PHASE III
IDENTIFICATION, EVALUATION AND SELECTION OF COMPREHENSIVE REMEDIAL ACTION ALTERNATIVES (REMEDIAL ACTION PLAN)

WETLAND TO THE WEST OF KEITH MIDDLE SCHOOL
225 HATHAWAY BOULEVARD
NEW BEDFORD, MASSACHUSETTS

Release Tracking Number (RTN) 4-21300

Submitted to:

Massachusetts Department of Environmental Protection
Southeast Regional Office
20 Riverside Drive
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October 2012

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

Acronyms

AUL	Activity and Use Limitation
BETA	The BETA Group, Incorporated
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
COPC	Compound of Potential Concern
CSA	Comprehensive Site Assessment
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ERC	Environmental Risk Characterization
ES	Environmental Screening
Ft^2	Square foot/feet
IH	Imminent Hazard
IRA	Immediate Response Action
KMS	Keith Middle School
LSP	Licensed Site Professional
LTMMIP	Long-Term Monitoring and Maintenance Implementation Plan
MassDEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
mg/kg	Milligrams per Kilogram
NPDES	National Pollutant Discharge Elimination System
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
POTW	Publicly Owned Treatment Works
RAO	Response Action Outcome
RGP	Remediation General Permit
ROW	Right-of-Way
RTN	Release Tracking Number
SOC	Superseding Order of Conditions
TRC	TRC Environmental Corporation
TSCA	Toxic Substances Control Act
UCL	Upper Concentration Limit
USGS	United States Geological Survey
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

TRC Environmental Corporation (TRC) prepared this Massachusetts Contingency Plan (MCP) Interim Phase III Identification, Evaluation and Selection of Comprehensive Remedial Action Alternatives (Phase III) report on behalf of the City of New Bedford, Massachusetts (City) through the City's Department of Environmental Stewardship, per the MCP; 310 CMR 40.0000. This Phase III report was prepared for the wetland to the rear (west) of the Keith Middle School (KMS) located at 225 Hathaway Boulevard in New Bedford, Massachusetts (the Site).

This Phase III report addresses a wetland area managed under Release Tracking Number (RTN) 4-21300, and is intended to complement the documentation of response actions detailed in the Phase II Comprehensive Site Assessment (CSA) report submitted in January 2012 (TRC, 2012). Response actions at the Site are presently conducted under a Special Project Designation under RTN 4-15685 due to logistical complexities. On May 2, 2012, the Special Project Designation was conditionally extended until February 25, 2014. A condition of the extension was the submittal to the Massachusetts Department of Environmental Protection (MassDEP) of a Phase III or Phase III in support of a Class C Response Action Outcome (RAO) by an interim deadline of August 31, 2012.

Background

The Site has been impacted by polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), and/or heavy metals. The wetland initially became impacted due to the fill material associated with the former Andrea McCoy Field. In 2006, the BETA Group, Incorporated (BETA) oversaw the excavation of six inches of PCB-impacted sediment by a contractor from areas of the wetland where the PCB concentrations were above the Toxic Substances Control Act (TSCA) 1 milligram per kilogram (mg/kg) sediment cleanup criterion. As required by the Long-Term Monitoring and Maintenance Implementation Plan (LTMMIP),TRC conducted sampling of the sediment, and on June 9, 2008, discovered PCB impacts in shallow wetland sediment that required reporting per 310 CMR 40.0321(2)(b) of the MCP. The City reported the detection to MassDEP per 310 CMR 40.0321(2) and 310 CMR 40.0311(7) of the MCP via telephone on June 9, 2008. MassDEP assigned RTN 4-21300 and verbally approved Immediate Response Action (IRA) assessment activities. An IRA Completion report was filed with the MassDEP in October 2010.

Environmental site investigation activities are described in the Phase II CSA. Phase II environmental site investigations were conducted between November 2007 and May 2011, and investigations consisted of multiple rounds of soil and sediment sampling as well as surface water and groundwater sampling. For the Phase II CSA, a Method 3 risk characterization approach, including a Stage I Environmental Screening (ES) and Stage II Environmental Risk Characterization (ERC) (TRC, 2012), was used to evaluate potential risks to both human and ecological receptors (plants, animals, birds, and insects) from exposure to wetland sediment, soil, surface water, and groundwater. The Phase II findings were used to develop specific remedial action objectives for the northern wetland. Based on the Method 3 risk characterization, the southern wetland does not require further remediation. As summarized within the Phase II CSA,

exceedances of the Massachusetts Surface Water Standards for zinc in surface water may be associated with a background condition and are not addressed within this Phase III.

Specific Remedial Objectives

Based on the findings associated with the Method 3 human health risk characterization and the Stage II ERC, the following specific remedial objectives for sediment and soil were developed for the northern wetland.

- **Sediment remediation.** Sediment remediation is proposed at specific locations in the northern wetland to address potential impacts to human health and benthic macroinvertebrates (organisms that live in or on the sediment). The human health risk characterization was based on a MCP Method 3 risk characterization summarized within the TRC Phase II CSA. Estimated risks and hazards that were above MassDEP risk limits formed the basis of selected human health-based remediation areas (in this case, a PCB MCP hot spot [locations ERC-SED-11A, ERC-SED11A-B and ERC-SED11A-D] was identified for removal). The Stage II ERC defined sediment remedial goals for ecological receptors for PCBs at 5 milligrams per kilogram [mg/kg], total PAHs at 30 mg/kg, and 459 mg/kg for zinc, for protection of benthic macroinvertebrates. As summarized in Table 3-1 in the full report, the specific remedial objectives for sediment are as follows:

  - Address PCBs within the vicinity of ERC-SED-11A, which is bounded by locations ERC-SED-11A, -11A-A, -11A-B, -11A-C, -11A-D, -11A-E, -11A-F, and -11A-K;
  - Address PAHs and zinc at ERC-SED-8 and ERC-SED-11A;
  - Address PCBs at SD-3F, SD-3G and SD-3K (SD-03 vicinity for sediment);
  - The exposure point concentrations within several other 1,000-square foot areas that were studied in the Stage II ERC are below sediment targets and may be left in place;
  - Achievement of background conditions, where feasible.

- **Surface soil remediation.** Surface soil remediation is proposed at specific locations in the northern wetland to address potential impacts to ecological receptors. The Stage II ERC 95 percent upper confidence level concentration targets for surface soil are defined for PCBs at 6.6 mg/kg, lead at 100 mg/kg and zinc at 423 mg/kg. Surface soil remediation is proposed at specific locations in the northern wetland to address the following conditions.

  - Address potential impacts to omnivorous birds and mammals and insect-eating mammals from PCBs, lead, and/or zinc;
  - Remediate soil at location ERC-SED-6 to address soils for lead and zinc;
  - Pursuant to the Stage II ERC targets for soils, remediate PCB impacts in the vicinity of SD-03 (soil locations ERC-SED-6 and the SD-03/SD-3A/SD-3D area);

- Following remediation of the above soil locations, EPCs (i.e., 95 percent upper confidence level concentrations) will be below Stage II ERC targets for soils;

- Achieve background conditions, where feasible.

Further, remediation of the northern wetland must also comply with EPA's TSCA regulations pursuant to 40 CFR 761.61. PCB remediation waste is defined as waste containing PCBs resulting from a spill, release, or other unauthorized disposal at concentrations greater than or equal to 50 mg/kg for materials disposed prior to April 18, 1978. The sediment locations in the TSCA PCB area defined by ERC-SED-11A, ERC-SED-11B, ERC-SED-11A-B, and ERC-SED-11A-D meet this definition of PCB remediation waste. Two TSCA cleanup goals were considered for evaluating a range of PCB cleanup alternatives as follows:

- Sediment in the TSCA PCB area in the northern wetland would be cleaned up to less than 50 mg/kg PCBs.

- Sediment and surface soil in the northern wetland would be cleaned up to the most conservative TSCA criterion of less than or equal to 1 mg/kg PCBs (this would also achieve background).

In summary, there are four specific areas where cleanup of the northern wetland is targeted to achieve a condition of No Significant Risk. Impacted material is primarily sediment versus soil. The four discrete areas of proposed remediation are as follows:

- Location ERC-SED-8 for sediment;
- Vicinity of ERC-SED-11A for sediment;
- Vicinity of SD-03 for soil; and
- Vicinity of SD-03 for sediment.

Remedial Alternatives Evaluation and Selection

The Phase III process evaluates practical remedial alternatives that are reasonably likely to achieve a Permanent Solution for closure, except where it is demonstrated that a Permanent Solution is not feasible or that the implementation of a Temporary Solution, while equally protective, would be more cost-effective and timely than the implementation of a Permanent Solution. This Phase III addresses the components set forth in the MCP at 310 CMR 40.0850 and incorporates related TSCA elements.

The Phase III identification and evaluation of remedial action alternatives uses the following process:

- An initial screening of remedial technologies to identify those technologies that are reasonably likely to be feasible and effective.

- An assembly of feasible remedial technologies into remedial action alternatives that are reasonably likely to achieve a condition of No Significant Risk under the MCP.
- A detailed, comparative evaluation of the selected remedial action alternatives with respect to effectiveness, reliability, difficulty of implementation, comparative cost, risk, benefits, and timeliness.
- Selection of a remedial action alternative.

A range of remedial alternatives was developed to support an evaluation of a range of remedial outcomes from No Action to various Permanent Solutions under the MCP and TSCA. The remedial alternatives considered are as follows:

- Alternative No. 1 – No Action, maintenance of existing site controls
- Alternative No. 2 – Class A-3 RAO, capping with possible limited removal
- Alternative No. 3 – Class A-2 RAO, removal and unrestricted use

Remedial Alternative No. 2, Capping with Possible Limited Removal, is selected as the preferred remediation and outcome. The final cap design will be developed in the Phase IV Remedy Implementation Plan. This alternative includes the following elements:

- Install soil or composite material caps over the four discrete areas of proposed remediation.
- Possible removal and off-site disposal of sediment and soil in the four discrete remediation areas prior to cap installation.
- Achieve a Permanent Solution with a Class A-3 Response Action Outcome including an Activity and Use Limitation (AUL).

Please see the following full report for additional details pertaining to the aforementioned analysis and conclusions.

1.0 INTRODUCTION

TRC Environmental Corporation (TRC) prepared this Massachusetts Contingency Plan (MCP) Interim Phase III Identification, Evaluation and Selection of Comprehensive Remedial Action Alternatives (Phase III) report on behalf of the City of New Bedford, Massachusetts (City) through the City's Department of Environmental Stewardship, per the Massachusetts Contingency Plan (MCP; 310 CMR 40.0000). This Phase III report was prepared for the wetland to the rear (west) of the Keith Middle School (KMS) located at 225 Hathaway Boulevard in New Bedford, Massachusetts (hereinafter the "Site"). The Site is located between the east side of Summit Street and the west side of the KMS campus, bordered to the north by Durfee Street, and is identified by the City of New Bedford Assessor as block 167 on map 75. The location of the Site is shown on Figure 1-1.

This Phase III report addresses a wetland area administratively tracked under Release Tracking Number (RTN) 4-21300, and is intended to compliment the documentation of response actions detailed in the Phase II Comprehensive Site Assessment (CSA) report submitted in January 2012 (TRC, 2012). Response actions at the Site are presently conducted under a Special Project Designation under RTN 4-15685 due to logistical complexities.

The Site owner and Licensed Site Professional (LSP) contact information is as follows:

Site Owner:

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Contact: Ms. Michele S. W. Paul
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The wetland has been impacted by polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), and/or heavy metals (including but not limited to zinc and lead).

This Phase III report focuses on remediating the impacts to the wetland tracked under RTN 4-21300. This Phase III report builds on the Phase II CSA submitted to the Massachusetts Department of Environmental Protection (MassDEP) by the City.

1.1 Objectives

The objective of this Phase III report is to evaluate several alternatives for remediation of sediment and soil within the northern wetland and to select a preferred alternative. This Phase III report has been prepared to evaluate and document practicable remedial alternatives to limit exposure to future users of the Site and to current and future ecological receptors to Site impacts. The analysis presented in this report supports the future preparation of a Phase IV Remedy Implementation Plan for the selected remedial action alternative prior to the implementation phase.

Overall objectives for remedial actions under the MCP are, where applicable, as follows:

- Achieve a condition of No Significant Risk to human health, safety, public welfare, and the environment, if feasible, and reduce concentrations to background conditions, if feasible;
- Eliminate or control continuing sources of impacts;
- Eliminate Upper Concentration Limit exceedances in soil and groundwater, if feasible; and
- Eliminate Substantial Hazards.

For a Permanent Solution under the MCP, e.g., a Class A Response Action Outcome (RAO), the first three remedial objectives must be achieved. For a Temporary or Class C RAO, only the fourth objective must be achieved. Overall, the goal is to achieve a Permanent Solution for closure, except where it is demonstrated that a Permanent Solution is not feasible or that the implementation of a Temporary Solution, while equally protective, would be more cost-effective and timely than the implementation of a feasible Permanent Solution.

In addition, for Toxic Substances Control Act (TSCA) compliance relative to PCBs in soil and sediment, the objective is to perform the cleanup and off-site disposal of PCB remediation waste per 40 CFR 761.61 and as approved by the United States Environmental Protection Agency (EPA).

2.0 SITE DESCRIPTION AND BACKGROUND INFORMATION

A site plan is presented in Figure 2-1. The area of focus under this Phase III report occupies an approximately 5-acre area adjacent to the approximately 11.5-acre KMS property. The KMS property is identified by the City of New Bedford Assessor as block 167 on map 75. The Site is located at approximately 90 feet above mean sea level, is between the east side of Summit Street and the west side of the KMS campus, and is bordered to the north by Durfee Street. There are no buildings at the wetland Site. The KMS building is located directly east of the Site on the KMS campus and several residential properties are located to the west of the Site. An unpaved land bridge separating the northern and southern portions of the wetland is present between the KMS campus and Auburn Street. There are no impervious surfaces (e.g., pavement or buildings) within the Site boundary. The northern portion of the wetland is surrounded by an approximately eight-foot high metal chain-link perimeter fence to restrict unauthorized access.

