil conditions in the Field Guide described as "X.C. Sandy with Redox." A gleyed horizon with abrupt upper and lower boundaries was observed at 13 to 15 inches, consisting of loamy fine sand with a matrix color of 10YR 6/1, gray-light gray. Additional common, fine, distinct redoximorphic features were identified below 15 inches with a color of 10YR 4/4, dark yellowish brown upon a matrix of 10YR 5/2, grayish brown loamy sand. The Ap horizon appeared to have been disturbed possibly by mixing due to beach vehicular traffic or anthropogenic addition of sandy material.

Besides the shoreline area, access to the remainder of the subject property was possible to observe soil conditions in an irregular-shaped area of the property bounded to the north by a fence-line running east-west along the Shuster property and bounded to the west by a partially-

fenced radio station property. Proceeding along a foot path adjacent to the north side of the DMF fence-line, the ground surface was hummocky and undulating on both sides of the fence due to irregular filling with construction debris; particularly with boulders, concrete slabs, and solidified liquid asphalt. Vegetation was very dense in the area closest to beach, and included briars and thorn bushes, which rendered the area essentially impenetrable. Halfway up the DMF fence-line, the ground surface leveled off although surface debris was still common. Repeated attempts to advance an observation hole were refused at 6 inches or less.

Apex-2 was located within a lobular, depression area adjacent to the fence-line along the northern boundary with the Shuster property, mostly open grass areas with a variety of shrubs. Underlying a 10-inch 10YR, 2/2 very dark brown Ap horizon, redoximorphic features due to wetness were encountered. Numerous cobble- and gravel-sized pieces of brick, concrete, tires, and other debris were observed, and refusal was encountered at a depth of 12 inches. The general area was impacted by mounds of construction debris, boulders of various size, tires, etc. Outside of this area, at slightly higher elevation of 6 inches or more, upland soils were thought to occur but shallow refusal denied confirmation.

Apex-3 was situated half of the distance between the northeast corner of the fence at the radio station property and the northern boundary fence-line, in an open, level landscaped area maintained in grass and occasional shrubs and trees. The observation hole was advanced to a depth of 15 inches, when refusal was encountered. Underlying an Ap horizon of 10 inches, was what appeared to be a well developed B horizon with a uniform matrix color of 10YR 4/3 brown/dark brown and no redoximorphic features. The position in the landscape, and appearance of subsoil material that could be observed, conformed to an upland location. The entire opening of the 1 foot diameter hole was obstructed by a smooth hard object that appeared to be concrete, indicating that deposition of manmade materials and historic fill activities had occurred throughout the subject property.

In addition to the three observation holes, where notes of soil characteristics were kept, attempts were made throughout accessible portions of the subject property to no avail. The entire site had been impacted by filling with construction waste and other material over a long period of time, and sufficiently long ago to permit growth of extensive opportunistic vegetation. In general, progressing from the west to the east, the property was more finished (i.e., level and maintained) around the radio station transitioning to the roughest part nearest to the beach, and groundwater fluctuations appeared to become closer to the surface. At two thirds of the distance to the beach, waste piles were more evident, the land surface became more hummocky, and the vegetation turned to an unkempt, scrub forest of low lying trees and shrubs.

In conclusion, no functioning wetlands were observed in the open (unfenced) areas of the subject property, although groundwater levels may fluctuate to the upper part of the soil in certain areas and some wetland plant species are present to some degree. The area qualifies as urban fill, reflecting its historic use as a construction debris landfill area and previous filling of what was long ago coastal wetlands. The subject property is not significant to the protection of any of the interests identified in the regulations at 310 C.M.R. § 10.01(2).

Appendix B

Wetland Function-Value Evaluation Form

Wetland Function-Value Evaluation Form

Total area of wetland 6.6ac Human made? Yes Is wetland part of a wildlife corridor? No or a "habitat island"? No

Adjacent land use Industrial/Commercial Distance to nearest roadway or other development 400-500ft

Dominant wetland systems present M1UB, M2US, PEM Contiguous undeveloped buffer zone present Yes

Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? Coastline

How many tributaries contribute to the wetland? N/A Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D.

Latitude 41.622936 Longitude 70.915271

Prepared by: CHM Date 5/1/10

Wetland Impact:
Type Cap/Fill Area 6.6ac

Evaluation based on:
Office ✓ Field ✓

Corps manual wetland delineation completed? Y ✓ N

Function/Value	Suitability Y	Suitability N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge	✓		4,7,10,15	✓	Wetland is a groundwater discharge location.
Floodflow Alteration	✓		6,7,8,10		wetland serves as flood storage.
Fish and Shellfish Habitat	✓		3,4,5,6	✓	Evidence of shellfish; however, watercourse impaired.
Sediment/Toxicant Retention		✓	1,2		Entire watercourse impaired.
Nutrient Removal		✓	5		Wetland does not act to remove nutrients.
Production Export		✓	6		Not significant export of production.
Sediment/Shoreline Stabilization	✓		7,8,9,2,1	✓	Wetland provides shoreline stabilization.
Wildlife Habitat	✓		4,5,8,17,21		Shellfish and avians present.
Recreation		✓	9,12		wetland not a valuable recreation area.
Educational/Scientific Value		✓	11		wetland has little scientific/educational value.
Uniqueness/Heritage		✓	1,12,13,14		wetland relatively unimportant to area/region.
Visual Quality/Aesthetics		✓	1,2,5,12		wetland is stream w/trash. within port area.
ES Endangered Species Habitat		✓	N/A		No endangered or threatened species.
Other					

Notes:

* Refer to backup list of numbered considerations.

APPENDIX 5

Apex Companies, LLC
"Where Excellence Meets Value"

184 High Street, Suite 502
Boston, MA 02110
Telephone 617-728-0070
Facsimile 617-728-0080

DRAFT

May 3, 2010

Ms. Kristin Decas
Executive Director
New Bedford Harbor Development Commission
52 Fisherman's Wharf
New Bedford, Massachusetts 02740

RE: Project No. 6690.003
Shellfish Survey Results
South Terminal CDF
New Bedford, MA

Dear Ms. Decas,

Apex Companies, LLC (Apex) has conducted a shellfish survey in order to determine potential impacts to the local shellfish population due to the South Terminal CDF Project (the Project). Apex has previously prepared numerous shellfish surveys within New Bedford Harbor under the guidance of the directives of Mr. David K. Whittaker, the (former) aquatic biologist who was the South Shore Section Leader of the Massachusetts Department of Marine Fisheries (DMF). Mr. Whittaker is the author of *Quahog Standing Crop Survey, New Bedford/Fairhaven Inner and Outer Harbors,* Massachusetts Division of Marine Fisheries, published June 6, 1999.

Prior to preparing the scope for this particular shellfish survey, Apex consulted briefly with Ms. Eileen Feeney, Program Coordinator II, of the Environmental Impact Assessments division of DMF at a meeting on April 29, 2010 regarding the scope of the South Terminal CDF. At that meeting, Ms. Feeney stated that the Coastal Beach areas between low and high tide represented Horseshoe Crab habitat. The area of Coastal Beach/Horseshoe Crab habitat that will be impacted is approximately 1.27 acres (5,140 square meters).

In order to prepare its scope for this particular shellfish survey, Apex contacted Mr. Mike Hickey, current South Shore Shellfish Program Chief of the Massachusetts DMF. In an April 30, 2010 telephone call, Apex consulted Mr. Hickey as to the scope of the potential impact to potential shellfish habitat, and requested guidance with regard to planning the shellfish survey. Mr. Hickey advised Apex in the conduct of a Relative Abundance Survey and provided guidance for completion of that survey.

A Relative Abundance Survey would estimate the existing shellfish population within the proposed footprint of the South Terminal CDF in New Bedford. This will be done by creating a grid over the projected footprint and then projecting the results found within the individual grid

sections over the area of the Project (the Impacted Area). The Impacted Area for the project consists of 1.27 acres of Coastal Beach and 2.99 acres of Land Under the Ocean (as categorized under 310 CMR 10.0000, the Commonwealth of Massachusetts' Wetland Protection Act), 4.26 total acres of Land Containing Shellfish (approximately 17,240 square meters).

Apex conducted the shellfish survey within the footprint of the CDF. Apex utilized a grid of lines, spaced 150 linear feet on center in the north-south direction and spaced every 20 linear feet in the east-west direction on the Coastal Beach and every 40 linear feet in the east-west direction within the Land Under the Ocean. A set of transect lines were superimposed upon the proposed footprint of the South Terminal CDF within the identified resource areas, resulting in thirty four (34) sampling locations.

Apex conducted the shellfish survey in one of the following two methods:

1. On the beach or within shallow water, using a three-tined garden hoe to sort sediment in a ¼ square meter (a "quadrat"). The garden hoe was to penetrate at least 12 inches into the substrate. All shellfish or other organisms found during the survey were to be brought to the surface and sorted by Apex personnel by length.

2. Within deep water, a diver utilized a three-tined garden hoe to sort one quadrat of sediment to a depth of at least 12 inches. All shellfish or other organisms found in this manner would be placed into a mesh diving bag and brought to the surface and sorted by Apex personnel by length.

Apex conducted the survey activities using both methods described above on May 2, 2010 and May 3, 2010. An Apex diver collected samples from 3 (three) of the thirty four locations. Survey locations are shown on **Figure 1**.

Apex identified all recovered shellfish and invertebrates using *The Peterson Field Guide Series: A Field Guide to the Atlantic Seashore*, by Kenneth L. Gosner, Houghton Mifflin Company, 1978. A table summarizing recovered shellfish and invertebrate data is included as **Table 1**.

Apex categorized recovered Quahogs using Table 1 of the *Quahog Standing Crop Survey, New Bedford/Fairhaven Inner and Outer Harbors* by David K. Whittaker, Massachusetts Division of Marine Fisheries, published June 6, 1999. A table summarizing Quahog data is included as **Table 2**.

Apex divided the survey area into an area in which Quahogs were present (approximately 57% of the area) and an area in which Quahogs were not present (approximately 43% of the area). Using **Table 3**, Apex determined that the average concentration of "seed" Quahogs was 3 per square meter, the average concentration of "littleneck" Quahogs was 2.4 per square meter, the average concentration of "cherrystone" Quahogs was 1.2 per square meter, and the average concentration of "chowder" Quahogs was 3 per square meter. The average concentration of Common Oysters in the survey area was 3 per square meter, and the average concentration of Soft-Shelled Clams was 0.8 per square meter.

As stated earlier, the Impacted Area is approximately 17,240 square meters. The results of the Relative Abundance Survey indicate that approximately 57% of the Impacted Area (9,863 square meters) represents area expected to contain Quahogs. Assuming that the concentration of "seed" Quahogs is similar in the Impacted Area as in the survey area (3 per square meter), approximately 29,589 "seed" Quahogs will be impacted by the Project. Similarly, assuming that the concentration of shellfish is similar in the Impacted Area as in the survey area, the following numbers of shellfish are likely to be impacted by the project:

Type of Shellfish	**Projected #**
"Seed" Quahogs	29,589
"Littleneck" Quahogs	23,671
"Cherrystone" Quahogs	11,836
"Chowder" Quahogs	29,589
Common Oysters	29,589
Soft-Shelled Clams	7,890
Total Shellfish	132,164

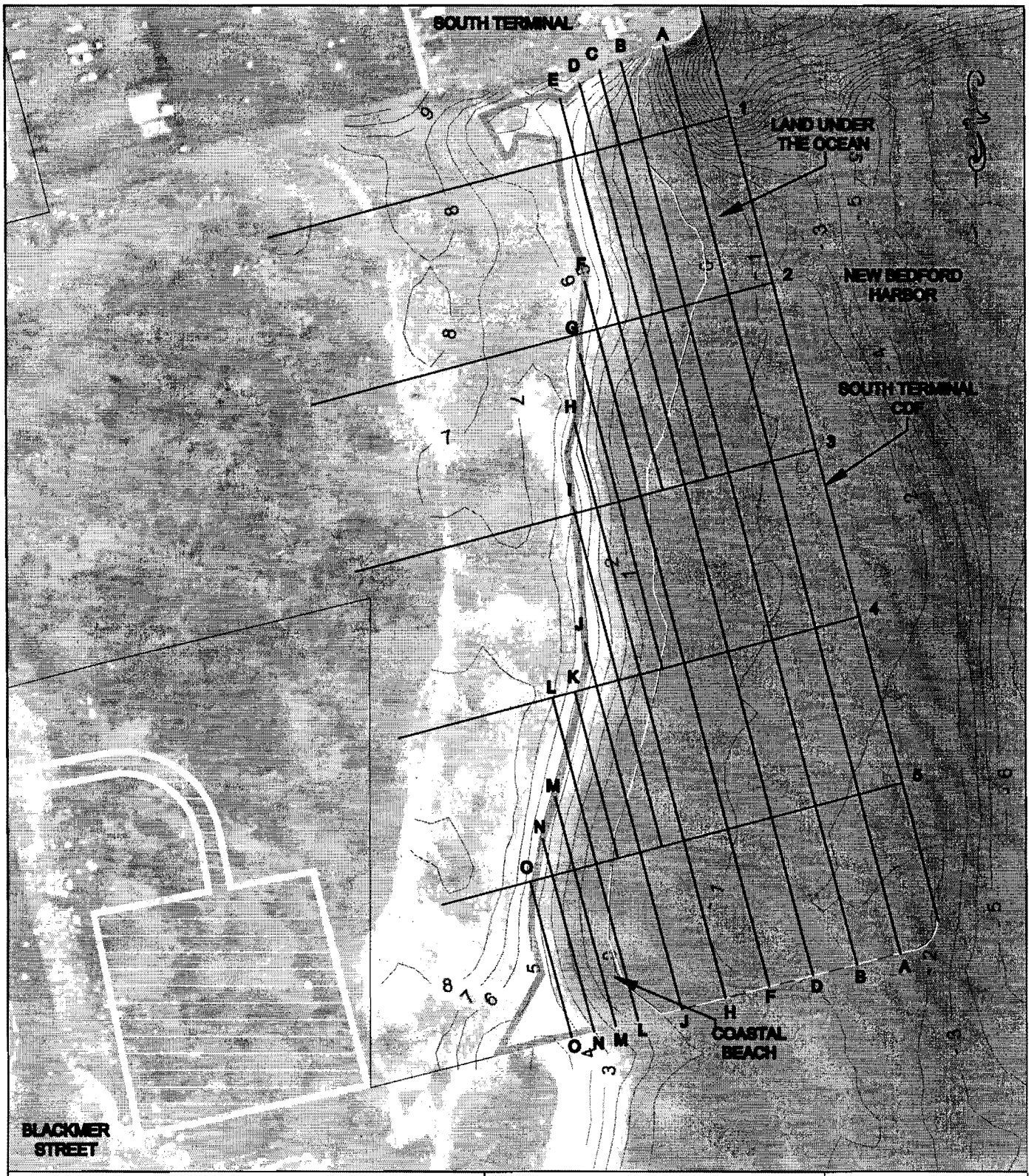
Calculations supporting these conclusions are included in **Table 3**.

If you have any questions, please call either of the undersigned at (617) 728-0070.

Sincerely,
Apex Companies, LLC.

Chet Myers
Project Manager

Jay Borkland
Division Manager



Apex Companies, LLC APEX COMPANIES, LLC 184 HIGH STREET, BOSTON, MA. 02110 1 WAMSUTTA STREET, NEW BEDFORD, MA 02740	NEW BEDFORD HARBOR DEVELOPMENT COMMISSION	FIGURE 1
SCALE: 0 30 60 120 240 FEET	PROJECT TITLE: SOUTH TERMINAL CDF SHELLFISH SURVEY	DRAWING TITLE: SHELLFISH SURVEY GRID AND SAMPLE LOCATIONS

Table 1: Recovered Shellfish and Invertebrate Data

Sample Location	Organism	Size (inches)	Number
A1	Quahog	2 1/2	2
	Quahog	2 1/4	2
	Quahog	2	1
	Quahog	2 3/4	3
	Quahog	3 3/4	1
	Common Oyster	2 1/2	1
A2	Quohog	2 7/8	1
	Quohog	1 1/2	1
	Quohog	3/4	1
A3	Quohog	2 1/2	1
A4	Hermit Crabs		7-10
	Shrimp	1 - 1 1/4	7-10
A5	Quohog	3	2
	Quohog	2 1/2	1
	Quohog	3 1/2	1
	Quohog	3 3/4	1
	Quohog	3 5/8	1
	Long Clawed Hermit Crab in Perwinkle Shell	1 1/2	1
B1	Common Oyster	2	1
	Common Oyster	2 1/4	1
	Common Oyster	3	1
	Common Oyster	4	1
	Common Oyster	2 7/8	1
	Common Oyster	2 3/4	1
	Quohog	2 1/4	1
	Quohog	2 5/8	1
	Quohog	1 7/8	1
	Quohog	3 1/2	1
	Quohog	2 3/8	1
	Quohog	2 1/2	1
	Quohog	1	2
	Quohog	1 1/2	2
	Quohog	1 1/4	1
	Quohog	1 3/8	1

B2	Common Oyster Quohog	3 1/8 2 3/8	1 1
B3	Common Oyster Common Oyster Smooth Periwinkle	2 3/4 3 3/8	1 1 2
B4	Quohog Quohog	3 1/2 3 1/8	1 1
B5	Quohog Quohog Quohog	2 1/2 3 3 1/2	2 1 1
C1	Smooth Periwinkle Common Oyster Common Oyster Common Oyster Common Oyster Quohog	3/8 2 1/2 2 1/8 1 7/8 2 1/4 2 7/8	2 1 1 1 1 1
C2	Milky Ribbon Worm Smooth Periwinkle Common Oyster	10 1/4 - 3/8 2 1/2	1 36 1
D1	Quohog Smooth Periwinkle	3 1/4 - 3/8	1 3
D2	Ribbed Mussel Ribbed Mussel Smooth Periwinkle	1 7/8 2 1/4 - 3/8	1 1 17
D3	No Findings		
D4	No Findings		

D5	Quahog	1 7/8	1
E1	No Findings		
E2	No Findings		
F2	No Findings		
F3	No Findings		
F4	No Findings		
F5	Smooth Periwinkle Quahog Quahog Quahog Quahog	5/8 3 2 3/8 2 5/8 3 1/8	1 2 1 1 1
G3	Dog Winkle/Young Waved Whelk Dog Winkle/Young Waved Whelk	7/8 7/8	1 1
H3	Soft-Shelled Clam Soft-Shelled Clam Smooth Periwinkle	1 2 1/4 3/8	1 1 1
H4	Dog Winkle/Young Waved Whelk Dog Winkle/Young Waved Whelk Quahog Unknown Polychaete	7/8 1 2 3	7 1 1 1
H5	Quahog Quahog Quahog Quahog Quahog	1 1/8 1 1/2 1 3/4 2 2 1/2	1 1 2 1 1
I3	No Findings		
I4	Soft-Shelled Clam Soft-Shelled Clam	2 3	1 1
J4	No Findings		

J5	No Findings		
K5	No Findings		
L5	No Findings		
M5	Quahog Quahog Quahog Quahog Unknown Polychaete	1 1/8 7/8 1 1/4 2 1/4 4 1/4	1 1 1 1 1
N5	No Findings		
O5	No Findings		

Table 2: Quahog Data

Sample Location	Organism	Size (inches)	Number	Class Size
A1	Quahog	2 1/2	2	Cherrystone
	Quahog	2 1/4	2	Littleneck
	Quahog	2	1	Littleneck
	Quahog	2 3/4	3	Chowder
	Quahog	3 3/4	1	Chowder
A2	Quohog	2 7/8	1	Chowder
	Quohog	1 1/2	1	Seed
	Quohog	3/4	1	Seed
A3	Quohog	2 1/2	1	Cherrystone
A4	No Quahogs Found Within Sample			
A5	Quohog	3	2	Chowder
	Quohog	2 1/2	1	Cherrystone
	Quohog	3 1/2	1	Chowder
	Quohog	3 3/4	1	Chowder
	Quohog	3 5/8	1	Chowder
B1	Quohog	2 1/4	1	Littleneck
	Quohog	2 5/8	1	Cherrystone
	Quohog	1 7/8	1	Seed
	Quohog	3 1/2	1	Chowder
	Quohog	2 3/8	1	Cherrystone
	Quohog	2 1/2	1	Cherrystone
	Quohog	1	2	Seed
	Quohog	1 1/2	2	Seed
	Quohog	1 1/4	1	Seed
	Quohog	1 3/8	1	Seed

B2	Quohog	2 3/8	1	Cherrystone
B3	No Quahogs Found Within Sample			
B4	Quohog Quohog	3 1/2 3 1/8	1 1	Chowder Chowder
B5	Quohog Quohog Quohog	2 1/2 3 3 1/2	2 1 1	Cherrystone Chowder Chowder
C1	Quohog	2 7/8	1	Chowder
C2	No Quahogs Found Within Sample			
D1	Quohog	3	1	Chowder
D2	No Quahogs Found Within Sample			
D3	No Findings			
D4	No Findings			

D5	Quahog	1 7/8	1	Seed
E1	No Findings			
E2	No Findings			
F2	No Findings			
F3	No Findings			
F4	No Findings			
F5	Quahog Quahog Quahog Quahog	3 2 3/8 2 5/8 3 1/8	2 1 1 1	Chowder Cherrystone Cherrystone Chowder
G3	No Quahogs Found Within Sample	7/8	1	Seed
H3	No Quahogs Found Within Sample			
H4	Quahog	2	1	Littleneck
H5	Quahog Quahog Quahog Quahog Quahog	1 1/8 1 1/2 1 3/4 2 2 1/2	1 1 2 1 1	Seed Seed Seed Littleneck Cherrystone
I3	No Findings			
I4	No Quahogs Found Within Sample	2	1	Littleneck
J4	No Findings			

J5	No Findings			
K5	No Findings			
L5	No Findings			
M5	Quahog Quahog Quahog Quahog	1 1/8 7/8 1 1/4 2 1/4	1 1 1 1	Seed Seed Seed Littleneck
N5	No Findings			
O5	No Findings			

Table 3: Relative Abundance Survey Calculations

Shellfish Survey Statistics

Total Survey Area[7]:	17,240 m^2
Survey Area With No Quahogs[5]:	7,377 m^2
Percentage of Survey Area With No Quahogs:	43%
Survey Area With Quahogs[5]:	9,863 m^2
Percentage of Survey Area With Quahogs:	57%

Shellfish Count in Survey Area[7]

Sample Location	Number Per Quadrat[1]					
	Quahogs				Oysters	Soft-Shelled Clam
	"Seed"	"Littlenecks"	"Cherrystones"	"Chowder"		
A1	1	2	1	1	1	0
A2	2	0	0	1	0	0
A3	0	1	0	0	0	0
A5	0	1	0	4	0	0
B1	5	2	2	1	6	0
B2	0	1	0	0	1	0
B3	0	0	0	0	2	0
B4	0	0	0	2	0	0
B5	0	0	1	2	0	0
C1	0	0	0	1	4	0
C2	0	0	0	0	1	0
D1	0	0	0	1	0	0
D2	0	0	0	0	0	0
D5	1	0	0	0	0	0
F5	0	1	1	2	0	0
H3	0	0	0	0	0	2
H4	0	1	0	0	0	0
H5	3	2	1	0	0	0
I4	0	0	0	0	0	2
M5	3	1	0	0	0	0
Average Count per Quadrat[1]:	0.75	0.6	0.3	0.75	0.75	0.2
Average Count per Square Meter:	3	2.4	1.2	3	3	0.8
Estimated Count in Impacted Area[6,7]:	**29589**	**23671**	**11836**	**29589**	**29589**	**7890**

Notes:
1). Estimated Impacted Area with Shellfish = Estimated Impacted Area X Percentage of Impacted Area with Shellfish.
2). Percentage of Impacted Area with Shellfish assumed to be the same as the percentage of survey area with Shellfish.
3). Survey area with (or without) Shellfish estimated based on recovery during shellfish survey.
4). Estimated count in Impacted Area = average count per square meter X estimated Impacted Area with Shellfish.
5). Impacted Area = Shellfish habitat to be impacted during New Bedford South Terminal Project
6). Quahog Classifications from Table 1: Class Size Lengths, page 4, Quahog Standing Crop Survey, New Bedford/Fairhaven Inner and Outer Harbors, David K. Whittaker, Massachusetts Division of Marine Fisheries, June 6, 1999.
7). Survey Area = Area in which a manual shellfish survey was conducted on 5/2/2010 and 5/3/2010

APPENDIX 6

****DRAFT****
ESSENTIAL FISH HABITAT AND
ENDANGERED SPECIES ASSESSMENT
FOR
SOUTH TERMINAL CDF CONSTRUCTION
NEW BEDFORD HARBOR

APRIL 2010

Prepared for

NEW BEDFORD HARBOR DEVELOPMENT COMMISSION
106 CO-OP WHARF
NEW BEDFORD, MA 02740

By

Apex Companies, LLC
New Bedford, MA
and
Boston, MA

TABLE OF CONTENTS

TABLE OF CONTENTS ii
1.0 INTRODUCTION 1
1.1 Project Description 1
2.0 Effects of the Proposed project 2
2.1 Affected Environment 2
2.2 Essential Fish Habitat Assessment 3
2.2.1 EFHA New Bedford State Pier Dredge Project 4
2.2.2 EFHA New Bedford/Fairhaven Harbor Dredge Material Management Plan 5
2.2.3 EFHA New Bedford Harbor – Phase II North Terrminal Dredge 6
2.2.4 Project Specific Information 7
2.3 Endangered Species and Other Wildlife 8

LIST OF FIGURES

Figure 1: Site Location Map
Figure 2: Proposed Design of South Terminal CDF
Figure 3: Historic High Water Line in New Bedford, Massachusetts
Figure 4: EPA Fishing and Shellfishing Ban Areas

ABBREVIATIONS AND ACRONYMS

APEX	Apex Companies, LLC
CAD	Confined Aqueous Disposal
CI	Channel Inner
CZM	The Office of Coastal Zone Management
DMF	Division of Marine Fisheries
DMMP	Dredge Material Management Plan
DO	Dissolved Oxygen
DEIR	Draft Environmental Impact Report
EENF	Expanded Environmental Notification Form
EFH	Essential Fish Habitat
EFHA	Essential Fish Habitat Assessment
EIR	Environmental Impact Review
FFMP	Federal Fisheries Management Plan
HAPC	Habitat Areas of Particular Concern
iscy	in situ cubic yards
MACZM	Massachusetts Costal Zone Management
MADEP	Massachusetts Department of Environmental Protection
MADMF	Massachusetts Division of Marine Fisheries
MA EOEA	Massachusetts Executive Office of Environmental Affairs
MLW	mean low water
NAI	Normandeau Associates, Inc.
NBHDC	New Bedford Harbor Development Commission
NBRA	New Bedford Re-Development Authority
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
PIN	Popes Island North
SER	State-Enhanced Remedy
UDM	Unsuitable Dredge Material

1.0 INTRODUCTION

This assessment of Essential Fish Habitat (EFH) and Endangered Species for the South Terminal CDF construction is prepared on behalf of the New Bedford Harbor Development Commission and in conformance with the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). The Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan (FMP). Section 305(b)(2) of the Magnuson-Stevens Act requires federal action agencies to consult with the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH.

