Sevenson
Environmental
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US ARMY CORPS OF ENGINEERS
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2013 DREDGE SEASON DATA SUBMITTAL NEW BEDFORD HARBOR SUPERFUND SITE

December 2014

Prepared by
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ACRONYMS AND ABBREVIATIONS

CRE	CR Environmental, Inc.
CSO	combined sewer overflow
Cu	copper
cy	cubic yard
DDA	debris disposal area
DSR	Data Summary Report
EPA	U.S. Environmental Protection Agency
Fathom	Fathom Research, LLC.
ft	foot/feet
GAC	granulated activated carbon
GISP	geographic information systems professional
GPS	Global Positioning System
HDPE	High Density Polyethylene
Jacobs	Jacobs Engineering Group, Inc.
MU	management unit
NAE	U.S. Army Corps of Engineers - New England District
NBH	New Bedford Harbor Superfund Site
PCB	polychlorinated biphenyl
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SES	Sevenson Environmental Services, Inc.
T&D	transportation and disposal
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxic Substances Control Act
WWTP	Wastewater Treatment Plant
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EXECUTIVE SUMMARY

August 30, 2013 marked the successful completion of the tenth season of full-scale remedial dredging at the New Bedford Harbor Superfund Site (NBH). As in previous dredge seasons, the Jacobs Engineering Group, Inc. (Jacobs) and Sevenson Environmental Services, Inc. (SES) team performed the cleanup work under contract to the U.S. Army Corps of Engineers – New England District with direction provided by the U.S. Environmental Protection Agency (EPA) in NBH's Upper Harbor.

During the design phase of the NBH project an archaeological survey was conducted to identify any submerged cultural resources. This survey, conducted in the late 1990's and early 2000's utilized modern survey equipment at the time. Following the 2009 discovery of a shipwreck in an active dredge area it was decided by EPA that a supplemental survey be performed in 2011 and 2012 using more advanced remote sensing technology than had been previously available during the initial survey. The supplemental surveys and associated follow-up investigations revealed no submerged cultural resources in the areas designated as 2013 dredge areas.

Utilizing hydraulic dredging, the Jacobs/SES team dredged a total of 18,995 cubic yards of polychlorinated biphenyl (PCB) - contaminated sediment from the upper harbor portion of the NBH site, as determined by bathymetry. The dredged sediment (slurry) contains gravel, sand, silt, clay and harbor water. Based on production data, it is estimated that the slurry contained approximately 15,006 tons of damp solids.

Consistent with past hydraulic dredging efforts at NBH, sediment was hydraulically dredged from the upper harbor and pumped to the Sawyer Street Desanding Facility, Area C. Desanding operations removed 1,849 tons of material (primarily gravel and sand) from the dredge slurry. All sand generated during 2013 was disposed of in a licensed and approved TSCA landfill. The desanded dredge slurry was pumped from Area C to the Area D Dewatering Facility located on the shore of the lower harbor portion of NBH. From the transferred slurry, dewatering operations removed the contaminated sediment from the dredge slurry at Area D. Thirteen thousand one hundred fifty eight (13,158) tons of contaminated filter cake was produced in 2013 at Area D and disposed of in an approved TSCA landfill.

The water removed from the dredge slurry at Area D was treated to meet Record of Decision (ROD) discharge goals (Table 8 of the ROD, Action Specific Applicable or Relevant and Appropriate Requirements) and Massachusetts Class SB water standards prior to discharge back into the harbor. Routine periodic testing confirmed that the waste water treatment plant was functioning as intended. During the course of 2013 dredge operations, 22,273,000 gallons of water were treated and discharged to the harbor.

Jacobs continued to perform ambient air monitoring for PCBs similar to previous seasons. Analytical results and modeling efforts demonstrated that the NBH remedial dredging program is not causing ambient PCB levels to exceed established thresholds.

Jacobs estimates that 1.3 tons of PCBs were removed and disposed of with the contaminated dredged materials during the 2013 season. Remedial dredging by the Jacobs/SES team at NBH has removed an estimated 54.0 tons of PCBs since 2004.

In addition to remedial dredging at NBH, Jacobs conducted routine facility maintenance at both Areas C and D and performed a variety of non-dredging but complimentary tasks.

1.0 INTRODUCTION

The purpose of this *2013 Data Summary Report* (2013 DSR) is to summarize key activities associated with the remediation of the New Bedford Harbor Superfund Site (NBH) during the 2013 field season. After Action Reports were generated for the 2004 (Jacobs 2005) and 2005 (Jacobs 2006) seasons to fully document the respective dredge seasons. From 2006 to 2010 the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers - New England District (NAE) had requested that a scaled back data summary report be prepared annually to document field activities. In 2011, 2012 and 2013, EPA and NAE requested that the annual document contain more detailed text information specific to the corresponding field season. This 2013 DSR documents dredging and associated programmatic activities.

Activities performed by the Jacobs Engineering Group, Inc. (Jacobs)/Sevenson Environmental Services, Inc. (SES) team during the 2013 field season are documented in Section 2.0 as the 2013 Scope of Work Performed. Section 2.0 is further broken down into the following six sub-sections:

- Project Planning (Section 2.1)
- Mobilization (Section 2.2)
- Project Execution (Section 2.3)
- Air Monitoring (Section 2.4)
- Demobilization (Section 2.5)
- Post-Dredge Activities (Section 2.6)

Section 3.0 presents a discussion on mass balance calculations derived from 2013 production data. The mass balance calculations provide a measure of process inputs, process outputs, as well as intermediate processes.

Section 4.0, Lessons Learned, presents observations on methods to improve production, safety or quality. Improvements presented in Section 4.0 were either implemented in 2013 or may be utilized when applicable on the project in the future.

Section 5.0 briefly describes work performed at NBH by the Jacobs/SES team related to the remediation efforts that were non-dredging in scope. Examples of work included in Section 5.0 are maintenance of institutional controls and improvements to existing facilities.

Section 6.0 provides a tabulated chronology of events at NBH during 2013.

Section 7.0 provides a list of reference documents used in the preparation of this DSR.

