

Sampling and Analysis Plan

for the
Parker Street Waste Site
New Bedford, Massachusetts



Prepared by:

*United States Environmental Protection Agency,
Region I Office of Site Remediation & Restoration
Emergency Planning & Response Branch*

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Southeast Regional Office, Bureau of Waste Site Clean-Up*

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Citizens Leading Environmental Action Network*

Weston Solutions, Region I, Superfund Technical Assessment & Response Team III

April 2010

1.0 APPROVAL PAGE

U.S. EPA New England

| | |
|-------------------------------|---------------|
| _____ On-Scene Coordinator | _____ Date |
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| _____ Program Manager | _____ Date |
| _____ QA Chemist | _____ Date |

Weston Solutions, Inc.

| | |
|------------------------------------|---------------|
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| _____ Quality Assurance Officer | _____ Date |

Mass DEP

| | |
|--------------------------|---------------|
| _____ Project Manager | _____ Date |
| _____ Program Manager | _____ Date |

Community Technical Representatives

| | |
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| _____ LSP | _____ Date |
| _____ PE | _____ Date |

Preface and Instructions

This Sampling and Analysis (SAP) was prepared in conjunction with the *U.S. Environmental Protection Agency New England (EPA) Emergency Planning and Response Branch (EPRB) Generic Program Quality Assurance Project Plan (QAPP)* [1]. This SAP describes technical and quality control activities specific to the data collection operations, and will reference back to the *QAPP* for routine technical and quality assurance procedures that will be employed.

A copy of the SAP will be maintained in the site file and field. Also, a copy of the SAP may be forwarded to the Regional Sample Coordinator at the Office of Environmental Measurement and Evaluation (OEME) instead of the Data Quality Objective (DQO) Summary Form.

Acronyms

| | |
|--------------------------|----------------------------------------------------------|
| ADR | Automated Data Review |
| AL | Action Level |
| ATSDR | Agency for Toxic Substances and Disease Registry |
| CAM | Compendium of Analytical Methods |
| CBI | Confidential Business Information |
| CGI/O₂ | Combustible Gas Indicator/Oxygen Meter |
| CLEAN | Community Leading Environmental Action Network, Inc. |
| CLP | Contract Laboratory Program |
| CO | Contracting Officer |
| COC | Contaminant of Concern and Chain of Custody |
| COI | Conflict of Interest |
| CPR | Cardio-pulmonary Resuscitation |
| CRQL | Contract Required Quantitation Limit |
| DAS | Delivery of Analytical Services |
| DOT | Department of Transportation |
| DPW | Department of Public Works |
| DQI | Data Quality Indicators |
| DQO | Data Quality Objectives |
| EM | Equipment Manager |
| EPA | U.S. Environmental Protection Agency |
| EPRB | Emergency Planning and Response Branch |
| ERT | Environmental Response Team |
| FASTAC | Field and Analytical Services Teaming Advisory Committee |
| FID | Flame Ionization Detector |
| FORMS2L | Field Operations and Records Management System II Lite |
| HASP | Health and Safety Plan |
| HAZWOPER | Hazardous Waste Operations |
| HSO | Health and Safety Officer |
| IATA | International Air Transportation Agency |
| ICS | Incident Command System |
| IDW | Investigative-derived Waste |
| ID/IQ | Indefinite Delivery/Indefinite Quantity |
| KMS | Keith Middle School |
| LFB | Laboratory Fortified Blank |
| MassDEP | Massachusetts Department of Environmental Protection |
| MCP | Massachusetts Contingency Plan, 310 CMR 40.0000 |
| MDL | Method Detection Limit |
| MPC | Measurement Performance Criteria |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| MS/Dup | Matrix Spike/Duplicate |
| NB | City of New Bedford, MA |
| MSDS | Material Safety Data Sheet |
| NCP | National Contingency Plan |
| NIST | National Institute of Standards and Technology |
| OEME | Office of Environmental Measurement and Evaluation |
| OSC | On-Scene Coordinator |
| OSHA | Occupational Safety and Health Administration |