The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth maturity." The proposed project is located within an area designated as EFH for 20 fish species and is under the management jurisdiction of the New England Fisheries Management Council.

As part of the EFH consultation process, the guidelines require the action agency to prepare a written EFH Assessment describing the effects of that action on EFH (50 CFR 600.920(e)(1)). However, the guidelines state that if the proposed action is similar to a previous action (i.e., involves similar impacts to EFH, occurs in the same geographic area or similar ecological setting) and an EFH Assessment was prepared for that previous action, the agency may incorporate by reference the completed EFH Assessment and supplement it with any relevant new project specific information. Three previous EFH Assessments have been prepared for dredging and dredging related disposal projects located in New Bedford Harbor. This assessment will incorporate these previous documents and supplement them with new project specific information.

The South Terminal CDF construction involves the extension of an existing marine terminal via the installation of sheet piling and filling behind the sheet piling and associated dredging in front of the sheet piling at South Terminal located in New Bedford Harbor. A Site Location Map and a figure showing the proposed work are included as **Figures 1 and 2**, respectively.

1.1 Project Description

Sheet piling will be extended to the south from the existing face of South Terminal. The sheets will be driven to an appropriate depth, as determined by geotechnical testing and recently completed test probes and borings, and will be secured to concrete deadmen to be installed within the existing earthen portion of the pier. Once secured, the area underlying the existing pier will be backfilled with free draining material. The area behind the sheet piling will be filled to meet the grade of the existing terminal elevation. It is currently anticipated that the area will be completed with a covering of crushed stone.

The area in front of the sheet piling is anticipated to be dredged to approximately -30 MLLW.

2.0 EFFECTS OF THE PROPOSED PROJECT

The environmental characteristics of, and dredging impacts to, New Bedford/Fairhaven Harbor have been extensively studied and presented in previous documents (Maguire 2002, Maguire 2002, Maguire 2003, Apex 2002, Apex 2004). It is the intent of this document to summarize the relevant information from past assessments, with a concentration on actions and areas in common with the South Terminal CDF construction and, specifically, to assess the project's potential impact on the designated EFH.

2.1 Affected Environment

The marine areas currently within the South Terminal CDF construction area have been previously disturbed. During construction activities throughout the past century, various portions of the property have been filled since the first record of the historic shoreline was tracked in 1849. **Figure 3** shows the historic high water mark within New Bedford Harbor, and it is shown to be significantly far to the west of the existing shoreline. This indicates that the site in question has been filled significantly over time. The existing shoreline is fill material.

The current submerged area within the project location is relatively shallow (the depth of the area is between 0 MLLW and -2 MLLW). Therefore, the actual volume of water that can serve as fish habitat between the coastal beach and the proposed bulkhead line is relatively low. A significant quantity of fish habitat will be created in front of the new bulkhead line when dredging is completed in front of the bulkhead (estimated to be dredged to -30 MLLW).

A loss of fish habitat will occur in the areas beneath the proposed South Terminal CDF construction that will be isolated from the harbor and backfilled. There are no known submerged aquatic vegetation beds located within the project area. It is critical to note that the project is taking place within the New Bedford Superfund Site. This designation has been given to the locale due to the ubiquitous presence of PCB contaminated fine-grained organic sediment that covers the New Bedford Harbor benthic substrate. As a result of the PCB contamination, the entire New Bedford Harbor is banned by USEPA from shellfishing, lobstering, and fishing. See **Figure 4**, which notes the USEPA bans.

Previous Essential Fish Habit Assessments (EFHAs) prepared for various locations throughout New Bedford Harbor have addressed water quality issues, including the physical, chemical and biological impacts, associated with dredging. Unlike previous dredge projects in the area, the activities associated with the South Terminal CDF construction only are not anticipated to introduce a suspended sediment plume into the water column, since the sheet piling will slide quickly through the fine sediment with little disturbance, and subsequent filling will take place until the sheet piling has been

installed and will effectively isolate the areas to be filled. Dredging activities will have similar impacts to previous EFHAs.

No appreciable or permanent changes to the salinity regime, tidal cycle, or harbor-wide current patterns are anticipated with the South Terminal CDF construction.

2.2 Essential Fish Habitat Assessment

The South Terminal CDF construction is proposed within an area designated as EFH for at least one life stage of 20 fish species (**Table 1**). Detailed life history and habitat information for these species can be found in on the NMFS/NEFSC web site at http://www.nefsc.noaa.gov/nefsc/habitat/efh/. A fisheries resource survey conducted for the Dredged Material Management Plan Draft Environmental Impact Report (DMMP/ DEIR) (Normandeau Associates, Inc., 1999) found that of the 20 federally managed construction project vicinity (Scup, Atlantic herring, winter founder, windowpane flounder). Overall, only nine of the managed species were represented in the results of the year long survey (black sea bass, bluefish, red hake, scup, winter flounder, Atlantic sea herring, butterfish, summer flounder, windowpane) (NAI 1999). The abundances of the different species varied both seasonally and with depth throughout the harbor.

Table 1: Designated Essential Fish Species for New Bedford/Fairhaven Harbor

Species	Eggs	Larvae	Juveniles	Adults
Atlantic Cod (*Gadus morhua)*	X	X	X	X
Haddock *(Melanogrammus aeglefinus)*	X	X		
Red hake *(Urophycis chuss)*		X	X	X
Winter flounder *(Pleufonectes americanus)*	X	X	X	X
Windowpane flounder *(Scopthalmus aquosus)*	X	X	X	X
American plaice *(Hippoglossoides platessoides)*			X	X
Atlantic sea herring *(Clupea harengus)*			X	X
Bluefish *(Pomatomus saltatrix)*			X	X
Long finned squid *(Loligo pealei)*			X	X
Atlantic butterfish *(Peprilus triacanthus)*	X	X	X	X
Atlantic mackerel *(Scomber scombrus)*	X	X	X	X
Summer Flounder *(Paralicthys dentatus)*	X	X	X	X
Scup *(Stenotomus chrysops)*	X	X	X	X
Black sea bass *(Centropristus striata)*		X	X	X
Surf clam *(Spisula solidissima)*			X	X
King mackerel *(Scomberomorus cavalla)*	X	X	X	X
Spanish mackerel *(Scomberomorus maculatus)*	X	X	X	X
Cobia *(Rachycentron canadum)*	X	X	X	X
Sandbar shark *(Charcharinus plumbeus)*				X
Bluefin tuna *(Thunnus thynnus)*			X	

No Habitat Areas of Particular Concern (HAPC) are located within the project areas. HAPC are described by NOAA as "subsets of EFH which are rare, particularly

susceptible to human-induced degradation, especially ecologically important or located in an environmentally stressed area" (50 CFR 600.815(a)(8)).

As stated in **Section 1.0**, three previous EFHAs have been prepared for dredging and dredging related projects located in New Bedford harbor. Three of the next four sections (**Sections 2.2.1 to 2.2.3**) will discuss the results and conclusions of the three previous EFHAs. **Section 2.2.4** presents project specific information.

2.2.1 EFHA New Bedford State Pier Dredge Project

The EFHA for the New Bedford State Pier Dredge Project (prepared by Apex Environmental, Inc. in February 2002 as supplemental information in support of filing an Expanded Environmental Notification Form (EENF) on behalf of the NBHDC) evaluated the impacts of maintenance dredging of approximately 18.8 acres of harbor bottom to a depth of approximately –30 feet Mean Low Water (MLW), dewatering of the dredge materials and appropriate upland disposal. The dredging area consisted of the slip on the south of the State Pier, the fairways leading thereto, and a portion of the federal navigation channel. The State Pier Maintenance Dredge project occurred in the same general area as the proposed South Terminal CDF construction project.

The assessment for the State Pier Dredge project concluded that **the project would not adversely impact the EFH designated** in New Bedford/Fairhaven Harbor. This conclusion was a result of methods used to minimize impacts and the limited time frame of the project. The project had a time frame (8-12 weeks) to be completed in the months May through August. Silt curtains were proposed for active dredge areas. Although the shallow inshore waters, eelgrass beds and salt marsh environments within the harbor were identified as having moderate to high nursery potential for juvenile fish (especially for Atlantic cod, Pollock, winter flounder, butterfish, black sea bass), the proposed dredging was for deeper, open water areas of the harbor. Additionally, due to the strict time frame within which dredging operations were set to commence and due to the substrate requirements of the majority of spawning New Bedford/Fairhaven Harbor EFH species (usually sand, gravel or eel grass areas), spawning potential was not expected to be impacted.

The State Pier Maintenance dredging EENF referenced the DMMP/DEIR (Maguire, 2000) finding that "In general, fine-grained unconsolidated sediments were found overlaying till and bedrocks throughout New Bedford/Fairhaven Harbor." More specifically, most of the sediment in the previous work area was characterized as "a depositional sedimentary environment composed of very soft muddy sediment with methane bubbles. Sediment sampling prior to the project indicated that the material to be removed was primarily fine grained with 50-95% silt/clay content. Geotechnical testing conducted in preparation of the Phase III Navigational Dredge project (conducted during 2009), located adjacent to the project location has confirmed these upper sediment layer characteristics within the proposed work area, below the low tide mark.

Spawning potential reflects the capacity of an area to be essential for the reproduction and development of fishes and invertebrates. The spawning potential of New Bedford has been estimated as "moderate" because of the uniformity of the soft silt sediments and lack of eelgrass beds. The South Terminal CDF construction is anticipated to create a permanent alteration to the habitat of the area; however, due to the degraded quality of the environment, it is anticipated that this alteration will also have positive qualities as well.

The EENF referenced several documents regarding the quality and type of habitat located within the South Terminal CDF construction vicinity. "According to the DMMP DEIR (Maguire, 2000) and the Record of Decision (ROD) for the New Bedford Superfund Site (USEPA, 1998), no salt marshes are known to occur in the proposed dredge area or along the Melville North Lobe dewatering facility....Vegetated shallows in New Bedford Harbor occur primarily along the eastern shoreline of the Outer Harbor, and none are known to occur in our proposed dredge area and the Melville Northern Lobe dewatering facility as discussed in the DMMP DEIR (Maguire, 2000) and the ROD (USEPA, 1998).... There are no known tidal flats in the proposed dredge area or Melville North Lobe dewatering facility (USEPA, 1998)." (Apex, 2002)

The South Terminal CDF construction project work is proposed in harbor areas similar to the State Pier Dredging project with fine-grained sediments.

2.2.2 EFHA New Bedford/Fairhaven Harbor Dredge Material Management Plan

The EFHA for the New Bedford/Fairhaven Harbor Dredge Material Management Plan (DMMP) (prepared by Maguire Group Inc., dated March 2002, as a supplement to an Environmental Impact Review (EIR) prepared for the DMMP) evaluated the potential impact to finfish and shellfish resources from the implementation of the DMMP. The DMMP addressed the disposal of unsuitable dredged material (UDM- unsuitable for unconfined open water disposal) within the harbor resulting from proposed harbor development projects over the next ten years. Total volume of dredge material was estimated in excess of 1,800,000 cubic yards. The EFHA specifically analyzed the use of a series of proposed Confined Aqueous Disposal (CAD) cells at two locations in the harbor, the Popes Island North (PIN) and Channel Inner (CI) sites. The South Terminal CDF construction is similar in nature to the DMMP project only in the respect that it will occur in a similar vicinity of New Bedford Harbor as the DMMP project.

The EFHA for the DMMP concluded that dredging projects and the use of CAD sites within the harbor "could result in local, temporary impact to EFH for at least one federally managed fisheries resource, and various prey organisms of other EFH species". Potential impacts include localized impairment to water quality, destruction of benthic habitat, and direct effects to EFH species and other marine organisms. Indirect effects to EFH species and other marine organisms within the area may occur due to the alterations of energy flow, habitat structure, and biotic interaction" (Maguire 2002). A loss of habitat will occur in the land behind the bulkhead, however, much of this area is historic fill and areas below mean high water are impacted by PCBs from the New

Bedford Superfund Site and new habitat will be created immediately in front of the bulkhead.

The EFHA stated that certain fisheries resources within the Inner Harbor are particularly sensitive to UDM management and resultant turbidity-induced impacts due to their demersal egg and larval stages, or due to their migration or hibernation habits. Winter flounder and anadromous fish were identified as particularly susceptible to dredging and turbidity induced impacts. Winter flounder eggs are demersal and attach to benthic substrate and, therefore, are susceptible to removal via dredging and via smothering during the re-settlement of sediment from the water column.

The EFHA indicated that there may be local disruptions to the predator/prey cycle within the Inner Harbor during discharge of the sediment. Many EFH species are known to feed on organisms inhabiting the harbor, especially benthic invertebrates that have colonized the sediment within the proposed CAD cells. Many of the EFH species and certain motile invertebrate prey species would flee the area of disturbance during release of the sediment. Other prey species such as sessile invertebrates (i.e., shellfish, and colonial invertebrates) would be buried. Some invertebrates are capable of digging themselves out once covered by sediment, whereas others would be eliminated via suffocation. Recolonization of the sediment surface would occur following cessation of dumping within the CAD cell. It was also noted that EFH species that feed on pelagic and planktonic organisms are likely to experience minimal disruption to their feeding (Maguire 2002). The same benthic invertebrates that inhabit the CAD cell areas are likely found in the vicinity of the proposed South Terminal CDF construction site. An area of potential benthic prey and EFHA species habitat will be buried and permanently filled with the construction of the CDF. Additionally, the EFH species that feed on pelagic and planktonic organisms will lose a portion of the open-water habitat available for feeding; however, this habitat is very shallow (between 0 and -2 MLLW) and therefore, there would be severe limits on the size or maturity of organisms that could inhabit this area. Additional areas will be created via dredging that will be conducted in front of the proposed bulkhead.

2.2.3 EFHA New Bedford Harbor – Phase II North Terminal Dredge

The Revised Essential Fish Habitat Assessment and Endangered Species Update for New Bedford Harbor Dredge – Phase II North Terminal Maintenance Dredge by Apex Environmental, 2005, was a summary of the available EFHA literature for New Bedford Harbor. The Phase II North Terminal EFHA evaluated the impacts of dredging, transport and disposal of contaminated and non-contaminated sediments from the New Bedford Harbor Dredge – Phase II dredge areas as well as the construction and use of CAD cells in the harbor. The New Bedford Harbor Dredge – Phase II dredge activities have been and will be conducted in harbor areas within and adjacent to New Bedford's existing marine facilities. The impacts associated with dredging in the areas adjacent to the Maritime Terminal, White's Pier, Norpel Terminal/Fish Island and the Approach to the Route 6 swing bridge were evaluated in the EFHA. The work was performed as Phase II under the State Enhanced Remedy (SER).

As with the previous assessments, the Phase II North Terminal Dredge EFHA concluded that the dredging activity in the deeper marine transportation areas would not adversely impact EFH within New Bedford Harbor during a majority of the year. Localized impacts to water quality were temporary and minimized with appropriate dredge methods as dictated by the project Performance Standards, which the dredge contractor was required to incorporate into the project, and which was monitored by the NBHDC to ensure compliance. The EFHA concluded that removal of benthic substrate would remove prey species, temporarily disrupting habitat structure. However, dredged areas would be re-colonized from adjacent source populations.

The EFHA noted that the fisheries resource in the localized areas of New Bedford Harbor could be impacted, as Phase II dredging was scheduled to occur until February 28th. Mitigation measures were employed to reduce the impacts to the resource that resulted from conducting dredge and disposal activities between January 15th and February 28th, 2005.

2.2.4 Project Specific Information

As in the previous assessments, it can be concluded that construction activities will not significantly impact EFH within the Harbor during the South Terminal CDF construction or associated dredging. The areas to be filled are lined with fine-grained sediments contaminated with PCBs. No areas of submerged aquatic vegetation (SAV) are known to exist in the proposed work area.

The filling of areas with benthic substrate will remove prey species and available habitat. The areas that are filled will not be re-colonized by adjacent source populations of prey species, nor will the areas be available for EFH species. Due to the shallow nature of the area to be filled (i.e. average depths of between 0 and -2 MLLW), this loss of habitat may affect only a small portion of the federally managed EFHA species that were represented in the Normandeau Associates survey. Additionally, it should be noted that the areas of South Terminal CDF Site subject to filling contain contaminated sediments, and are located within an active marine port. Finally, it should also be noted that a large quantity of habitat will be created in front of the new bulkhead wall.

Localized impact to water quality will be temporary and minimized with appropriate construction methods during construction of the South Terminal CDF and associated dredging. The water quality impacts associated with the South Terminal CDF construction will be much less significant than those associated with dredging projects. Sheet piling will be driven into the substrate and the areas behind the piling will be backfilled. Only minor amounts of suspended sediments will be introduced into the water column during construction. This approach to the South Terminal CDF will minimize the negative water quality impacts that are associated with suspended sediment plumes.

2.3 Endangered Species and Other Wildlife

The EFHA for the State Pier Dredge Project (Apex 2002) provided the following information about other wildlife considerations in the New Bedford/ Fairhaven Harbor area. Eelgrass and intertidal flat areas of New Bedford Harbor provide habitat for ducks, shorebirds and seabirds, though none are known to occur within the South Terminal CDF Site. According to the DMMP DEIR (Section 5.3.5.1, Maguire, 2000), diving ducks, loons, grebes, and cormorants are all typically found within New Bedford Harbor. Numerous shorebirds also frequent New Bedford harbor, including plovers, sandpipers. Roseate terns (*Sterna dougallii*) have recently returned to New Bedford Harbor according to Massachusetts Office of Coastal Zone Management. Portions of New Bedford Harbor north of the hurricane gates are considered a critical feeding habitat for the Roseate terns as designated by the US Fish and Wildlife Service and the Massachusetts Division of Marine Fisheries. It is assumed that the impacts to the Roseate tern will be minimal as the terns will avoid the areas around the South Terminal CDF Site.

Section 5.3.5.2 of the DMMP DEIR (Maguire, 2000) states that most marine mammal species may occasionally be found in the waters closer to Gloucester, Provincetown, or Nantucket, but rarely, if ever, within the harbors. According to the DMMP DEIR (Maguire, 2000), thirteen species of whales and porpoises, and two species of seals have been found offshore, especially in the waters in and around Stellwagen, Nantucket and Georges Bank. Section 5.3.5.3 of the DMMP DEIR (Maguire, 2000) states that the only marine reptiles found in the region of New Bedford are sea turtles. The Atlantic or Kemp's ridley is the most commonly reported turtle from Buzzard's Bay, but typically Buzzard's Bay lies outside the normal range of sea turtles.

According to the DMMP DEIR, Section 5.3.5.4, five whales and two turtles are federally listed as endangered. These include the humpback whale, fin whale, sei whale, blue whale, northern right whale, leatherback turtle and the Atlantic or Kemp's ridley turtle. These species rarely occur within New Bedford Harbor, or close enough to be affected by any indirect impacts of the proposed project.

The Massachusetts Natural Heritage Atlas does not indicate any state-listed Rare Species in or adjacent to the marine waters of the New Bedford area.

REFERENCES

Apex Environmental, Inc. 2005. Revised Essential Fish Habitat Assessment and Endangered Species Update for New Bedford Harbor Dredge – Phase II North Terminal Maintenance Dredge.

Apex Environmental, Inc. 2004. Work Plan for New Bedford Harbor Dredge- Phase II (North Terrninal Maintenance Dredge).

Apex Environmental, Inc. 2002. Essential Fish Habitat Assessment. New Bedford State Pier Dredge Project. South Side of State Pier and Inner Harbor Channel.

EOEA. 2002. Decision On The Joint Request For Approval of the New Bedford/ Fairhaven Harbor Plan. Pursuant To 301 CMR 23.00 September 24, 2002 Commonwealth of Massachusetts Executive Office of Environmental Affairs. Robert Durand, Secretary.

Maguire Group, Inc. 2002. Essential Fish Habitat Assessment New Bedford/Fairhaven Harbor Massachusetts. Prepared for Massachusetts Office of Coastal Zone Management.

Maguire Group, Inc. 2002. Draft Environmental Impact Report for the Dredged Material Management Plan for City of New Bedford and Town of Fairhaven (#EOEA 11669). Prepared for Massachusetts Office of Coastal Zone Management.

Maguire Group, Inc. 2003. Final Environmental Impact Report for the Dredged Material Management Plan for City of New Bedford and Town of Fairhaven (#EOEA 11669). Prepared for Massachusetts Office of Coastal Zone Management.

Normandeau Associates, Inc. (NAI) 1999. Dredged Material Management Plan. Fisheries Resources Survey for New Bedford. Final Report. Prepared for Massachusetts Office of Coastal Zone Management.