For the purposes of this Phase III report, the Site boundary includes the wetland, the adjacent capped slope area of the KMS campus to the east of the wetland (i.e., the Phase I Embankment), the Summit Street Right-of-Way (ROW) west of the wetland, the Durfee Street ROW north of the wetland, and the "Durfee Street West Lot" northeast of the wetland (a municipal property located within the fence that surrounds the northern portion of the wetland). These areas reflect the locations investigated during the assessment of Site impacts tracked under RTN 4-21300. Based on the finding of the Phase II CSA and risk characterization, remedial actions are needed for soil and sediment in discrete areas of the northern wetland adjacent to the capped slope area to the east, to achieve Site closure.

2.1 Site Geology and Hydrogeology

Subsurface material at the Site generally consists of up to approximately four feet of dark brown organic silt (i.e., peat) material underlain by various sized sands. Minor amounts of gravel have been observed within the peat and sand layers in places. The surficial geology at the Site consists of glacial till and potentially eolian derived deposits. Drumlins flank the Site to the east and west. Based on review of the United States Geological Survey (USGS) Bedrock Geologic Map of Massachusetts (Zen et al., 1983), bedrock beneath the Site is light gray, pinkish-gray to tan, mafic-poor granite known as Alaskite (Zagr).

The Site is mostly a wetland. The land bridge between Auburn Street and the KMS campus separates the southern and northern portions of the wetland; however, there is no culvert through the land bridge and thus no surface water flow occurs between the two areas. Depending on the season, the northern portion of the wetland may contain up to several feet of surface water, whereas the southern portion of the wetland generally does not contain standing surface water.

Additional wetland areas are located north (downstream) of the wetland on the opposite side of Durfee Street and are connected hydrologically to the northern wetland via a culvert. Surface water flow through the northern portion of the wetland is controlled by topography and the elevation of surface water in the wetland relative to the culvert that crosses Durfee Street. During wet periods (i.e., periods of rain and snowmelt), water flows overland into the wetland primarily through two mechanisms: direct runoff across the ground into the wetland and flow

from storm water drains surrounding the KMS campus that collect both runoff from paved areas surrounding the school and from the roof of the school. Some runoff may collect in channels and be conveyed into the wetland. When water in the wetland rises above the elevation of the outfall of the culvert at the north end of the wetland crossing Durfee Street (the outfall appears to be at a higher elevation than the inlet), surface water flows through the culvert and along the channel north of Durfee Street, eventually discharging into Apponagansett Swamp to the north. Apponagansett Swamp is approximately 15 feet lower in elevation than the wetland; hence water flows downgradient into the swamp.

The groundwater aquifer at the Site is unconfined and is generally present about 4 feet below ground surface in the vicinity of the Site. The aquifer is composed of organic peat underlain by glacial/eolian deposits. The aquifer thickness is not known. It is expected to extend down to the underlying bedrock. The aquifer is not considered potentially productive. As noted within the Phase II CSA, a portion of the Site groundwater is classified into the GW-1 category due to the presence of a private well within 500 feet to the west of the Site (other than this noted well, the Site and surrounding area are supplied potable water by the municipality). This private well is a low volume well, likely pumping intermittently and at a rate less than 5 gallons per minute. Based on the results of the synoptic groundwater level events conducted by TRC, groundwater flows predominantly to the south/southeast. Therefore, it is unlikely that Site groundwater flows toward this well. Concentrations of Compounds of Potential Concern (COPCs) detected in GW-1 monitoring wells located at the Site meet (and are less than) Massachusetts Drinking Water Standards and Guidelines. In addition, sampling of the private well indicates that COPC concentrations in the private well are also less than Massachusetts Drinking Water Standards and Guidelines. Therefore, this private well and the surrounding groundwater are not impacted by the Site.

The groundwater flows predominantly to the south/southeast at a gradient of approximately $2x10^{-3}$ ft/ft. Locally groundwater at the Site discharges to the wetland surface water; however, there are times (e.g., during periods of runoff/snowmelt) when the wetland may discharge to groundwater.

Based on literature values, the peat layer is expected to exhibit low hydraulic conductivity.

2.2 Site History

A comprehensive disposal site history is presented in Section 2.3 of the Phase II CSA . Site history associated with prior remedial response activities at the Site is summarized herein.

The wetland was originally investigated following the detection in 2000 of PCBs in the adjacent site identified by RTN 4-15685. Investigations of the surrounding area were undertaken by BETA Group, Incorporated of Norwood, Massachusetts (BETA) on behalf of the City in response to a conditional approval for the KMS site remedy issued by EPA.

2.3 Previous Remedial Actions

An EPA-approved remedy previously implemented by others for the PCB-impacted wetland sediments at the Former McCoy Field/KMS portion of the RTN 4-15685 disposal site (the Site in this Phase III report) took place between July and December 2006. The remedy implemented by BETA included the following components:

- **Impacted sediment removal.** Removing approximately six inches of sediment containing PCB concentrations greater than 1 milligram per kilogram (mg/kg) from the wetland for off-site disposal.
- **Limited impacted soil removal.** Excavating approximately 12 to 36 inches of PCB-impacted soil from the toe of the embankment adjacent to the east side of the wetland ("Phase I Embankment") for off-site disposal.
- **Soil cap modification.** Extending the existing soil cover from just above the high water line on the Phase I Embankment, over the remaining impacted soils in the excavation area at the toe of the embankment. The cover consists of a geotextile separation fabric, up to three feet of granular soil, a marker layer (orange snow fence), and a vegetated topsoil layer. The project engineer, BETA, also directed the contractor to placed crushed stone and/or sand and gravel against the geotextile separation barrier at the toe of the embankment beneath the water line to help stabilize the embankment.
- **Wetland sediment replacement.** Replacing excavated wetland sediments with high organic content sediment.
- **Wetland restoration.** Replanting the wetland with native vegetation.

Following stabilization of the Phase I Embankment and impacted sediment excavation, verification samples were collected and analyzed for PCBs via SW-846 Method 8082. Removal efforts continued until verification sample results were below the 1 mg/kg remediation goal, at which point Site restoration activities were initiated.

On December 11, 2006, the Former McCoy Field/KMS portion of the RTN 4-15685 disposal site was closed with a Class A-3 Partial RAO including an activity and use limitation (AUL). The KMS remedy is monitored under a Long-Term Monitoring and Maintenance Implementation Plan (LTMMIP) approved by EPA (dated October 20, 2006). An RAO was not filed for the wetland remediation. Wetland remediation is documented in BETA's 2006 *Final Completion and Inspection Report prepared for the McCoy Field/Keith Middle School* (BETA, 2006a - 2006h).

In accordance with the provisions for wetland sediment monitoring at the Site as set forth in the EPA-approved Long-Term Monitoring, Maintenance and Implementation Plan (LTMMIP), TRC performed sampling of sediment in the wetland on May 27, 2008 (SD-01 through SD-04), with the samples analyzed for PCBs via SW-846 Method 8082. Three out of the four samples were non-detect; however, sediment sample SD-03 contained total PCBs at a concentration that required reporting to MassDEP in accordance with 310 CMR 40.0321(2) and 310 CMR 40.0311(7). MassDEP was notified within the regulatory reporting timeframe on June 9, 2008.

MassDEP assigned RTN 4-21300 and approved an "assessment only" Immediate Response Action (IRA).

Under the IRA, additional assessment activities were performed that included iterative sampling events to define the extent of PCB impact. An IRA Plan was submitted to MassDEP on August 7, 2008 and outlined supplemental assessment sampling planned. This iterative sampling occurred from June 2008 through October 2008. Sampling results indicated that PCB concentrations in wetland sediment samples in excess of 1 mg/kg are present in portions of the wetland to the north of the land bridge. Samples collected to the south of the land bridge indicate that total PCB concentrations in that area are below 1 mg/kg. Subsequently and as approved by EPA, a comprehensive sampling program was implemented in December 2008 for both the southern and northern wetlands.

Based on these results, additional sediment sampling occurred in the northern wetland in March, June, July, August, and December 2009 to support Site delineation and preparation of the Stage I Environmental Screening (ES) and the Stage II Environmental Risk Characterization (ERC).

To prevent access to the northern portion of the wetland while environmental investigation was ongoing in accordance with the MCP, the City elected to install an eight-foot high chain-link perimeter fence enclosing the entire northern portion of the wetland. Two gates were installed completing the perimeter fence on December 11, 2009, with locks installed by the City of New Bedford School Department on December 14, 2009. . The City worked with the fence company over the next several months to adjust the height of certain portions of the fence, and reviewed the fence construction in a site walk with MassDEP on August 30, 2010.

The Phase II CSA describes the sampling results, Site delineation, and environmental and human health risk characterizations. The Phase II CSA concludes with the identification of Site areas that are not at a condition of No Significant Risk. Areas of the northern wetland requiring remediation to mitigate risk are described in Section 3.2. The southern wetland does not require further remediation.

2.4 Risk Summary

A Stage II ERC evaluated potential exposures to six indicator species and two indicator communities to PAHs, pesticides, PCBs and/or inorganics in sediment, potential exposures to five indicator species from PAHs, pesticides, PCBs and/or inorganics in surface soil, and potential exposures to the amphibian community from zinc in surface water. Assessment and measurement endpoints were selected to represent ecological attributes used to gauge the degree of potential impact. The results of the Stage II ERC indicate the following:

- **Sediment/Northern Wetland –**
  - Potential for impacts to benthic macroinvertebrates from PCB and PAH concentrations based on a reduction in midge larvae growth rates when exposed to the highest detected concentrations of those chemicals.

- Low potential for risk from the pesticide 4,4'-DDT due to its lower ecological screening benchmark criteria, but reduced bioavailability (a function of the high organic carbon content of the sediment).
- Potential ecological risk to benthic macroinvertebrates from zinc based on sediment concentrations that exceed MassDEP sediment screening values.

- **Surface Soil/Northern Wetland** (0-12 inches deep) **–**

  - A Condition of No Significant Risk exists for foraging carnivorous birds and mammals.
  - Potential impacts to omnivorous birds and mammals and insectivorous mammals from concentrations of PCBs, lead and/or zinc.

- **Surface Water/Northern Wetland –**

  - Zinc concentrations detected in 10 of 17 surface water samples collected from the northern wetland in 2009 are above the acute/chronic national recommended water quality criterion, which represents the Massachusetts Surface Water Standard for zinc [314 CMR 4.05(5)(e)]. However, six out of seven surface water samples collected in 2010 were below the Massachusetts standard for zinc. Toxicity testing of the sample containing an elevated concentration of zinc was subsequently conducted to further evaluate the potential effects of zinc on aquatic organisms. No adverse effects on survival and growth/reproduction to either test species (*Pimephales promelas* or *Ceriodaphnia dubia*) were noted in the toxicity testing.
  - The lower observed levels of zinc in surface water samples collected from the KMS Wetland in 2010 coupled with the lack of toxic effects on the survival and growth/reproduction of two test organisms indicate that impacts from zinc on the aquatic biota community inhabiting the KMS Wetland are not anticipated.
  - Note that zinc has not been identified in Site soil above the MCP Method 1 S-1 soil standard, nor identified in groundwater samples collected from monitoring wells surrounding t*he Site above MCP M*etho*d 1 GW-3 standards*. The zinc concentrations in surface water appear to be a "background" condition.

  - Zinc concentrations in RTN 4-15685 disposal site soil are generally below the MCP S-1/GW-1 soil standard of 2,500 mg/kg. Over 99-percent of the soil samples collected from the RTN 4-15685 disposal site have zinc concentrations below the MCP S-1/GW-1 standard.

  - Total zinc has only been identified above the applicable MCP GW-3 groundwater standard in a sample of water obtained from a seep in the floor of the boiler room at NBHS, which is attributed to zinc associated with galvanized metal objects and/or paint on the floor of the boiler room and not considered a reflection of actual groundwater conditions. Dissolved zinc has not been identified above the MCP GW-3 standard in any of the 36 RTN 4-15685 disposal site groundwater samples collected by TRC that have been analyzed for dissolved zinc.

- The fact that RTN 4-15685 disposal site soil/fill generally contains zinc levels below the MCP S-1/GW-1 soil standard coupled with the fact that dissolved zinc levels in RTN 4-15685 disposal site groundwater are below the MCP GW-3 standard further supports attributing zinc levels identified in surface water at the KMS wetland to a "background" condition.

Based on the Method 3 human health risk characterization and the Stage I environmental screening, a Condition of No Significant Risk exists for both human and environmental receptors in the southern portion of the wetland (south of the land bridge). The Method 3 human health risk characterization concluded, based on the groundwater results obtained to date, that a Condition of No Significant Risk also exists for Site groundwater. In addition, a Condition of No Significant Risk exists for human receptors in the northern portion of the wetland under the current use scenario given the current fence, based on data collected to date.

A Condition of No Significant Risk exists for human receptors in the northern portion of the wetland under future use scenarios, with the exception of the ERC-SED-11A MCP hot spot area (sample locations ERC-SED-11A, SED-11A-B, SED-11A-D). The ERC-SED-11A MCP hot spot area contains PCB concentrations in sediment greater than one hundred times the corresponding MCP Method 1 S-1 soil standard, and the average PCB concentration in the remainder of the northern wetland. Therefore, the ERC-SED-11A MCP hot spot area meets the MCP definition of a "hot spot". Upon removal of the ERC-SED-11A MCP hot spot, a condition of No Significant Risk to human health will be achieved.

No nuisance conditions exist with respect to the Site, there has been no significant loss of active or passive uses of the property, no public resource is known to be impacted by the wetland, and soil and groundwater EPCs are less than their respective MCP upper concentration limits (UCLs). Therefore, a Condition of No Significant Risk to public welfare exists at the Site.

2.5 Special Project Designation

The RTN 4-15685 disposal site has a Special Project Designation, per 310 CMR 40.0060, granted on December 20, 2001. On June 2, 2007, MassDEP granted a five-year extension of the Special Project Designation to February 25, 2012. On May 2, 2012, MassDEP granted conditional approval of a further extension until February 25, 2014.

Public involvement meetings are regularly held to inform concerned citizens of the project status.

3.0 PHASE III REMEDIAL ACTION ALTERNATIVES

The purpose of this Phase III report is to document the results of the Identification, Evaluation, and Selection of the Comprehensive Remedial Action Alternatives process, which was performed for the Site. This section addresses the selection and design of remedial response actions per the MCP (310 CMR 40.0850). Certifications called forth by the MCP were provided on the electronic Bureau of Waste Site Cleanup transmittal form submitted to MassDEP via eDEP concurrent with the submittal of this document.