1.1 PROJECT BACKGROUND

The 1998 *Record of Decision for the Upper and Lower Harbor Operable Unit New Bedford Harbor Superfund Site, New Bedford, Massachusetts* (ROD) (EPA 1998) delineates the NBH site into three geographical areas based on physical features as well as contaminant concentration gradients. Figure A-1 illustrates this delineation showing NBH divided into the upper harbor, lower harbor and outer harbor. The upper harbor starts in the northern reaches of the Acushnet River, north of the Wood Street Bridge and extends south to the Interstate 195 Bridge. The lower harbor begins at the Interstate 195 Bridge to the north and continues south to the New Bedford hurricane barrier. The outer harbor begins at the hurricane barrier and encompasses the area bound on the south by an imaginary line drawn from Rock Point in Fairhaven southwesterly to Buoy C3, continuing westerly to Mishaum Point in Dartmouth. Buoy C3 is a United States Coast Guard navigational buoy used to mark the approach to the New Bedford Harbor Channel. Figure A-2 identifies areas requiring dredging to remove polychlorinated biphenyl (PCB) - contaminated sediment as identified in the 1998 ROD.

Since the initiation of full scale dredging activities by the Jacobs/SES team in 2004, remediation efforts have focused on the Upper Harbor. Figure A-3 shows areas dredged by the Jacobs/SES team since 2004 as well as earlier cleanup efforts by others. The apparent patchwork of dredge areas is by design. Dredge areas were designed by considering geographical features, material types, tidal conditions, contaminant mass, dredge technology and future use requirements. An important consideration in designing a dredge area is contaminant mass with the intention to remove the most contaminated sediment first (mass removal). The majority of cleanup efforts by the Jacobs/SES team have utilized mass removal hydraulic dredging as the preferred method. A limited amount of mechanical dredging has been conducted at NBH in relatively small dredge areas. Mechanical dredging is selected typically due to material type such as contaminated gravel or cobbles where hydraulic dredging would be inefficient or ineffective. There were no mechanical dredging activities conducted during 2013.

Since 2004 all materials hydraulically dredged or debris removed at NBH have been temporarily stored onsite in Cell #1 or disposed of at approved, off-site landfills following gravity dewatering of removed sand, oversize and debris or filter press dewatering of desanded sediment slurry. All of the water recovered during the dewatering process has been treated to the project effluent water quality criteria as described in the ROD and discharged back to the harbor.

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2.0 2013 SCOPE OF WORK PERFORMED

2.1 PROJECT PLANNING

2.1.1 Pre-Dredge Archaeology

In 1999 a marine archaeological survey was conducted in the upper harbor by John Milner & Associates, Inc. and Dolan Research, Inc. (Dolan 2000). Most of the upper harbor was surveyed with a side scan sonar, sub-bottom profiler and magnetometer. Due to the technology available at the time and limited water depth, some areas of the upper harbor were only able to be surveyed with a magnetometer while others were not surveyed at all.

Following the unanticipated 2009 discovery of shipwreck remains during debris removal operations in an active dredge area, it was decided that a supplemental marine archaeological survey would be conducted in areas anticipated to be dredged in 2011. The survey was conducted utilizing a side scan sonar, magnetometer and sub-bottom profiler by CR Environmental, Inc. (CRE) and Fathom Research, LLC. (Fathom). Prior to the initiation of 2012 mobilization activities, EPA and NAE requested that a survey similar in scope to the 2011 survey be conducted in areas anticipated to be dredged in that year's field season. The areas surveyed prior to the 2012 dredge season were over a much larger area that what was actually dredged in 2012. Because of this, no additional pre-dredge archaeology was required prior to the initiation of 2013 activities; sufficient surveyed area remained to be dredged.

Detailed information on the 2012 archaeological survey work is available in the document *Technical Memorandum Supplemental Marine Archaeological Investigations New Bedford Harbor Superfund Site Dredge Area P and Dredge Area H* (Fathom, 2013).

2.1.2 Dredge Plan Development

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2.1.3 Minimization of Dredge Related Impacts to Wildlife

The Jacobs document *Final 2013 Fish Migration Impact Plan, New Bedford Harbor Remedial Action* (Jacobs 2013b) is updated annually with the cooperation of the Massachusetts Division of Marine Fisheries and NAE. This document, referred to as the Fish Plan, considers the effects that dredging related activities could have on both the migratory fish that use NBH as a pathway to their spawning grounds in the Acushnet River as well as resident fish. The Fish Plan details the planned pipeline routes and dredge area logistics. The plan also describes the preventative measures that the Jacobs/SES team would undertake during the season to minimize or eliminate dredging related negative impacts to the fish. The Fish Plan also provides a communication matrix if negative impacts are observed. There were no instances of documented dredging related negative impacts to resident or migratory fish populations during the 2013 season at NBH.

2.2 MOBILIZATION

Full-scale mobilization activities for the 2013 season commenced on May 30, 2013 and continued until June 28, 2013. Major tasks performed during mobilization included:

- re-assembling dredge pipelines;
- setup of booster pump station;
- replacement of all press cloths in filter presses;
- service and calibration of on-site truck scales;
- setup of dredge area sheet piles and cables;
- inspection and repair if necessary of facilities and equipment;

- deployment of oil boom around dredge areas;
- launching and installation of dredges in two dredge areas;
- setup, calibration and testing of health and safety monitoring equipment;
- system test; and
- re-energizing and testing of major electrical systems and motors by electrician.

Figure A-4 illustrates the pipeline, dredge areas, booster pump station and ferric sulfate injection system as it was setup for 2013.

The final portion of mobilization is the shakedown period. Shakedown involves filling the treatment system with water, pressure testing all pipelines and valves, and operating the system until three press drops of filter cake are produced. Shakedown was completed on June 28, 2013.

2.3 PROJECT EXECUTION

Following a successful shakedown period, full scale dredging was initiated on July 1, 2013. In previous seasons debris removal crews began operations on the same day hydraulic dredging was initiated. The 2013 mobilization schedule allowed debris removal to begin on June 26, 2013, before the initiation of hydraulic dredging.

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Debris removal crews worked systematically removing obstructions to dredging while hydraulic dredging commenced in areas previously cleared of debris. Of the two hydraulic dredges deployed in 2013, only one dredge was operated at any one time. The physical removal of contaminated sediment from the harbor begins when the cutter head for an operating dredge is lowered into the sediment. As the spinning auger breaks up the sediment, the material is mixed with harbor water to create a slurry. The dredge pump then moves the slurry from the dredge to the shore based booster pump station through a flexible floating pipeline. The booster pump station is required to offset hydraulic head losses caused by the relatively long pipeline run to the Desanding Building.