NOAA website
http://www.nmfs.noaa.gov/habitat/habitatprotection/essentialfishhabitat.htm

NOAA website
http://www.nodc.noaa.gov/dsdt/cwtg/natl.html

NOAA website
http://www.nefsc.noaa.gov/nefsc/habitat/efh/

FIGURES

Figure 1
Site Location Map

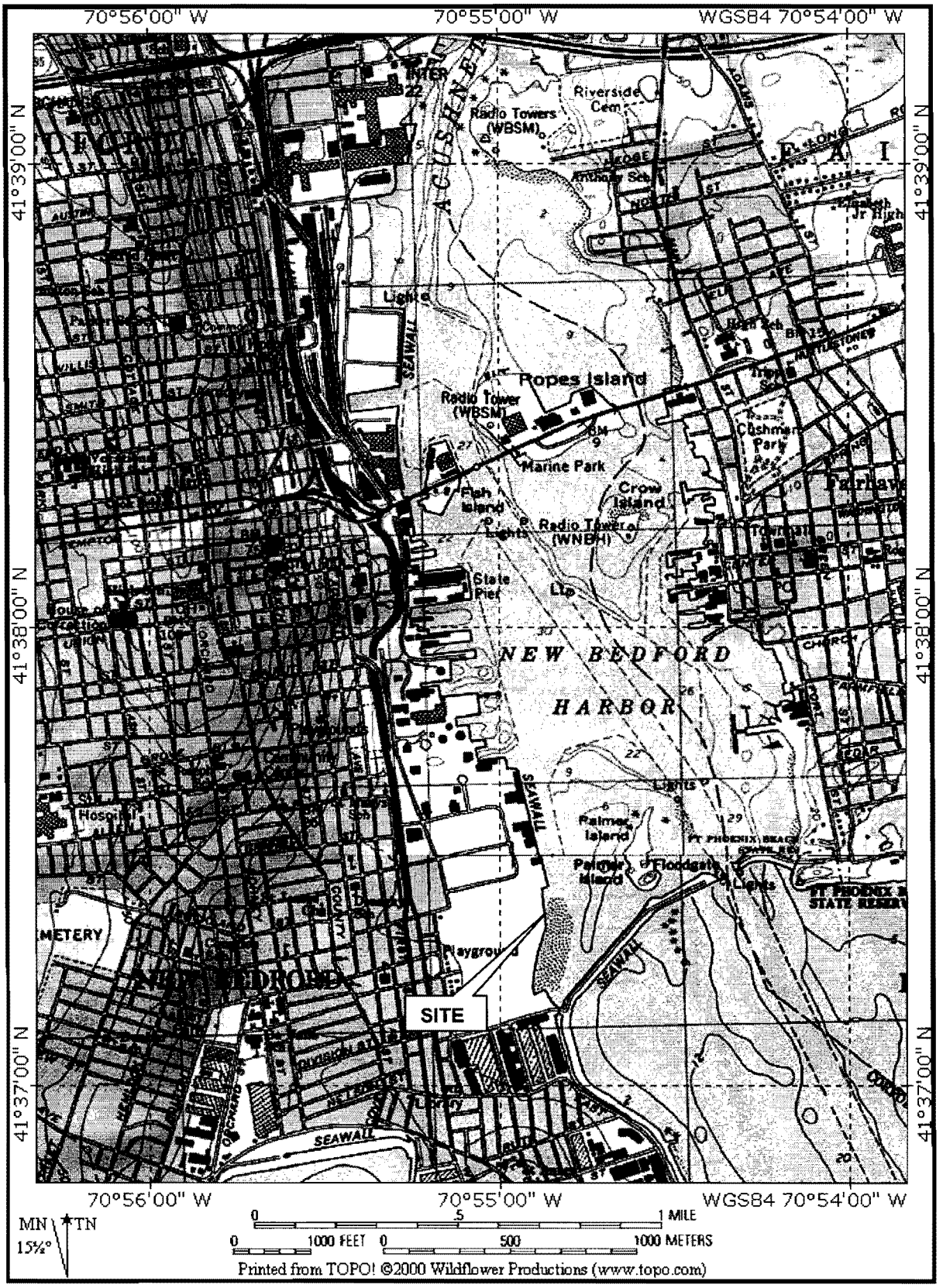
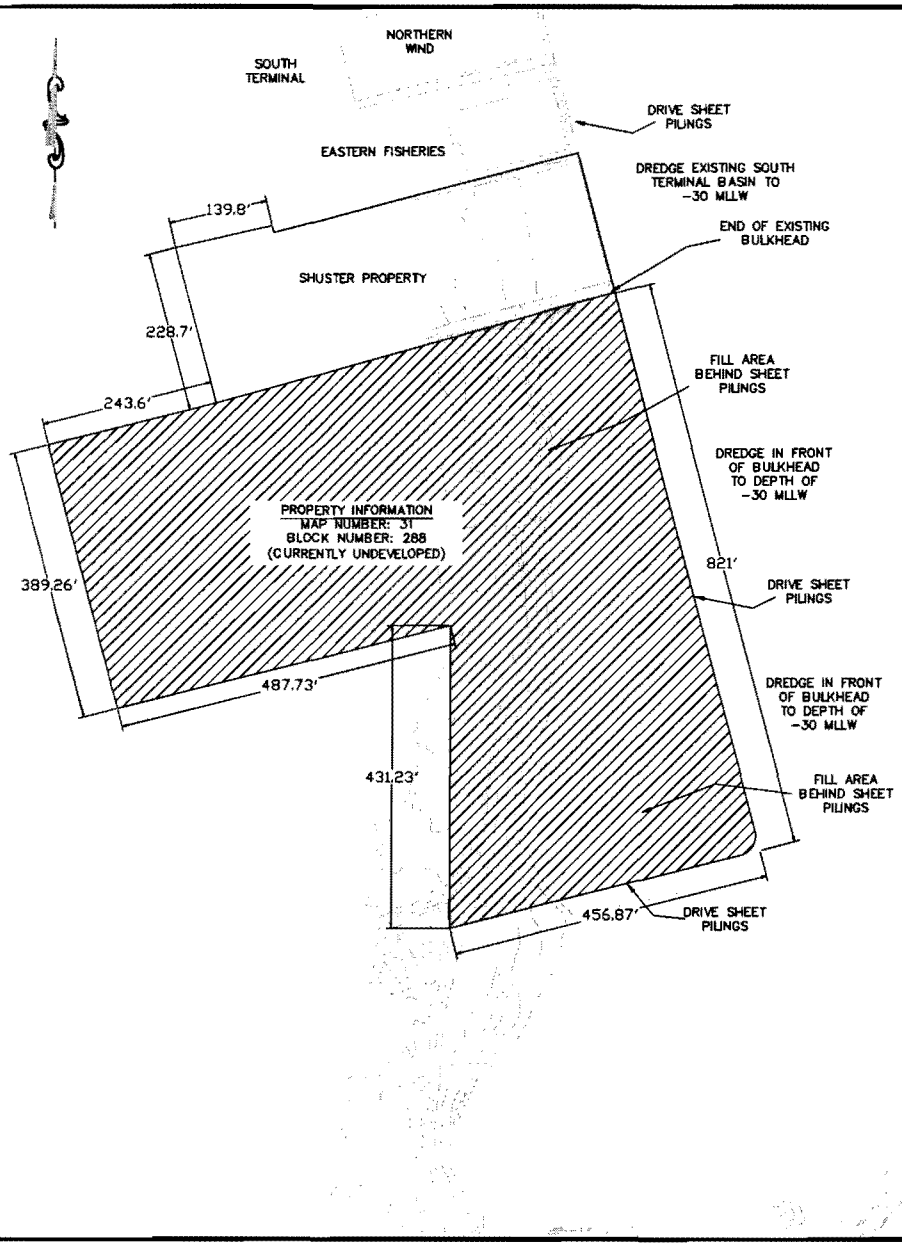


Figure 1: Site Location Map

South Terminal CDF Proposed Location

City of New Bedford, New Bedford, Massachusetts

Figure 2
Proposed Design of South Terminal CDF

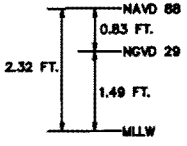


NOTES

[redacted]

HURRICANE BARRIER

GRAPHIC DEPICTION OF DATUM SEPARATIONS FOR NEW BEDFORD HARBOR



Apex Companies, LLC.

[redacted]

[redacted]

[redacted]

PROJECT TITLE:

RENEWABLE ENERGY MARINE PARK

PREPARED FOR:

THE NEW BEDFORD HARBOR DEVELOPMENT COMMISSION

DRAWING TITLE:

CONCEPTUAL DESIGN A OF RENEWABLE ENERGY MARINE PARK

NOT FOR CONSTRUCTION

Scale: 1"=60'

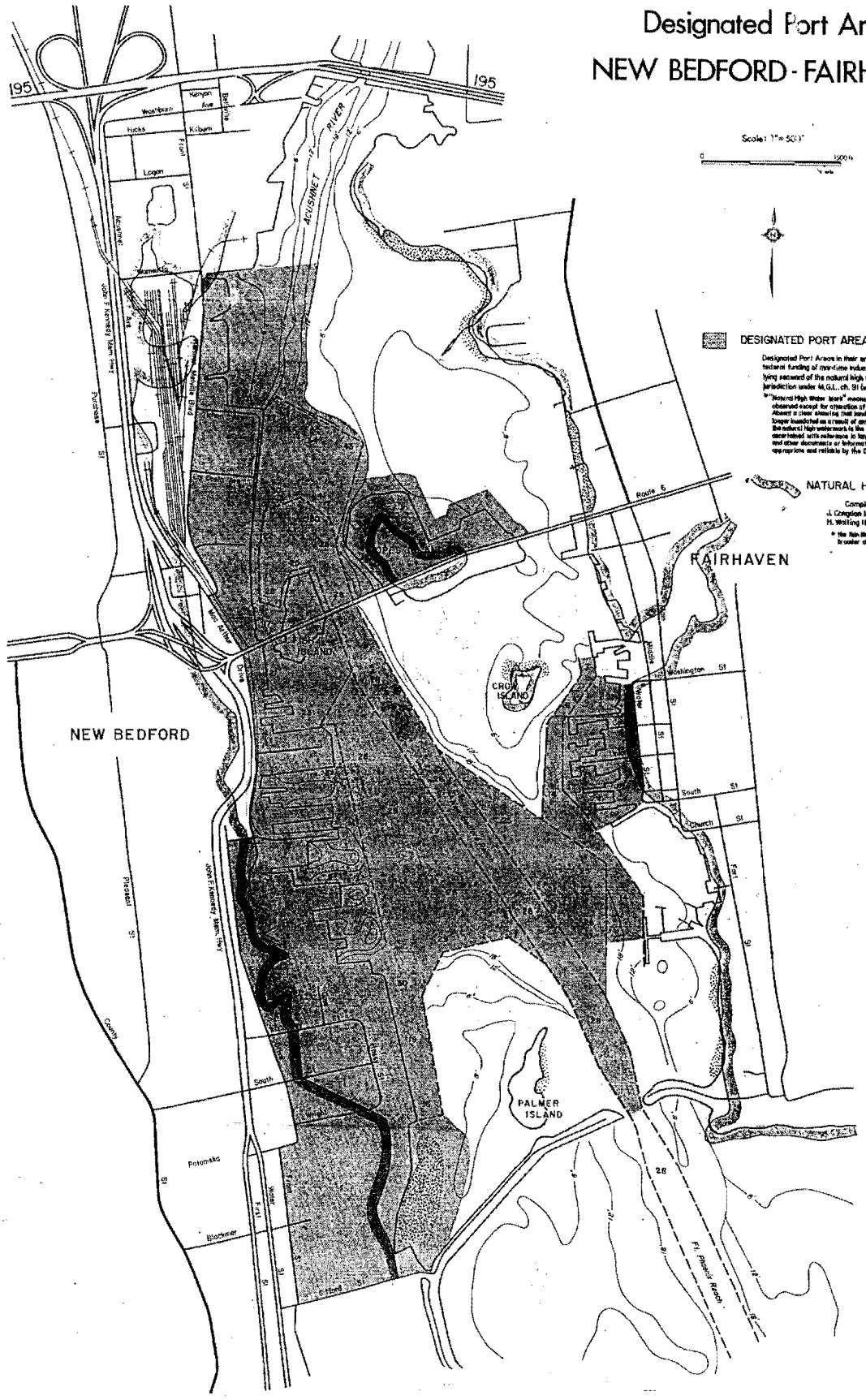
0 40 80 160 240 FEET

Date	[redacted]
Proj. Mgr.	[redacted]
Design	[redacted]
Check	[redacted]
Drawn	[redacted]
Job. No.	[redacted]
Last Rev.	[redacted]

Drawing No. 1

Figure 3
Historic High Water Line in
New Bedford, Massachusetts

Designated Port Area:
NEW BEDFORD - FAIRHAVEN



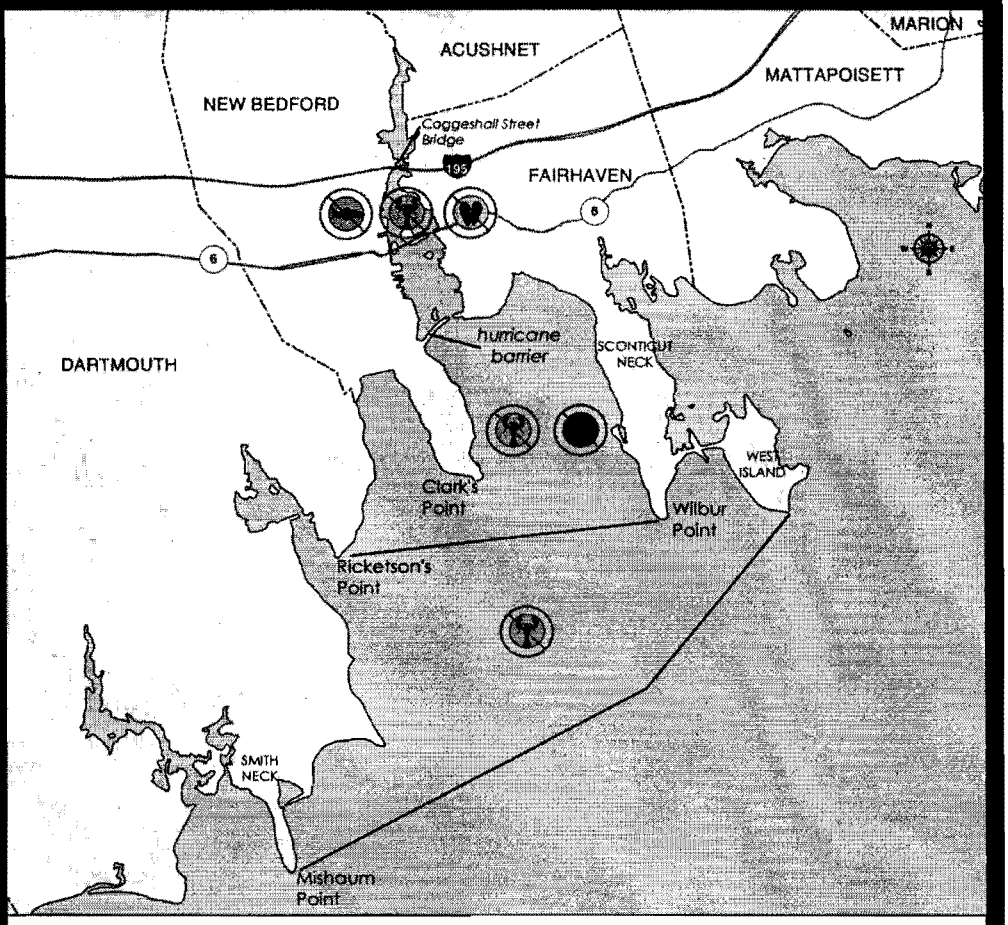
Dept. of Environmental Quality Engineering
Division of Wetlands and Waterways Regulation

Coastal Zone Management

Base map: NOAA Nautical Chart No. 13230, May 1985 Ed.; USGS Quad. sheets and local maps.

Figure 4
EPA Fishing and Shellfishing Ban Areas

Fish Smart—Use this Chart



Fish Smart-Use this Chart
¡Pesque con cabeza! Utilice esta gráfica
Pesque esperto-Use este mapa

Don't eat any fish
No coma pescado
Não coma peixe

Don't eat any lobster
No coma langosta
Não coma lagosta

Don't eat any shellfish
No coma mariscos
Não coma mariscos

Don't eat any bottom fish:
No coma pescado de fondo:
Não coma peixe de fundo:

- *flounder*
- *lenguado*
- *solha*
- *tautog*
- *tautoga*
- *bodião da ostra*
- *scup*
- *sargo*
- *sargo*
- *eel*
- *anguila*
- *anguila*

Map Produced By The US EPA New England GIS Center
30 May 2003

APPENDIX 7

****DRAFT****

PROPOSED RESOURCE COMPENSATORY MITIGATION FOR PROPOSED SOUTH TERMINAL EXTENSION CDF NEW BEDFORD HARBOR

MAY 2010

Prepared for

NEW BEDFORD HARBOR DEVELOPMENT COMMISSION
52 FISHERMAN'S WHARF
NEW BEDFORD, MA 02740

By

Apex Companies, LLC
New Bedford, MA
and
Boston, MA

TABLE OF CONTENTS

TABLE OF CONTENTS ii
1.0 INTRODUCTION 1
2.0 ASSESSMENT OF AREA TO BE IMPACTED 3
2.1 List of Impacted Resources from EFH / FVA / Shellfish Survey 3
2.2 Proposed Calculation of Compensation 4
3.0 RANKING OF POSSIBLE COMPENSATORY MITIGATION SITES 13
3.1 Description of All Possibilities – Reference Information 13
3.2 Description of Top 10 Locations 14
3.3 Ranking Matrix 17
3.4 List of Selected Sites 19
4.0 PROPOSED COMPENSATORY MITIGATION FOR LONG-TERM IMPACTS 21
4.1 Strategy 21
4.2 Conceptual Designs 23

DRAWINGS

Figure 1 – Site Locus Map
Figure 2 - Proposed Project Footprint
Figure 3 – Resource Area Location Map
Figure 4 – Historic High Water Line Map
Figure 5 – USEPA Fishing/Shellfishing/Lobstering Ban Notice
Figure 6 – Mitigation Project Locus Map
Figure 7 – Coastal Beach Mitigation Cross-Section
Figure 8 – Marsh Restoration Area Cross-Section

APPENDICES

Appendix A - Cover, Index and Relevant Cut Sheets from New Bedford Harbor Wetlands Restoration Plan

ABBREVIATIONS AND ACRONYMS

APEX	Apex Companies, LLC
CAD	Confined Aqueous Disposal
CI	Channel Inner
CZM	The Office of Coastal Zone Management
DMF	Division of Marine Fisheries
DMMP	Dredge Material Management Plan
DO	Dissolved Oxygen
EENF	Expanded Environmental Notification Form
EFH	Essential Fish Habitat
EFHA	Essential Fish Habitat Assessment
EIR	Environmental Impact Review
FFMP	Federal Fisheries Management Plan
HAPC	Habitat Areas of Particular Concern
iscy	in situ cubic yards
MACZM	Massachusetts Costal Zone Management
MADEP	Massachusetts Department of Environmental Protection
MADMF	Massachusetts Division of Marine Fisheries
MA EOEA	Massachusetts Executive Office of Environmental Affairs
MLW	mean low water
NBHDC	New Bedford Harbor Development Commission
NBRA	New Bedford Re-Development Authority
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
PIN	Popes Island North
SER	State-Enhanced Remedy
UDM	Unsuitable Dredge Material

1.0 INTRODUCTION

This report was prepared in order to evaluate the potential for mitigation to address presumed impacts to resource areas due to implementation of a Confined Disposal Facility (CDF) via an extension of South Terminal in New Bedford, Massachusetts.

The purpose of the Proposed South Terminal Extension CDF Project is to develop a marine terminal that will provide essential infrastructure to serve offshore renewable energy facilities, facilitate the remediation of the New Bedford Harbor and manage the dredge sediment generated from the maintenance of navigational channels within the Harbor.

CAD Cells have been chosen as the preferred methodology for disposal of PCB contaminated sediment within New Bedford Harbor associated with the State Enhanced Remedy to the Record of Decision of the New Bedford Superfund Site. The USEPA is also considering the use of CAD Cells in implementing the Remedy for the Superfund Site. It is currently anticipated that approximately 1.8 million cubic yards of clean sand will be generated during construction of the future CAD Cells. MassDEP has stated that it is preferable to find alternatives to Open Ocean Disposal due to the large volume of material, specifically, alternatives that can be implemented at the site. One of those potential alternatives is to utilize Confined Disposal Facilities (CDFs) within New Bedford Harbor to dispose of the clean sand while constructing a marine terminal, which can subsequently help to store additional clean sand in the future, helping to implement other potential disposal or re-use alternatives. Analysis of the best location in New Bedford Harbor for the first proposed CDF (the preferred Alternative) indicates that the Proposed South Terminal Extension CDF is the best candidate for fulfilling the Project Purpose as the Least Environmentally Damaging Alternative, when consideration is given to all factors.

The Site is located immediately to the south of South Terminal in New Bedford, Massachusetts. A Site Locus Map is included with this document as **Figure 1**. The extension involves the installation of approximately 800 linear feet of sheet piling to the south, aligned with the existing bulkhead. The proposed extension is shown on **Figure 2**. The area behind the bulkhead would be filled with clean sand generated during CAD Cell construction. The surface of the CDF, after

filling, is currently anticipated to be crushed stone, to accommodate anticipated uses at the facility. The full facility:

- Encompasses approximately 20 acres of area;
- Would cover and cap subaqueous PCB and metals contaminated sediments that exist to the east of the current shoreline, and cover contaminated urban fill areas upland, and paved and filled areas upland;
- Reflects ideal future potential industrial use as an Alternative Energy Industrial Marine Park, potential direct rail access, and nearby highway access;
- Is currently industrial and industrially impacted property;
- Is located south of the Route 6 swing bridge, and has no restriction on vessel size nor timing;
- Land is currently owned by the HDC, but leased to non-water-dependant users;
- Does not require the relocation of any users; and
- Would allow for future storage of a large amount of clean sand from CAD cells as a transient storage holding area until other uses can be found for the material.

While CDFs will impact some resource areas, this impact will be mitigated by the fact that contaminated lands will be incorporated into the footprint of the CDFs, effectively capping these environmentally impaired potential future contaminant source areas. The impact to resource areas by building the CDFs will be further mitigated by the environmental benefit to the overall Harbor that will be realized by expediting the cleanup of contaminated sediments that CDFs will facilitate.

2.0 ASSESSMENT OF AREA TO BE IMPACTED

The following sections review the information promulgated within the Essential Fish Habitat Assessment, Shellfish Survey, as well as the Functions and Values Assessments prepared by Apex Companies, LLC (Apex) all completed in 2010, for the Proposed South Terminal Extension CDF.

2.1 List of Impacted Resources from EFH / FVA / Shellfish Survey

The anticipated impacts from the construction of the Proposed South Terminal Extension CDF are both short-term and long-term. The short-term impacts primarily are due to construction related impacts, associated with potential generation of dust, noise, turbidity within the water column, and excessive erosion.

Long-term impacts are related to impacts associated with the loss of resource areas. A resource delineation completed by Apex Companies, LLC (Apex), and presented within the Functions and Values Assessment for the Proposed South Terminal Extension CDF indicated that the resource areas anticipated to be impacted by completion of this project are as follows:

- 2.99 acres of Land Under the Ocean/Land Containing Shellfish.
- 1.27 acres of Coastal Beach/Land Containing Shellfish/Horseshoe Crab Habitat.
- 0.34 acres of Coastal Beach/Land Subject to Flooding.
- 0.26 acres of Coastal Bank/Land Subject to Flooding.
- 1.03 acres of Land Subject to Flooding.
- 0.71 acres of Isolated Wetlands.

Which is a total of approximately 6.6 acres of resource area at this facility that will be lost due to completion of this project. A resource area location map is included as **Figure 4**.