3.1 Scope

This Phase III report presents an identification and evaluation of feasible remedial alternatives to address areas at the Site impacted by the presence of PCBs, PAHs, lead, and zinc. The wetland soil and/or sediment in the areas identified in Section 3.2.2 exceed target levels for soil and sediment derived by the Stage II ERC and/or exceed MassDEP risk limits for human health. The identification and evaluation of the remedial action alternatives process includes:

- **Technology screening -** An initial screening to identify those remedial technologies that are reasonable likely to be feasible and effective.
- **Compile remedial technologies -** The assembly of feasible remedial technologies into remedial action alternatives that are reasonably likely to achieve a condition of No Significant Risk under the MCP.
- **Comparison of alternatives -** A detailed, comparative evaluation of the selected remedial action alternatives with respect to effectiveness, reliability, difficulty of implementation, comparative cost, risks, benefits, and timeliness.
- **Selection -** Selection of a remedial action alternative that is a Permanent or Temporary Solution, where a Permanent Solution includes measures that reduce, to the extent feasible, the concentrations in the environment to levels that achieve or approach background.

3.2 Alternatives Analysis

3.2.1 Remedial Action Objectives and Cleanup Goals

The objective of remediation at the Site is to address the elements of the MCP and TSCA related to the cleanup of PCB impacts in soil and sediment, where applicable. If feasible, MCP remediation seeks to eliminate the risks identified in the Phase II CSA Risk Characterization. Elimination of significant risks and the achievement of a Permanent Solution and Class A RAO indicates a condition of No Significant Risk has been achieved. A Permanent Solution must address elements set forth in 40 Code of Federal Regulations (CFR) Part 761 to the extent that portions of the site are regulated under TSCA.

The Phase II CSA documented the nature and extent of impacts at the Site and describes both the human health and ecological risk characterization results. This information provided the basis for the development of remedial objectives and cleanup levels, if applicable, and identifies the

impacts of concern and associated exposure pathways for which a condition of No Significant Risk does not exist and which must be addressed in the Phase III evaluation. Section 3.2 presents the specific cleanup goals and locations needing remediation.

For this Site, the general remedial objectives are prescribed by the MCP and TSCA regulations.

The general remedial objectives for under the MCP are as follows:

- Achieve a condition of No Significant Risk to human health, safety, public welfare, and the environment, if feasible, and reduce concentrations to background conditions, if feasible.
- Eliminate or control continuing sources of impact.
- Eliminate UCL exceedances in soil and groundwater, if feasible.
- Eliminate Substantial Hazards if a condition of No Significant Risk is not feasible to achieve at this time.

The general remedial objective for cleanups under TSCA is compliance with the EPA's PCB remediation waste regulations in 40 CFR 761.61.

For the wetland, there are no continuing sources, there are no UCL exceedances in soil and groundwater, and there is no Substantial Hazard for human receptors. Thus, the general cleanup objectives that will define the remediation are to achieve a condition of No Significant Risk under the MCP, if feasible; eliminate Substantial Hazards for ecological receptors, if feasible; reduce concentrations to background conditions, if feasible; and to comply with 40 CFR 761.61 and EPA project-specific direction.

3.2.2 Areas Requiring Remediation

Table 3-1 presents a summary of the specific remedial objectives for the Site including media and locations requiring remediation, chemicals that are contributing to risk and cleanup goals, as applicable. Remediation is only proposed for the northern wetland. Specific objectives are summarized as follows:

- **Sediment remediation.** Sediment remediation is proposed at specific locations in the northern wetland to address potential impacts to human health and benthic macroinvertebrates. The human health risk characterization was based on a MCP Method 3 risk characterization summarized within the TRC Phase II CSA. Estimated risks and hazards in excess of MassDEP risk limits formed the basis of selected human health-based remediation areas (in this case, a PCB MCP hot spot [locations ERC-SED-11A, ERC-SED11A-B and ERC-SED11A-D] was identified for removal). The Stage II ERC defined sediment remedial goals for ecological receptors for PCBs at 5 milligrams per kilogram [mg/kg], total PAHs at 30 mg/kg, and 459 mg/kg for zinc, for protection of

benthic macroinvertebrates. As summarized in Table 3-1 in the full report, the specific remedial objectives for sediment are as follows:

- Address PCBs within the vicinity of ERC-SED-11A, which is bounded by locations ERC-SED-11A, -11A-A, -11A-B, -11A-C, -11A-D, -11A-E, -11A-F, and -11A-K;
- Address PAHs and zinc at ERC-SED-8 and ERC-SED-11A;
- Address PCBs at SD-3F, SD-3G and SD-3K (SD-03 vicinity for sediment);
- The exposure point concentrations within several other 1,000-square foot sediment area that were studied in the Stage II ERC are below sediment targets and may be left in place;
- Achievement of background conditions, where feasible.

- **Surface soil remediation.** Surface soil remediation is proposed at specific locations in the northern wetland to address potential impacts to ecological receptors. The Stage II ERC targets for surface soil are defined for PCBs at 6.6 mg/kg, lead at 100 mg/kg and zinc at 423 mg/kg. Surface soil remediation is proposed at specific locations in the northern wetland to address the following conditions.
  - Address potential impacts to omnivorous birds and mammals and insectivorous mammals from PCBs, lead, and/or zinc;
  - Remediate soil at location ERC-SED-6 to address soils above the Stage II ERC 95 percent upper confidence level concentration targets for lead and zinc soil impacts;
  - Pursuant to the Stage II ERC targets for soils, remediate PCB impacts in the vicinity of SD-03 (soil locations ERC-SED-6 and the SD-03/SD-3A/SD-3D area);
  - Following remediation of the above soil locations, EPCs (i.e., 95 percent upper confidence level concentrations) will be below Stage II ERC targets for soils;
  - Achieve background conditions, where feasible.

Further, remediation of the northern wetland must also comply with EPA's TSCA regulations pursuant to 40 CFR 761.61. PCB remediation waste is defined as waste containing PCBs resulting from a spill, release, or other unauthorized disposal at concentrations greater than or equal to 50 mg/kg for materials disposed prior to April 18, 1978. The sediment locations in the TSCA PCB area defined by ERC-SED-11A, ERC-SED-11B, ERC-SED-11A-B, and ERC-SED-11A-D meet this definition of PCB remediation waste. Two TSCA cleanup goals were considered for evaluating a range of PCB cleanup alternatives as follows:

- Sediment in the above defined TSCA PCB area in the northern wetland would be cleaned up to less than 50 mg/kg PCBs.

- Sediment and surface soil in the northern wetland would be cleaned up to the most stringent TSCA criterion of less than or equal to 1 mg/kg PCBs (this would also achieve background).

In summary, there are four specific areas where cleanup of the northern wetland is targeted to achieve a condition of No Significant Risk. Impacted material is primarily (90 to 95 percent) sediment versus soil. The four discrete areas of proposed remediation are as follows:

- Location ERC-SED-8 for sediment;
- Vicinity of ERC-SED-11A for sediment;
- Vicinity of SD-03 for soil; and
- Vicinity of SD-03 for sediment.

Sediment and soil impacts in the northern wetland are largely surficial, typically in the top six inches or less. In addition, to achieve a condition of No Significant Risk for the environment, only the top six inches needs to be addressed. There are only two possible exceptions to remediating just the top six inches as follows:

- **Sediment in the TSCA PCB area in the vicinity of ERC-SED-11A**. Elevated PCB impacted sediment exists in the top six inches, and the limited available data suggests no deeper impacts. The top six inches will be remediated and confirmatory sampling will be used to determine whether remediation goals have been achieved.

- **Sediment and soil above background**. Concentrations greater than background may extend deeper than six inches. Thus, remediation to background could involve deeper excavations.

In summary, the areas needing remediation and dimensions of removal areas are characterized as follows for purposes of the remedial alternatives evaluation. The specific remediation areas are also summarized within Figures 3-1 and 3-2.

Location/vicinity	Surface Area, ft^2	Depth, feet	Volume, CY
Vicinity of ERC-SED-11A(1)	1,215	0.5	23
Location ERC-SED-8	334	0.5	6
Vicinity of SD-03(2) (soil and sediment)	539	0.5	10
Subtotal	*2,088*	*0.5*	*39*
Area above background(3)	33,028	0.5	612

Notes:
ft2= square feet, CY= cubic yards, in situ
(1) Vicinity of ERC-SED-11A is defined by sampling locations ERC-SED-11A, -11A-A, -11A-B, -11A-C, -11A-D, -11A-E, -11A-F, and -11A-K.
(2) Vicinity of SD-03 is defined by ERC-SED-6 and SD-03/SD-3A/SD-3D for soil and SD-3F/SD-3G/SD-3K for sediment.
(3) "Area above background" also includes the other areas identified in this table.

3.2.3 Identification and Initial Screening of Remedial Action Technologies

Identification of Potential Remedial Technologies

An identification and initial screening of remedial action technologies was conducted to identify remedial action alternatives which are reasonably likely to be feasible, based on the impacts present at the Site, media impacted, and Site characteristics. Remedial action alternatives are considered (310 CMR 40.0856) reasonably likely to be feasible if:

- The technologies to be employed by the alternative are reasonably likely to achieve a Permanent or Temporary Solution; and
- Individuals with the expertise needed to effectively implement available solutions would be available, regardless of arrangements for securing their services.

Table 3-2 provides a description of potential remedial technologies for sediment and soil impacts at the Site.

Technologies Retained for Further Evaluation

Table 3-3 summarizes the initial screening results for remedial technologies. The retained technologies are as follows:

- No action
- Use restrictions/institutional controls.
- Dredging – mechanical and hydraulic;
- Dewatering;
- Stabilization (ex situ);
- Capping;
- Wetland filling;
- Off-site landfill;
- Off-site treatment (if needed); and
- Fencing and institutional controls.

Selected technologies were retained for further development and evaluation in Section 3.2.4.

3.2.4 Identification of Remedial Action Alternatives

Based on the initial screening evaluation, a limited number of practical remedial action alternatives were identified with a range of possible outcomes for detailed evaluation. Development of these comprehensive remedial action alternatives incorporated the remedial goals, including consideration of the generally small areas and sediment/soil quantities for most alternatives compared to the overall size of the wetland. The remedial action alternatives developed from the initial screening are presented in Table 3-4 and summarized as follows:

- **No. 1 – No Action, Maintenance of Existing Site Controls**. This is a no action alternative that would continue current conditions. Due to an ecological Substantial Hazard associated with potential migration of sediment beyond the northern wetland, this alternative would not result in a Temporary Solution.

- **No. 2 – Class A-3 RAO, Capping with Possible Limited Removal**. A soil or composite material cap would be installed in the areas to be remediated. Depending on final cap design, some sediment and/or soil may be excavated prior to the installation of the cap. The cap would limit vertical migration of remaining chemicals of interest from underlying sediment/soil, and may require establishment of compensatory wetland depending on the extent of capping applied.

- **No. 3 – Class A-2 RAO, Removal for Unrestricted Use**. Sediment/soil containing greater than 1 mg/kg PCBs would be excavated and disposed off site. This would approach or achieve background for PCBs and possibly metals. Areas would be backfilled to existing grades with clean material and the wetland re-established.

3.3 Evaluation and Comparison of Comprehensive Remedial Solutions

Each comprehensive remedial alternative identified above was further evaluated with respect to the comparative evaluation criteria specified at 310 CMR 40.0858 of the MCP. These criteria include: effectiveness, reliability, difficulty of implementation, cost, risks, benefits, and timeliness. Each criterion is briefly summarized as follows:

- **Effectiveness.** The ability of the remedy to treat, destroy, detoxify, reuse, or recycle contaminants at the Site, and achieve either a Permanent Solution or a Temporary Solution under the MCP. The effectiveness of the alternative to reduce levels to concentrations that achieve or approach background is also considered.
- **Reliability.** The degree of certainty that the remedy would be successful over the short- and long-term timeframes. The effectiveness of any measures intended to manage residues or control discharges to the environment is also evaluated under this criterion.
- **Implementability.** Comparative difficulty in terms of technical complexity, integration with facility operations, monitoring elements, and material and labor availability.
- **Cost.** Costs of remedy design, implementation, and regulatory compliance.
- **Risk.** Comparative risks posed by the Site to workers, the community, and the environment during and after remedy implementation.
- **Benefits.** The comparative benefits of the alternative including the provision for productive Site reuse, restoration of natural resources, and the avoided costs of disruption to people and businesses.
- **Timeliness.** The relative time for the alternative to eliminate impacts and achieve a condition of No Significant Risk at the Site.

- **Non-pecuniary Effects**. The relative effect on non-pecuniary interests, such as aesthetics.

The cost estimates presented in this document (Appendix C) were prepared solely for the relative comparison of the remedial alternatives, and are not design-level estimates. Costs are presented as net present value capital and operating costs. Each comprehensive remedial solution was also evaluated to determine whether it would achieve a condition of No Significant Risk pursuant to a Permanent Solution and a Class A RAO, or a condition of No Substantial Hazard pursuant to a Temporary Solution and Class C RAO. Compliance with TSCA is also addressed.

A remedial alternatives evaluation matrix is presented in Table 3-5. Each remedial alternative is rated for each of the evaluation criterion. Table 3-6 summarizes pertinent quantities and costs. A discussion of the remedial alternatives is presented in the following subsections.

3.3.1 Conceptual Remedial Alternative No. 1: No Action, Maintenance of Existing Site Controls

Remedial Alternative No. 1 would involve periodic inspection and maintenance of the existing perimeter fence surrounding the northern wetland area to restrict human access. Site trespassers and ecological receptors may potentially be exposed to impacted sediment and soil in a limited area of the northern wetland. The existing fencing surrounding the wetland currently limits access to the wetland for human receptors and would be periodically inspected and maintained. The No Action alternative will not achieve a condition of No Significant Risk and would not be suitable as a Temporary Solution under the MCP due to an ecological Substantial Hazard. It would also not meet the post-remedial standards set forth in the TSCA regulations. It would achieve No Substantial Hazard for human exposures.