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From the booster pump station, the slurry is pumped to the Area C Desanding Facility. At the Desanding Facility, hydrocyclones and vibratory inclined screens remove sand, gravel and other relatively coarse materials from the slurry. This removed material is allowed to gravity drain, chemically and physically tested as required (Tables B-1 and B-2), and stockpiled according to the Toxic Substances Control Act (TSCA) classification at Area C to await disposal. Once a sufficient quantity of material has been stockpiled at Area C, trucks are loaded and weighed on-site, and the material is transported to the appropriate contracted landfill.

The remaining dredge slurry, a mixture of water and contaminated silt and clay, is pumped from Area C to the Area D Dewatering Facility via pipeline. At Area D the slurry is pumped directly into a set of mix tanks, which keep the solids in the slurry suspended. Feed pumps attached to the mix tanks transfer the slurry to a bank of filter presses. Polymer is added to the slurry during the transfer process to enhance the dewatering efficiency of the filter presses. The filter presses remove the majority of the water in the dredge slurry with smaller amounts being entrained in sand, gravel and filter cake. The water removed by the filter presses is pumped through an on-site waste water treatment plant where it is treated and then discharged back into the harbor. The filter cake is chemically and physically tested as required (Tables B-2, B-3, and B-4) and stockpiled to await disposal. Filter cake generated at Area D is loaded and weighed on-site, then transported off-site for disposal in a licensed and approved TSCA landfill.

2.3.1 Debris Removal Activities

Prior to hydraulic dredging, dredge areas are typically cleared of debris. This process involves systematically raking sediment, removing debris, and repositioning the debris removal equipment until the entire dredge area has been covered. Debris removal was conducted by a Komatsu® PC-220 excavator fitted with an Add-A-Stick® boom extension and a hydraulic rake attachment. The excavator was mounted on a 40-ft by 40-ft barge equipped with spuds to maintain position. To contain debris recovered during activities, 40-ft by 20-ft scows were used. The scows were brought to the Area C dock for unloading as needed. Following the unloading process, the size of debris was reduced if necessary and then stockpiled for disposal.

Debris removal activities began on June 26, 2013. During the 2013 season debris removal activities were constrained to Area P as debris removal in Area L was completed in a previous season. It was noted in 2012 that disturbance of the sediment in some portions of Area P produced a light to moderate sheen; anecdotally it appeared that the sediments producing the sheen were generally located in areas requiring thicker dredge cuts and or were closer to the Manomet Street CSO outlet. To determine the nature of the sheen and assess any potential exposure issues, a sediment core was collected July 12, 2013 from ZBlock PI9 (Figure A-5), this core indicated that the sediment contained 13,000 parts per million of C9-C36 petroleum hydrocarbons (C9-C36 refers to the range of the number of carbon atoms in the quantified hydrocarbons). This location was selected to collect the core based on worker observations of the areas that appeared to produce the most significant sheen. The majority of debris removal activities were conducted in the western half of Dredge Area P. By moderating the pace of work in this area, regularly maintaining the boom, and monitoring the site conditions, any oil sheen developed during work was effectively controlled and captured. Meters deployed daily on the dredge and debris removal barges continuously monitored the breathing air, no issues were noted regarding volatile organic compounds during the 2013 season.

On July 30, 2013 two pieces of a small heavily corroded ships anchor was recovered during debris removal activities along the southern border of Area P. The anchor was inspected and photographed by the project’s on-call archaeologist on August 6, 2013. The archaeologist upon reviewing remote sensing data from the survey discussed in Section 2.1.1 recommended no additional restrictions on dredging in the recovery area. Following submittal and review of the archaeologist’s findings to NAE, Jacobs was directed to resume dredge activities in the recovery area on August 14, 2013.

2.3.2 Hydraulic Dredging

The 2013 hydraulic dredging operations were conducted utilizing similar means and methods as previous seasons. During mobilization, sheet piles were installed along the perimeter of each area to be dredged. Sheet piles installed at the two edges of a dredge area perpendicular to the direction of dredge travel had a cable strung between the sheets, typically 1 to 2 ft above high tide, providing anchoring points for the dredge traverse cable. The dredge traverse cable, attached to two opposing sides of a dredge area, is utilized for dredge propulsion. The traverse cable is run through a set of pulleys and a winch on the dredge. This allows the dredge operator to pull the dredge back and forth over the length of the cable. Lateral movement of the dredge is accomplished by relocating the ends of the traverse cable. The actual dredging is performed by the dredge cutter head, an 8-ft long horizontal auger partially encased in a shroud on the end of a hydraulically articulated boom. The boom is lowered and raised to control the depth of the cutter head and, hence, the dredge cut. The auger, in conjunction with an on-board pump, breaks up the sediment, mixes it with harbor water to form a slurry, and moves the material from the harbor bottom into the floating dredge pipeline, towards the booster pump station. The booster pumps provide additional hydraulic head to move the dredge slurry to the desanding facility.

Hydraulic dredging operations commenced on July 1, 2013. An Ellicot Mudcat MC2000 dredge was initially installed in Dredge Areas L and a second similar dredge was installed in Dredge Area P. Throughout the 2013 season, hydraulic dredging efforts focused on the west side of Area P and the east side of Area L.

Area L (Figure A-6) dredging in 2012 focused on the east side. Sediment core samples have shown the east side to be relatively sandy with most required dredge cuts relatively thin. Given the availability of more contaminated material and thicker dredge cuts in Area P, dredge activities in Area L were secondary to P; this strategy fits with mass removal goals currently being employed at NBH. Dredging was typically performed in Area L during 2013 when a less oily material was desired to improve dewatering efficiency (see Section 3.3) or when maintenance or dredge area reconfiguration was required in Area P. Dredging in Area L was initiated on July 9, 2013 and completed on August 8, 2013.