An Essential Fish Habitat Assessment was prepared by Apex Companies, LLC (Apex) which stated that, although construction impacts for the Proposed South Terminal Extension CDF are

anticipated to be minimal, 2.99 acres of Land Under the Ocean will be lost as Essential Fish Habitat due to the installation of a bulkhead and the filling behind the bulkhead to create the facility.

A shellfish survey conducted by Apex Companies, LLC estimated that 132,164 shellfish will be impacted by capping and filling the Proposed South Terminal Extension CDF area.

2.2 Proposed Calculation of Compensation

The wetland impacts associated with the Proposed South Terminal Extension CDF have been assessed and the following mitigation is proposed for the anticipated impacts:

Short–Term Construction Related Impacts and Proposed Mitigation

Stormwater Best Management Practices – Upland Construction

The upland construction associated with this project presents multiple opportunities to avoid and minimize potential short-term environmental impacts. One of the most significant areas in which short-term impacts to the environment can be reduced relates to stormwater discharges. While earthwork is being conducted on-site and soils and/or fill material are exposed, appropriate measures will be employed to limit the offsite transport of sediment/soil. Suitable erosion and sedimentation controls will be implemented as described below to minimize additional potential sources of sedimentation and pollution.

Silt fencing, composed of geotextile fabric and/or haybales, will be installed around the perimeter of the project site while native soils or underlying fill material is exposed on-site. Additionally, silt fencing will be installed around material stockpiles on-site, to minimize erosion and run-off potential.

When clean sand from the CAD Cell and/or contaminated sediment is placed within the CDF, secure, passive dewatering areas will be established within the work area. Berms will be established around the dewatering areas, to prevent the discharge of sediments back into the

harbor. Dewatering fluids will be run through a filtration unit (such as a sand filter) to remove suspended sediment prior to discharge into New Bedford Harbor.

Physical Barriers

The first step of the preferred construction alternative will involve the installation of sheeting. Dredging and backfilling operations will occur only after the sheeting has been installed. Once installed, the sheeting will act as a physical barrier to the transport of suspended sediments entrained in the water column that may result from filling operations behind the CDF. Additionally, the use of floating semi-permeable turbidity barriers, or "silt curtains", during construction will be utilized, if they are determined necessary and feasible (typically in shallow, tidally influenced water, the silt curtains may impact the water column with fine-grained sediment more than protect the water column). The silt curtains (should they be employed) will further minimize the distribution of any fine-grained sediment that is unintentionally suspended during construction operations and will minimize potential turbidity exceedances. As an added benefit, the proposed silt curtains will act as a physical barrier to keep finfish and mobile invertebrates out of the work areas. The silt curtains, if they are used during project activities, and the steel sheeting, will both act as physical barriers to reduce siltation at spawning locations.

Water Quality Monitoring

Turbidity will be monitored during the Proposed South Terminal Extension CDF construction and related dredging projects, the potential impact to water quality will be measured and evaluated against threshold standards previously defined for dredging and construction activities under the State Enhanced Remedy (SER). Avoidance and minimization measures will be taken if threshold exceedences are identified during the water quality monitoring.

Monitoring of the water column turbidity will measure the potential impact to water quality using an Optical Backscatter Sensor and will follow the parameters and standards established previously for the dredging and construction activities under the SER.

If an exceedance of the project turbidity standard is triggered (activities when the average turbidity at the monitoring site exceeds the average reference site turbidity plus the permissible turbidity increase) construction, dredging and/or disposal activities will cease, and additional water quality samples will be collected. Water quality samples will be composited over three depths from the water column, and will be taken from both the up-current and down-current monitoring sites. Water quality samples will be taken at the same approximate locations and depths as where the turbidity measurements were taken and submitted to a certified laboratory under proper chain of custody. Water quality samples will be analyzed for the following parameters: Total Suspended Solids (TSS), total PCBs (Summation of Congeners), and total metals (arsenic, cadmium, copper, chromium, lead, mercury, nickel and zinc).

If compliance with the turbidity standards cannot be reestablished within 48 hours, dredging and/or construction will cease. If dredging is stopped due to a water quality exceedance, the Massachusetts Department of Environmental Protection (MassDEP) and any other interested local, state or federal agency staff, subcontractors, and/or consultants, shall review the operational actions undertaken, all analytical results and data evaluations. A determination would be made regarding the requirement for any additional mitigation (if necessary).

Additional Construction Related Impacts

Additional short-term environmental and other impacts may be expected during the phases of construction. These impacts include the potential for increased amounts of airborne dust on-site, increased noise and/or odors as related to construction activities, potential for chemical spills related to the on-site heavy machinery.

The New Bedford Building, Codes and Planning departments will be consulted during the construction phases to ensure that increased construction-related noises and odors on-site do not violate local ordinances. Appropriate measures will be employed if it is determined that noise or odor violations of these ordinances occur.

During the bidding process, construction contractors will be required to address mitigation measures for potential spills related to the diesel engines and other heavy machinery to be used on-site. Spill clean-up kits will be available on-site during construction activities and the proper regulatory agencies will be notified and appropriate clean-up measures will be undertaken, should a spill occur on-site.

Long-Term Impacts and Proposed Mitigation

Long-term impacts include impacts anticipated to be generated via construction of the facility. Construction of the Proposed South Terminal Extension CDF is anticipated to have a long-term impact on the following resource areas:

- 2.99 acres of Land Under the Ocean/Land Containing Shellfish.
- 1.27 acres of Coastal Beach/Land Containing Shellfish/Horseshoe Crab Habitat.
- 0.34 acres of Coastal Beach/Land Subject to Flooding.
- 0.26 acres of Coastal Bank/Land Subject to Flooding.
- 1.03 acres of Land Subject to Flooding.
- 0.71 acres of Isolated Wetlands; and
- Destruction of 132,164 shellfish.

Land Subject to Flooding

1.03 acres of land within the project footprint has been identified as Land Subject to Flooding under the Commonwealth of Massachusetts' Wetland Protection Act (310 CMR 10.0000). The resource areas at the site provide storage for flood flows present within the Acushnet River; however, flood storage is not as crucial at the base of the Acushnet River, where New Bedford Harbor intersects with Buzzard's Bay. Reduction of flood storage at this end of the Acushnet River provides less benefit due to the ease at which flood waters drain out through the Hurricane Barrier at the mouth of New Bedford Harbor. Flood flows during storm surges are many orders of magnitude higher than what can be accommodated at properties within New Bedford Harbor; and the New Bedford Hurricane Barrier protects New Bedford Harbor from significant storm surges. It does not appear to be critical to mitigate for this lost resource, due to its relatively low

importance at this location within the watershed; therefore, no mitigation is proposed for the loss of this resource.

Isolated Wetlands

0.71 acres of land within the project footprint is designated Isolated Wetlands under the Commonwealth of Massachusetts' Wetland Protection Act (310 CMR 10.0000). Prior to conducting a resource identification at the site in question, historical records of land use were reviewed. A map prepared by the Massachusetts Office of Coastal Zone Management indicates that the historic high water line at the facility is significantly inland of the current coast line. This map is presented as **Figure 3**. The resource area location map (**Figure 4**) notes the location of the historic high water line as a blue stripe running approximately 200 feet inland and parallel to the existing coastline; the area between the historic high water line and the existing high water line consists of filled tidelands.

During the course of its wetland resource investigation on April 20, 2010, Apex Companies, LLC, the presence of historic fill was confirmed in all but one of up to nine separate test pit locations dug to investigate the presence of hydric soils. In all but one location, man-made materials (brick, asphalt, trash, etc.) were identified within 15 inches of the surface. This was found to be the case even for areas in which hydric soils were noted within the top 10-15 inches of soil and where wetland indicator species (primarily the invasive species *phragmites australis*) were detected. Due to the highly degraded nature of these wetlands, and the fact that they are not natural, but are instead man-made and are choked with invasive species, the functions and values of these wetland areas are questionable.

The main value that these wetlands provide is in stormwater retention onsite. Fortunately, the facility is currently not planned to be paved, so it is unlikely that significant stormwater retention capacity will be lost; however, to ensure that the significant stormwater retention function is not lost by construction of the facility, a Stormwater Runoff/Infiltration Study will be performed during the design of the facility to analyze the capacity of the facility to retain runoff and infiltration capacities at the facility.

It is known that environmental stakeholders in the Harbor are concerned about general stormwater infiltration, non-point source pollution and runoff issues, including non-point source pollution that enters the Harbor from major roadways such as I-195 where it crosses the Acushnet River. Therefore, a pilot Rain Garden program will be undertaken in an area within New Bedford that can benefit from additional stormwater retention and/or treatment. At present, one possibility under consideration is a location nearby one of the major highways within New Bedford (such as Route 18 or Route 195). Such a pilot rain garden is anticipated to be approximately 0.25 acres in size, but will depend heavily upon the final location chosen for the site.

Land Under the Ocean

2.99 acres of land within the project footprint has been identified as Land Under the Ocean under the Commonwealth of Massachusetts' Wetland Protection Act (310 CMR 10.0000). The resource area consists of Essential Fish Habitat as well as shellfish habitat. All sediments in New Bedford Harbor are severely degraded with contamination and contain PCBs and heavy metals. All areas under the high water mark within New Bedford Harbor are part of the New Bedford Superfund Site; so designated due to historic releases of PCBs into the marine environment that have universally impacted sediment within the Harbor with PCBs (typically fine-grained organic sediments of varying thicknesses). Although the concentration of PCBs in this fine-grained sediment varies depending upon the location within the Harbor, historic sampling results indicate that the concentration of PCBs within the sediment at the subject site is higher than the upper limit allowed within landfills within the Commonwealth of Massachusetts. USEPA has banned fishing and shellfishing within New Bedford Harbor indefinitely due to the presence of PCBs within fish and shellfish (see **Figure 5** for a copy of the notice issued by USEPA indicating the bans). Although it may be possible to depurate the shellfish of PCB impacts, the PCBs are not anticipated to degrade on their own and depuration of the shellfish within a clean area will only transport the PCBs to the clean location at which depuration occurs, thereby transporting Superfund material outside of a Superfund site. Areas at the site (and within New Bedford Harbor as a whole) below the high water mark act as a source of contaminants for the surrounding communities (beginning at Buzzard's Bay), rather than retaining sediment or toxics, as non-impacted wetland areas would be expected to do.

Traditional production from within a wetland is provides the opposite effect than what is normally anticipated at wetland sites: the production of food or usable products for humans or other living organisms by the wetland areas are harmful, instead of beneficial to humans, wildlife, fish or the environment.

The New Bedford Harbor Development Commission has diligently worked to remove PCB contaminated sediment from New Bedford Harbor while conducting Navigational Dredging and has removed it from contact with Essential Fish Habitat and benthic organisms. The Navigational Dredging Projects have been completed in three Phases.

Phase I of Navigational Dredging involved dredging on the south side of the New Bedford State Pier in New Bedford Harbor, and the fairway and a portion of the Federal Channel leading up to the Pier. Work on Phase I began in 2001, and dredging of the project area was completed by the end of 2002. For this project, approximately 75,000 yards of contaminated sediment was dredged from the area to the south of the State Pier and the fairways leading there-to.

Phase II included the maintenance dredging of portions of Maritime Terminal, Norpel Terminal, Whites Terminal, South-of-Route 6 Bridge, and Niemiec Marine, as well as removing and disposing of the top of an 85,000 cubic yard CAD Cell (CAD Cell #1), in New Bedford Massachusetts, and the Warren Alexander Property, D.N. Kelley & Son, Linberg Marine, and Pease Park properties, in Fairhaven, Massachusetts. The New Bedford Harbor Phase II Dredge Project began in January 2005 and was completed Phase II harbor maintenance dredging in January 2006, removing more than 156,000 cubic yards (cy) of material from sites in New Bedford and Fairhaven.

Phase III included the maintenance dredging of portions of the New Bedford Rowing Facility boat basin, Packer Marine, Tonnesson Park, South Terminal, Gifford Street Boat Ramp, Niemiec Marine as well as removing and disposing of the top of an 92,000 cubic yard CAD Cell (CAD Cell #2), in New Bedford, Massachusetts and Linberg Marine, Olde North Wharf Fisheries, Fairhaven Shipyard, Union Wharf, Warren Alexander (South) in Fairhaven, Massachusetts.

Phase III began in September 2006 and was completed in September 2009, removing more than 189,000 cubic yards (cy) of material from sites in New Bedford and Fairhaven.

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The New Bedford Harbor Navigational Dredging projects have removed approximately 49.5 acres of PCB contaminated sediment from the bottom of New Bedford Harbor. This work has not been utilized as mitigation for any construction project to date, and has resulted in the removal of PCB and heavy metals impacted sediment, thereby enhancing the quality of 49.5 acres of Land Under the Ocean. The effects of this mitigation work has resulted in the enhancement of 49.5 acres of Land Under the Ocean and Shellfish Habiat, as well as improvement to Essential Fish Habitat within New Bedford Harbor, and a much improved benthic substrate. This 49.5 acres of Land Under the Ocean enhancement is proposed as mitigation for the 2.99 acres of Land Under the Ocean that will be impacted on a long-term basis by construction of the Proposed South Terminal Extension CDF.

Loss of Shellfish

The following is a calculation of the quantity of shellfish that will be re-seeded for this project, in accordance with DMF guidelines. The results of a shellfish survey completed by Apex indicates that approximately 132,164 of varying sizes and species will be impacted by the completion of the Proposed South Terminal Extension CDF project. DMF has indicated in the past that the dollar value recommended for seed purchases to mitigate for shellfish loss during construction projects is often five times the value of the shellfish. Therefore, mitigation proposed for shellfish loss due to the construction of the Proposed South Terminal Extension CDF is five times (660,820 [rounded to 661,000] shellfish seed) the estimated number of shellfish being impacted (132,164 shellfish).

Coastal Beach/Coastal Bank

1.27 acres of land within the project footprint has been identified as Coastal Beach/Land Containing Shellfish/Horseshoe Crab Habitat, 0.34 acres of land within the project footprint has been identified as Coastal Beach/Land Subject to Flooding, and 0.26 acres of land within the project footprint has been identified as Coastal Bank/Land Subject to Flooding under the Commonwealth of Massachusetts' Wetland Protection Act (310 CMR 10.0000). A total of 1.87

acres of Coastal Beach/Coastal Bank is proposed to be created as mitigation for the long-term impact to these resource areas. Ideally, the mitigation for this lost resource area should serve as both shellfish habitat and/or horseshoe crab habitat, if possible.

3.0 RANKING OF POSSIBLE COMPENSATORY MITIGATION SITES

A number of potential mitigation alternatives were evaluated for compensation of lost resources identified within the previous section. A number of pre-screened mitigation projects were reviewed and evaluated. Additional projects that had either been suggested by representatives of the New Bedford Conservation Commission, or had been separately conceptualized were also considered. A list of 10 potential mitigation projects were selected from the greater number of potential projects. Those 10 potential mitigation projects were evaluated and a particular mitigation proposal was developed.

3.1 Description of All Possibilities – Reference Information

Approximately 52 pre-screened potential mitigation alternatives were researched within the New Bedford Harbor Wetlands Restoration Plan, dated August 2002, prepared by the Massachusetts Wetlands Restoration Program (cover, index and relevant cut sheets attached as **Appendix A**). Review of the document did indicate several projects which restore similar resources to those in the proposed project area. Additionally, alternatives identified by project stakeholders and local officials were gathered. Other potential alternatives were prepared based upon the results of historic meetings conducted with the New Bedford Conservation Commission Agent as well as observations made at various time periods within New Bedford Harbor and the surrounding community. Many of the potential options were not selected since they were known to have been already undertaken since 2002, or were known to be on hold until the completion of the USEPA Superfund Remedy within Upper New Bedford Harbor. Still others were not selected due to the fact that they presented insurmountable logistical difficulties involved in complicated ownership arrangements and/or did not present opportunities to provide the functions and values that are needed for mitigation for the impacts anticipated from the Proposed South Terminal Extension CDF project. Finally, some options were not selected due to their distance from the source of impact.

3.2 Description of Top 10 Locations

As stated within the last section, the many potential mitigation alternatives were not found to be viable for many potential reasons, including ownership issues, proximity to the location of impact, and a poor match of newly created functions and values with functions and values that are anticipated to be lost. The following ten alternatives were chosen for a more detailed evaluation:

Alternative 1 – Beach construction between the Coggeshall Street and the Route 1-95 Bridges.
This alternative would remove PCB contaminated sediment between the two bridges. The removal of the PCB impacted sediment would allow for the construction of 250 linear feet of beach and .7 acres of habitat. The area is well sheltered, although the two bridges act as a tidal restriction to the upper reaches of the harbor water movement in the area would allow for continued tidal flushing. The location of the site is ideal as there is no access to the site from the land side as the on ramp and off ramp to Route 1-95 limits access.

Alternative 2 – Riverside Park Riparian Restoration.
The Riverside Park is located on Bellville Ave adjacent to the upper harbor. The site has very interesting and distinct characteristics. The cove acts as a still water area for all types of biota. The shore line at the site meanders back and forth creating several peninsulas. The project could restore up to 2,400 linear feet of bank and approximately 1.4 acres of marsh. There have been proposals to add a bike path/walking trail with educational interpretive signs at the site as well. Before work could begin at the site location, the USEPA remedy would need to be complete in this area.

Alternative 3 – Capping of OU3 between the Hurricane Barrier and Existing OU3 Cap
At a request from USEPA, the New Bedford Harbor Development Commission capped an area of OU-3 as part of Phase II of Navigational Dredging. The action helped to further the Superfund Remedy by capping PCB contaminated sediments which were distributed in the surficial soft sediments in the area surrounding a Hurricane Barrier stormwater discharge. The capping began in 2004; the material was placed over approximately 75% of the designated area for capping. Much of the area closest to the Hurricane Barrier remained uncapped due to

limitations at the time of the placement method. The proposed alternative would utilize clean sand from the CAD Cell to cap a portion of OU-3 nearest to the Hurricane Barrier as well as to to create beach and dune habitat in this area. The project would create coastal beach and a coastal bank structure which would integrate into the existing capped area. The proposed alternative would create approximately 2 acres of Coastal Beach extending approximately 800 linear feet in an area which is environmentally distressed. The project would beneficially reuse approximately 65,000 cubic yards of clean sand generated during CAD Cell construction.

Alternative 4 – Beach Construction in Clarks Cove along Hurricane Barrier

The alternative would construct a beach along the Hurricane Barrier in Clark's Cove. The proposal would be to create up to 800 linear feet of beach and 2 acres of coastal structure on the east side of Clarks Cove. This project is outside of the Superfund Site, and therefore would require conventional permits. The project would construct Coastal Beach where presently a riprap slope exists.

Alternative 5 – Construction of Beach North of Pease Park, Fairhaven

The alternative would remove PCB contaminated sediments from along a rip-rap slope and sheet pile wall north of Pease Park in Fairhaven. The material would be disposed of within a CAD Cell or CDF. Clean sand generated during CAD Cell construction would be placed along the sheet pile wall and rip-rap slope creating approximately 400 linear feet of beach and .5 acres of Coastal Beach habitat within the inner harbor.

Alternative 6 – Beach Construction at Crow Island

The alternative would construct a beach on a small sand bar/jetty on the south west side of Crow Island. Crow Island is located immediately south of Pope's Island, and is privately owned. It is currently unclear if this project would interfere with existing or future navigational requirements of either recreational boating or commercial or industrial navigational activity within New Bedford Harbor. The project could create approximately 145 linear feet of beach and .11 acres of habitat.

Alternative 7 – Marsh Island Saltwater Marsh Restoration

Marsh Island is located in Fairhaven, north of Route 6, but south of Route 195, adjacent to the Riverside Cemetery. The site presently has a radio tower which broadcasts the signal for WBSM. The project would remove approximately 2 to 6 feet of fill from the north side of the island within the marsh at the site. The removal of the fill would eliminate tidal restrictions to approximately 5 acres of salt marsh area, restoring flow to the site. It is unclear; however, whether this project may either be underway or may be completed in the near future by other parties.

Alternative 8 – Hurricane Barrier Vegetated Swale Rehabilitation and Restoration.

The alternative would remove PCB contaminated sediment from an existing stormwater swale on the inland side of the Hurricane Barrier between Gifford Street and Cove Street. The restoration would include the removal of PCB contaminated sediment currently within the drainage swale, and addition of clean sand from the CAD Cell, raising the elevation of the submerged area to between 6 inches and 1 foot below high tide. A central drainage channel and branched drainage channels would run through the new material, allowing for stormwater drainage through the area to continue. The low areas would be planted with low marsh plants. Rip-rap running along the western side of the channel would be removed and the low area would be graded gradually up to the existing grade, to allow a salt marsh succession ending at the top of slope. The project would create approximately 2 acres of marsh habitat.

Alternative 9 – Silver Beach Drive Salt Marsh Restoration

The alternative would restore tidal flow to an approximately 50 acre area of Sconticut Neck in Fairhaven. The project would remove sand and gravel which build up with in the outlet structure to the marsh. The tidal restriction at the site impounds fresh water within the marsh system creating a mosquito control issue as well as causes a degradation of the saline environment. The project would explore a more permanent solution keeping the outlet structure free of foreign debris as well as sand and gravel which is deposited by tidal flushing. It is unclear; however, whether this project may either be underway or may be completed in the near future by other parties

Alternative 10 – Round Hill Beach Highland Marsh Restoration

The alternative would restore tidal flow to approximately 10 acres of highland marsh behind the Round Hill Barrier Beach in Dartmouth, MA. The project would remove 1 to 3 feet of fill from within a historic saltwater marsh. The restoration would establish wetland grad, soils, hydrology and vegetation, as well as placement of an appropriate culvert or bridge under Ray Peck Rd. to provide full tidal flushing to the restored salt marsh.

3.3 Ranking Matrix

Each of the potential mitigation options that passed the initial screening was evaluated using standardized criteria, selected in order to help prioritize logistical, engineering, cost, and environmental qualities of the alternatives. The criteria are grouped into the following categories: Effectiveness, Timeliness, Benefits, Ownership, Environmental Issues, Difficulty in Implementation, Size, Proximity to Area of Impact, and Cost. Each of the categories has been given equal weighting in order to compare the desirability of each alternative. The resulting formula assigns a score for each construction alternative based on the following formula where an alternative with a higher score is a more desirable option and an alternative with a lower score is a less desirable option:

$$[\#] = E + T + B + O + N + I + S + P + C$$

Where:

E is Effectiveness	I is Difficulty in Implementation
T is Timeliness	S is Size
B is Benefits	P is Proximity to Area of Impact
O is Ownership	C is Cost
N is Environmental Issues	

Within each of the criteria, the alternatives were assigned a relative ranking for comparative purposes. The relative ranking was given a range of [1 to 10] for each category, with [10] being

the most desirable and [1] being the least desirable rank for each category. The following matrix table shows the alternatives, the evaluation criteria, each alternative's ranking for its respective criteria, and the total score for each alternative. Alternatives are ranked by total score (highest score indicates the most preferred alternative).