3.3.2 Conceptual Remedial Alternative No. 2: Class A-3 RAO, Capping with Possible Limited Removal

Remedial Alternative No. 2 would remediate the four relatively small areas (2.3 percent of the total area of the northern wetland) by installing a soil or composite material cap. Depending on final cap design, some sediment and/or soil may be excavated prior to the installation of the cap. Figure 3-1 presents the conceptual capping areas for Remedial Alternative No. 2. This alternative is the preferred remediation method as the capping isolates remaining chemicals of interest that exceed cleanup goals. Possible removals prior to capping would reduce the presence of chemicals of interest. This alternative is also the most cost-effective and timely remedial measure, which could be implemented outside the school year.

The final cap design will be developed in the Phase IV Remedy Implementation Plan for the Site. A range of cap and removal designs are available including for example simple soil caps to engineered composite caps. Cap thickness, cap components, soil/sediment removal prior to cap installation, construction approach, and the need for compensatory wetlands (and location thereof) are other considerations that will be addressed in the final design.

Soil caps for wetlands typically vary in thickness from six inches to three feet. The thicker soil caps at this Site would eliminate the wetland in the capped area and thus also need compensatory wetland construction. Thinner soil or composite caps support the continued presence of a wetland and may reduce the water freeboard over the cap unless a similar thickness of sediment is removed prior to cap installation. The final cap design process will evaluate these details and develop a final solution.

Composite caps offer additional measures to mitigate impacts. A typical composite cap would consist of a 3-inch low permeability clay-type cap overlain by 3 inches of clean soil. The clay-type layer would be AquaBlok®, or similar. AquaBlok® is a patented, composite-aggregate technology typically comprised of a dense aggregate core of small stones individually coated with Bentonite clay. AquaBlok® particles expand when hydrated creating a continuous and soft body of material. Once developed, the hydrated AquaBlok® acts as an effective physical, hydraulic, and chemical environmental barrier by virtue of its relatively cohesive and homogeneous character, low permeability to water, and chemically sorptive nature. The composite cap would provide a substrate for wetland vegetation and habitat for macroinvertebrate organisms. The AquaBlok® would be applied dry across the surface being capped and would hydrate in place. A positive slope of the AquaBlok® layer towards the perimeter is needed to allow gases normally generated by wetland sediments to migrate horizontally and vent, while maintaining the integrity of the cap. A 3-inch soil layer would be installed on top of the AquaBlok® layer to protectively cover the clay and provide additional clean substrate for aquatic organisms.

Depending on final cap design, sediment/soil may be removed prior to cap installation. Sediment/soil removal and treatment would generally follow the process below. Design details would be developed in the Phase IV RIP for the selected remedy. Also, remediation contractors would be allowed to bid alternate methods, which may alter details. The typical approach to removal and cap installation is as follows:

- In the excavations vicinity, stage fractionation (frac) tanks to receive excavation dewatering water, water treating equipment for treatment of water before discharge, if necessary (if off-site disposal is not used), and water tight roll-off tanks to receive sediment.
- Place timber mats in the wetland around the area(s) to be excavated to provide a base for the operation of heavy equipment.
- Install interlocking sheet piling around the area(s) to be excavated to isolate the area(s) and minimize the inflow of water from the surrounding wetland.
- Pump water from within the sheet-piled area to the frac tanks prior to excavation. Continue pumping as needed and process for discharge; collect discharge samples as necessary.
- Excavate the sediment (mostly 6-inch depth) from within the sheet-piled areas with clam shell, or similar, excavation equipment and load into water tight roll-off tanks. Collect confirmatory sediment samples, as needed or as desired.

- Apply soil or composite cap within sheet-piled area(s). Remove sheet piling.
- Install soil or composite cap outside sheet-piled area(s).
- Stabilize sediment from the TSCA area. This sediment might need metals stabilization to render it suitable for disposal. This sediment would be treated in the water-tight roll-off tanks by the addition of a stabilizing agent.
- Sediment removed from the wetlands would generally need measures to increase solids content for transport and disposal. The relatively small quantities of sediment probably do not justify the mobilization and use of on-site dewatering equipment. Alternatively, the supernatant in the roll-off tanks would be removed following gravity settling of the sediment contents. Then the sediment would be mixed with sand, cement, or other additive acceptable to the disposal facilities to increase the solids content and render the sediment suitable for shipment and disposal.
- Demobilize staged equipment and facilities (e.g., timber mats) from the wetland.
- Restore the disturbed wetland areas with plantings.
- Demobilize all equipment from the site.

Possible dewatering fluids would be collected within frac tanks and staged pending treatment and disposal. Disposal of dewatering fluids would involve treatment and discharge to a storm drain under a Remediation General Permit (RGP) under the National Pollutant Discharge Elimination System (NPDES), or to the publicly-owned treatment works (POTW) under a POTW pretreatment permit, or transported off site via tanker truck to a MassDEP licensed industrial wastewater treatment plant (WWTP). Dewatering fluids may undergo treatment prior to discharge. The dewatering fluid treatment steps would potentially involve primary and secondary sediment removal through settling within the fractionation tank and bag filtration, respectively, and tertiary activated carbon treatment. Treated dewatering fluids would be transferred to a fractionation tank and sampled to ensure compliance with discharge criteria. In the case of off-site transport, untreated dewatering fluids would be directly transferred to tanker trucks and transported to a WWTP.

Possible installation of the cap on top of existing sediments would reduce the water freeboard over remediated areas by the cap thickness. This would be subject to New Bedford Conservation Commission approval. A Class A-3 RAO with an AUL would be achieved for site closure. Continued operation, maintenance and monitoring may be needed to inspect and maintain the cap.

3.3.3 Conceptual Remedial Alternative No. 3: Class A-2 RAO, Removal for Unrestricted Use

Remedial Alternative No. 3 involves a larger scale removal of sediment and soil from multiple areas with the wetland with the goal to remove sediment with PCB concentrations greater than 1 mg/kg and applicable areas in exceedance of the Stage II ERC targets. These areas would be backfilled with clean sand. Figure 3-2 presents the conceptual sediment removal areas for Remedial Alternative No. 3.

Dewatering within aquatic areas of the wetland would be necessary prior to sediment removal. Dewatering operations could be performed to varying degrees to achieve objectives. It is anticipated that the wetland would be completely or partially dewatered and that an aquifer test would be necessary to evaluate the transmissivity of groundwater to be removed from the wetland during full-scale remediation. The aquifer test would involve installation of an extraction well on the south end of the northern wetland. This aquifer test could be logistically difficult and could cause impact to the wetland habitat. During remediation, targeted sediment removal and capping would be performed within individual remediation "cells" to isolate the contaminated materials. Each remediation cell would be confined by inter-locking sheet piles. Extraction wells would be installed in the vicinity of each remediation cell to remove surface water and drawdown the groundwater table to approximately 1-foot below the wetland bedding material to remove sediment material in the "dry".

Staging elements associated with sediment removal would encompass a significant portion of the parking lot areas at the KMS. Therefore, sediment removal would best be performed during the summer months while school is out of session at the adjacent KMS. However, the large amount of sediment removal may extend the construction beyond the summer period and could temporarily impact school operations. TRC has assumed that sediment removal would also be conducted during the "dry season" when the groundwater table is relatively low, typically during late summer/early fall, in order to minimize dewatering needs. Complete or partial dewatering may involve continuous overnight dewatering operations and cause noise disturbances in the community. Stormwater runoff also originates from the rooftop of the KMS and is discharged into the wetland through the existing clean utilities corridors installed as part of the KMS construction. Dewatering could also be complicated by stormwater events and associated runoff discharge into the wetland and would involve temporary diversion from active remediation cells.

The initial capital cost for this alternative would be significantly higher than all other alternatives being by far the most complicated and difficult alternative to implement. Although, this alternative would achieve background conditions for PCBs as defined under the MCP and may approach background for the other constituents and may achieve a Class A-2 RAO it would come at an arguably disproportionate expense and significant disturbance to the wetland environment.

3.4 Selection of Remedial Alternative

Three Comprehensive Remedial Alternatives were evaluated for addressing the risk associated with impacts to soil and sediment at the Site. A remedial alternatives evaluation matrix is presented in Table 3-5. The No Action alternative will not achieve a condition of No Significant Risk and would not be suitable as a Temporary Solution under the MCP due to an ecological Substantial Hazard. It would also not meet the post-remedial standards set forth in the TSCA regulations. The remaining two alternatives were identified as being potentially able to achieve a Permanent Solution. Each alternative was evaluated with consideration given to the comparative evaluation criteria contained in 310 CMR 40.0858 of the MCP (effectiveness, reliability, difficulty of implementation, cost, risks, benefits, and timeliness). The detailed remedial alternatives evaluation matrix is presented in Table 3-5. Each remedial alternative is rated for

each of the comparative evaluation criterion. Table 3-6 summarizes pertinent quantities and costs. The results of the remedial alternative evaluations are summarized in Table 3-7.

As noted in Table 3-7, Remedial Alternative No. 2 is the preferred and most practical remedy due to the combined benefits of risk-reduction effectiveness and ease of implementation and cost. This alternative will provide a Class A-3 RAO Permanent Solution with an AUL.

3.5 Schedule

Per 310 CMR 40.0861(2)(i), a projected schedule for implementation of Phase IV activities and an estimated timeframe by which the selected remedial action alternative would result in the achievement of No Significant Risk and/or no Substantial Hazard is required as part of this Phase III. Upon approval of this Phase III from MassDEP and additional stakeholders, a Phase IV Remedial Implementation Plan would be compiled as part of remedial design completion. The Phase IV would include the remedial design for the selected remedial alternative. Following review and approval of the Phase IV from MassDEP and additional stakeholders, the estimated timeframe for remedial implementation activities would be in July 2013 prior to the beginning of the school year and during the approximate lowest annual wetland surface water and groundwater levels. The estimated timeframe for remedial implementation would require approximately two to three months. Once wetland remediation is completed, a final inspection report and Phase IV Completion statement would be submitted to MassDEP. A condition of No Significant Risk will be achieved following completion of the activities detailed within future Phase IV. Periodic monitoring of the capping materials would be conducted as part of the current wetland cap inspections. The observations from inspections would be summarized within periodic Phase V Status Reports to be submitted to MassDEP on a semi-annual basis. This schedule is contingent upon the City's ability to secure adequate project funding.

4.0 FEASIBILITY EVALUATIONS

A Feasibility Evaluation was completed in accordance with 310 CMR 40.0860 and with consideration of the guidance presented in MassDEP's document *Conducting Feasibility Assessments Under the MCP* (Policy #WSC-04-160).

4.1 Feasibility of Approaching Background

In certain cases, remedial actions to achieve or approach background may be considered to be categorically infeasible. Such is the case when the incremental cost of conducting a remedial action would be substantial and almost always disproportionate to the incremental benefit or risk reduction (see Policy #WSC-04-160).

The remedial objective at the Site is to achieve a condition of No Significant Risk to human health and the environment and comply with the MCP and TSCA. The implementation of Remedial Alternative No. 2, Class A-3 RAO, Capping with Possible Limited Removal, achieves this objective, while promoting cost efficiency. The installation of a capping system would isolate residual contamination and provide burrowing materials for benthic habitat. The possible limited removal portion of Remedial Alternative No. 2 targets the TSCA Area (including the MCP PCB hot spot) and possibly the additional ecological risk-based areas to immediately reduce risk to human health and the environment. Remedial Alternative No. 2 could likely be implemented readily during the summer months outside the regular school year without significantly impacting the current wetland configuration. The removal action proposed would involve disturbance to a limited area of the wetland, while the other Permanent Solution remedial alternative involves extensive excavation, backfilling and restoration and associated impact to the wetland environment and community. These more extensive remedial actions complicate project implementability and greatly reduce cost efficiency and respective environmental benefits.

Approximately 2,100 square feet of surface area is targeted for remediation for any selected remedial alternative (except Alternative No. 1) based on the conclusions of the environmental risk characterization and the human health risk characterization previously performed for the Site, with the exception of Remedial Alternative No. 3, which considers unrestricted site use. In the interest of preserving the current wetland habitat, while limiting collateral remedy implementation impacts, the selection of Remedial Alternative No. 2 provides a relatively benign option to isolate and possibly remove residual wetland contamination while still achieving a Permanent Solution under the MCP. The most significant wetland remediation implementation impacts and costs would be associated with Remedial Alternative No. 3, which involves the removal of residual impacts to provide a scenario of unrestricted Site use. The associated costs of Remedial Alternative No. 3, involving an attempt to achieve or approach background, would be substantially disproportionate to the cost necessary to achieve a condition of No Significant Risk, with undeniably significant collateral impacts to the environmental setting of the wetland. The remaining alternatives present remedial options that comprehensively consider effectiveness, implementability, reliability, risk and timeliness, while limiting impacts to the existing wetland habitat and increasing economic efficiency. Remedial Alternative No. 2 achieves the highest level of environmental benefits given this Phase III remedial alternatives analysis. The reliability

of all alternatives considered (except No. 3) would be verified with continued monitoring as a component of the wetland cap inspections.

The chemical of interest at the Site are considered persistent (e.g., metals, PAHs, PCBs) and select soils and sediment will be targeted, removed or contained by the composite capping material with the implementation of Remedial Alternative No. 2. Removal of soils and sediments from the wetland to background levels for unrestricted site use does not reduce existing environmental exposure risks without incurring high levels of remediation costs. Given the human health and environmental risk characterizations, the incurrence of these associated remediation costs does not appear to be feasible and efficient. The chemicals of interest are relatively immobile, and installation of a cap associated with Remedial Alternative No. 2 further isolates the residual contaminants. The risks of exposure are increased as part of the other active alternative considered, which involves potential disturbance of existing capping systems and extensive soil and sediment removal. Off-site disposal of these impacted soils and sediments as opposed to isolation with capping measures further increases exposure potential during transport and restoration of capping materials. Active removal measures would be most limited with the implementation of Remedial Alternative No. 2, which minimizes disturbance to the wetland.

In accordance with MassDEP guidance, for those co-located, non-persistent chemicals of interest that are present below risk-based standards, but exist at levels higher than would be the case if the disposal site was not present, it is unnecessary to evaluate the feasibility of achieving or approaching background since persistent chemicals are also present.

4.2 Reducing Chemicals at or below Upper Concentration Limits

A comparison of soil and groundwater EPCs to MCP UCLs was completed as part of the Phase II CSA risk characterization. No soil or groundwater EPCs exceed their respective MCP UCLs.