| | |
|---------------|---------------------------------------------------------------------|
| PAH | Polycyclic Aromatic Hydrocarbons |
| PCB | Polychlorinated Biphenyl |
| PE | Performance Evaluation Sample |
| PID | Photoionization Detector |
| PL | Project Leader |
| PM | Program Manager |
| PO | Project Officer |
| PPE | Personal Protective Equipment |
| PQL | Practical Quantitation Limit |
| PQO | Project Quality Objectives |
| QA | Quality Assurance |
| QAO | Quality Assurance Officer |
| QAPP | Quality Assurance Project Plan |
| QATS | Quality Assurance Technical Support |
| QC | Quality Control |
| QL | Quantitation Limit |
| RAL | Removal Action Level |
| RAS | Routine Analytical Services |
| RCRA | Resource Conservation and Recovery Act |
| RM | Reports Manager |
| RPD | Relative Percent Difference |
| RSCC | Regional Sample Control Coordinator |
| RSD | Relative Standard Deviation |
| SAP | Sampling and Analysis Plan |
| SDG | Sample Delivery Group |
| SEDD | Staged Electronic Data Deliverable |
| SERAS | Scientific, Engineering, Response, and Analytical Services Contract |
| SMO | Sample Management Office |
| SOP | Standard Operating Procedure |
| SOW | Statement of Work |
| START | Superfund Technical Assessment and Response Team |
| SVOC | Semivolatile Organic Compound |
| TAT | Turn-around-time |
| TDD | Technical Direction Document |
| TPO | Technical Project Officer |
| TR | Traffic Report |
| TRC | TRC Environmental Corp. |
| Weston | Weston Solutions, Inc. |
| WSC | MassDEP Bureau of Waste Site Cleanup |
| VOA | Volatile Organic Analysis |
| VOC | Volatile Organic Compound |
| XRF | X-Ray Fluorescence |

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2.0 INTRODUCTION

This SAP was developed by EPA and the Massachusetts Department of Environmental Protection (MassDEP) in consultation with the City of New Bedford. The SAP identifies the data collection activities and associated Quality Assurance/Quality Control (QA/QC) measures specific to the Parker Street Waste Site, located in New Bedford, Bristol County, Massachusetts. Data will be generated in accordance with the quality requirements described in the *QAPP*, dated June 16, 2005; applicable MassDEP Bureau of Waste Site Cleanup (WSC) Compendium of Analytical Methods (CAMs); and modified EPA Contract Laboratory Program (CLP) Laboratory methods. The purpose of this SAP is to describe site-specific tasks that will be performed in support of the stated objectives. The SAP will reference back to the *QAPP* for “generic” tasks common to all data collection activities including routine procedures for sampling and analysis, sample documentation, equipment decontamination, sample handling, data management, assessment and data review. Additional site-specific procedures and/or modifications to procedures described in the *QAPP* are described in the following SAP elements.

This SAP is prepared, reviewed, and approved in accordance with the procedures detailed in the *QAPP*, Section 3. Any deviations or modifications to the approved SAP will be documented using SAP Table 1, SAP Revision Form.