Alternative Matrix Table

Alternative	**E**	**T**	**B**	**O**	**N**	**I**	**S**	**P**	**C**	**Total**
Acushnet River Between 1-95 Bridge and Coggeshall Street Bridge	8	1	5	10	1	1	5	6	4	**41**
River Side Park Riparian Restoration	10	1	8	10	1	5	8	5	3	**51**
Capping of OU3 Between Hurricane Barrier and Existing Cap	8	10	8	10	10	10	10	8	10	**84**
Construction of Beach at Clarks Cove along Hurricane Barrier	8	3	8	5	4	7	8	4	6	**53**
Removal of contaminated sediments at existing beach and construction of replacement beach and new beach in Fairhaven.	10	9	10	5	10	6	5	8	6	**69**
Beach construction at Crow Island	5	1	5	1	1	10	3	5	6	**57**
Marsh Island salt water marsh restoration	6	4	5	1	5	6	3	5	4	**39**
Hurricane Barrier saltwater marsh restoration	8	10	8	10	10	10	6	10	8	**80**
Silver Beach Drive (Fairhaven) saltwater marsh restoration	8	10	7	3	10	6	10	4	10	**68**
Round Hill Beach marsh restoration	8	1	8	10	10	1	8	1	1	**48**

Where:

E is Effectiveness
B is Benefits of Habitat
N is Environmental Issues
S is Size
C is Cost of Implementation

T is Timeliness
O is Ownership
I is Difficulty in Implementation
P is Proximity to Area of Impact

3.4 List of Selected Sites

The alternatives evaluated are listed below in descending order of preference as determined by the Alternative Matrix Table:

Ranking (Total Score)	Alternative	Reasoning
#1 (84 points)	Capping of OU3	Unlike many other alternatives, this alternative will create beach and coastal dune structures where they do not presently exist. In addition, the alternative will permanently isolate PCB impacted sediment from storm water outfalls. The project could be completed as a part of the construction of the next CAD Cell, thereby enhancing the remedy. The area of capping is owned by the Commonwealth of Massachusetts and has been partially capped in 2004. As stated previously the project would isolate PCB impacted sediment present in the surficial sediment in the area. Coarse-grained material could be placed hydraulically or mechanically placed on the surface of the soft sediment. The proposed area is 2 acres and would create approximately 800 linear feet of beach. The alternative is directly south of the hurricane barrier and would proved habitat for displaced biota. The cost of placement will be marginal as the capping of the remaining areas of OU3 is required and the project can be done in conjunction.
#2 (80 points)	Hurricane Barrier Marsh Restoration	This alternative will remove contaminated sediment from the existing drainage swale which runs along the back side of the hurricane barrier. The swale will be then graded so that no more than a half a foot to a foot of water exists in the swale at high tide. The swale will be designed so that low marsh plants and high marsh plants can be planted on the west side (land side) of the structure. The interior of the swale will be seeded with the appropriate salt resistant plants and wetland species.
#3 (69 points)	Beach Restoration and Construction	This alternative will remove PCB contaminated sediment from the beach between Pees Park and the Seaport Inn and Conference Center on the Fairhaven side of the Harbor. The dredged sediment would be placed within a CAD Cell or CDF. Sand dredged as a part of future CAD Cell construction will be placed within the footprint of where contaminated sediment was removed. In addition a beach will be created along the rip-rap slope and be integrated into the beach restored to the north. The project would create approximately 0.5 acres of beach area and would create 400 linear feet of beach with in the inner Harbor. This project is a good alternative as it restores beach habitat within the inner harbor.

Ranking (Total Score)	Alternative	Reasoning
#4 (68 points)	Silver Beach Drive Marsh Restoration	This alternative was selected from the New Bedford Harbor Environment Wetland Restoration Plan. The alternative would restore tidal flow to an approximately 50 acre area of Sconticut Neck in Fairhaven. The project would remove sand and gravel which build up with in the outlet structure to the marsh. Additionally the project would explore a more permanent solution keeping the outlet structure free of foreign debris. The project sheet from the Wetlands Restoration Plan is included in Appendix A. This project is a good alternative and scores well on the effectiveness, timeliness and lack of other environmental issues however the project is not in proximity to the proposed project and restores resources similar to those taken in the proposed project.
#5 (53 points)	Construction of Beach in Clarks Cove	Construction of a Beach with in Clarks Cove along the Army Corp of Engineers Hurricane barrier similar to that of the previously described alternative. The beach would tie into existing beaches within the Cove and create new habitat and salt marsh. The project is not a good alternative as it would take a great deal of time to implement the project.
#6 (51 points)	Construction of Beach at Crow Island	This alternative would create beach on the south west side of Crow Island. There is currently a small sand bar which could be enlarged to create a new beach in the inner Harbor. However the alternative could have a significant impact on navigation with in the Harbor.
#7 (45 points)	Riverside Park Riparian Restoration	This alternative was selected from the Wetlands Restoration Plan. Before the project could be completed the US Environmental Protection Agency would need to complete the removal of superfund waste from the adjacent cove and wetland. The time line for the completion of this is unknown at this time. A project description is included in Appendix A.
#8 (48 points)	Round Hill Beach Marsh Restoration	This alternative was selected from the New Bedford Harbor Environment Wetland Restoration Plan. This alternative will likely be the most expensive of any of the considered alternatives. The project includes the removal of 1 to 3 feet of fill across a 10 acres site. The site would be reseeded and restored to its natural state. A detail description of the project is included in Appendix A.
#9 (41 points)	Acushnet River between the 1-95 and Coggeshall Bridge	This alternative would require the US EPA to remove PCB contaminated sediment from the area before the alternative could be realized. The site does offer a protected location with effective tidal flushing.
#10 (39 points)	Marsh Island Marsh Restoration	This alternative was selected from the New Bedford Harbor Environment Wetland Restoration Plan. This alternative would remove tidal restrictions on the North side of the Island by removing 2 to 6 feet of fill from the site. The site is owned by several entities. The project would be difficult to implement and would restore a minimal amount of salt marsh. A detailed description is included in Appendix A.

4.0 PROPOSED COMPENSATORY MITIGATION FOR LONG-TERM IMPACTS

In order to compensate for Long-Term impacts to 1.87 acres of Coastal Beach and Coastal Bank resource areas due to construction of the Proposed South Terminal Extension CDF, a number of potential mitigation options have been evaluated. The results of this evaluation were that the following mitigation package is proposed:

- Creation/Enhancement of 2.5 acres of Coastal Beach/Coastal Bank via a combination of sites either within or immediately outside of New Bedford Harbor.
- Creation/Enhancement of 2 acres of a combination of successional marsh areas (mudflat, low marsh, high marsh, and transitional area).

4.1 Strategy

The proposed mitigation strategy for long-term impacts is to implement the following three proposed mitigation alternatives:

- Alternative 3 – Capping of OU3 between the Hurricane Barrier and Existing OU3 Cap;
- Alternative 5 – Construction of Beach North of Pease Park, Fairhaven; and
- Alternative 8 – Hurricane Barrier Vegetated Swale Rehabilitation and Restoration.

The three locations are shown on **Figure 6**.

Alternative 3, Capping of OU-3 Between the Hurricane Barrier and Existing OU-3 Cap is anticipated to create or enhance approximately 2.0 acres of coastal beach and coastal bank. The mitigation project would have the dual purpose of creating Coastal Beach habitat while simultaneously capping and isolating from the environment sediments with a high level of PCB contamination within them while also utilizing clean sand from CAD Cell construction. The Coastal Beach would be approximately 800 feet in length, the exact length of Coastal Beach that will be impacted by implementation of the Proposed South Terminal Extension CDF. The majority of the new beach will be below the high tide line; however, a portion may be left above the high tide line nearer to the Hurricane Barrier to act as Coastal Bank. It is anticipated that this

project will also help to prevent scouring at the toe of the Hurricane Barrier and will likely also help allow waves to break slightly before they reach the Hurricane Barrier, which should help to improve the operation and functioning of the Hurricane Barrier as well. This location is not accessible from the shore and is rarely travelled by recreational vessels. As a result, the area that would be created would be relatively isolated from human impacts, and would provide a prime location for Horseshoe Crab habitat. A generic cross-section of the beach work is attached as **Figure 7**.

Alternative 5, Construction of Beach North of Pease Park, Fairhaven is anticipated to create or enhance approximately 0.5 acres of coastal beach and coastal bank. The mitigation project will create Coastal Beach habitat in front of an existing rip-rap wall, while utilizing clean sand from CAD Cell construction. The Coastal Beach would be approximately 400 feet in length. The majority of the new beach will be below the high tide line; however, some sand may be placed above the high tide line in order to provide material for construction of a Coastal Bank. A specific cross-section is not provided for this site; however, the work would be similar to that shown within **Figure 7**.

Alternative 8 – Hurricane Barrier Vegetated Swale Rehabilitation and Restoration is anticipated to create or enhance an approximately 2 acre area. The area currently serves as a stormwater runoff channel that runs behind the Hurricane Barrier. The benthic substrate is currently filled with PCB impacted sediment. The western side of the channel is currently a rip-rap slope that has little ecological value. By removing the PCB contaminated sediment and capping the residual impacted sediment, creating drainage channels, removing the rip-rap slope, and grading into the upland behind the rip-rap slope, approximately 2 acres of mudflat, low marsh, high marsh, and transitional salt marsh area can be created or enhanced. This area is owned by the City of New Bedford. The project will enhance the hydraulic capacity of the drainage ditch to transport stormwater from behind the Hurricane Barrier, and will create significant breeding ground for Essential Fish as well as bird habitat and habitat for other salt-marsh dwelling species. A cross section of the swale is attached as **Figure 8**.

4.2 Conceptual Designs

Shellfish Seeding

In order to provide compensatory mitigation for impact to shellfish organisms in the footprint of the proposed South Terminal expansion, a shellfish seeding program is proposed. A Shellfish Survey (completed by Apex in May 2010) identified an approximate shellfish organism count in the to-be-affected area of 132,164 shellfish organisms. Mitigation seeding is proposed at a ratio of 5:1 (seed provided to organisms effected), in keeping with generally accepted practice. The following provides a summary of the proposed program:

- A total of 661,000 seed stock is proposed, with relative percentage of animal type provided at a ratio that is consistent with the current projected ratio found to be existing in the potential footprint of the proposed Terminal expansion (based upon the 2010 crop survey of the currently proposed affected area):
    - 72 % of the seed = Quahogs;
    - 22% of the seed = Common Oyster;
    - 6 % of the seed = Soft Shell Clam;

- The seed stock will be provided over a period of time (over a five year period):
    - 200,000 seed stock (at the organism percentage noted above) will be provided the first year of significant construction at the Site (expected to be 2011);
    - 115,250 seed stock (at the organism percentage noted above) will be provided each successive year for a period of 4 years;

- Seed stock will be provided to the New Bedford Shellfish Constable for distribution in accordance with the City shellfish program.

- As a condition of providing seed stock, the project will review the Shellfish Office seeding plan to encourage use of the seed stock in appropriate locations (i.e., not in contaminated areas), and at the appropriate time(s) of the year.

Coastal Beach Habitat Creation

In order to provide compensatory mitigation for impact to Beach/Land Containing Shellfish/Horseshoe Crab Habitat, 2.5 acres of Coastal Beach Creation is proposed. A Resource Assessment Study was conducted (by Apex in 2010) of the proposed affected area, indicating that approximately 1.87 acres of Coastal Beach area will be affected by the proposed South Terminal Extension Project. The following provides a summary of the proposed program:

- Coastal Beach would be created in two areas: inside the Hurricane Barrier on the Fairhaven side of the Harbor, and outside the Hurricane Barrier on the New Bedford side of the Bay (see Figure 6 for the location of the proposed Coastal Beach creation areas). These areas were selected because they were previously coastal beach areas that were formerly affected by anthropogenic structures (the Hurricane Barrier and parking lots), and would significantly benefit from created Coastal Beach;
    - 2 acres of Coastal Beach creation at the OU3 Pilot Cap location in the outer Harbor in New Bedford;
    - 0.5 acres of Coastal Beach creation north of Pease Park in Fairhaven, MA;
    - See Figure 6 for a Locus Map of the proposed Coastal Beach creation sites;

- The form of the Coastal Beach created would be designed to emphasize re-creation of a specific ecological system – namely that of shore bird foraging and Horseshoe Crab habitat. The Beach profile created will include a large proportion of intertidal sandy (silt/sand/gravel mixture) beach, representing creation of preferential habitat for Horseshoe Crab and foraging shore birds. A cross-sectional diagram of an example beach profile for the proposed created Coastal Beach is included in Figure 7.

Salt Marsh Creation

It is recognized that, by creating Coastal Beach area, as is proposed above, the project will affect a certain acreage of Land Under the Ocean. As noted above, Land Under the Ocean that is affected in the Inner New Bedford Harbor (inside the Hurricane Barrier) is effectively compensated for through 49.5 acres of Navigational/SER Dredging, that simultaneously improves the Harbor bottom resource through removal of PCB and metals contaminated sediments while providing for navigational maintenance dredging. As such, the approximately

0.5 acres of Land Under the Ocean that would be affected by the proposed Coastal Beach creation in Fairhaven is effectively mitigated for by the Navigational dredging.

The 2 acres of Land Under the Ocean that would be affected in the OU3 area (outside the Hurricane Barrier) by the creation of the proposed Coastal Beach at that location requires another mitigation strategy. The strategy proposed includes the creation of a 2 acre Salt Marsh and successionary sequence in the drainage swale that exists to the west of the Hurricane Barrier, just to the south of the Gifford Street Boat-ramp parking area. Currently, the drainage swale in this location is tidally influenced (it is subtidal), however the quality of the resource is degraded mudflat/drainage ditch. The area of the proposed mitigation is currently characterized by the growth of invasive species and has a large amount of trash evident. The sediments in the drainage swale are contaminated (with PCBs).

The goal of the restoration project at this location would be to create a functioning marsh area in a publically visible area, so as to have both an ecological benefit and an educational benefit. The mitigation project at this location would include four primary elements:

- Removal of PCB and metals contaminated sediments;
- Re-grading of the swale profile to allow for the creation of a successionary sequence of marsh vegetation;
- Planting of high, low, and transitional marsh species within the regarded swale; and
- Installation of a public access walkway/bike path adjacent to the created marsh area with appropriate signage identifying the type and importance of the biota in the restored/created resource area.

The proposed marsh restoration/creation includes the following characteristics:

- Sampling to determine the extent and depth of PCB and metals contaminated sediments;
- Excavation and removal of those sediments and placement of those sediments in the CAD Cell;
- Installation of a layer of clean material across the bottom of swale graded into a topographic succession that will include a deeper flow channel meandering through the middle of the swale and benched sides that will promote high and low marsh vegetation growth as well as transitional vegetation growth.

- Planting of Low Marsh vegetation (such as sp. *spartina alternaflora*) on the lower created benched steps;
- Planting of High Marsh vegetation (such as sp. *spartina patens* and sp. *distichlis spicata*, and possibly some sp. *spartina alternaflora* mixed in to the High Marsh sequence; and
- Planting of Transition Zone vegetation (such as sp. *panicum virgatum*, sp. *iva frutescens*, and some sp. *distichlis spicata and spartina patens*, as well as sp. *myrica pensylvanica*, sp. *rosa virginiana*, and sp. *arctostophylos uva-ursi* shrubs);
- Installation of an adjacent public access walkway/bike path and bordering ornamental fence with appropriate signage to inform the public of the restoration/creation project conducted as well as pointing out both the types and importance of the marsh sequences installed.
- A conceptual diagram of the proposed successionary marsh creation/restoration project is attached as Figure 8.

Other Proposed Activities

As noted in the Resource Functions and Values assessment conducted (completed by Apex in 2010), there exists in the proposed footprint of the South Terminal Extension CDF some amount of degraded upland wetland. As noted in the referenced studies, these wetlands have developed on top of urban fill (which includes piles of asphalt, brick, block, and stone debris, cement and other demolition rubble). An Environmental Site Assessment Report (21E Report) for a large proportion of the property indicates that the filled land that the wetlands have developed upon also contains soils contaminated with common industrial contaminants. Non-invasive wetlands plants are noticeably absent from the site, and invasive species (particularly sp. *phragmites austalis*) are dominant. As such, these upland wetlands at the site are in poor condition and do not represent functioning wetland resources. However, it is recognized that as topographic features on the site, these areas play a role in storm-water retention and filtration. In recognition of that, the project proposes to conduct certain activities related to storm-water management and retention, including:

- Conducting a thorough review of storm-water flow and infiltration for the proposed CDF Facility as part of the design activities that will be undertaken. Should the study results indicate that significant storm-water retention and/or discharge issues may be anticipated,

the project will incorporate into the Facility design best management practice solutions to the storm-water issues;

- The project will conduct a natural Pilot Storm-water Filtration project within New Bedford in order to assess and demonstrate the effectiveness and importance of designed natural storm-water filtration systems. Such a system (sometimes referred to as a "rain garden") would be constructed on City property or on easement property in an area where storm-water runoff issues are either present or suspected. While the ideal location for such a feature is currently unknown, a study would be undertaken as part of the project that would identify a useful location for such feature (likely to be adjacent to one of the major roadways that cross the Harbor or parts of the Harbor – such as the I-195 crossing of the Acushnet at Washburn Street). It is anticipated the size of the Pilot system that may be installed would be on the order of approximately 0.1 to 0.2 acres. Detailed design of this system would be conducted in concert with appropriate agency and non-governmental organization input.

Monitoring and Maintenance of Installed and Created Features

All of the features noted above will require periodic monitoring and maintenance. The project will conduct regular inspections of the installed features (on an appropriate frequency – but no longer than once per year) in order to assess their stability and effectiveness for their intended purpose. Inspection frequency for specific features will be dependent upon accepted protocols for the particular feature, and timetables that are appropriate for each feature will be created as part of the project. Maintenance and monitoring activities will be conducted by the project for a period of five years. At the end of the five-year assessment period, decisions as to the long-term monitoring and maintenance needs for each feature will be determined.

Figures

FIGURE 1

SITE LOCUS MAP

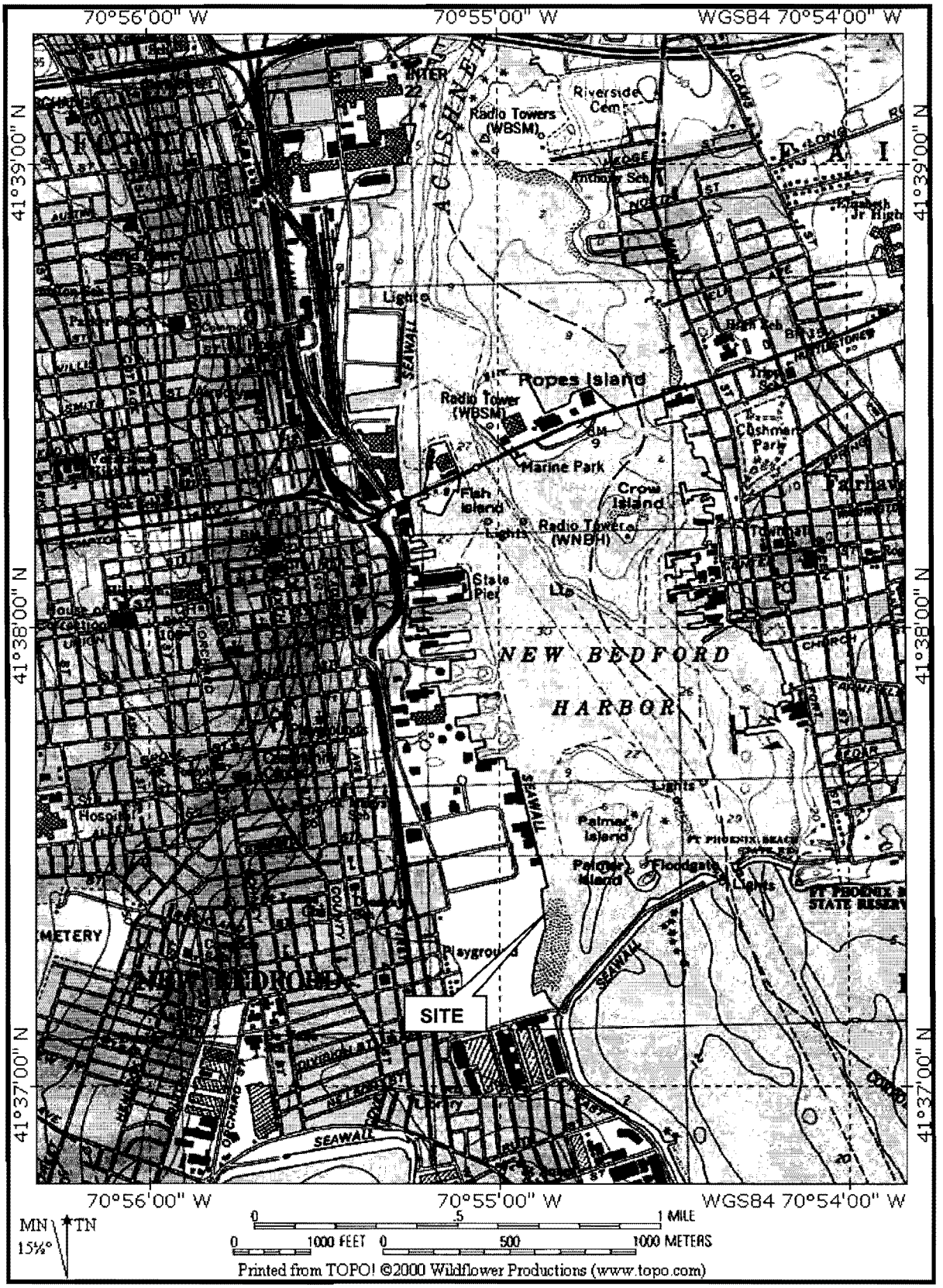


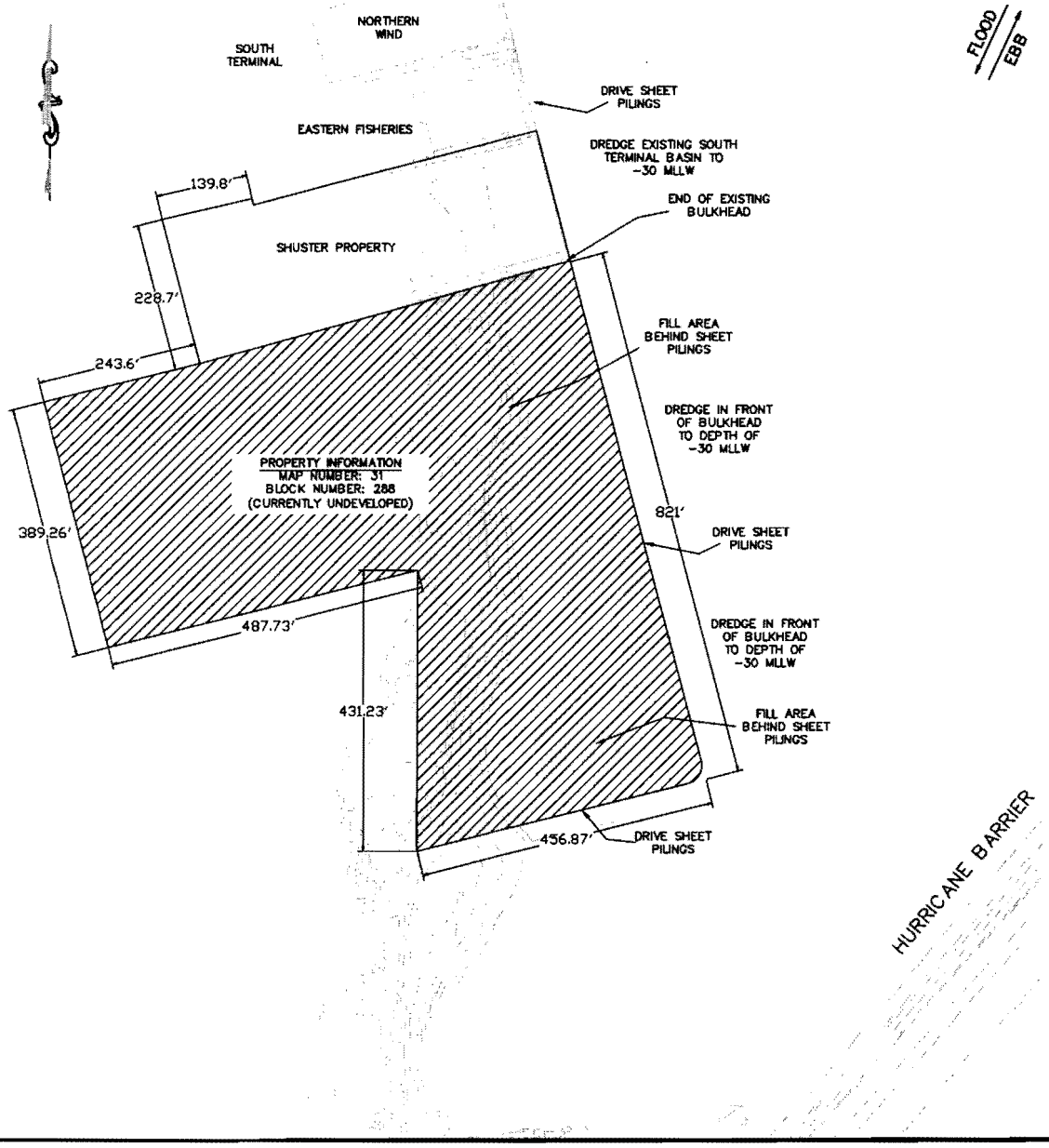
Figure 1: Site Location Map

South Terminal CDF Proposed Location

City of New Bedford, New Bedford, Massachusetts

FIGURE 2

PROPOSED PROJECT FOOTPRINT

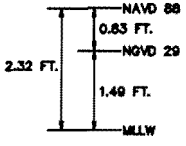


FLOOD / EBB

NOTES

[redacted]

GRAPHIC DEPICTION OF DATUM SEPARATIONS FOR NEW BEDFORD HARBOR



Apex Companies, LLC.