4.3 Critical Exposure Pathways

There are no critical exposure pathways at this Site.

5.0 PUBLIC INVOLVEMENT

In accordance with 310 CMR 40.0863 and 310 CMR 40.1400 thru 310 CMR 40.1406, the Mayor and the Board of Health for the City of New Bedford have been notified in writing of the availability of this report. The notifications were completed concurrent with the submittal of this report. Copies of the letters are provided in Appendix B.

In accordance with the City's Public Involvement Plan and in response to requests from the public to extend the comment period beyond the minimum 20-day period required by the MCP, a public comment period was conducted on the draft version of this report from August 31 through October 15, 2012. No comments were received during the public comment period.

6.0 REFERENCES

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MassDEP, 2005 — *New Bedford Wetlands DEP File No: SE-49-543, Superseding Order of Conditions-Affirmation.* Prepared for: City of New Bedford Department of Environmental Stewardship. Prepared by: New Bedford Conservation Commission

MassDEP, 2006 — *Revised Sediment Screening Values, Technical Update*, January 2006

TRC, 2012 — *Phase II Comprehensive Site Assessment, Wetland to the West of Keith Middle School, New Bedford, MA MassDEP RTN 4-21300.* On behalf of: City of New Bedford. Prepared by: TRC Environmental Corporation, Lowell, MA, January 2012.

Zen et al., 1983 — *Zen, E. (editor), Goldsmith, R., Ratcliffe, N.M., Robinson, P., Stanley, R. S., compilers, 1983, Bedrock Geologic Map of Massachusetts*. U.S. Geological Survey.

TABLES

Table 3-1

Specific Remedial Objectives
Wetland to the West of Keith Middle School
New Bedford, Massachusetts

Risk Category	Media-Area	Goals and Exceedence Locations by Parameter					Remediation Locations Summary
			PCBs	Lead	Zinc	PAHs	
Risk-based for Ecological Risk	Sediment-Northern Wetland	Cleanup Goal[1] - mg/kg	≤ 5	NSR	≤ 459	≤ 30	*Sediment* ERC-SED-11A Vicinity[3] SD-3F/SD-3G/SD-3K ERC-SED-8
		Remediation Locations	ERC-SED-11A Vicinity[2] SD-3F/SD-3G/SD-3K	-	ERC-SED-8 ERC-SED-11A	ERC-SED-8 ERC-SED-11A	
	Soil-Northern Wetland	Cleanup Goal[2] - mg/kg	≤ 6.6	≤ 100	≤ 423	NSR	*Soil* ERC-SED-6 SD-03/SD-3A/SD-3D
		Remediation Locations	ERC-SED-6 SD-03/SD-3A/SD-3D	ERC-SED-6	ERC-SED-6	-	
Risk-based for Human Health Risk	Sediment-Northern Wetland	Condition of Significant Risk	Yes	NSR	NSR	NSR	*Sediment* ERC-SED-11A MCP Hot Spot[4]
		Remediation Locations	ERC-SED-11A MCP Hot Spot[4]	-	-	-	
TSCA Regulatory Criteria[6]	Sediment-Northern Wetland	Cleanup Goal - mg/kg	< 50	NA	NA	NA	*Sediment* ERC-SED-11A TSCA Area[5]
		Remediation Locations	ERC-SED-11A TSCA Area[5]	-	-	-	

SUMMARY OF LOCATIONS REQUIRING REMEDIATION (three general areas)

1. ERC-SED-11A Vicinity[3] including TSCA Area[5] - sediment
2. ERC-SD-8 - sediment
3. SD-03 Vicinity: ERC-SED-6, SD-03, SD-3A, and SD-3D (soil); SD-3F, SD-3G, and SD-3K (sediment)

Notes:

1. Ecological cleanup goals for sediment are based on sediment toxicity testing (TRC 2009), except for zinc for which the MassDEP Revised Sediment Screening Value (MassDEP 2006) is used.
2. Ecological cleanup goals for forested soil are derived from No Observable Adverse Effect Level (NOAEL) and Lowest Observable Adverse Effect Level (LOAEL) Toxicity Reference Values, except lead which is set at the MassDEP natural soil background concentration (TRC 2009).
3. ERC-SED-11A Vicinity is defined by sampling locations ERC-SED-11A, -11A-A, -11A-B, -11A-C, -11A-D, -11A-E, -11A-F, and -11A-K.
4. ERC-SED-11A MCP Hot Spot (MCP Hot Spot) is defined by PCBs in sediment at sample locations ERC-SED-11A (434 mg/kg PCBs), -11A-B (705/805dup mg/kg PCBs), and -11A-D (838 mg/kg PCBs). PCBs in sediment in this Hot Spot represent a condtion of Significant Risk for human health and ecology.
5. ERC-SED-11A TSCA Area (TSCA Area) is defined by PCBs in sediments at sampling locations ERC-SED-11A, -11B (66.9 mg/kg PCBs), -11A-B, and -11A-D, the only locations where PCB concentrations in sediment/soil are ≥ 50 mg/kg. PCBs in sediment in this area represent a condition of Significant Risk to ecology. The MCP Hot Spot (significant risk for human health) is a subset of this area.
6. TSCA Regulatory Criteria - An alternate criterion for cleanup to the most restrictive TSCA limit is ≤ 1 mg/kg PCBs.
7. The wetland areas requiring remediation outside of the TSCA Area (and MCP Hot Spot), are collectively referred to as the"Additional Ecological Risk-based Area" for sediment and soil.

NSR - a condition of No Significant Risk exists.
NA - not applicable to TSCA.

Table 3-2

Identification of Remedial Action Technologies
Wetland to the West of Keith Middle School
New Bedford, Massachusetts

General Response Action/Technology	**Description of Technology**
SEDIMENT/SOIL REMOVAL	
Mechanical dredging	Physical removal of impacted sediment/soil using excavation equipment such as backhoes, draglines, clamshells, and bucket ladder dredges which can be vessel-mounted, track-mounted, or land-mounted.
Hydraulic dredging	Physical removal of impacted sediment/soil using a vacuum suction hose to remove material and discharge into a vactor truck for off-site disposal or a sludge box for partial dewatering on-site. Hose may clog with vegetation and/or debris
DESTRUCTION	
Incineration	Thermal destruction of organics in excavated sediment/soil by passing material through a high temperature combustion chamber. Organics are transformed into carbon dioxide. Metals are not destroyed. Ash residue disposal is required. Expensive.
Thermal Desorption	Heat treatment of excavated sediment/soil to volatilize volatile and semi-volatile compounds followed by the collection and combustion (destruction) of the volatilized compounds. Not effective for most metals. Thermal desorption is not a TSCA-approved method for PCB remediation waste treatment.
Biodegradation	In situ treatment of sediment/soil using indigenous or inoculated micro-organisms (e.g. fungi, bacteria, and other microbes) to degrade (metabolize) organic compounds, converting them to innocuous end products. Nutrients, oxygen, and/or other amendments may be used to enhance bioremediation and contaminant desorption.
In situ chemical oxidation	Injection of strong oxidizing chemicals such as potassium permanganate to chemically destroy organic compounds. Organically rich materials (e.g., wetland sediment/soil) require high chemical dosages to oxidize the natural organics before the organic contaminants are oxidized.
SEPARATION	
Sediment/soil washing	Excavation of impacted sediment/soil and mixing with surfactants to alter the attraction of contaminants to the finer soil particles and generate a concentrated liquid residual of contaminants. Also, sediment fines and associated adsorbed contaminants are separated from the bulk sediment/soil. Process is water based and works best with low organic content sediment/soil. Allows on-site reuse of bulk materials.
Dewatering	Removal of impacted water from sediment for separate treatment of the liquid and solid phases. Also used to dewater material before off-site transportation and disposal.

General Response Action/Technology	Description of Technology
Solvent extraction	Extraction of contaminants from the sediment/soil with water or other suitable aqueous solutions. Sediment flushing is accomplished by passing the extraction fluid through sediments using an injection or infiltration process. Extraction fluids must be recovered from the underlying aquifer and, when possible, recycled.
Phytoremediation	Planting special vegetation to remove, transfer, stabilize, and destroy OHM in soil and sediments. The technology may include vegetation harvesting to physically remove the absorbed contaminants from the environment. Shows some effectiveness on select organics and inorganics.
IMMOBILIZATION	
Stabilization /solidification (in situ)	Immobilization of metals and low concentrations of organic compounds by adding a solidifying agent (e.g. cement, fly ash, lime) to the sediment/soil with a mixing action to form a solid, low permeability matrix.
Stabilization (ex situ)	Stabilization of metals can be used to make contaminants, especially metals, less leachable and thus render potentially hazardous excavated sediment/soil nonhazardous prior to transport and disposal.
Capping	Installation of a physical barrier over areas of concern to reduce direct exposure and risk yet maintain the wetland environment. Caps can be constructed of a composite of materials to make them less permeable and/or capable of reducing vertical contaminant migration through the cap.
Wetland filling	Backfill the impacted wetland areas with clean soil of adequate thickness to eliminate the wetland environment in the area filled and provide a minimum 3-foot protective barrier. Would require the construction of compensatory wetlands to offset the wetland destruction. Minimizes disruption of remaining adjacent wetland areas.
DISPOSAL	
Off-site landfill	Removal and transport of impacted sediment/soil to an off-site permitted disposal facility. Sediment/soil characterization is required prior to disposal. On-site treatment of the excavated sediment/soil may be needed before shipment for off-site disposal, for example by metals stabilization as mentioned above.
Off-site treatment	Removal and transport of impacted sediment/soil to a permitted off-site treatment and disposal facility for off-site treatment via a number of methods (e.g., incineration, stabilization, thermal desorption).
EXPOSURE PATHWAY ELIMINATION	
Access restriction	Enclosure of the impacted area with a perimeter chain-link or similar fence to control access and prevent exposure to humans. May support a Temporary Solution.
Institutional controls	Implementation of property deed restrictions (such as the MCP Activity and Use Limitation (AUL)) to eliminate future exposure to residual subsurface impacts. Generally used following remediation.

Table 3-3

Screening of Remedial Action Technologies
Wetland to the West of Keith Middle School
New Bedford, Massachusetts

General Response Action/Technology	Effectiveness	Implementability	Screening Result
SEDIMENT/SOIL REMOVAL			
Mechanical dredging	Effective and reliable	Equipment and skills are available	**Retained**
Hydraulic dredging	Effective and reliable	Equipment and skills are available	**Retained**
DESTRUCTION			
Incineration	Effective and reliable but at high cost	Inappropriate to perform on site (due to school and space limitations)	Eliminated
Thermal desorption	Limited effectiveness	Facilities and capacity are available	Eliminated
Biodegradation	Questionable effectiveness for PCBs. Not effective for metals	Equipment and skills are available	Eliminated
In situ chemical oxidation	Limited effectiveness due to persistence of PCBs and large organic load in sediments. Not effective for metals	Equipment and skills are available	Eliminated
SEPARATION			
Sediment/soil washing	Unproven effectiveness for range of Site OHM	Equipment and skills are likely available, but infrequently used	Eliminated
Dewatering	Effective and reliable	Equipment and skills are available	**Retained**
Solvent extraction	Unproven effectiveness for range of Site OHM	Equipment and skills are available	Eliminated
Phytoremediation	Less effective on strongly sorbed OHM like PCBs. Does not destroy PCBs or metals	Equipment and skills are available	Eliminated

General Response Action/Technology	Effectiveness	Implementability	Screening Result
IMMOBILIZATION			
Stabilization /solidification (in situ)	May not be effective with high organic content of sediment. Solidified mass may not be conducive to wetland restoration	Equipment and skills are available	Eliminated
Stabilization (ex situ)	Effective and reliable	Equipment and skills are available	**Retained**
Capping	Effective and reliable. A range of options are available	Equipment and skills are available	**Retained**
Wetland filling	Effective and reliable. Needs regulatory approval for wetland filling	Equipment and skills are available	**Retained**
DISPOSAL			
Off-site landfill	Effective and reliable	Facilities and capacity are available	**Retained**
Off-site treatment	Effective and reliable	Facilities and capacity are available	**Retained**
EXPOSURE PATHWAY ELIMINATION			
Fencing	Effective for preventing human health exposures, but not for preventing longer term ecological exposures	Currently in place. May support a Temporary Solution	**Retained**
Institutional Controls	Effective and reliable	Mechanisms and skills are available for these institutional controls	**Retained**

Table 3-4
Remedial Alternatives for Evaluation
Wetland to the West of Keith Middle School
New Bedford, Massachusetts

1 No Action - Maintenance of Existing Site Controls

a. Fence maintenance to restrict access to the wetland
b. Regulatory submittals/approvals
    i. MCP - None. Substantial Hazard not controlled/eliminated.
    ii. TSCA - EPA 761.61(c) cleanup plan notification and approval (subject to negotiation,no prescriptive approval).
c. OMM - fence inspection
d. Activity and Use Limitation (AUL) for fencing - optional
e. Requires a future Permanent Solution under MCP and TSCA

2 Class A-3 RAO - Capping with Possible Limited Removal

a. Pre-implementation submittals/approvals
    i. MCP - Phase IV RIP with MassDEP approval
    ii. TSCA - EPA 761.61(c) cleanup plan notification and approval
    iii. NPDES - Regional General Permit
    iv. Wetlands - NOI and NB ConCom Order of Conditions (or Superceding Order)
b. Sediment removal
    i. Depending on final cap design, sediment may be removed prior to cap placement. The typical removal depth is 0.5 ft
c. Cleanup verification - as approved by EPA
d. Excavated sediment dewatering and disposal (off site); excavation water treatment and management
e. Sediment capping - the final cap design with determine the specific cap thickness and the cap will encompass the areas with Significant Risk
f. Wetland restoration - plantings in wetland. Depending on final cap design, compensatory wetland construction may be required
g. Fence removal - physically remove or indicate not required for closure; not part of AUL
h. MCP Phase IV Completion Statement following implementation
i. Closure with Permanent Solution
    i. Class A-3 RAO with an AUL and OMM for cap inspection
    ii. EPA 761.61(c) cleanup certification and approval