Dredging in Area P (Figure A-5) was initiated on July 1, 2013, the first day of the dredge season, and continued until the end of the dredge season on August 30, 2013. Due to the thickness of material to be dredged in Area P much of the dredging was accomplished in two or three passes as opposed to the normal single pass. The method, described in the *2013 Dredge Work Plan Addendum No. 9* (Jacobs 2013a) removes a foot to a foot and a half typically per pass, the dredge is then relocated 6 ft laterally and dredging continued. This first pass was continued over the majority of the West side of Area P with some Z blocks (requiring < 2 foot cuts) being dredged to grade. Following the completion of the first pass the dredge was repositioned and a second pass was performed removing up to a foot and half from Z blocks not yet to grade, with some of the thickest cut areas requiring a third pass. This method, while more time consuming is more effective at reducing the amount of residual contamination following mass removal dredging. The reason for this methods relative effectiveness is a reduction in sloughing. Sloughing in this context refers to (contaminated) material from an undredged area adjacent to a fresh dredge cut sliding into a fresh dredge cut as it seeks a more stable angle of repose. Figure A-7 illustrates how Dredge Area P was dredged in 2013 with respect to the number of passes used to get to grade. Both Dredge Areas L and P have material remaining to dredge. It is anticipated that 2014 dredge activities will continue where 2013 activities completed.

Dredge progress tracking was performed and reported in a manner similar to previous years. An auto logging global positioning system (GPS) was deployed daily on the active dredge, as crews moved between dredges throughout the day the GPS was relocated accordingly. At the end of the day the GPS data was downloaded for use in producing the daily tracking figure(s). In addition to the GPS tracking data, the SES dredge engineer recorded operational information on daily dredge sheets. This information includes areas dredged, cut depths and any difficulties encountered. The Jacobs geographic information systems professional (GISP) utilizes the GPS data and dredge engineer's sheets to produce a daily dredge figure illustrating dredge progress and an estimated in-situ amount dredged. The final 2013 daily dredge figures are presented as Figures A-7 and A-8. These figures serve a variety of purposes; the figures document previous dredge activities, the placement of sheet piles, alignment of dredge travel, and simplify the tracking of multiple dredge passes. The GISP translates GPS positions collected throughout the day into the horizontal coverage of the 8-ft wide dredge cutter head, the figures are essentially a collection of 8-ft wide dredge cutter head tracks. Periodically, a progress bathymetric survey was conducted in the active dredge areas to assess in-situ volume dredged, compliance with the dredge plan and completeness of coverage. The progress surveys are typically conducted on Saturdays to avoid impacting dredging operations. Typically, progress surveys are conducted bi-weekly. Experience at NBH has shown that one full day is normally required to survey an area which has been dredged over the course of two weeks. Regular surveys allow for the detection and correction of dredging related issues before progress has required significant changes to the dredge area configuration (i.e. relocating sheet piles, reconfiguring cables, pipeline rerouting). Progress bathymetric surveys were conducted July 13, July 27, August 10, and August 24, 2013.

2.3.3 Desanding Operations

2013 Desanding operations were conducted similarly to previous seasons.

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The pipeline discharges the slurry onto an inclined, vibratory coarse shaker screen where solids larger than ¼ inch are removed. The removed material is referred to as "oversize" and is dropped from the shaker onto an asphalt pad for stockpiling and draining. The remaining slurry is pumped through a hydrocyclone and an inclined, vibratory fine shaker screen. The fine screen removes solids larger than 200 mesh, primarily sand. The sand, like the oversize, is stockpiled to drain on the asphalt pad within the desanding building, where the accumulated water is pumped back into the shaker v-bottom tank for transfer to the dewatering plant. The remaining desanded slurry is retained in an agitated mix tank and is transferred to the dewatering facility via a pump once a sufficient slurry volume has accumulated in the tank.

In preparation for disposal, the materials generated in the desanding process are characterized. All oversize material is assumed to be TSCA, based on historical analytical results. Once approximately 100 tons (estimated by stockpile size) of sand has accumulated in a stockpile, it is sampled and chemically analyzed for disposal purposes (PCB Aroclors, metals, oil and grease, and reactive cyanide). Every other time a sand sample is collected for chemical analysis a portion of the sample is submitted for grain size analysis. The grain size test gives an indication of the performance of the desanding operation. At NBH the sand is segregated in the Debris Disposal Area (DDA) by PCB TSCA determination. A stockpile of sand will be segregated for TSCA disposal if a sand sample contains PCBs at a concentration close to or exceeding the TSCA determination limit (i.e., 50 parts per million [ppm] total PCB Aroclors) or if the sand sample contains a metals concentration that is near or above the relevant Resource Conservation and Recovery Act (RCRA) concentration level, as determined by the "20x Rule"[1]. In general, sand sample analyses have not shown RCRA characteristics for oil and grease or cyanide. The TSCA sand pile is mixed with the oversize material and stockpiled in the TSCA pile in the DDA for disposal at a licensed solid waste landfill suitable for disposal of PCB-contaminated solid wastes. If the sand sample is non-TSCA (< 50 ppm) and passes the RCRA 20x Rule criteria for metals, and does not show toxic characteristics for oil and grease and cyanide, it is stockpiled in the non-TSCA pile in the DDA for potential disposal at a RCRA Subtitle D landfill (non-hazardous). In the final weeks of the season, transportation and disposal (T&D) operations were commenced for the material generated at Area C. None of the sand generated in 2013 was characterized as non-TSCA-non-Hazardous because either the PCB concentrations were >50 ppm or the metals concentrations did not pass the 20x Rule, so all sand was disposed of at a licensed TSCA landfill. The T&D activities extended into the demobilization period until all the

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[1] The "20x Rule" is a common method of estimating the toxicity characteristic leaching procedure (TCLP) level of metals in a sample by comparing each detected metal concentration in the sample to 20x the respective RCRA regulatory level. For example, the RCRA regulatory level for lead is 5.0 ppm; multiply by 20 and get 100. If the lead concentration in the sample is greater than 100 ppm, the sample will likely not pass the TCLP test.

stockpiles had been disposed. A summary of all the routine chemical tests performed on the sand is presented as Table B-1. A summary of sand grain size results is presented on Table B-2.