[redacted]

[redacted]

[redacted]

PROJECT TITLE:

RENEWABLE ENERGY MARINE PARK

PREPARED FOR:

THE NEW BEDFORD HARBOR DEVELOPMENT COMMISSION

DRAWING TITLE:

CONCEPTUAL DESIGN A OF RENEWABLE ENERGY MARINE PARK

NOT FOR CONSTRUCTION

Scale: 1"=60'

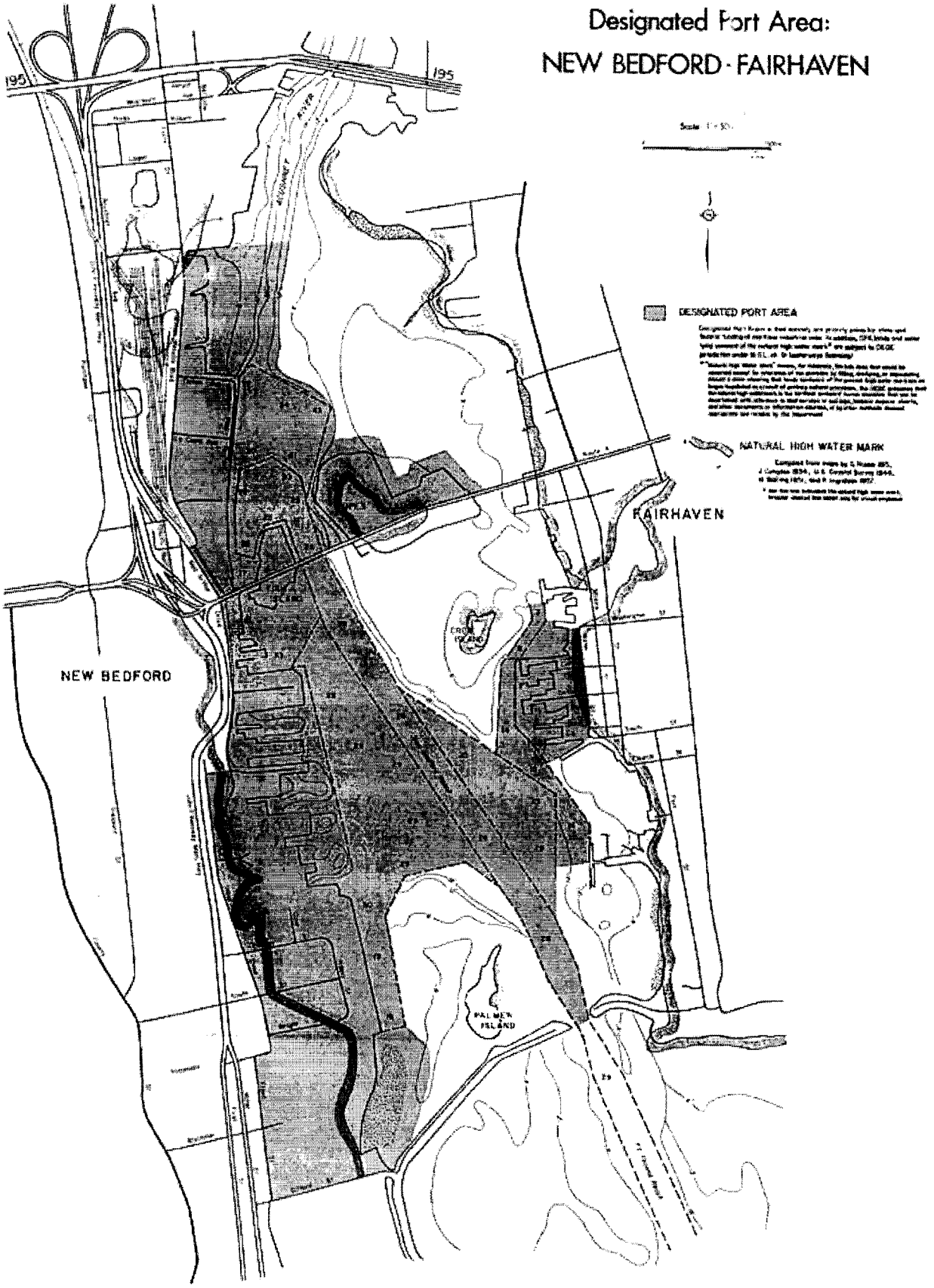
Date	[redacted]
Proj. Mgr.	JAB
Design	CM
Check	JAB
Drawn	CM
Job. No.	[redacted]
Last Rev.	[redacted]

Drawing No. 1

FIGURE 3

HISTORIC HIGH WATER LINE MAP

Designated Port Area:
NEW BEDFORD - FAIRHAVEN

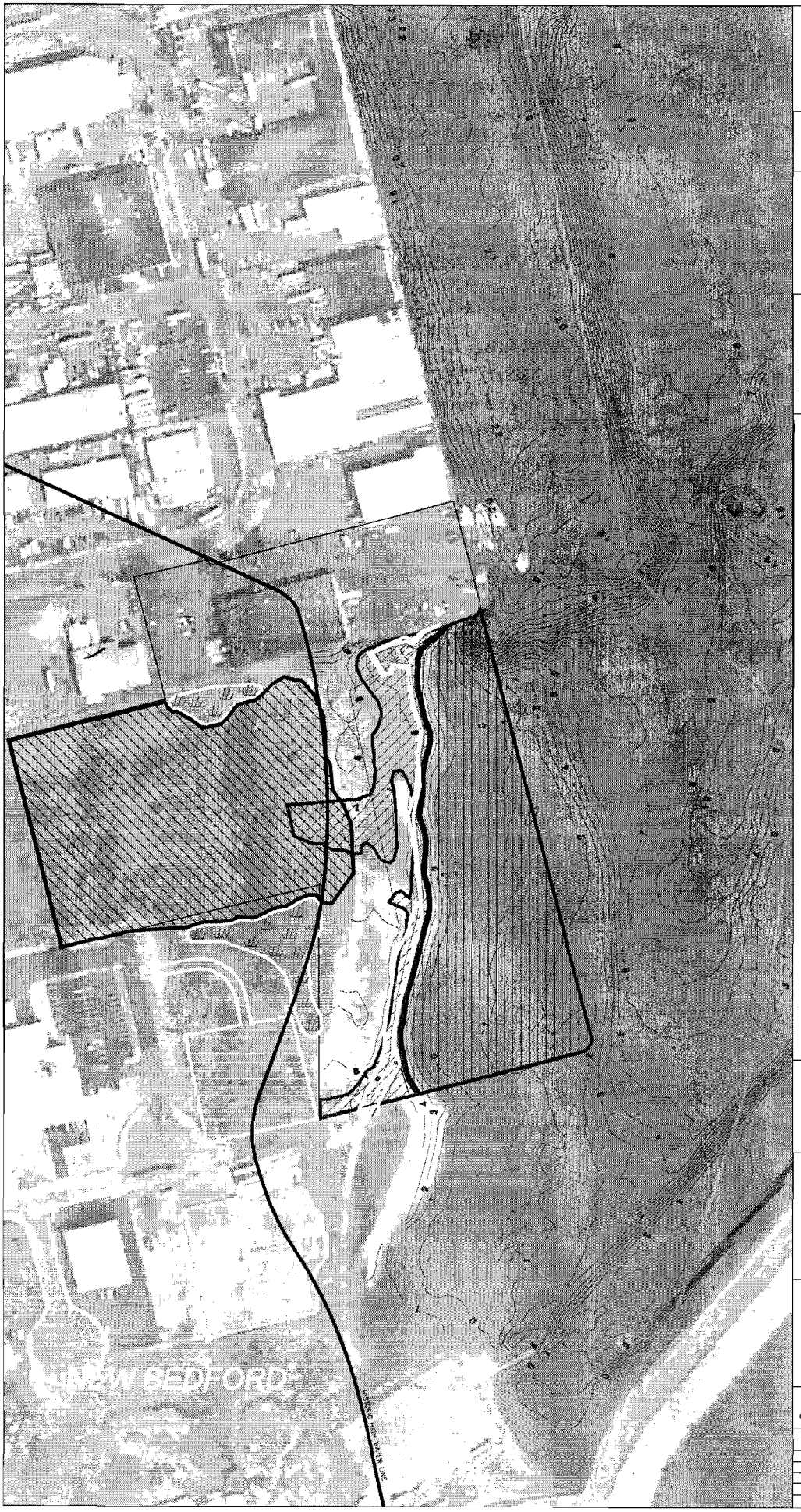


Dept. of Environmental Quality Engineering
Division of Wetlands and Waterways Regulation

Coastal Zone Management

FIGURE 4

RESOURCE AREA LOCATION MAP



Apex Companies, LLC.

184 HIGH STREET
SUITE 502
BOSTON MA 02110
(617) 728-0070

REVISIONS

NO.	DATE	DESCRIPTION
1.	2/11/10	PRELIMINARY LAYOUT
2.	4/09/10	PRELIMINARY ASSESSMENT
3.	4/15/10	FIELD LOCATION

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SUITABLE SHELLFISH GROWING AREA

LAND SUBJECT TO FLOODING

COASTAL BEACH

COASTAL BANK

WETLAND

PAVED AREA

URBAN FILL

PREPARED FOR:

THE NEW BEDFORD HARBOR DEVELOPMENT COMMISSION AND THE TOWN OF FAIRHAVEN, MASSACHUSETTS

DRAWING TITLE:

SOUTH TERMINAL MARINE INFRASTRUCTURE PARK 2010 RESOURCE AREA ASSESSMENT

Scale: 1"=80'

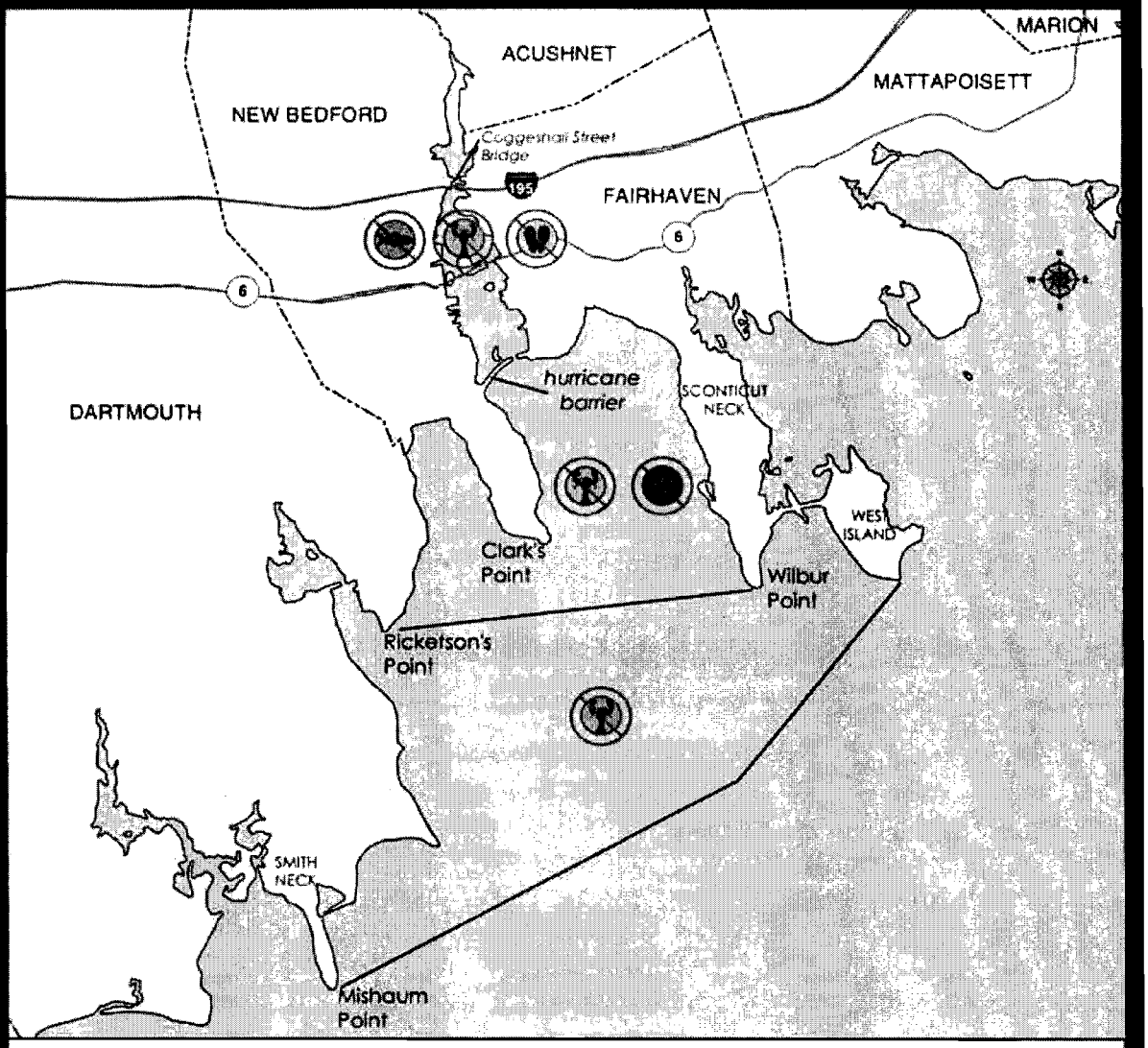
0 40 80 160 240 FEET

Date 3/24/10	Drawing No.
Proj. Mgr.	
Design	
Check CM	P-1
Drawn GCD	
Job. No. 6615	
Last Rev. 4/15/10	

FIGURE 5

USEPA FISHING/SHELLFISHING/LOBSTERING BAN NOTICE

Fish Smart—Use this Chart



Fish Smart-Use this Chart
¡Pesque con cabeza! Utilice esta gráfica
Pesque esperto-Use este mapa

Don't eat any fish
No coma pescado
Não coma peixe

Don't eat any lobster
No coma langosta
Não coma lagosta

Don't eat any shellfish
No coma mariscos
Não coma mariscos

Don't eat any bottom fish:
No coma pescado de fondo:
Não coma peixe de fundo:

- *flounder*
- *lenguado*
- *solha*
- *tautog*
- *tautoga*
- *bodião da ostra*
- *scup*
- *sargo*
- *sargo*
- *eel*
- *anguila*
- *anguila*

Map Produced By The US EPA New England GIS Center
30 May 2003

FIGURE 6

MITIGATION PROJECT LOCUS MAP

Mitigation Project Locus Map

184 HIGH STREET
SUITE 502
BOSTON MA 02110
(617) 728-0070

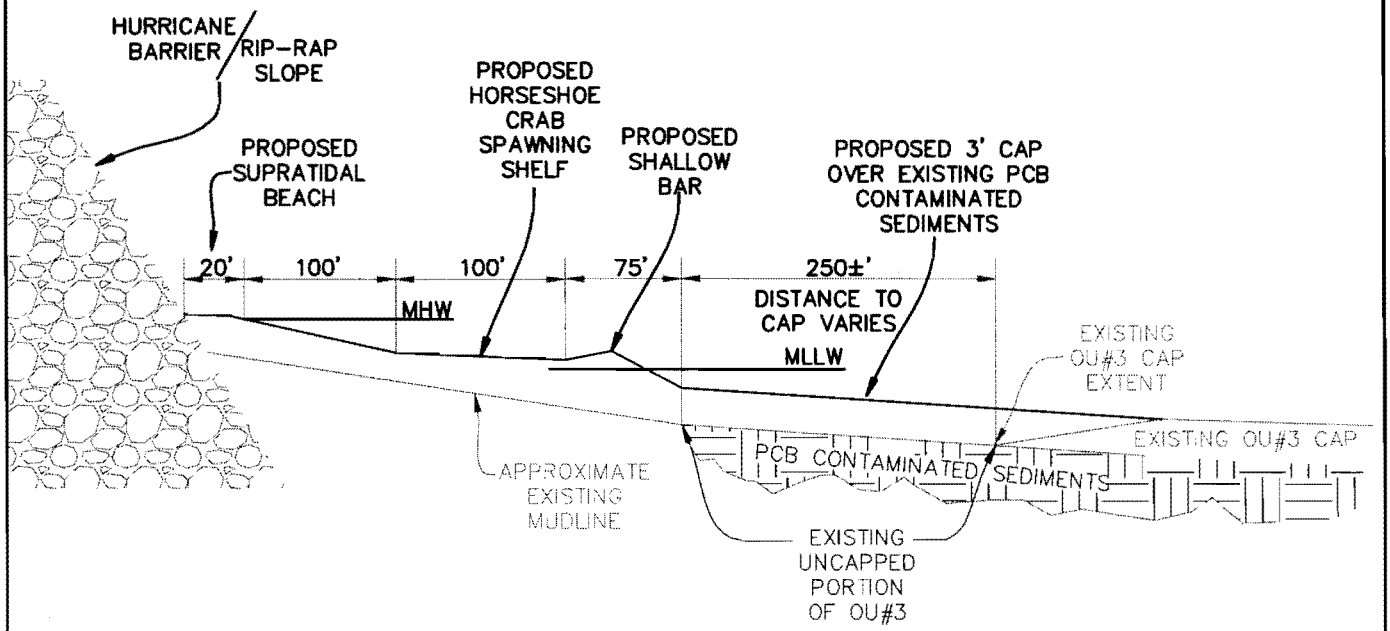
SOUTH TERMINAL MARINE INFRASTRUCTURE PARK
NEW BEDFORD, MA

Scale: 1"=1300'

0 650 1300 2600

FIGURE 7

COASTAL BEACH MITIGATION CROSS-SECTION



Scale: 1"=30'

0 15 30 60

EXAMPLE COASTAL BEACH CREATION AREA OU#3 CAP LOCATION

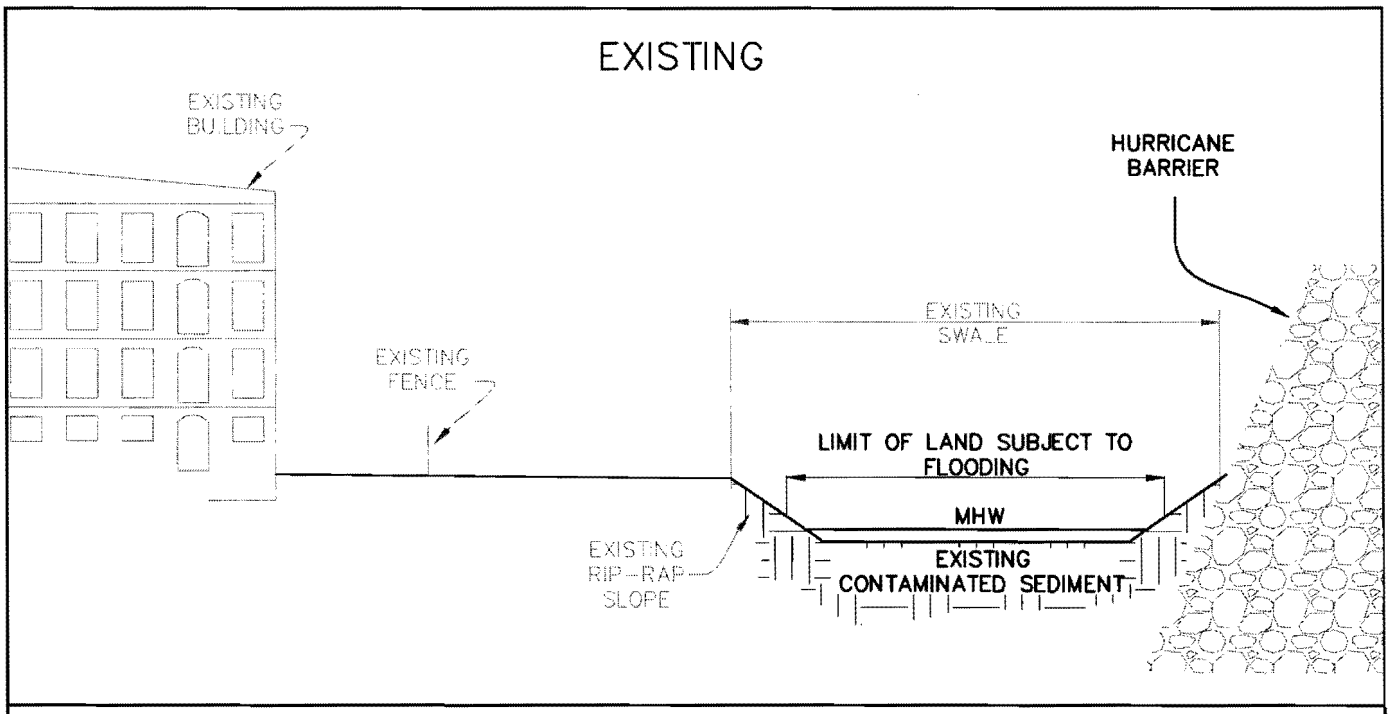
SOUTH TERMINAL CDF NEW BEDFORD, MA

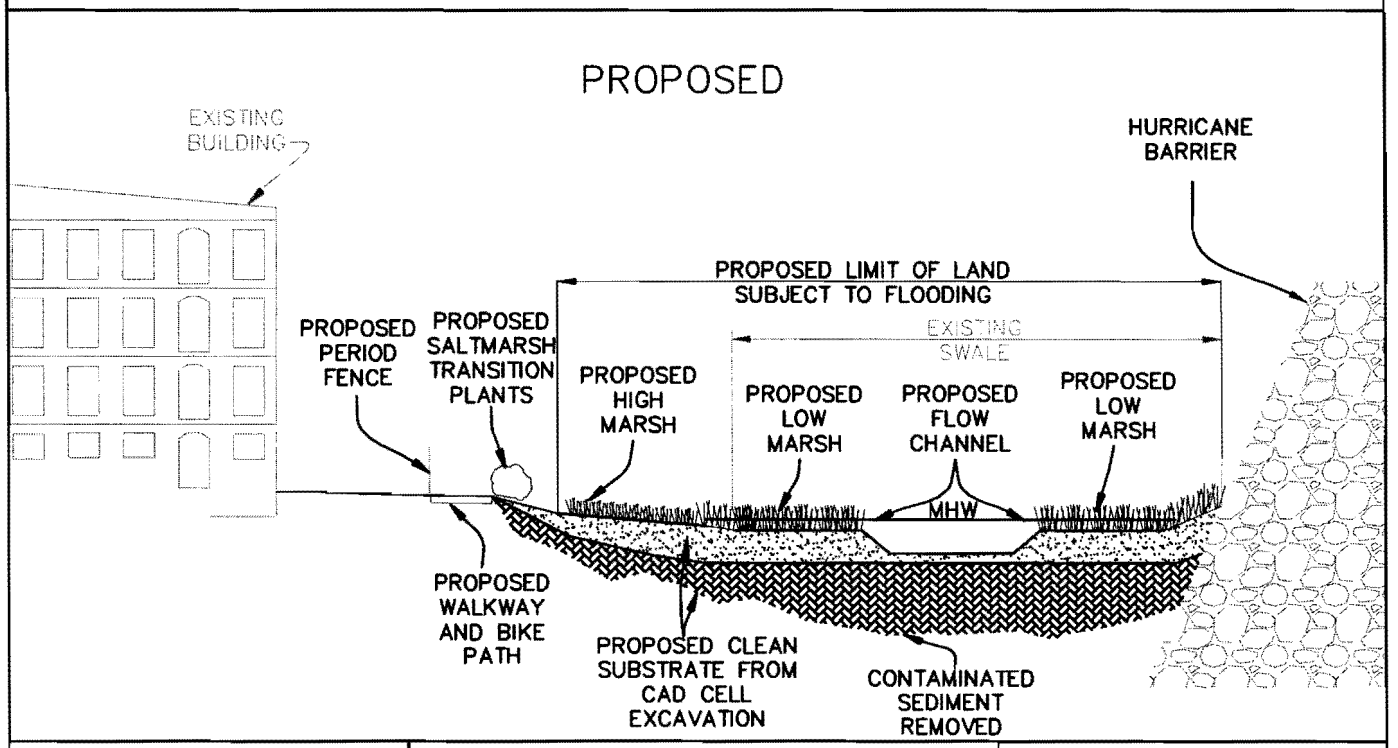
Apex Companies, LLC
1 WAMSUTTA STREET, SUITE 8
NEW BEDFORD, MA 02740
(617) 728-0070
184 HIGH STREET, SUITE 502
BOSTON MA 02110
(617) 728-0070