3 Class A-2 RAO - Removal for Unrestricted Use

a. Pre-implementation submittals/approvals
    i. MCP - Phase IV RIP with MassDEP approval
    ii. TSCA - EPA 761.61(a) cleanup plan notification and approval
    iii. NPDES - Regional General Permit
    iv. Wetlands - NOI and NB ConCom Order of Conditions (or Superceding Order)
b. Sediment removal
    i. Cleanup to TSCA 761.61(a) criteria of ≤ 1 mg/kg PCBs in expanded areas in wetland
c. Cleanup verification - as approved by EPA
d. Excavated sediment dewatering and disposal (off site); excavation water treatment and management
e. Excavation backfill - clean organic soil
f. Wetland restoration - plantings in wetland
g. Fence removal - physically remove or indicate not required for closure; not part of AUL
h. MCP Phase IV Completion Statement following implementation
i. Closure with Permanent Solution
    i. Class A-2 RAO possible (meets MCP S-1 standards of 2 mg/kg for PCBs and possibly for metals ; thus, no need for AUL for wetland)
    ii. EPA 761.61(a) cleanup certification and approval

Notes:

1. Areas where remediation is required are identified and defined by sampling locations in Table 3-1

2. Definition of terms: AUL - Activity and Use Limitation under the MCP; ConCom - Conservation Commission; MCP - Massachusetts Contingency Plan; NB - New Bedford; NOI - wetlands Notice of Intent; NPDES - National Pollutant Discharge Elimination System; OMM - operation, maintenance, and monitoring; RAO - Response Action Outcome; RIP - Remedy Implementation Plan; TSCA - Toxic Substances Control Act

Table 3-5 Remedial Alternatives Evaluation Matrix
Wetland to the West of Keith Middle School
New Bedford, Massachusetts

Evaluation Criteria[1]	Alternative #1	Alternative #2	Alternative #3
Alternate Description	**No Action –** Inspection and maintenance of existing perimeter fence to secure the site	**Class A-3 RAO –** Sediment capping with possible limited removal from beneath the cap, treatment, and off-site disposal; AUL	**Class A-2 RAO –**Removal of sediment with PCBs greater than 1 mg/kg with off-site disposal; backfill with soil; unrestricted future use
1. Effectiveness			
a) Temporary or Permanent	Class C Temporary Solution not achievable due to Substantial Hazard to ecological receptors	Class A-3 Permanent Solution with AUL	Likely Class A-2 Permanent Solution
b) Reuse, Recycling, Destroying, Detoxifying or Treating On-site	No actions to recycle, destroy, detoxify or treat on-site. OHM remains in place	OHM remains under the cap or is partially removed prior to capping, depending on final design. Up to 60 CY of sediment is removed, pretreated (stabilization, if needed, and dewatered) and disposed off-site	Approximately 612 CY of sediment with OHM is removed, pretreated (stabilization, if needed, and dewatered) and disposed off-site
c) Achieve or approach background	No OHM removal, thus no progress towards achieving or approaching background	OHM is covered to prevent exposure to human and ecological receptors. Some removal may occur, but background conditions would not be approached or achieved	Achieves background for PCBs. May not achieve or approach background for other site OHM due to the widespread presence and difficulty establishing background
Effectiveness Rating	**P**	**F-G**	**G**
2. Reliability			
a) Certainty of Success	Does not address current or long-term future risk associated with OHM in wetland sediment	Good certainty of containment of OHM, coupled with possible sediment removal. PCBs and metals are persistent with low mobility and remain isolated in the subsurface beneath cap	Very good certainty of success
b) Measures to Manage Residues	Inspection and maintenance of fence are required. Residues present significant current and future risk	Monitoring and maintenance of sediment cap are required due to underlying residues in capped areas	Limited residuals remain and no residuals management required
c) Measures to Control Emissions or Discharges	No measures are needed to control emissions or discharges since no field work is being performed	Sediment migration monitoring and controls are required during dewatering and dredging	The large remediation area requires extensive dewatering and increased sediment migration monitoring and control
Reliability Rating	**P**	**G**	**G**
3. Implementabililty			
a) Technical complexity	Least complex alternative due to no remedial action undertaken	Could require dewatering, dredging and/or capping of an area up to 3,400 sq ft in size. Depending on cap thickness, may need compensatory wetland construction. Moderate complexity	Most complex due to largest number and size (33,000 sq ft) of areas that need to be dewatered, dredged, and restored. High level of disturbance to wetland during implementation. High complexity
b) Integration with Facility Operations	No significant short-term impact to school operations , but requires future remediation and associated impacts	Not likely to impact school operations because should be able to complete in the summer time period. Capping systems with sediment removal or requiring compensatory wetland construction require more time to complete	Likely to impact school operations due to longest time required to implement, the largest equipment mobilization, and the greatest difficulty in completing work during summer months
c) Difficulty in Implementing Operations, Maintenance and Monitoring or Site Access Requirements and/or Limitations	No difficulty in implementing fence inspection and maintenance or accessing site	Requires sediment cap inspection and maintenance. No site access issues	Cap inspection and monitoring not likely required. No difficulty
d) Availability of Services, Materials, Equipment and Specialists	Minimal services required, but available.	Services available	Services available
e) Availability of Off-site Treatment, Storage or Disposal Facilities	Not required	Readily available. Volume of sediment for disposal is up to 60 CY	Readily available; largest waste quantity (612 CY) so most use of available disposal capacity
f) Approvals, Permits and Licenses	No permits or approvals required. No short-term disruption of wetland, but need for future remediation and permitting remains	Need approval of ConCom (and possibly others). Depending on design, up to 3400 sq ft of capped area and a compensatory wetland may be provided. Need Remediation General Permit for excavation and sediment dewatering discharge	Need approval of ConCom (and possibly others). Most disruptive of wetland during remediation (dredging in 33,000 sq ft excavation area or 22% of northern wetland) plus large ancillary impacts. Need Remediation General Permit for excavation and sediment dewatering discharge
Implementability Rating	**G**	**F**	**P**
4. Cost			
a) Cost of Implementation	Lowest cost at $180,000 for long-term OMM. No initial capital costs. Temporary Solution not achieved due to Substantial Hazard	Cost range of approximately $450,000 to $700,000 depending on detailed cap design. Lowest cost Permanent Solution	Highest cost at $7,200,000. Greater than ten times the cost of achieving No Significant Risk (Alt #2); thus not feasible due to incremental cost being much higher than incremental benefit
b) Cost of Environmental Restoration and Potential Damages to Resources	No environmental restoration included	Depending on cap details, may need compensatory wetland	No environmental restoration is required
c) Cost of Energy Consumption in Operation of Alternative	No long-term energy consumption associated with this alternative	No long-term energy consumption associated with remedy	No long-term energy consumption associated with remedy
Cost Rating	**G**	**F-G**	**P**

Table 3-5 Remedial Alternatives Evaluation Matrix
Wetland to the West of Keith Middle School
New Bedford, Massachusetts

Evaluation Criteria[1]	Alternative #1	Alternative #2	Alternative #3
Alternate Description	**No Action –** Inspection and maintenance of existing perimeter fence to secure the site	**Class A-3 RAO –** Sediment capping with possible limited removal from beneath the cap, treatment, and off-site disposal; AUL	**Class A-2 RAO –**Removal of sediment with PCBs greater than 1 mg/kg with off-site disposal; backfill with soil; unrestricted future use
5. Risk			
a) Risk During Implementation	No risk during implementation; no intrusive remedial actions.	Operation of heavy equipment creates worker safety risks	Greatest operation of heavy equipment creates worker safety risks. Greatest amount of material for off-site disposal with attendant potential for increased traffic and related nuisance and safety conditions
b) Risk During Operations	Essentially no risk from OMM during fence inspection and maintenance.	Minimal risk from OMM for inspection and maintenance of cap	No long-term OMM required
c) Risk Associated with Remaining Wastes	Significant long-term risk remains due to exposure to OHM for wetland biota and trespassers. Will not achieve No Substantial Hazard with No Action	No Significant Risk is achieved with capping and possible limited removal in areas beneath cap. Capping eliminates exposure pathway to remaining residues; low potential for vertical OHM migration. An AUL restricts future exposure to the OHM residues in the subsurface	No Significant Risk is achieved with removal; this alternative does the most to remove Site OHM and approaches background. An AUL is not likely required
Risk Rating	**P**	**G**	**F-G**
6. Benefits			
a) Restores Natural Resources	Will continue as wetland. No natural resources to be restored. Continuing risk of exposure to OHM. Does not achieve No Substantial Hazard for ecological receptors	Compensatory wetland may be needed depending on cap design details. Need wetland regulatory approvals for capping	No natural resources to be restored beyond remediation work. This alternative removes the largest amount of Site OHM, but temporarily disrupts entire northern wetland
b) Provides Productive Reuse of Site	Continuing environmental benefits of wetland	Continuing environmental benefits of wetland	Continuing environmental benefits of wetland
c) Avoids Cost of Relocation of People or Provision of Alternate Water Supply	No need for relocation or provision of alternate water supply	No need for relocation or provision of alternate water supply	No need for relocation or provision of alternate water supply
d) Avoids Lost Value of Site	No lost value of site. Will remain a protected wetland	No lost value of site. Will remain a protected wetland. Possible compensatory wetland would avoid loss of ecological value	No lost value of site. Will remain a protected wetland
Benefits Rating	**P**	**F-G**	**G**
7. Timeliness			
a) Time to Achieve Remedial Objectives	No remedial actions included	2 to 4 months to implement remedial actions	5 to 6 months to implement remedial actions
Timeliness Rating	**G**	**F**	**P**
8. Non-pecuniary Effects			
a) Aesthetics	No permanent impact to aesthetics. Minor/subjective visual impact of fencing	No permanent impact to aesthetics	No permanent impact to aesthetics. Most significant aesthetics impact during implementation of all alternatives
Non-pecuniary Rating	**F-G**	**G**	**F**

NOTES:

1 Criteria ratings are ranked **P** (Poor), **F** (Fair), and **G** (Good).

2 Abbreviations: AUL – Activity and Use Limitation; ConCom – Conservation Commission; CY – cubic yards; OHM – oil and/or hazardous material; OMM – Operation, Maintenance, and Monitoring; sq ft – square feet; TSCA – Toxic Substances Control Act

Table 3-6
Remedial Alternative Quantities
Wetland to the West of Keith Middle School
New Bedford, Massachusetts

Remedial Alternatives for Wetland Sediment/Soil	Sediment Excavation Area		Capped /Backfilled Area		Sediment Excavation Volume	Sediment Disposal Quantity	Estimated Cost
	(sq feet)	% total[1]	(sq feet)	% total[1]	(in situ cubic yards)	(tons)[2]	
#1 **No Action** - Maintenance of Existing Site Controls	0	-	0	-	0	0	$177,000
#2 **Class A-3 RAO** - Capping with Possible Limited Removal	0 - 2088	0 - 1.4	2088 - 3408	1.4 - 2.3	11 - 58	52 - 325	$450,000 - $700,000
#3 **Class A-2 RAO** - Removal for Unrestricted Use	33,028	22.2	33,028	22.2	612	3,532	$7,200,000

Notes:

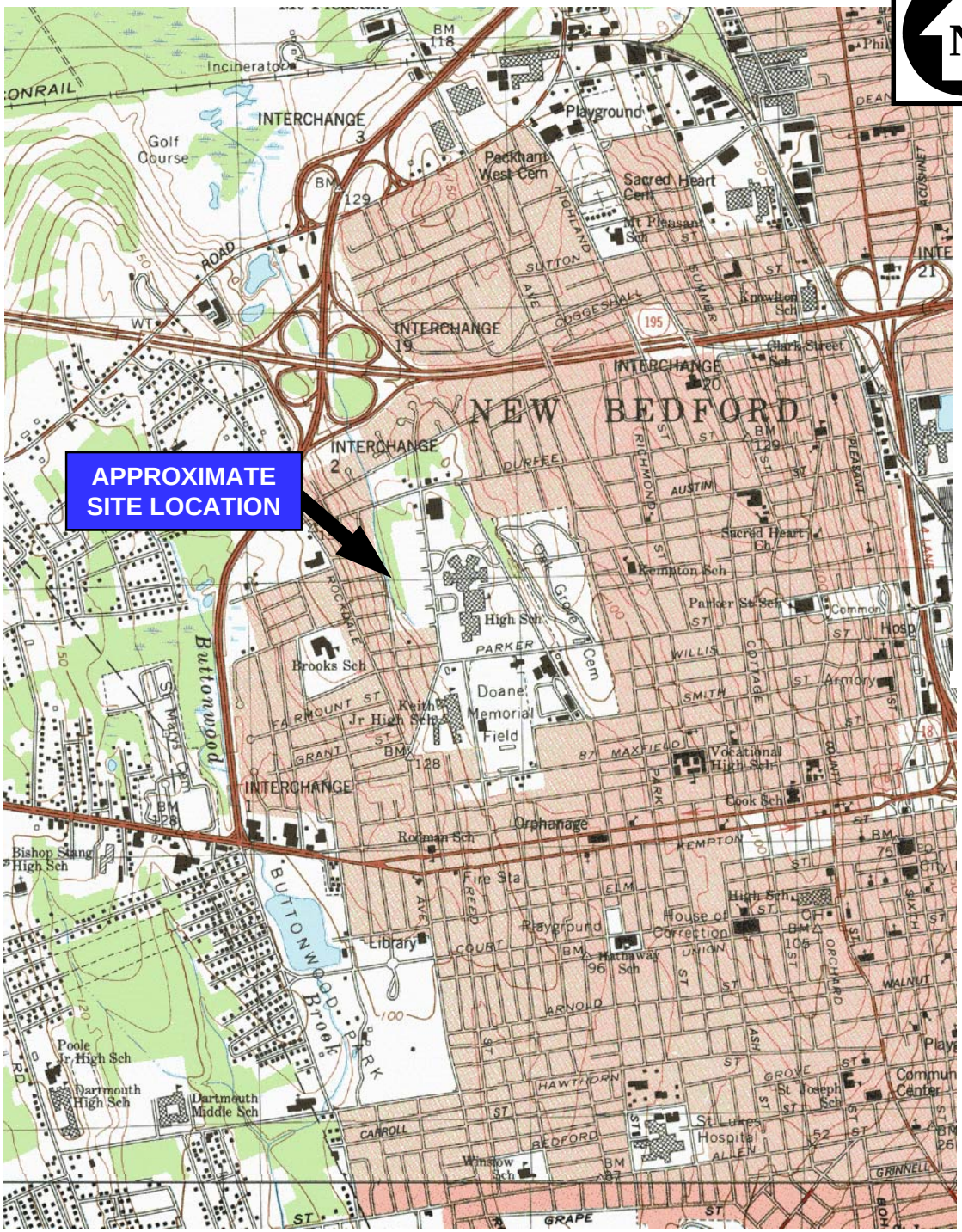
1. % total refers to percentage of the existing total area of the northern wetland.
2. Tonnage for disposal includes 1:1 dry weight addition of sand to reduce moisture for disposal.
3. For Alternative #2, a compensatory wetland of up to 3408 sq ft may need to be constructed, depending on final cap design.