2.3.4 Dewatering Operations

The 2013 dewatering operations were conducted similarly to previous seasons. Desanded slurry is transferred from the Area C Desanding Facility via dual wall HDPE pipeline to the Area D Dewatering Facility using a Caterpillar C-9 275 horsepower booster pump. At Area D the slurry is stored in a series of agitated mix tanks, which keep the solids in suspension. Feed pumps transfer the slurry from the tanks to one of a bank of six plate and frame filter presses. Polymer is added to the slurry during the transfer process to enhance dewatering. The filter presses remove the majority of the water from the sediment producing a dewatered sediment referred to as filter cake. The water removed from the filter cake is pumped to a holding tank for treatment by the on-site waste water treatment plant. Once sufficient water has been removed from the filter cake CBI , the cake is dropped from the press onto a series of conveyors and transported to the load out area where it is stockpiled for T&D.

Production data can be found on the Sevenson Operational Monitoring Data table (Attachment C). A brief summary of filter cake production follows. CBI

To gauge dewatering efficiency the percent solids content of the filter cake is measured on every press drop.

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The actual tonnage of cake produced is slightly different due to material variations.

This material includes the filter cake as

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well as personal protective equipment (PPE), used bag filters, and any other potentially contaminated waste generated at the facility.

Prior to the initiation of disposal activities a filter cake sample is collected and submitted to a laboratory for toxicity characteristic leaching procedure (TCLP) analysis, total PCB Aroclors, and RCRA characteristics. The TCLP results are reviewed and incorporated into the waste profile, the profile must be approved for the facility to accept the waste.

In order to create a running waste profile, composite samples of the filter cake were collected and analyzed at a frequency of approximately one sample every 550 tons. The composite filter cake samples were analyzed for PCB Aroclors, metals, oil and grease, and reactive cyanide. Filter cake analytical results are summarized on Table B-4. Samples were submitted for grain size analyses at a frequency of approximately one sample every 1,100 tons. Filter cake grain size results are reported on Table B-2.

2.3.5 Waste Water Treatment Plant Operations

2013 waste water treatment plant operations were conducted similarly to previous dredge seasons. Water removed from the filter cake by the presses is collected and stored in a set of influent equalization tanks prior to treatment. An oil water separator is utilized to remove any free product oils, if present, in the waste water. Solids are then removed from the water via bag filters followed by sand filters. If necessary the pH of the waste water can be adjusted at several points throughout the treatment process by the addition of sodium hydroxide. Organic contaminants are removed by a series of granular activated carbon (GAC) filters. Treated water is stored in an effluent equalization tank and periodically discharged back into the harbor.

As has been the practice since 2004, waste water treatment plant (WWTP) samples were collected and analyzed throughout the dredge season. The sampling frequency, methods and locations are described in detail in the Jacobs document *Field Sampling Plan New Bedford Harbor Superfund Site* (Jacobs 2012). The basic sampling scheme involves intensive sampling at startup with the effort scaled back as the system proves to be effective and operating as designed. The influent and effluent samples were analyzed for PCB Aroclors, copper (Cu), cadmium, and lead. The midpoint sample, collected between the lead and lag GAC vessels, is analyzed for PCB Aroclors and Cu. Analytical results are presented on Table B-5. Water quality parameters are monitored, recorded and evaluated throughout the sampling process. Water quality parameters are measured with a calibrated YSI brand water quality meter equipped with a flow-through cell. Discrete midpoint and influent water quality parameters are collected manually just prior to sample collection. Effluent water quality parameters are collected every 15 minutes and stored electronically via the YSI auto logging feature during an effluent sampling event. Tabulated effluent water quality parameters are presented as Table B-6, and midpoint and influent water quality parameters are presented as Table B-7. Only the final stabilized influent and midpoint parameters collected just prior to sampling are tabulated. Water quality parameters monitored include temperature, specific conductivity, dissolved oxygen, pH and turbidity.

Influent analytical results and water quality parameters are evaluated to aid in determining GAC loading and to assess the performance of the dewatering process. Midpoint data is used to monitor the performance of the WWTP system prior to the lag GAC vessel. Elevated PCBs or other contaminants would indicate a treatment issue such as breakthrough or carbon channeling and would trigger further investigation by project engineers and WWTP personnel. Effluent data is compared to ROD project effluent water quality criteria (values listed in footer of Table B-5) and Massachusetts Class SB water quality parameters (applicable values listed in footer of Table B-6).

Influent - Influent analytical results and water quality parameters were similar to what has been observed in previous seasons. The influent sample is collected as a grab sample and therefore reflects conditions at the time of sampling.

Midpoint - Midpoint analytical testing during the 2013 season showed that the WWTP was functioning as intended, no PCB Aroclors or Cu was detected in midpoint samples collected in 2013. The midpoint sample is collected as a grab sample and therefore reflects conditions at the time of sampling.

Effluent - Effluent analytical testing demonstrated that the WWTP system was performing as designed. Aroclor results were below detection limits for all sampling rounds. Metals results returned a few detections; however, all detections were below the ROD project effluent discharge criteria. Table B-6 summarizes the 2013 effluent water quality data. It should be noted that some turbidity values observed were negative. This does not necessarily reveal an issue with the water quality meter, as a negative turbidity value indicates that the water being measured is clearer than the distilled or deionized water used as a zero turbidity standard during calibration. Prior to discharge the effluent is collected in a large volume equalization tank. This practice typically results in little variability with regards to effluent water quality. The observation of short duration spikes in turbidity, dissolved oxygen or other parameters may be indicative of air bubbles in the flow through cell. This should be investigated before any corrective action is taken on parameters alone. A number of short duration spikes in the data are noted, and in order to identify statistical outliers, the Walsh's test for large sample sizes (EPA 2000) was used. The outliers are shaded red and have not been included in the calculation of the daily averages. Effluent samples are collected via a compositing auto-sampler programmed to collect sub-samples at discrete intervals over the course of a work day.

2.3.6 Transportation and Disposal

Transportation and disposal of waste generated at NBH has been conducted via truck and rail since 2005. Due to the anticipated 2013 season length it was determined that shipping via truck to rail was the most cost effective option. All material generated by dredging in 2013 at NBH was transported and disposed of by H&S Environmental, Inc. and their subcontractor, EQ Northeast, Inc.

TSCA sand and oversize material generated at Area C was loaded from gravity drained stockpiles into trucks at Area C in preparation for transportation to a rail trans-load facility in Worcester, MA. The material was shipped from Worcester, under manifest via rail to an approved TSCA landfill in Romulus, Michigan. CBI A summary of 2013 TSCA waste shipments from Area C is provided as Table D-1.