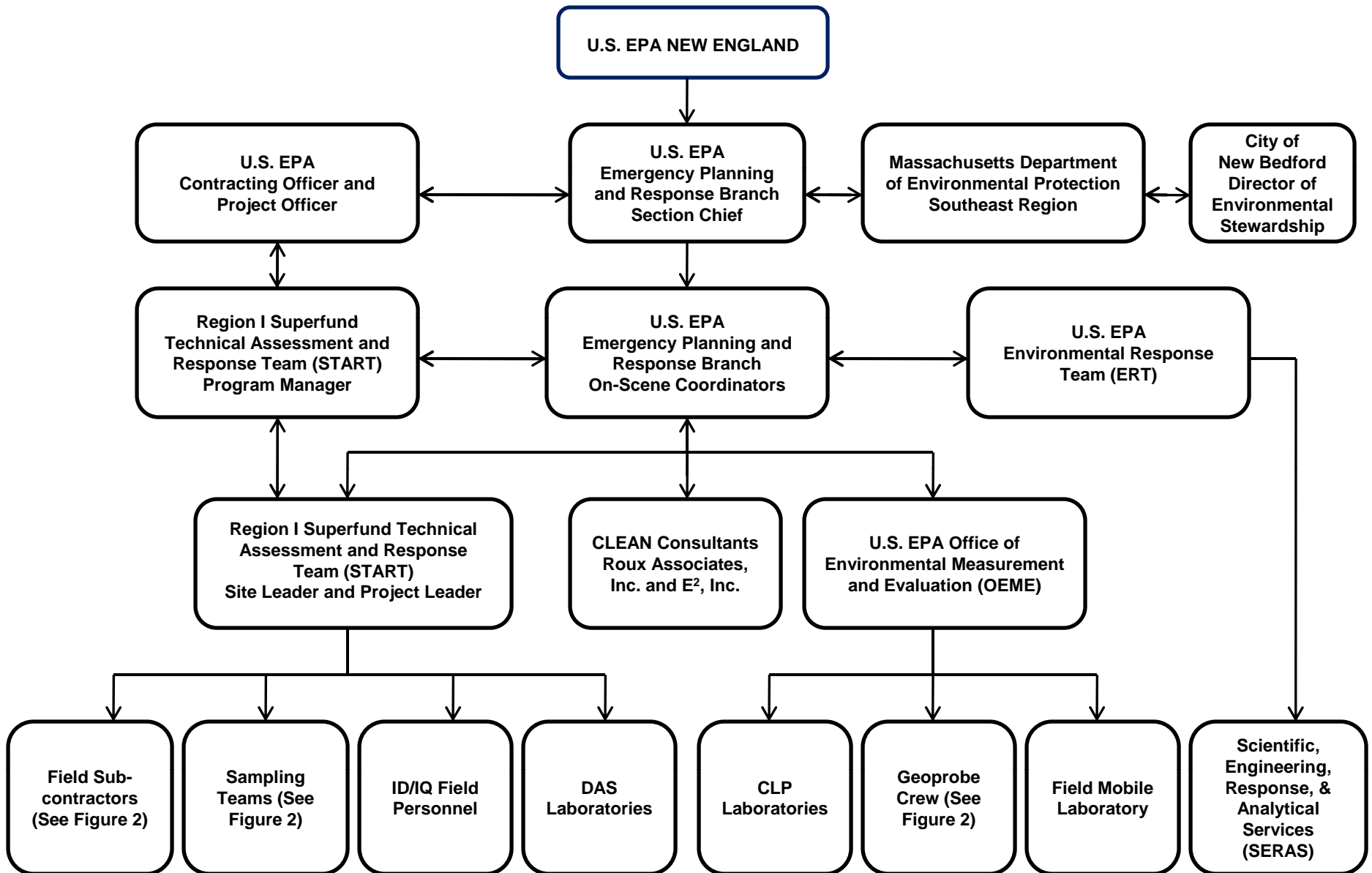
3.0 PROJECT ORGANIZATION, MANAGEMENT, AND RESPONSIBILITIES

Major project participants for the sampling activities at the Parker Street Waste Site include the EPA Region 1, EPA Environmental Response Team (ERT), Region I Weston Solutions, Inc., (Weston) Superfund Technical Assessment and Response Team (START), MassDEP, and City of New Bedford. Project organization and lines of communication for the participants are presented in Figure 1. When two or more prime contractors are tasked to work on the same project, the On-Scene Coordinator (OSC) coordinates technical issues between the contractors. One prime contractor may not direct the work of another prime contractor, nor can a contractor make site decisions that impact another contractor without authorization from the OSC, although routine communication between contractors is permissible. Only the roles and responsibilities for START are discussed in the following sections, while roles and communication lines are discussed for EPA, MassDEP, the City of New Bedford, and the Community Leading Environmental Action Network, Inc. (CLEAN) consultants. See Figure 1, Project Organization Chart. Field sampling teams are illustrated in Figure 2.