Table 3-7
Remedial Alternatives Evaluation Summary
Wetland to the West of Keith Middle School
New Bedford, Massachusetts

		Comparative Evaluation Criteria and Rankings*	Effectiveness	Reliability	Implementability	Cost	Risk	Benefits	Timeliness	Non-pecuniary	Discussion
Remedial Action Alternative	#1	**No Action** - Maintenance of Existing Site Controls	P	P	G	G	P	P	G	F-G	This alternative is the least expensive. Inspection and maintenance of the existing fencing is required. This alternative is quick to implement, but is the least effective, least beneficial, and least reliable due to continuing risks of exposure to chemicals of interest for ecological receptions and trespassers, and the ultimate need for remediation in the future. Overall, this alternative has a Poor rating and does not achieve No Substantial Hazard for ecological impacts.
	#2	**Class A-3 RAO** - Capping with Possible Limited Removal	F-G	G	F	F-G	G	F-G	F	G	This alternative is the lowest cost Permanent Solution and caps sediment to isolate chemicals of interest and prevent exposure to human and ecological receptors. Depending on the cap design, limited sediment removal may occur beneath the capped area prior to capping and compensatory wetland construction may be required. The cap minimizes vertical contaminant migration. Final cap design will be subject to wetland regulatory approval. This alternative minimizes impact to the existing wetland and can be accomplished in a reasonable time frame. An AUL prevents uncontrolled access to the subsurface and provide for long-term cap maintenance. Overall, this alternative has a Good rating. **This is the preferred remedial alternative.**
	#3	**Class A-2 RAO** - Removal for Unrestricted Use	G	G	P	P	F-G	G	P	F	This Permanent Solution is included as an alternative that approaches background conditions at the Site for PCBs and possibly for metals. It is thus effective and reliable. However, it requires a major amount of dewatering and dredging of the wetland, takes significantly longer to implement (may encroach on school sessions), and is much higher in cost than any other alternative. Due to the effective removal of residuals, an AUL is not likely needed. Overall, this alternative has a Fair rating

* Ratings are ranked **P** (Poor), **P-F** (Poor to Fair), **F** (Fair), **F-G** (Fair to Good), and **G** (Good)
Effectiveness - the ability of the remedy to treat, destroy, detoxify, reuse, or recycle contaminants at the Site, and achieve a Permanent Solution under the MCP and or background.
Reliability - the degree of certainty that the remedy will be successful over the short- and long-term timeframes and the effectiveness of managing residuals.
Implementability - comparative difficulty in terms of technical complexity, integration with facility operations, monitoring requirements, material and labor availability, and disposal facility availability.
Costs - costs in terms of remedy design, implementation, and regulatory compliance.
Risks - comparative risks posed by the Site to workers, the community, and the environment during and after remedy implementation.
Benefits - the comparative benefits of the alternative including the provision for productive Site reuse, restoration of natural resources, and avoided lost values.
Timeliness - the relative time for the alternative to eliminate uncontrolled hazardous material and achieve a condition of No Significant Risk at the Site.
Non-pecuniary - the relative effect on non-pecuniary interests, such as aesthetic values.

FIGURES



BASE MAP IS A PORTION OF THE FOLLOWING 7.5' X 15' USGS TOPOGRAPHIC QUADRANGLES: NEW BEDFORD NORTH, MA, 1979; NEW BEDFORD SOUTH, MA 1977

T:\E_CAD\115058\TOPO KEITH MIDDLE SCHOOL FIG 1-1 072011.ppt

WETLAND TO THE WEST OF KEITH MIDDLE SCHOOL NEW BEDFORD, MASSACHUSETTS

SITE LOCATION MAP

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
978-970-5600

FIGURE 1-1

Drawn: HWB	SCALE: AS SHOWN
Checked: DS	Date: AUGUST 2011

DURFEE STREET
RIGHT-OF-WAY

DURFEE STREET

HATHAWAY BOULEVARD

NASHUA STREET

NORTHERN
WETLAND (FENCED)

HAPWELL STREET

SEE INSET BELOW

LAND BRIDGE

AUBURN STREET

SOUTHERN
WETLAND
(UNFENCED)

SUMMIT STREET

MACOMBER STREET

RIP RAP

SED-11A-F
SED-11A-E
ERC-SED11B
ERC-SED11A/
ERC SW11A
SED-11A-C
ERC-SED-11A
SED-11A-D
SLP-11A-4
SLP-11A-2
SLP-11A-3
SED-11A-B
SED-11A-A
SLP-11A-1
RIP RAP
SDR-05
OF-05

APPROXIMATE GRAPHIC SCALE
0' 10' 20' 40'

APPROXIMATE GRAPHIC SCALE
0' 20' 40' 80'

LEGEND:

BETA SAMPLES:

- JULY 04–SEPT 04 SOIL SAMPLES
- DEC 04–APR 05 SEDIMENT SAMPLES
- SEPT 05 SEDIMENT SAMPLES
- JAN 06 SEDIMENT SAMPLES
- SEPT 06 SEDIMENT AND SOIL SAMPLES
- AUG/NOV 06 MONITORING WELLS

TRC SAMPLES:

- NOV 07 SEDIMENT AND SOIL BORINGS
- MAY 08 SOIL BORINGS
- MAY/JUNE 08 SEDIMENT SAMPLES
- JUNE 08A SEDIMENT SAMPLES
- JULY 08 SEDIMENT SAMPLES
- AUG 08 SEDIMENT SAMPLES
- SEPT 08 SEDIMENT SAMPLES
- OCT 08 SEDIMENT SAMPLES
- OCT 08A SEDIMENT SAMPLES
- DEC 08 SEDIMENT SAMPLES
- DEC 08A SOIL SAMPLES
- MAR 09 SEDIMENT SAMPLES
- MAR 09A SOIL SAMPLES
- MAR 09B SEDIMENT SAMPLES
- JUNE 09 SOIL BORINGS
- JUNE 09A SEDIMENT SAMPLES
- JULY 09 SEDIMENT SAMPLES
- AUG 09 SEDIMENT SAMPLES
- AUG 09A SOIL SAMPLES
- NOV 09 SOIL SAMPLE
- DEC 09 SOIL BORINGS
- DEC 09A SOIL BORINGS/MONITORING WELLS
- FEB 10 SEDIMENT BORINGS
- APR 10 STAFF GAUGES
- MAY 10 SEDIMENT SAMPLES
- JUNE 11 SEDIMENT SAMPLES

WF 66 — WETLAND FLAGS

APPROXIMATE 8' CHAINLINK FENCE

AREA OF 2006 BETA GROUP EXCAVATION

SOUTHERN WETLAND (UNFENCED) — EXPOSURE POINT AREA BOUNDARY/ DESIGNATION

WETLAND TO THE WEST OF KEITH MIDDLE SCHOOL NEW BEDFORD, MASSACHUSETTS

DISPOSAL SITE MAP AND EXPOSURE POINT AREAS

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

FIGURE 2-1

DRAWN BY: HWB
CHECKED BY: MAO
DATE: 9-30-11

FILE: T:\E_CAD\115068\KMS DISP SITE - EXP POINT AREAS 9-30-11.dwg

DRAFT

DESIGN REVIEW NOT FINALIZED

HAPWELL STREET

SUMMIT STREET

DURFEE STREET

8" SEWER PIPE

PREVIOUS EXCAVATED AREA

PREVIOUS EXCAVATED AREA

RIP RAP

12" DRAIN PIPE FROM RECORD PLANS NO EVIDENCE IN FIELD BEYOND DMH 9 (ABANDONED)

LEGEND:

- TRC SURFACE SAMPLE LOCATIONS (2008–2009)
- TRC SURFACE SAMPLE LOCATIONS (2008–2009)
- TRC SEDIMENT SAMPLE LOCATIONS (2008–2010)
- BETA SURFACE SOIL SAMPLE LOCATIONS (2004, 2005)
- WETLAND BOUNDARY (WF 59)
- LIMIT OF PONDED WATER
- AREA OF BETA GROUP EXCAVATION
- TSCA EXCAVATION AREA
- AREA REQUIRING CAPPING

NOTE: DRAWING BASED ON "McCOY FIELD SITE PLAN" FROM BETA GROUP, NORWOOD, MA DATED 6–04 AND "NEW BEDFORD PROGRESS DRAWING" FROM BETA GROUP, NORWOOD, MA DATED 8–06.

APPROXIMATE GRAPHIC SCALE

0' 30' 60' 120'

KEITH MIDDLE SCHOOL WETLAND NEW BEDFORD, MASSACHUSETTS

REMEDIAL ALTERNATIVE NO. 2

CAPPING WITH POSSIBLE LIMITED REMOVAL

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

FIGURE 3-1

DRAWN BY: ZLR

CHECKED BY: REJ

DATE: AUGUST 2012

FILE: \\lowell-gis\cad\E_CAD\115058\KMS Phase III Rev1.dwg

DRAFT

DESIGN REVIEW NOT FINALIZED

HAPWELL STREET

SUMMIT STREET

8" SEWER PIPE

DURFEE STREET

PREVIOUS EXCAVATED AREA

PREVIOUS EXCAVATED AREA

RIP RAP

12" DRAIN PIPE FROM RECORD PLANS NO EVIDENCE IN FIELD BEYOND DMH 9 (ABANDONED)

LEGEND:

- TRC SURFACE SAMPLE LOCATIONS (2008–2009)
- TRC SURFACE SAMPLE LOCATIONS (2008–2009)
- TRC SEDIMENT SAMPLE LOCATIONS (2008–2010)
- BETA SURFACE SOIL SAMPLE LOCATIONS (2004, 2005)
- WETLAND BOUNDARY (WF 59)
- LIMIT OF PONDED WATER
- AREA OF BETA GROUP EXCAVATION
- SEDIMENT EXCAVATION AREAS

NOTE: DRAWING BASED ON "McCOY FIELD SITE PLAN" FROM BETA GROUP, NORWOOD, MA DATED 6–04 AND "NEW BEDFORD PROGRESS DRAWING" FROM BETA GROUP, NORWOOD, MA DATED 8–06.

APPROXIMATE GRAPHIC SCALE

0' 30' 60' 120'

KEITH MIDDLE SCHOOL WETLAND NEW BEDFORD, MASSACHUSETTS

REMEDIAL ALTERNATIVE NO. 3

SEDIMENT REMOVAL FOR UNRESTRICTED USE

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

FIGURE 3-2

DRAWN BY: ZLR

CHECKED BY: REJ

DATE: AUGUST 2012

FILE: \\lowell-gis\cad\E_CAD\115058\KMS Phase III Rev1.dwg

APPENDIX A

LIMITATIONS

LIMITATIONS

1. TRC Environmental Corporation's (TRC's) study was performed in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same geographical area, and TRC observed that degree of care and skill generally exercised by other consultants under similar circumstances and conditions. TRC's findings and conclusions must be considered not as scientific certainties, but rather as our professional opinion concerning the significance of the limited data gathered during the course of the study. No other warranty, express or implied is made. Specifically, TRC does not and cannot represent that the Site contains no hazardous material, oil, or other latent condition beyond that observed by TRC during its study. Additionally, TRC makes no warranty that any response action or recommended action will achieve all of its objectives or that the findings of this study will be upheld by a Massachusetts Department of Environmental Protection (MassDEP) audit.

2. This study and report have been prepared on behalf of and for the exclusive use of the MassDEP and the City of New Bedford (Client), solely for use in environmental response actions at the wetland to the west of Keith Middle School in New Bedford, Massachusetts ("Site") under the Massachusetts Contingency Plan (MCP; 310 CMR 40.0000). This report and the findings contained herein shall not, in whole or in part, be disseminated or conveyed to any other party, nor used by any other party in whole or in part, without the prior written consent of TRC.

3. The observations described in this report were made under the conditions stated therein. The conclusions presented in the report were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by Client. The work described in this report was carried out in accordance with the Terms and Conditions referenced in our proposals with the City of New Bedford.

4. In preparing this report, TRC has relied on certain information provided by state and local officials and other parties referenced therein, and on information contained in the files of state and/or local agencies available to TRC at the time of the study. Although there may have been some degree of overlap in the information provided by these various sources, TRC did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

5. In the event that the Client or others authorized to use this report obtain information on environmental or hazardous waste issues at the Site not contained in this report, such information shall be brought to TRC's attention forthwith. TRC will evaluate such information and, on the basis of that evaluation, may modify the conclusions stated in this report.

6. The purpose of this report was to assess the Site with respect to the requirements of the MCP. No specific attempt was made to check on the compliance of present or past

owners or operators of the Site with federal, state, or local laws and regulations, environmental or otherwise.

7. The conclusions and recommendations contained in this report are based in part upon the data obtained from soil and groundwater samples obtained from subsurface and other explorations described herein. The nature and extent of variations between these explorations may not become evident until further exploration. If variations or other latent conditions then appear evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

8. The conclusions and recommendations contained in this report are based in part upon various types of chemical data and are contingent upon their validity. These data have been reviewed and interpretations made in the report. As may be indicated within the report, some of these data may be preliminary "screening" level data, and should be confirmed with quantitative analyses if more specific information is necessary. Moreover, it should be noted that variations in the types and concentrations of contaminants may occur due to past disposal practices, the passage of time, and other factors. Should additional chemical data become available in the future, these data should be reviewed by TRC and the conclusions and recommendations presented herein modified accordingly.

9. Chemical analyses have been performed for specific parameters during the course of this Site assessment, as described in the text. However, it should be noted that additional chemical constituents not searched for during the current study could be present at the Site.