TSCA waste generated at the Area D Dewatering Facility was loaded from filter cake stockpiles into trucks at Area D for transportation to a rail trans-load facility in Worcester, MA. The material was shipped from Worcester, under manifest via rail to an approved TSCA landfill in Romulus, Michigan. CBI A summary of 2013 TSCA waste shipments from Area D is provided as Table D-2.

2.4 AIR MONITORING

Ambient air monitoring was conducted during 2013 similarly to how it has been conducted from 2004 to 2012. Ambient air samples were collected by EPA Method TO-10A. The samples were then analyzed by EPA Method 1668A for PCB Homologues via high resolution gas chromatography/mass spectroscopy.

The air quality monitoring program in 2013 was conducted to monitor remedial activities which included hydraulic dredging in Areas L and P. Based on the dredging locations and activities, various locations were selected for air monitoring. Figure E-1 shows the monitoring locations used for the 2013 season. Station locations used for the 2013 dredging season included: 24 (Aerovox), 44 (Taber), 30 (Fibre Leather), 42 (NSTAR North), 43 (Veranda), 46 (Coffin)), 49 (Area C Downwind), 50 (Area D Downwind), 53 (Dredge), 25 (Manomet), 27 (Porter), and 64 (Pilgrim). The new location (64) was added for the 2013 season at the request of EPA. The 24-hour time-weighted average PCB concentrations were collected from all locations with the exception of the station (53), the dredge, which was sampled during the work hours to a maximum of eight hours for the day. The air sampling at the monitoring stations began during the day's dredging activities, and terminated the next day (24 hours later).

One round of pre-dredge sampling was completed before the 2013 season mobilization activities on March 26, 2013 at Stations 24, 25, 27, 42, 43, 44, 46, 50 and, and 64. Two monthly rounds of samples were collected in 2013 during hydraulic dredging activities on the following dates: July 16, and August 20, 2013. Sampling at location 64 was discontinued during the 2013 dredge season following the July 16 round, sampling may resume at this location. A post-dredge round of samples was collected at all locations except 44, 53 and, 64 on September 25, 2013, after the completion of the dredging season, demobilization and winterization activities.

Air monitoring data collected as part of the 2013 dredging season show that in general the most elevated concentrations of total PCBs were detected during the periods of active dredging (Table E-1). The highest concentrations were found at the air monitoring stations on the dredge (53) and Aerovox (24) with maximum concentrations of 510 and 240 nanograms per cubic meter of air, respectively.

Modeling of PCB concentrations in air has also been performed as a means of quantifying the impacts of ambient PCBs on air quality. The modeling effort, at the direction of EPA, is a continuation of modeling efforts by Jacobs (since 2004) and previously by other contractors. NBH modeling utilizes sampling and meteorology data as inputs to the EPA developed Industrial Source Complex Model to predict the dispersion of PCBs in air from such scenarios as dredging activities, proposed CAD cell development, and continued exposure of tidal mud flats.

2.5 DEMOBILIZATION

Demobilization activities commenced on September 2, 2013 and were completed on September 13, 2013. Demobilization was conducted similar to past seasons with one exception, the entire Area C dock assembly was removed for repair. Several of the floating dock sections and many of the pins used to hold the sections together had sufficient corrosion damage, discovered during routine inspection, to warrant removal and repair or replacement. It is anticipated that the dock will be replaced prior to or during 2014 mobilization activities.

A brief list of the major activities conducted as a part of demobilization is presented below:

- flushing all dredge lines;
- disassembly and storage of all booster pump related equipment and materials;
- restoration to pre-dredge conditions at booster pump site;
- removal and disposal of all cables from dredge areas;
- removal and storage of select sheet piles from the harbor;
- disassembly and storage of all dredge pipelines up to the Area C fence line;
- removal of all boats, scows and dredges from the water;
- flushing of the WWTP system;
- wash down of Desanding plant;
- wash down of Dewatering plant; and
- draining of all piping systems that are not in a heated area or freeze protected.

2.6 POST-DREDGE ACTIVITIES

2.6.1 Post-Dredge Bathymetric Survey

Following the cessation of dredge activities in a dredge area for a field season a post-dredge bathymetric survey is typically conducted. The purpose of a post-dredge bathymetric survey is to assess the compliance of the actual field work with the dredge plan and to calculate the volume of in-situ material removed.

CRE performed the post-dredge bathymetric surveys in a manner similar to post-dredge surveys performed in the past for Jacobs at NBH.

The post-dredge bathymetric survey was conducted in Dredge Areas L on August 10, 2013, and P on September 10, 2013. The dredge plan compliance and final in-situ volume dredged were calculated and reported in a project Quality Control Report, *Final Dredge Accuracy 2013 New Bedford Harbor Superfund Site* (Attachment A-1).

2.6.2 Post-Dredge Sediment Sampling

Post-dredge sediment samples are collected and analyzed following dredging to assess the amount of residual PCB contamination remaining in situ. Sediment samples are also evaluated and described geologically for soil types, color and consistence.

Post-dredge sediment cores were collected from Dredge Areas P and L by Jacobs on October 29 through November 06, 2013. The majority of the 2013 post-dredge cores were collected at locations where pre-dredge samples had been collected. Following the collection of the cores, Jacobs personnel split, described and sampled the cores for PCB Aroclor analysis. The results of the Jacobs post-dredge coring activities are presented in Attachment A-2.

3.0 MASS BALANCE

The 2013 mass balance calculations represent a high level assessment of the primary treatment process conducted at NBH, dredging contaminated sediment and separating the solids from the liquids for further treatment or disposal. The major components of this process are as follows:

- dredge and pump sediment slurry from the dredge areas via slurry pipeline to Area C;
- inject ferric sulfate into slurry pipeline to treat hydrogen sulfide gas;
- introduce City water to the process from booster pump seal water, wash down water and polymer make-up water;
- separate wet solid oversize material from slurry using a coarse screen shaker ($\geq$ 1/4 in);
- separate wet solid sand from the slurry using desander hydrocyclones that report wet solids (primarily sand) from slurry onto the 200-mesh desander screens;
- separate wet sand ($\geq$ 0.0029 in) from residual silt and clays on the 200-mesh inclined vibratory screens, the sand passes over the screens and drops to the floor for stockpiling, finer materials pass through the screen with the water and the resultant slurry is pumped to the Dewatering Facility;
- add polymer flocculent to increase dewatering efficiency;
- separate wet solid sediment from slurry using Dewatering Facility filter presses; and
- separate residual solids from waste water using the Area D WWTP, recycling solids back to the filter press feed tanks, and discharging treated water to New Bedford Harbor.