NEW BEDFORD HARBOR DEVELOPMENT COMMISSION
106 CO-OP WHARF
NEW BEDFORD, MASSACHUSETTS 02740
(508) 961-3000

FIGURE 8

MARSH RESTORATION AREA CROSS-SECTION





Scale: 1"=30'

0 15 30 60

HURRICANE BARRIER RESOURCE AREA ENHANCEMENT

SOUTH TERMINAL CDF NEW BEDFORD, MA

Apex Companies, LLC
1 WAMSUTTA STREET, SUITE 8
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(617) 728-0070
184 HIGH STREET, SUITE 502
BOSTON MA 02110
(617) 728-0070

NEW BEDFORD HARBOR DEVELOPMENT COMMISSION
106 CO-OP WHARF
NEW BEDFORD, MASSACHUSETTS 02740
(508) 961-3000

APPENDICES

APPENDIX A

COVER, INDEX, AND RELEVANT CUT SHEETS FROM NEW BEDFORD HARBOR WETLANDS RESTORATION PLAN

Draft New Bedford Harbor Environment WETLANDS RESTORATION PLAN

Massachusetts Wetlands Restoration Program

Executive Office of Environmental Affairs

August 2002

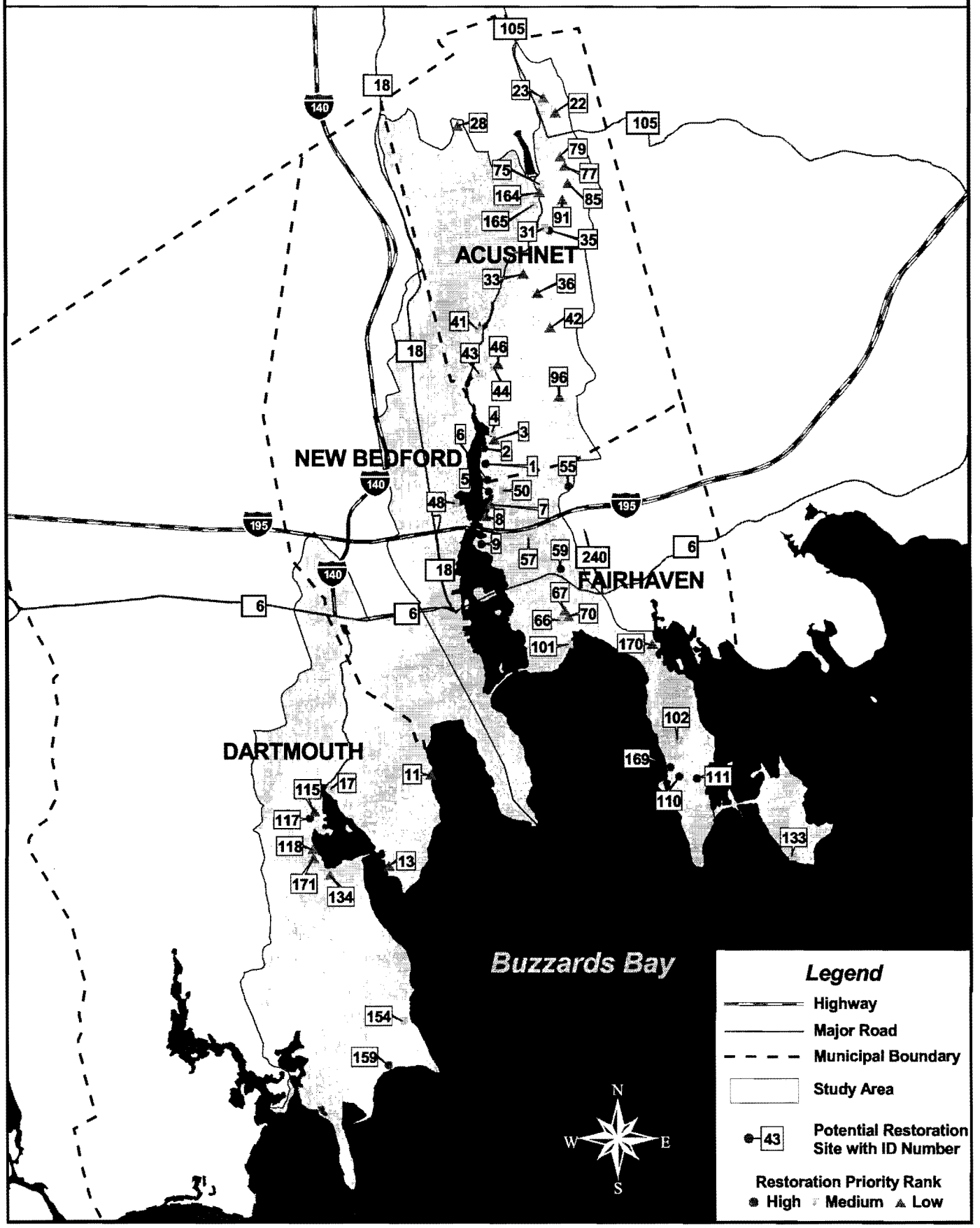
JANE SWIFT
Governor

BOB DURAND
Secretary

SHARON MCGREGOR
Assistant Secretary

CHRISTY FOOTE-SMITH
Director

New Bedford Harbor Environment
Potential Wetland Restoration Sites



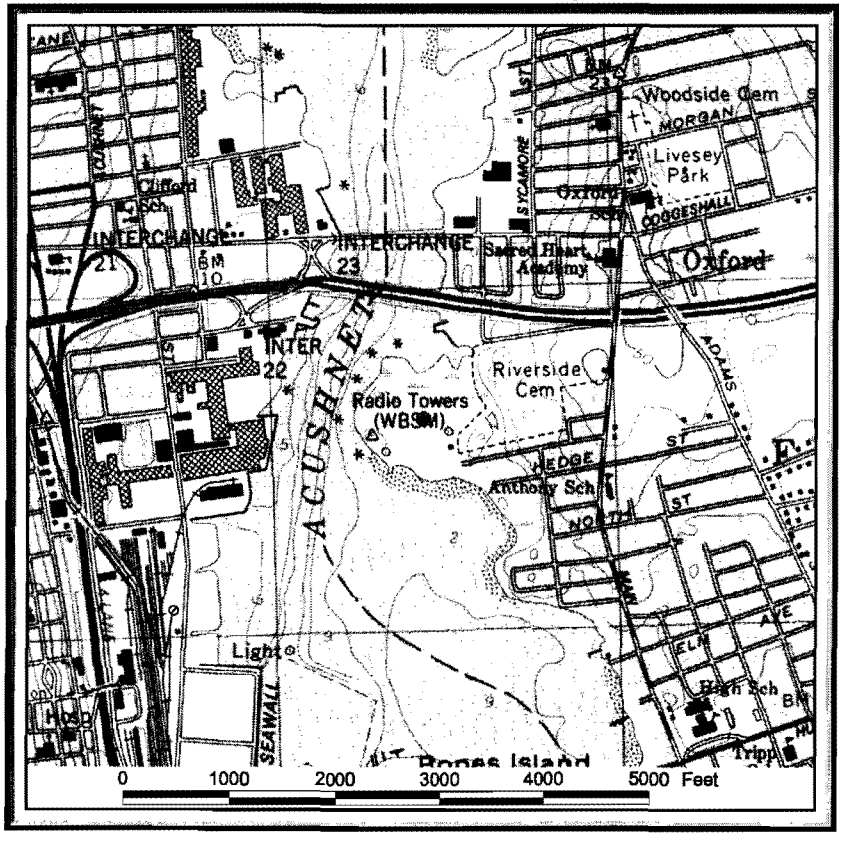
Site	Priority Rank:	Town	Ownership:	Acres:	Wetland Type:
9	High	Fairhaven	Mixed	5+	Tidal

Impact Type
- [x] Filled
- [ ] Drained
- [ ] Impounded
- [x] Tidally Restricted
- [ ] Active Agriculture
- [ ] Channelized
- [ ] No Riparian Buffer
- [ ] Unknown

Site Attributes
- [ ] In NHESP Habitat
- [ ] In NHESP Biomap
- [x] In Flood Zone
- [x] In Open Space

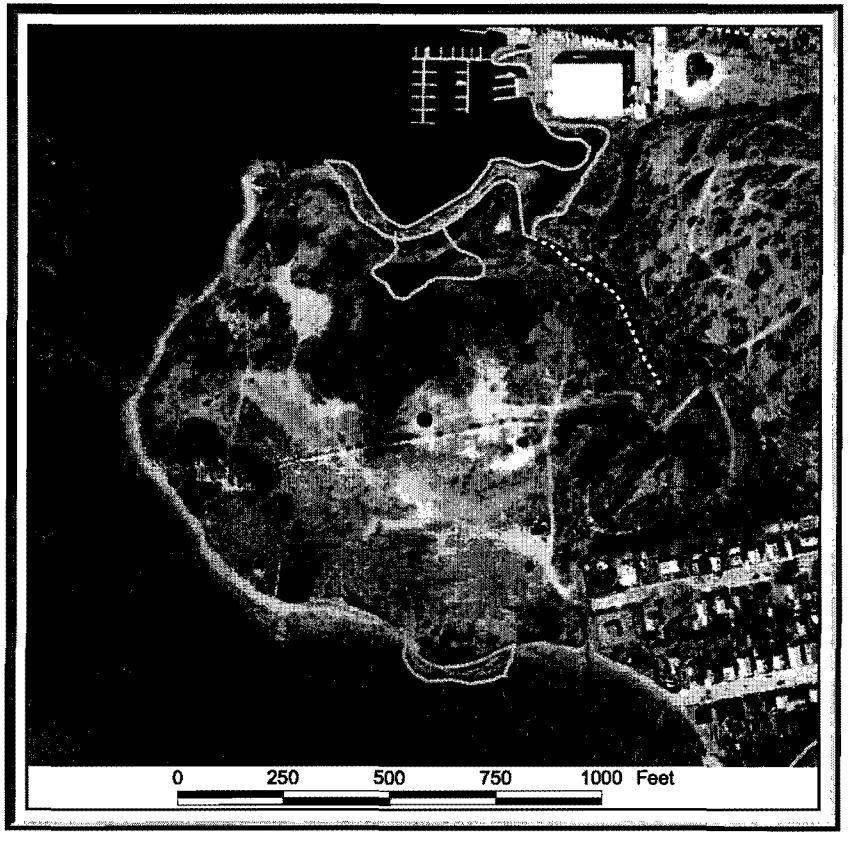
This is an extremely degraded site located west of the Riverside Cemetery and directly abutting New Bedford Harbor. Research to date indicates that a majority of the site is privately owned and leased for the operation of two radio towers located on the southern portion. The town of Fairhaven also owns part of the site. GIS analysis and site observation indicate that the majority of this site is historically filled salt marsh. The fill ranges 2-6 feet above marsh grade. A small (0.5 ac.) area of marsh that remains along the northern perimeter appears to be severely tidally restricted and is dominated by Phragmites. Restoration actions may include removal of fill material and re-establishment of wetland grade, soils, hydrology, and vegetation. Restoration of proper tidal flow to the existing northern marsh should also be considered. The New Bedford Harbor Trustees and the Fairhaven / Acushnet Land Trust are exploring the purchase of this site for restoration purposes.

USGS Site Location Map



N

Aerial Photo Site Image



Site	Priority Rank:	Town	Ownership:	Acres:	Wetland Type:
48	Medium	New Bedford	Public	2?	Tidal

Impact Type
- [x] Filled
- [ ] Drained
- [ ] Impounded
- [ ] Tidally Restricted
- [ ] Active Agriculture
- [ ] Channelized
- [ ] No Riparian Buffer
- [ ] Unknown

Site Attributes
- [ ] In NHESP Habitat
- [ ] In NHESP Biomap
- [x] In Flood Zone
- [ ] In Open Space

This city-owned site directly abuts New Bedford Harbor and is known as Riverside Park. It appears to be an old industrial site that contains a recently demolished brick building. GIS analysis and site observation indicate that a portion of the site is historically filled salt marsh. The eastern shoreline of the site is fenced off with contamination warning signs. Research indicates that the EPA is planning to dredge and replace existing contaminated wetlands along the shoreline where a narrow fringe of salt marsh remains. Restoration actions may include removal of fill material and re-establishment of wetland grade, soils, hydrology, and vegetation. Salt marsh restoration should be considered during preparation of redevelopment plans. The Trustee Council has allocated $2M to assist the city with upland park improvements and will work with city planners to explore wetland restoration options.

USGS Site Location Map

N

Aerial Photo Site Image

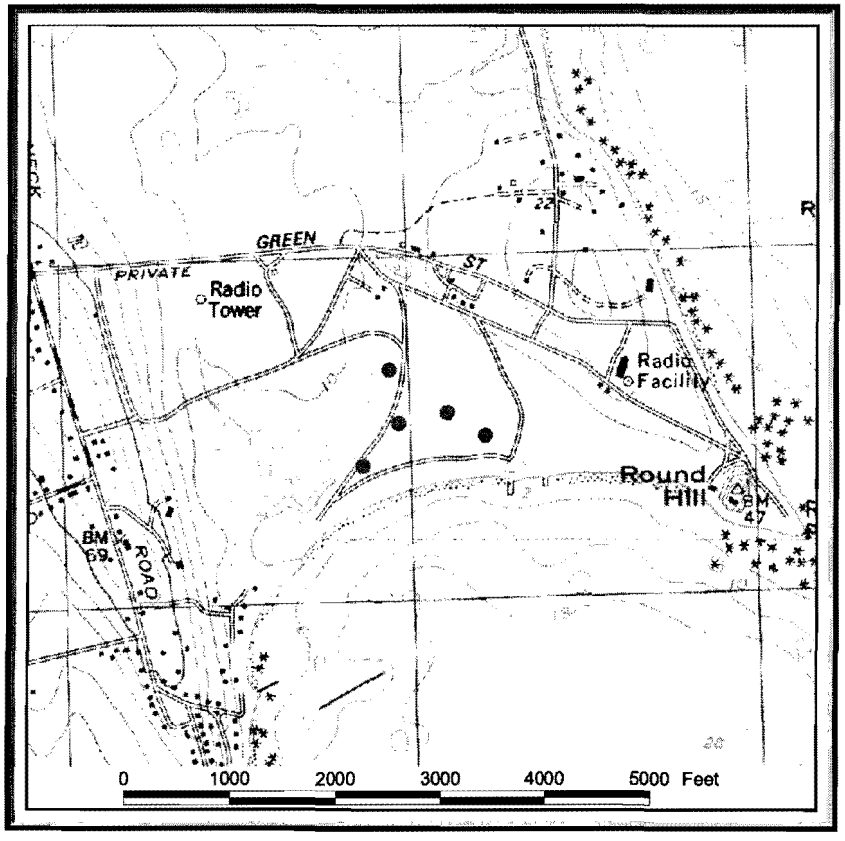
Site	Priority Rank:	Town	Ownership:	Acres:	Wetland Type:
159	High	Dartmouth	Public	10+	Tidal

Impact Type
- [x] Filled
- [ ] Drained
- [ ] Impounded
- [x] Tidally Restricted
- [ ] Active Agriculture
- [ ] Channelized
- [ ] No Riparian Buffer
- [ ] Unknown

Site Attributes
- [ ] In NHESP Habitat
- [ ] In NHESP Biomap
- [x] In Flood Zone
- [x] In Open Space

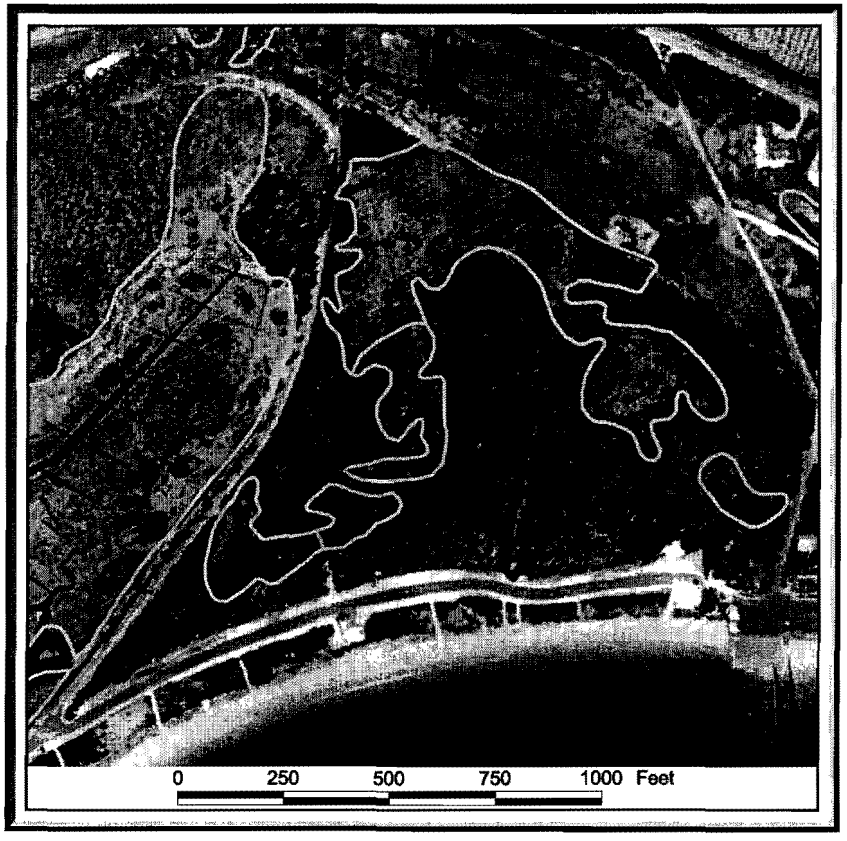
Site consists of a large, highly disturbed area that is part of the town-owned Round Hill Beach property. GIS analysis and site observation indicate that this area was historically a typical barrier beach-protected salt marsh system. Research to date suggests that back in the 1800s, the entire Round Hill peninsula was privately owned and extensively altered. It appears that the eastern half of the historic barrier beach and salt marsh system was filled in and cut off from tidal flow by construction of Ray Peck Drive (the public access road to the beach). An old wooden beam culvert is located beneath this road just before it intersects the beach parking lot, but it is unclear whether the culvert conveys any tidal flow to upgradient wetlands. Small areas of fragmented and degraded fresh marsh exist east of the road. Another potential salt marsh restoration area exists south of the sharp curve in the road, adjacent to the existing healthy salt marsh system. The majority of fill observed is 1-3 feet above wetland grade. Restoration actions may include removal of fill material and re-establishment of wetland grade, soils, hydrology, and vegetation, as well as placement of an appropriate culvert or bridge under Ray Peck Rd. to provide full tidal flushing to the restored salt marsh to the east. See Site Evaluation for further details.

USGS Site Location Map



N

Aerial Photo Site Image



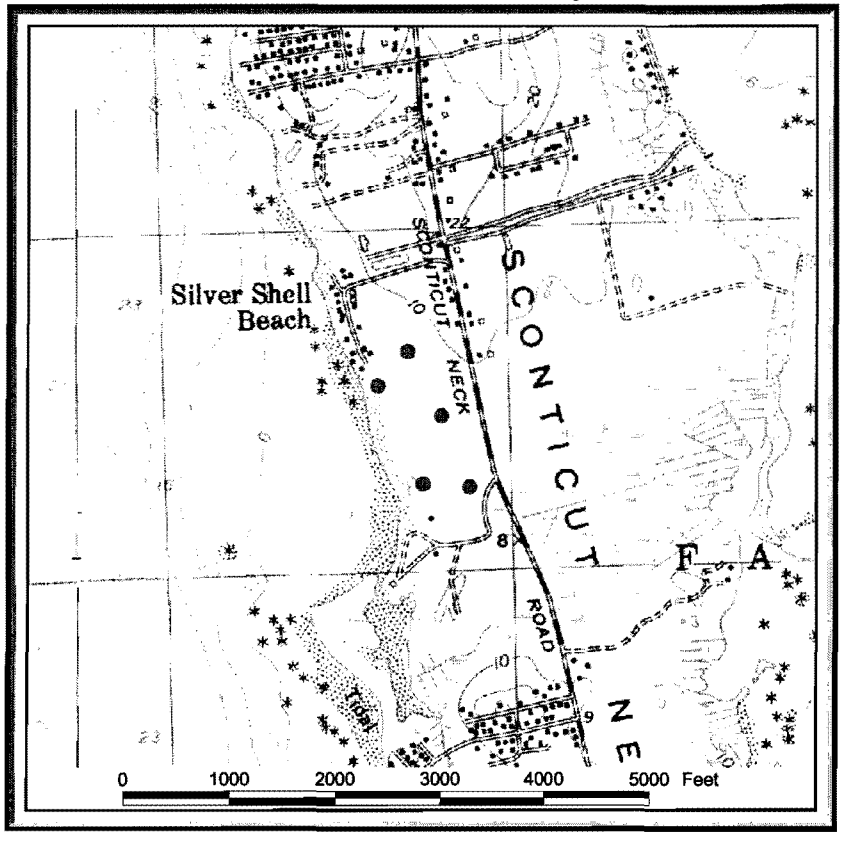
Site	Priority Rank:	Town	Ownership:	Acres:	Wetland Type:
169	High	Fairhaven	Private	~50	Tidal

Impact Type
- [ ] Filled
- [ ] Drained
- [ ] Impounded
- [x] Tidally Restricted
- [ ] Active Agriculture
- [ ] Channelized
- [ ] No Riparian Buffer
- [ ] Unknown

Site Attributes
- [ ] In NHESP Habitat
- [x] In NHESP Biomap
- [x] In Flood Zone
- [ ] In Open Space

Site consists of a tidally influenced wetland system on the western shore of Sconticut Neck. GIS analysis and site observation indicate that this system may be tidally restricted by the natural dynamics of its outlet to the ocean (located just south of the end of Silver Shell Beach Drive). During the site visit, a long-time resident stated that mosquito control officials sometimes maintain the tidal opening, but it is often clogged with sand and gravel, thus restricting tidal flow and impounding freshwater within the wetland. The wetland observed is dominated by Phragmites and had a large standing pool of water upstream of the outlet opening. It appeared that only the highest portion of the tide would flow into the wetland. This site should be further evaluated for restoration options which may include more frequent maintenance of the outlet, application of Open Marsh Water Management, and/or the installation of an outlet structure to ensure full and consistent tidal flushing.