10. TRC's risk evaluation was performed in accordance with generally accepted practices of the MassDEP and other consultants undertaking similar studies. The findings of the risk evaluation are dependent on numerous assumptions and uncertainties inherent in the risk assessment process. Sources of uncertainty may include the description of Site conditions, the nature and extent of chemical distribution and the use of toxicity information. Consequently, the findings of the risk assessment are not an absolute characterization of actual risks, but rather serve to highlight potential sources of risk at the Site. Although the range of uncertainties has not been quantified, the use of conservative assumptions and parameters throughout the assessment would be expected to err on the side of protection of human health and the environment.

APPENDIX B

PUBLIC NOTICE LETTERS

Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854

978.970.5600 PHONE
978.453.1995 FAX

www.TRCsolutions.com

October 22, 2012

TRC Reference Number: 115058.0000.0000

Mayor Jonathan F. Mitchell
Office of the Mayor
City Hall, Room 311
New Bedford, Massachusetts 02740

RE: KMS Wetland Phase III Remedial Action Plan
New Bedford, Massachusetts
MassDEP RTN 4-21300.

Dear Mr. Mitchell:

On behalf of the City of New Bedford (the "City"), and pursuant to 310 CMR 40.1403 of the Massachusetts Contingency Plan (MCP), TRC Environmental Corporation (TRC) has prepared this letter to inform you of the submittal of a Phase III Identification, Evaluating and Selection of Comprehensive Remedial Action Alternatives (Remedial Action Plan), Wetland to the West of Keith Middle School, 225 Hathaway Boulevard, New Bedford, Massachusetts.

If you have any questions concerning this document, please do not hesitate to contact David Sullivan at TRC at (978) 656-3565 or Cheryl Henlin with the Department of Environmental Stewardship, at (508) 961-4576.

Sincerely,
TRC Environmental Corporation

David M. Sullivan, LSP
Sr. Project Manager

Cc: Cheryl Henlin, New Bedford Department of Environmental Stewardship

Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854

978.970.5600 PHONE
978.453.1995 FAX

www.TRCsolutions.com

October 22, 2012

TRC Reference Number: 115058.0000.0000

Dr. Brenda Weis
Health Department
1213 Purchase Street, First Floor
New Bedford, Massachusetts 02740

RE: KMS Wetland Phase III Remedial Action Plan
New Bedford, Massachusetts
MassDEP RTN 4-21300.

Dear Dr. Weis:

On behalf of the City of New Bedford (the "City"), and pursuant to 310 CMR 40.1403 of the Massachusetts Contingency Plan (MCP), TRC Environmental Corporation (TRC) has prepared this letter to inform you of the submittal of a Phase III Identification, Evaluating and Selection of Comprehensive Remedial Action Alternatives (Remedial Action Plan), Wetland to the West of Keith Middle School, 225 Hathaway Boulevard, New Bedford, Massachusetts.

If you have any questions concerning this document, please do not hesitate to contact David Sullivan at TRC at (978) 656-3565 or Cheryl Henlin with the Department of Environmental Stewardship, at (508) 961-4576.

Sincerely,
TRC Environmental Corporation

David M. Sullivan, LSP, CHMM
Sr. Project Manager

Cc: Cheryl Henlin, New Bedford Department of Environmental Stewardship

APPENDIX C

COST ESTIMATES

Table 1

COST ESTIMATE SUMMARY

ALTERNATIVE 1 - Maintenance of Existing Site Controls
WETLAND REMEDIATION, NEW BEDFORD, MA

Assumptions: Date: August-12

Additional remediation will be required to reach a permanent regulatory endpoint
For Item 4.0 OMM Annual Costs, the net present value (NPV) is based on the following:

15	year duration
3.5%	investment rate
2.0%	annual escalation rate

DESCRIPTION	QTY	UNIT	UNIT COST	COST	TOTAL
CAPITAL COSTS					
1.0 Confirmation of Existing Site Control Integrity					$1,000.00
1.1 Confirmatory Site Visit and Review	1	day	$1,000.00	$1,000.00	
2.0 Regulatory Compliance					$10,000.00
2.1 Class C RAO Temporary Solution	1	ls	$10,000.00		
3.0 Project Oversight					$1,100.00
3.1 Project Management			10%	$1,100.00	
				Estimated Capital Costs:	**$12,100.00**
OPERATION, MAINTENANCE, AND MONITORING (OMM) COSTS					
4.0 OMM Annual Costs (15 years)				(NPV)-->	$117,200
4.1 Semi Annual Fence Inspection	2	day	$1,000.00	$2,000	
4.2 Semi Annual Fence Inspection Report	2	ea	$2,500.00	$5,000	
4.3 Class C RAO Periodic Review (every 5 years to 15 years)	3	ls	$10,000.00	$30,000	
				Estimated Annual Operation, Maintenance, and Monitoring Costs:	**$129,300**
5.0 Contingencies					$35,350
5.1 Contingency - Percentage of Total			25%	$35,350	
				ESTIMATED TOTAL COST:	**$176,800**

Table 2

COST ESTIMATE SUMMARY

ALTERNATIVE 2 - Capping with Possible Removal
WETLAND REMEDIATION, NEW BEDFORD, MA

Assumptions: Date: August-12

The sediment removed from the TSCA Area will require stabilization for metals
Confirmatory samples will meet cleanup levels; no further excavation required
For Item 7.0 OMM Annual Costs, refer to Alternative 1 assumptions

DESCRIPTION	QTY	UNIT	UNIT COST	COST	TOTAL
CAPITAL COSTS					
1.0 Site Preparation and General Equipment					$48,600 to $79,300
1.1 Duration of Remediation/Replication Activities					
1.2 Site Investigation and Delineation					
1.3 Mobilization/Demobilization (assume 8%)					
1.4 Timber Mats and Site Preparation					
1.5 Existing Fence Removal					
1.6 Temporary Fencing					
1.7 Portable Facilities					
1.8 Professional Survey					
2.0 Dewatering					$6,900 to $58,500
2.1 Dewatering and Frac Tank Rental					
2.2 Transportation and Disposal of Dewatering Fluids					
3.0 Excavation, Disposal, and Capping					$59,400 to $110,900
3.1 Excavate and Load Rolloffs (includes staging rolloffs on site)					
3.2 Off-site Disposal & Transport (all fail TCLP, >50 ppm PCB)					
3.3 Off-site Disposal & Transport (non-haz, non-TSCA, dewatered)					
3.4 Sand Borrow for Capping					
3.5 Aquablok Capping (3 inches dry, expands to 4 inches wet)					
3.6 Backfilling for Cap from On-site Stockpiles					
3.7 Post Excavation Samples Analytical					
3.8 Soil Stabilization for Metals					
3.9 Disposal Characterization Analysis (1 sample every 250 tons)					
4.0 Site Restoration					$17,300 to $27,000
4.1 Wetland Revegetation and Restoration					
4.2 Professional Survey					
5.0 Project Oversight					$52,300 to $109,700
5.1 Field Staff Oversight					
5.2 Project Management					
5.3 Construction Management and Coordination					
Estimated Capital Costs:					**$184,500 to $385,400**
REGULATORY COMPLIANCE COSTS					
6.0 Regulatory Compliance					$58,000
6.1 Amended Order of Conditions	1	ls	$5,000	$5,000.00	
6.2 NPDES Remediation General Permit	1	ls	$2,500	$2,500.00	
6.3 EPA Notification and Approval	1	ls	$10,000	$10,000.00	
6.4 Health and Safety Plan	1	ls	$500	$500.00	
6.5 Phase IV RIP	1	ls	$15,000	$15,000.00	
6.6 Phase IV Completion Statement	1	ls	$5,000	$5,000.00	
6.7 Class A RAO and AUL	1	ls	$20,000	$20,000.00	
Estimated Compliance Costs:					**$58,000**
OPERATION, MAINTENANCE, AND MONITORING (OMM) COSTS					
7.0 OMM Annual Costs (20 years)				(NPV)-->	$118,200
7.1 Semi Annual Cap Inspection	2	day	$1,000.00	$2,000	
7.2 Semi Annual Cap Inspection Report	2	ea	$2,500.00	$5,000	
Estimated Annual Operation, Maintenance, and Monitoring Costs:					**$118,200**
8.0 Contingencies					$90,200 to $140,400
8.1 Contingency - Percentage of Total			25%		
ESTIMATED TOTAL COST:					**$450,000 to $700,000**

Table 3

COST ESTIMATE SUMMARY

ALTERNATIVE 3 - Removal for Unrestricted Use
WETLAND REMEDIATION, NEW BEDFORD, MA

Assumptions: Date: August-12

Area of excavation will be approximately 33,000 sq feet (areas with PCBs > 1 mg/kg)
Excavation will extend to a depth of 6 inches in areas with PCBs > 1 mg/kg
Confirmatory samples meet cleanup levels; no further excavation required

	DESCRIPTION	QTY	UNIT	UNIT COST	COST	TOTAL
CAPITAL COSTS						
1.0	Pre-Remediation Assessment					$741,500
1.1	TRC- Aquifer Test-Work Plan, Data Collection, Analysis, and Reporting	1	ls	$100,000.00	$100,000.00	
1.2	Sheet Pile Cells	1	ls	$75,000.00	$75,000.00	
1.3	Temporary Construction Area Access Road (Swamp Mats)	1	ls	$112,500.00	$112,500.00	
1.4	Aquifer Test-Well Installation	1	ls	$32,000.00	$32,000.00	
1.5	Aquifer Test Operation (Pumps, Hoses, and Generators, 2-man crew)	9	day	$4,200.00	$37,800.00	
1.6	Aquifer Test (Mobilization and Demobilization Frac Tank)	1	ls	$950.00	$950.00	
1.7	Aquifer Test (Frac Tank Rental)	150	day	$45.00	$6,750.00	
1.8	Aquifer Test (Frac Tank Cleaning)	5	ls	$2,200.00	$11,000.00	
1.9	Aquifer Test (Water Disposal)	436,000	gal	$0.54	$235,440.00	
1.10	Geotechical Evaluation of Cap	1	ls	$10,000.00	$10,000.00	
1.11	Bench Scale Bioremediation Testing	1	ls	$30,000.00	$30,000.00	
1.12	Elevation Survey	1	ls	$15,000.00	$15,000.00	
1.13	TRC Field Oversight	1	ls	$50,000.00	$50,000.00	
1.14	Complete Alternatives Analysis Report	1	ls	$25,000.00	$25,000.00	
2.0	Site Preparation and General Equipment					$2,063,000
2.1	Duration of Remediation Activities	3	mo			
2.2	Mobilization/Demobilization	1	ls	$5,000.00	$5,000.00	
2.3	Temporary Storage Trailer	3	mo	$432.00	$1,296.00	
2.4	Install Additional Extraction Wells	1	ls	$40,000.00	$40,000.00	
2.5	Pump Operation (Pumps, Hoses, and Generators, 2-man crew)	30	day	$4,200.00	$126,000.00	
2.6	Sheet Pile Cells	33,028	sf	$50.00	$1,651,400.00	
2.7	Temporary Construction Area Access Road (Swamp Mats)	1	ls	$112,500.00	$112,500.00	
2.8	Temporary Fencing	1,000	lf	$7.74	$7,743.60	
2.9	Fence Gates	2	ea	$712.80	$1,425.60	
2.10	Police Detail	480	hr	$70.00	$33,600.00	
2.11	Portable Facilities	3	mo	$200.00	$600.00	
2.12	Dumpster, Weekly, 1 Dump/wk, 20 cy Capacity	12	wk	$545.40	$6,544.80	
2.13	Install Erosion Control Measures	3,500	lf	$14.12	$49,404.60	
2.14	Dust Monitoring	2	mo	$13,728.00	$27,456.00	
3.0	Dewatering					$1,252,600
3.1	Well Installation	1	ls		$0.00	
3.2	Frac Tank Mobilization	1	ls	$4,800.00	$4,800.00	
3.3	Frac Tank Rental (3 tanks)	90	day	$256.00	$23,040.00	
3.4	Frac Tank Cleaning	1	ls	$4,500.00	$4,500.00	
3.5	Water Treatment Equipment Mobilization	1	ls	$30,515.00	$30,515.00	
3.6	Monthly Rental	3	mo	$6,000.00	$18,000.00	
3.7	Transportation and Disposal of Dewatering Fluids	2,160,000	gal	$0.54	$1,166,400.00	
3.8	Water Treatment Equipment Demobilization	1	ls	$5,272.00	$5,272.00	
4.0	Excavation and Disposal					$372,800
4.1	Excavate & Load	673	cy	$5.66	$3,807.29	
4.2	Transport to Storage Yard	673	cy	$4.20	$2,826.54	
4.3	Off-site Disposal & Transport, Non-haz, Non-TSCA (dewatered)	3,532	ton	$81.90	$289,284.00	
4.4	Backfill Soil Excavation with Organic Soil (10% bulking factor)	673	lcy	$36.93	$24,846.23	
4.5	Post Excavation Samples Analytical	100	ea	$470.50	$47,050.00	
4.6	Disposal CharacterizationAnalysis (1 sample every 250 tons)	5	ea	$985.00	$4,925.00	
5.0	Site Restoration					$243,800
5.1	Wetland Revegetation and Restoration	3,670	sy	$65.87	$241,728.26	
5.2	Professional Survey	1	ls	$2,000.00	$2,000.00	
6.0	Project Oversight					$1,020,000
6.1	Field Staff Oversight	60	day	$1,421.40	$85,284	
6.2	Project Management			10%	$467,340.49	
6.3	Construction Management and Coordination			10%	$467,340.49	
					Estimated Capital Costs:	**$5,693,700**
REGULATORY COMPLIANCE COSTS						
7.0	Regulatory Compliance					$58,500
7.1	Amended Order of Conditions	1	ls	$5,000	$5,000	
7.2	NPDES Remediation General Permit	1	ls	$2,500	$2,500	
7.3	EPA Notification and Approval	1	ls	$10,000	$10,000	
7.4	Health and Safety Plan	1	ls	$1,000	$1,000	
7.5	Phase IV RIP	1	ls	$15,000	$15,000	
7.6	Phase IV Completion Statement	1	ls	$10,000	$10,000	
7.7	Class A RAO	1	ls	$15,000	$15,000	
					Estimated Compliance Costs:	**$58,500**
8.0	Contingencies					$1,438,050
8.1	Contingency - percentage of total			25%	$1,438,050	
					ESTIMATED TOTAL COST:	**$7,190,250**