The information used to present and calculate the mass balance data is derived from a number of sources. The monitoring data such as totalized flow meter readings, percent solids measurements, solids quantity estimates and chemical additive quantities is based on the Sevenson Operational Monitoring Data table (Attachment C). The table is updated and distributed daily by SES throughout the dredge season. Water balance information is based on flow meter readings and usage estimates from historical measurements. Water added to the treatment system is tabulated by use and points of addition (Table F-1). Solids balance information is based on Area C weigh scale data and filter cake production (Attachment C). It should be noted that the sand weights in Attachment C differ from those presented in Attachment D, and that the Attachment C weights are that of the sand as it is removed from the Desanding Facility for stockpiling. The Attachment D weights are the weights at the time of disposal.

3.1 SOLID BALANCE

CBI

3.2 WATER BALANCE

CBI

CBI

CBI

3.3 PREDICTED PRODUCTION QUANITITIES VERSUS ACTUAL PRODUCTION QUANTITIES

CBI

CBI

3.4 PCBs REMOVED

Table F-4 provides an estimate of the mass of PCB Aroclors removed from the harbor by dredging in 2013. The following paragraph describes how the amount of PCBs removed is calculated. First, the average PCB Aroclor concentrations and average percent solids values used for the calculation were determined from the analytical data presented in Table B-1 (sand) and Table B-4 (filter cake). Using the average percent solids value for a particular material and the wet weight (Table F-3) of that material the dry weight is calculated. The next step is to take the dry material weight and average material Aroclor concentration and convert all values to similar units (kilograms). The dry weight of material and average Aroclor concentration are then multiplied to yield kilograms of PCB Aroclors. This value is then converted to tons. The PCB mass removed calculations have been performed for previous dredge seasons. Table F-5 provides a cumulative summary of PCB Aroclors removed via dredging by the Jacobs team since 2004.

While it is believed that the methods used to determine the amount of PCBs removed is accurate, there are several factors that may bias the measurement:

- the oversize material generated on the coarse screen is not analyzed for PCBs; for estimating purposes, its weight is added to the sand and the average sand PCB concentration is applied;

- concentration variations inherent in sampling or compositing;
- PCBs removed by the WWTP are not measured;
- variations in material affecting percent solids;
- differences in the material weight due to draining or evaporation between the time of sample collection and weighing of trucks.

Attachment G provides a brief summary of NBH production metrics; Table G-1 summarizes 2013 production while Table G-2 provides a production summary since the beginning of NBH dredging activities by the Jacobs/SES team in 2004.

4.0 LESSONS LEARNED

This section evaluates the field execution of the project and different ways that improvements can be made to enhance safety, efficiency or reliability. The inclusion of an idea as a lesson learned does not guarantee that it will be carried forth, but means that it warrants closer examination. Only after evaluating the cost, implementability and practicality can it be determined if a lessons learned will become a routine practice at the site. Attachment H includes a list of lessons learned developed over the 2013 season.

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5.0 NON-DREDGING SCOPE OF WORK

5.1 AREA D IMPROVEMENTS

5.1.1 Building Lighting

Prior to the initiation of mobilization activities, the ceiling lights in the load-out area were removed and replaced. The original sodium vapor lights, while effective, required a warm up period to reach full brightness and consumed more power than equivalent systems now available. A new fluorescent lighting system similar to what was installed in the dewatering portion of the building in 2012 was installed in the load out area. These lights were found to consume significantly less power, reach full brightness instantly, and provide better lighting. Considerations are being made to improve the lighting in the WWTP portion of the building in the future.

5.1.2 Building Maintenance

During the off season Jacobs performed routine building maintenance at the Area D building. Work included reapplying non-skid paint in walking areas, and repairing or replacing of facilities equipment as needed. During the 2013 dredge season a number of the rooftop exhaust fans were replaced after corrosion issues and weather damage were noted during an inspection.

5.1.3 Maintenance of Institutional Controls

As a part of the Superfund remedy, institutional controls such as fencing, informational kiosks and signage are installed at access points to the harbor around the NBH site. Jacobs, at the direction of EPA/NAE, routinely replaces damaged or missing signage, repairs fencing and gates, and updates information on the kiosks. The institutional controls are maintained under the NBH Operations and Maintenance contract.

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6.0 SUMMARY OF 2013 ACTIVITIES

Attachment I provides a detailed list of major events, submittals and activities conducted by Jacobs at NBH during the 2013 calendar year.

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7.0 REFERENCES

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U.S. Environmental Protection Agency (EPA). 2000 (July). *Guidance for Data Quality Assessment, Practical Methods for Data Analysis*. EPA/600/R-96/084. Office of Environmental Information, Washington, D.C.

——— 1998 (September) *Record of Decision for the Upper and Lower Harbor Operable Unit New Bedford Harbor Superfund Site*, New Bedford, Massachusetts.