USGS Site Location Map



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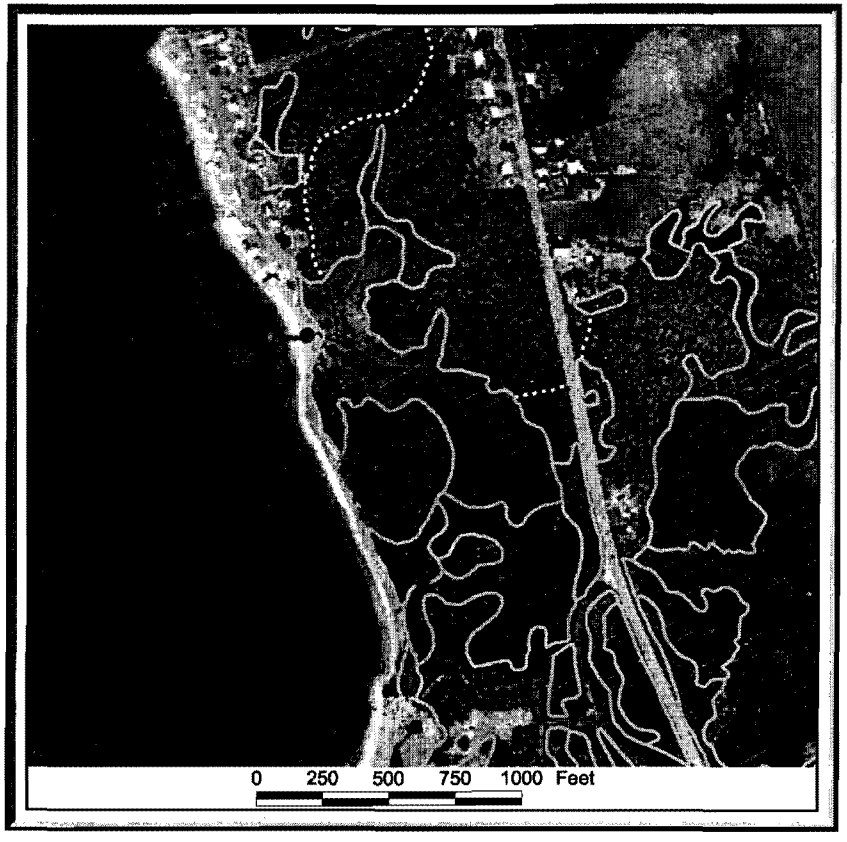
Aerial Photo Site Image



ROUND HILL BEACH / MEADOWS SHORE, DARTMOUTH, MASSACHUSETTS POTENTIAL WETLAND RESTORATION SITE #159

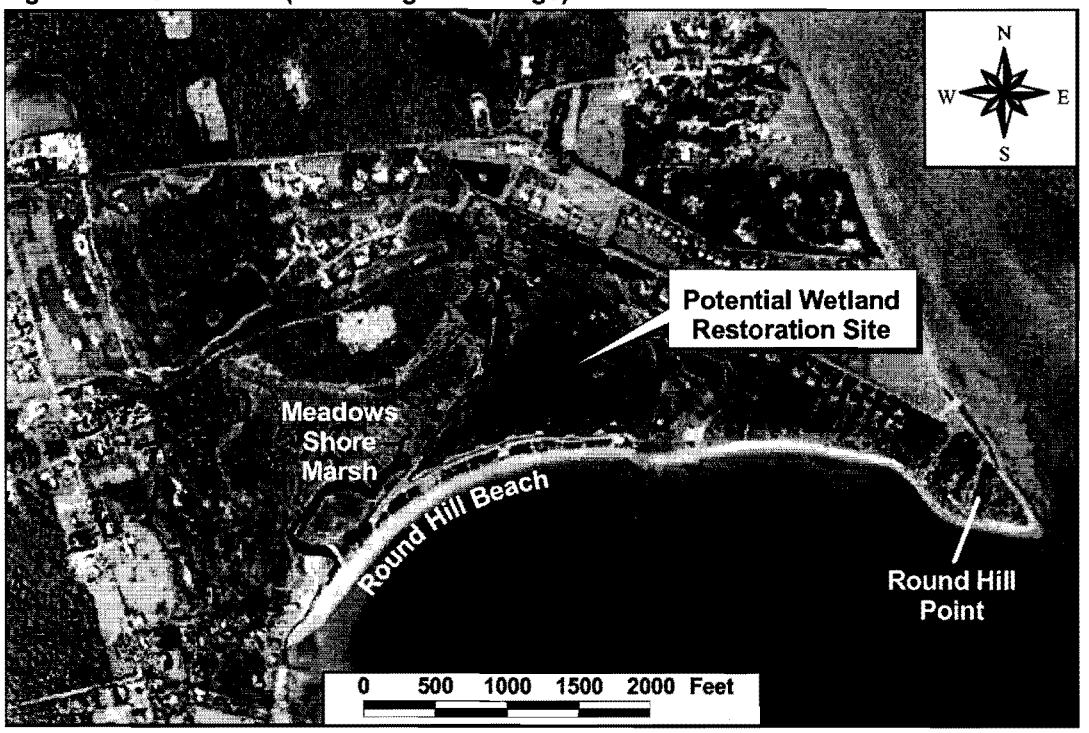
Overview

The Round Hill Beach / Meadows Shore potential wetland restoration site consists of a highly disturbed (former) coastal wetland system protected by a barrier beach along the southern shore of the town of Dartmouth, just west of Round Hill Point (Figure 1). The site is situated within a larger town-owned beach and park property and contains up to (or possibly more than) 24 acres of historically filled salt marsh. Historic documents, including an 1893 USGS map, confirm that the areas of forested upland and degraded freshwater wetlands east of Ray Peck Drive and north of Round Hill Beach were once coastal salt marsh associated with the barrier beach and dune system that is still present today. Research to date indicates that this entire wetland area was filled in during the early 1900s to create a private airport and runway system with associated buildings and infrastructure.

Table 1: General Site Information	
Town:	Dartmouth
Location:	North of Round Hill Beach, south of Round Hill Condominiums, and east of the Meadows Shore salt marsh
Ownership:	Town of Dartmouth
Contacts:	**Property**: Dartmouth Park Department **Restoration Activities**: Dartmouth Park Department and Conservation Commission **Local Environmental Groups**: Dartmouth Natural Resources Trust, Lloyd Center for Environmental Studies **Site History**: Round Hill Associates, Bristol County Mosquito Control

This site presents a superb - and quite rare – opportunity to restore a large area of contiguous, historically filled salt marsh and barrier beach coastal ecosystem that is publicly owned and remains vacant of permanent structures. Through the removal of fill material, re-creation of salt marsh plain, and excavation of historic tidal channels, this project could significantly enlarge this valuable tidal system and greatly enhance the many natural functions and values that it provides within the greater New Bedford Harbor environment. These functions and values include flood protection, pollutant attenuation, and coastal ecosystem fish and wildlife habitat. A restoration project at this site would also provide valuable stewardship and educational opportunities due to its highly visible public location.

Figure 1: Site Location (click image to enlarge)

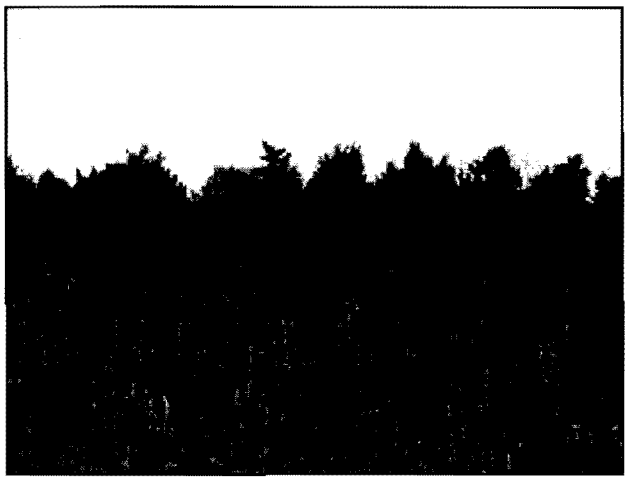


Site Description

The landscape surrounding this site is occupied by the Round Hill Condominiums and Round Hill Golf Course to the north and east, Round Hill Beach to the south, and Ray Peck Drive and Meadows Shore marsh to the west (Figure 1). Just west of the site, the existing Meadows Shore marsh appears to have been left largely untouched by historic human alterations (except for a filled area in the northeast corner) and is dominated by native salt marsh vegetation. The potential wetland restoration site includes all areas of historically filled salt marsh. It presently contains a mix of secondary successional upland vegetation surrounding areas of degraded seasonal freshwater wetlands. Sections below provide more information on the site's soils, hydrology, and vegetation.

Vegetation: The site's wooded upland areas consist of mid-successional species such as Eastern Red Cedar (*Juniperus virginiana)* that are quite uniform across the upland areas of the site. The freshwater wetlands located within the site are dominated by Purple Loosestrife (*Lythrum salicaria*, an invasive species), which is an indicator of degraded wetland conditions (Photograph 1).

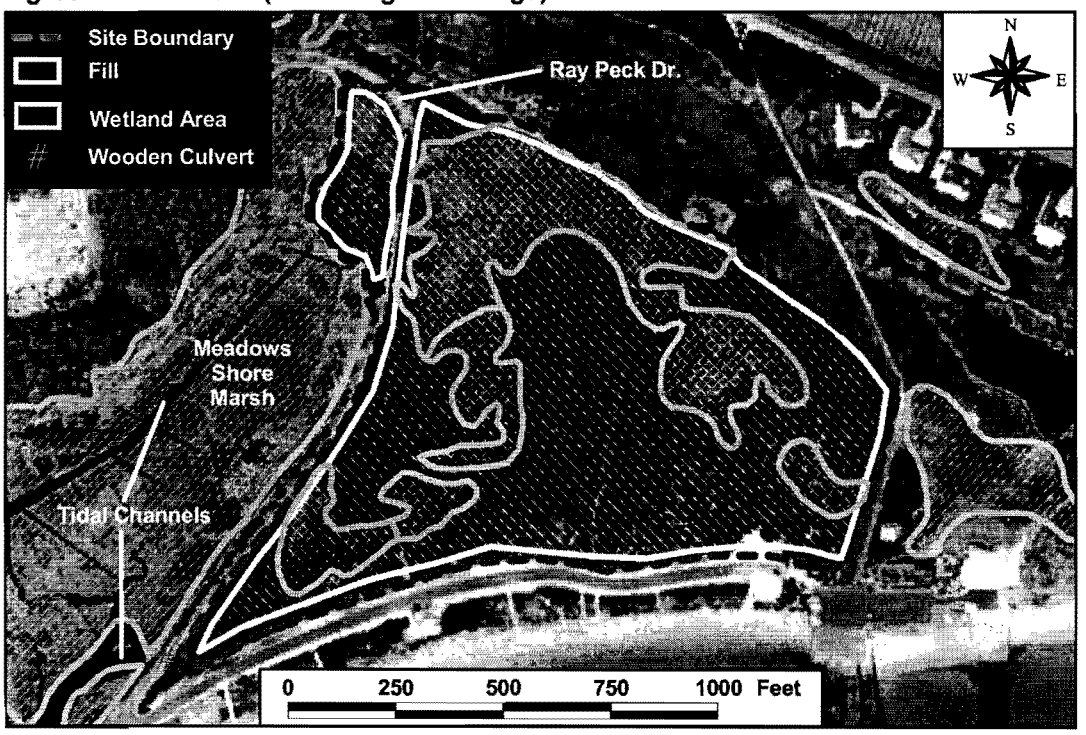
Photograph 1: View of degraded wetland area within site (foreground) - upland area shown in background



Soils: Soil samples (20 cm deep) taken from within the wetlands of this site revealed minimal development of organics with less than 1 cm of humus underlain by a sandy, mineral soil. Soil mottling indicated hydric conditions. Soils in the surrounding upland areas were extremely sandy and well drained.

Hydrology: The main tidal channel within the marsh west of the site terminates at an old wooden culvert (4 ft. by 8 ft.) beneath Ray Peck Drive. The culvert does not appear to convey tidal flow to the site (Figure 2, Photograph 2). Salinities within the tidal channel at Meadows Shore marsh were between 24 and 22 ppt. There was no standing water present in the wetland areas east of Ray Peck Drive during July 2002.

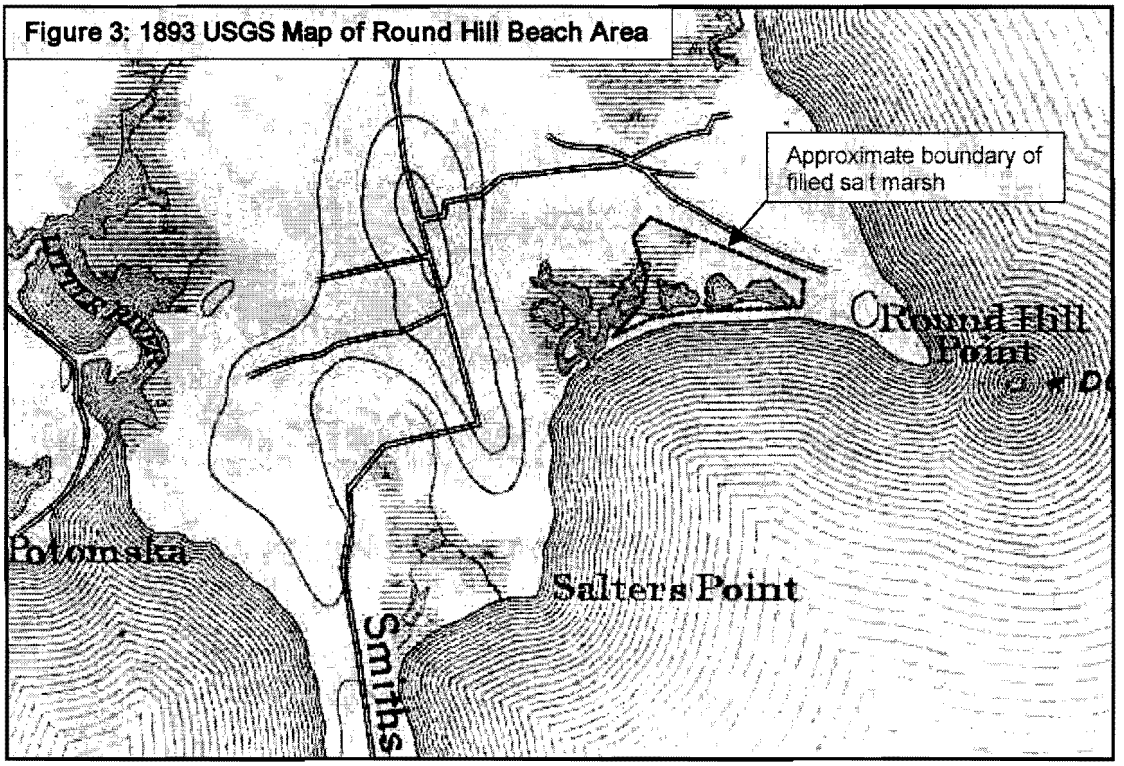
Figure 2: Site Details (click image to enlarge)



Sources of Degradation

Past human activity has significantly altered this historic coastal wetland site. Historic maps, including an 1893 USGS Topographic map (Figure 3) and a tracing of an 1856 Town of Dartmouth map, confirm that this site was coastal wetland prior to at least the late 1800's. A 1928 aerial photograph of this site, provided by the Lloyd Center for Environmental Studies (Dartmouth, MA), depicts this site "shortly after filling of the northern third of the marsh and dredging of the inlet". Under private ownership, farm facilities, dwellings, airplane and blimp hangers, an aviation school, runways, M.I.T research facilities, and a series of pumping stations and catch basins were constructed on this filled site between 1928 and 1937. Information obtained from the Bristol County Mosquito Control indicates mosquito control activities, including ditching, took place on this site as far back as 1959. Today, only remnants such as concrete foundations, catch basin structures, and the non-functioning wooden culvert beneath Ray Peck Drive remain, with approximately 4 to 8 ft. of fill material throughout the site.

Figure 3: 1893 USGS Map of Round Hill Beach Area



Photograph 2: View of wooden culvert at end of tidal creek in Meadows Shore marsh

Photograph 3: Remnant structure on upland fill.

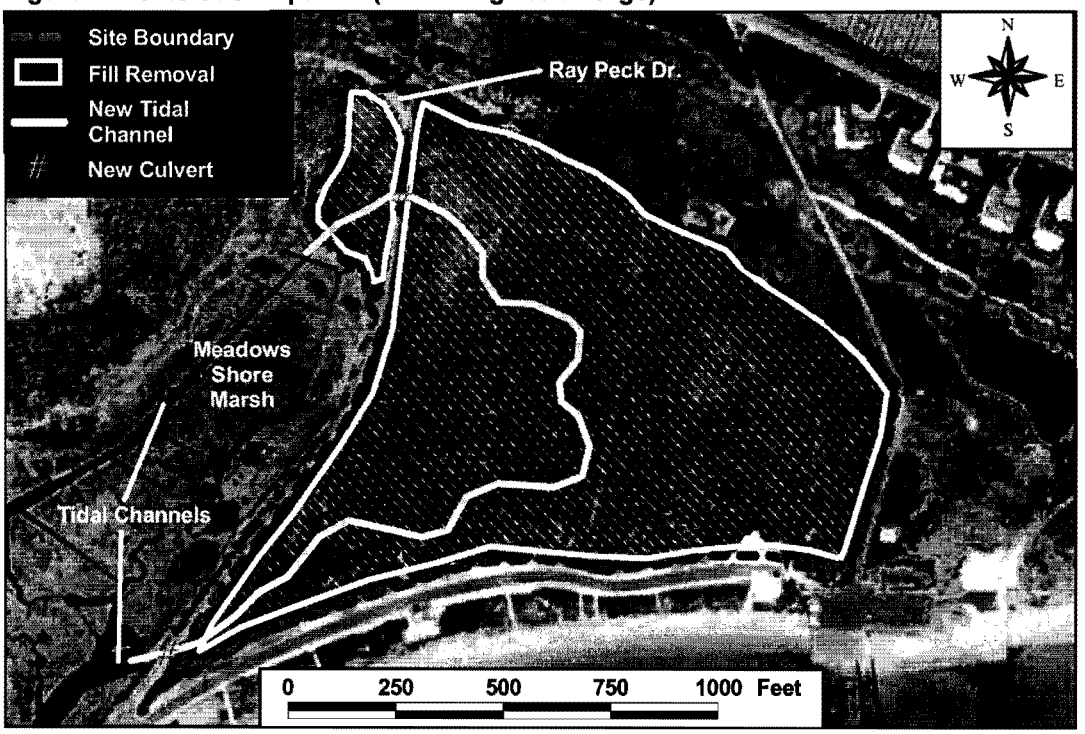
Restoration Recommendations

The main focus of this project will be the removal of significant amounts of fill material to restore coastal salt marsh. The access road (Ray Peck Drive) which separates the existing Meadows Shore marsh from this site must remain intact as it provides public access to the Round Hill Beach area. Therefore, a tidal connection at either the non-functioning wooden culvert or other location will need to be constructed to provide tidal flushing to restored wetland areas east of the road (Figure 4). Under current conditions, restoration of tidal flow alone would not restore salt marsh habitat because the elevation of fill and degraded wetlands east of Ray Peck Drive is much higher than the Meadows Shore marsh. Removal of fill material and re-grading to proper marsh elevations will be required. Possible restoration actions may include:

- Removal of all fill from historic wetlands east of Ray Peck Drive as well as the smaller filled wetland in the northeast corner of Meadows Shore marsh; and re-grading to proper salt marsh elevation
- Re-location and piling of a portion of the fill within the site to create a habitat island (an option that would reduce the costs of off-site hauling and disposal)
- Replacement of the old wooden culvert beneath Ray Peck Drive to restore full tidal flushing to newly restored salt marsh
- Installation of a second culvert further north beneath Ray Peck Drive to improve flushing of newly restored salt marsh and northern reaches of the Meadows Shore salt marsh
- Excavation of tidal channels to aid in tidal flushing and create coastal open-water habitat associated with the newly restored salt marsh
- Re-planting of newly created marsh plain to aid in marsh establishment

The image below depicts the location and extent of features discussed in the various restoration alternatives. MWRP would be happy to discuss these alternatives in greater detail with those who are interested in this potential restoration site.

Figure 4: Restoration Options (click image to enlarge)



Anticipated Permits / Regulatory Issues

A number of permits and regulatory reviews are anticipated for this project (Table 3). Additional permits and review may be required depending on the source of funding and final scope of work. This site is not under a Wetlands Restriction Order, Conservation Restriction Order, and is not located within an Area of Critical Environmental Concern. Therefore, this project would not require the associated additional regulatory review.

Table 3: Description Of Anticipated Permits and Regulatory Review

REGULATION:	POTENTIAL THRESHOLD:	ACTION:	PERMIT:
Wetlands Protection Act, MGL c.131, s.40 and 310 CMR 10.00 & local by-laws	Any project that will dredge, fill, alter, or remove any wetland resource area	File a Notice of Intent (NOI) with Cons. Commission and DEP	Order of Conditions
Federal Clean Water Act, Section 404	All projects involving discharge of fill or dredged materials to the Waters of the US, including wetlands	File for a federal permit from the US Army Corps of Engineers	Programmatic General Permit for Massachusetts
Massachusetts 401 Water Quality Certification Program, MGL c. 21, ss 26-53, and 314 CMR 9.00	Discharge of dredged or fill material, dredging and dredged material disposal activities in waters of the US within the Commonwealth which require federal licenses or permits.	File for 401 Water Quality Certification with the MA DEP	MA DEP 401 Water Quality Certificate
Massachusetts Environmental Policy Act, MGL Ch. 30, ss. 61-61H and 310 CMR 11.00	Alteration of 5,000 sq. ft. or more of bordering or isolated vegetated wetlands	File an Environmental Notification Form (ENF), an EIR may be required for wetland conversion	Massachusetts Environmental Policy Act Certificate
Chapter 91, Waterfront Protection Act, MGL c. 91	The placement of fill or structures (such as culverts), or the alteration of existing licensed structures in flowed or filled tidelands	File for a license to place a structure, in this case a culvert, in the tidal channel	DEP Waterways Program Chapter 91 Liscense
Coastal Zone Consistency Review	Any coastal project that requires a federal license, is implemented by a federal agency, or gets federal funding	File an application with the Massachusetts Coastal Zone Management Office	CZM Consistency Statement

Cost Estimates

Project costs will vary depending on the restoration options chosen. Removal of one-half of the fill, wetland plantings, installation of one culvert, and creation of a tidal channel is estimated to cost approximately **$3,063,000**. Removal of all fill areas, wetland plantings, installation of two culverts, and creation of a tidal channel is estimated to cost approximately **$6,086,000**. Note that these estimates assume that hazardous materials will not be encountered. *Costs estimated using RS Means, *Site Work & Landscape Cost Data*, 2002.

Planning & Permitting:
Topographic Survey w/ major features and vegetation zones @ $2,675.00* / acre x 24 acres = $64,200.00
Permitting, including permit applications and permit plans is estimated @ $40,000.00
Total: $104,200.00

Construction:
Excavation @ $4.44*/cu yd, Hauling @ $9.90*/cu. yd., and Dewatering @ $9.65 /cu. yd. = $23.99 / cu. yd.

24 ac. fill @ 232,318 cu. yds = $5,573,308.82
Plantings + labor @ $0.75/pot (18in. grid) x 24 ac. = 459,976 plants = $344,982.00

Excavation of Tidal Channel @ 2000 cu. yds. = $47,980.00
Pre-cast 4 ft. by 8 ft. Concrete Culvert @ $200.00 / linear ft. x 40 ft. x 2 culverts = $16,000.00

Other Information

- An historic map depicting 1937 engineering plans for Edward H. R. Green's estate is available through the M. I. T. archives
- Additional historic information may be available through Bristol County Mosquito Control and the Round Hill Associates
- This site is near listed Priority / Estimated Habitat for the Piping Plover (*Charadrius melodus*), a threatened species listed by the MA Natural Heritage and Endangered Species Program; it is also listed as a threatened species under the Federal Endangered Species Act.