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ATTACHMENT A

Figures

ATTACHMENT A-1

Quality Control Report

Final Dredge Accuracy 2013

ATTACHMENT A-2

2013 Post Dredge Sediment Core Evaluation

ATTACHMENT B

Analytical Data Summary

ATTACHMENT C

Sevenson Operational Monitoring Data

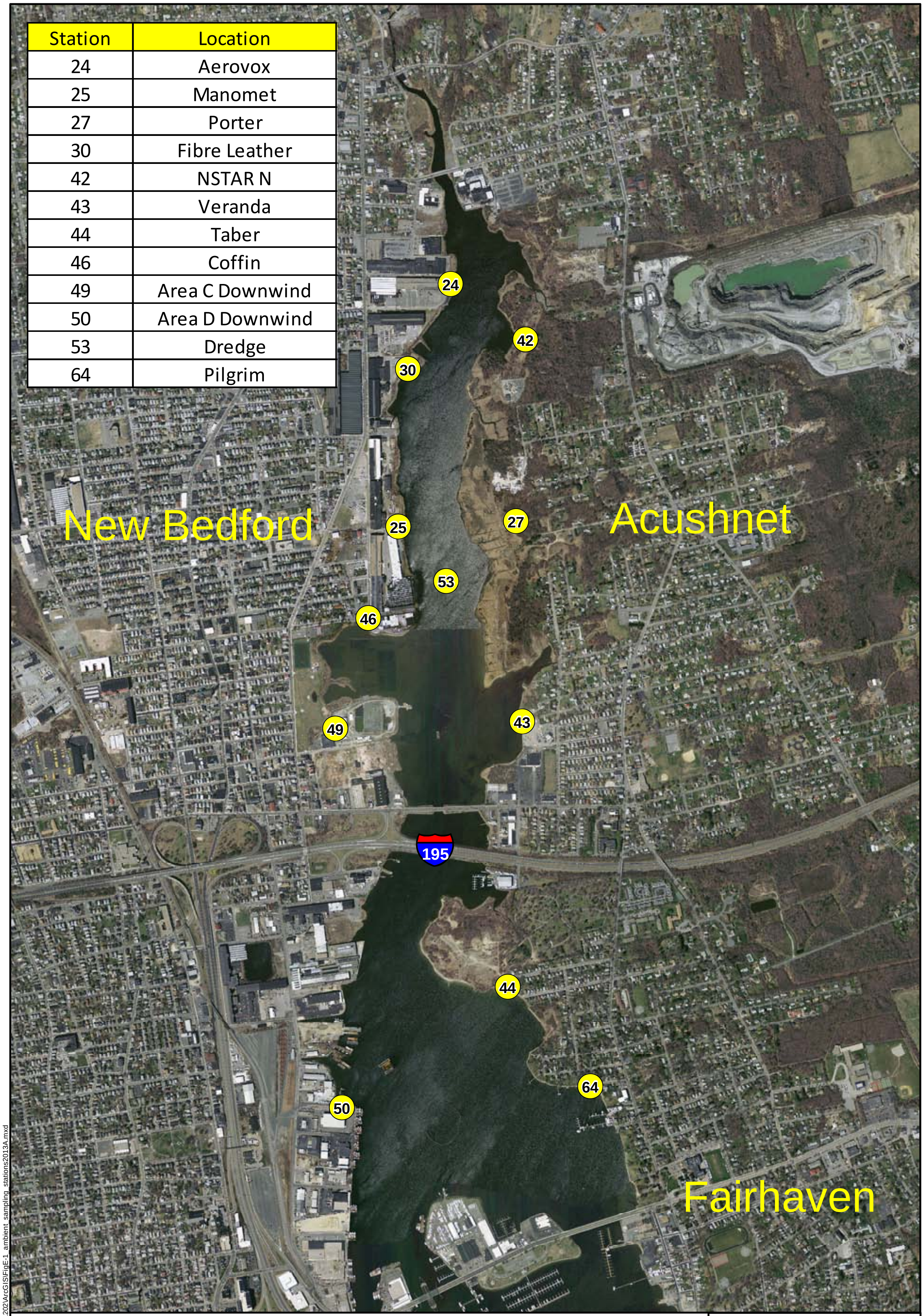
ATTACHMENT D

Transportation and Disposal Reports

ATTACHMENT E

Ambient Air Monitoring Information

Station	Location
24	Aerovox
25	Manomet
27	Porter
30	Fibre Leather
42	NSTAR N
43	Veranda
44	Taber
46	Coffin
49	Area C Downwind
50	Area D Downwind
53	Dredge
64	Pilgrim



Legend

● 2013 Ambient Air Sampling Station Location

JACOBS™

2013 Ambient Air Sampling Station Locations

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 12/2/2013

Figure E-1

Path: Y:\NBH\Projects\35BG0708\20131202\ArcGIS\FigE-1_ambient_sampling_stations2013A.mxd

Table E-1
2013 Ambient Air Monitoring Program
Total Detectable PCB Homologues in Air

	Station 24	Station 25	Station 30	Station 42	Station 43	Station 44	Station 46	Station 49	Station 50	Station 53	Station 64	Station 27		
Sampling Period[1]	**Aerovox**	**Manomet**	**Fibre Leather**	**NSTAR North**	**Veranda**	**Taber**	**Coffin**	**Area C Downwind[2]**	**Area D Downwind [3]**	**Dredge [4]**	**Pilgrim**	**Porter**	**Duplicate**	**Comments**
	PCB Concentration (ng/m^3)													
26-Mar-2013	14	1.4	NS	6.6	8.3	1.1	0.65	NS	0.49	NS	1.8	3.2	1.8	Duplicate sample at Pilgrim
16-Jul-2013	240	110	130	22	36	16	48	110	69	510	14.4	8.1	NA	Duplicate sample pump failed
20-Aug-2013	230	130	160	18	61	NS	60	29	29	240	NS	15	57	Duplicate sample at Coffin Avenue
25-Sep-2013	25.6	26.5	14.7	8.05	11.2	NS	4.1	14	13.3	NS	NS	2.65	12.8	Duplicate sample at Area D

NA= not analyzed due to insufficient air volume
NS = not sampled
ng/m^3 = nanograms per cubic meter of air

Notes:

(1) Sampled using EPA method TO-10A, analyzed using EPA method 1668A.

(2) Area C has three potential sampling stations #47, #48, and #49 that represent the downwind sample location for the desanding facility. Regardless of where the sample is collected that is, #47, #48 or #49, it is reported as Station #49.

(3) Area D has three potential sampling stations #50, #51 and #52 that represent the downwind sample location for the dewatering facility. Regardless of where the sample is collected that is, #50, #51 or #52, it is reported as Station #50.

(4) All results reported for 24 hour time-weighted average in nanograms per cubic meter of air (ng/m^3) with the exception of Station 53 (Dredge) which is an 8 hour sample.

ATTACHMENT F

Jacobs Solids and Water Balance, and PCB Mass Removal Calculations

ATTACHMENT G

2013 Dredge Production Summary

ATTACHMENT H

2013 Lessons Learned

ATTACHMENT I

Summary of 2013 Activities