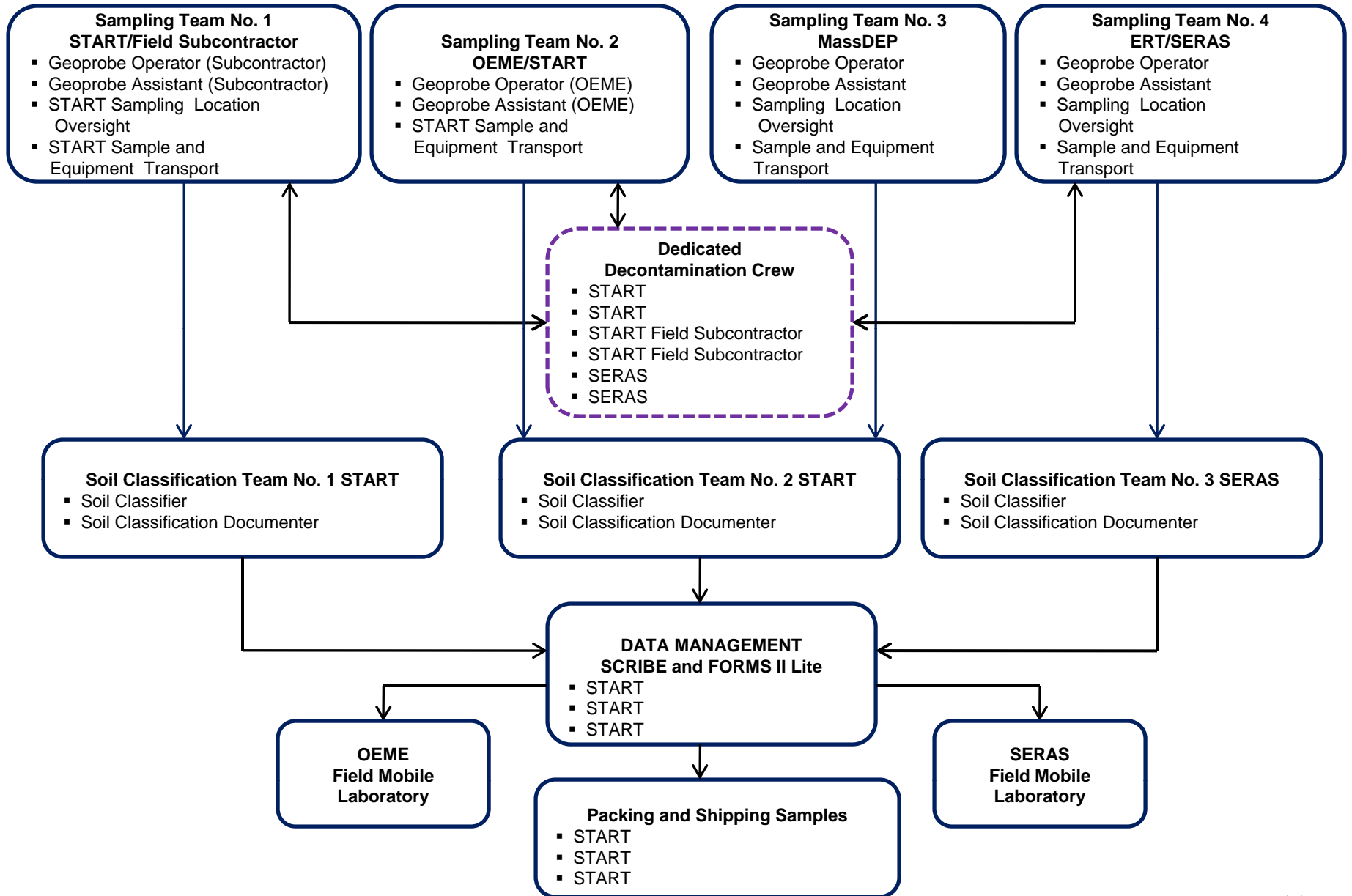
3.1 U.S. Environmental Protection Agency, Region 1 New England

The Organization Charts and lines of communication are shown in Figure 1. The EPA EPRB Section Chief for the project is Mr. Steve Novick. The EPA Lead OSC for the Parker Street Waste Site is Mr. Wing Chau, who will be assisted by OSC Mr. Marcus Holmes and OSC Ms. Sarah DeStefano. The EPA Contracting Officer (CO) is Ms. Hilary Kelley and the Project Officer (PO) is Mr. John Carlson.

**FIGURE 1
PROJECT ORGANIZATIONAL CHART**



**FIGURE 2
SAMPLING TEAMS**



EPA Emergency Planning and Response Branch (EPRB) Emergency Response and Removal Section II Chief - The EPA EPRB Section Chief for the project is Mr. Steve Novick. The EPRB OSCs report directly to Mr. Novick.

EPA Project Officer - The EPA CO is Ms. Hilary Kelley and the EPA PO is Mr. John Carlson. Ms. Kelley and Mr. Carlson will issue Technical Direction Documents (TDDs) and Task Orders (TOs) to START as requested by the OSCs. TDDs and TOs describe the projected work, budgeted costs, and schedule. TDDs and TOs are submitted directly by Ms. Kelley and Mr. Carlson to the START Program Manager (PM). The START PM reviews and accepts the TDD and TOs and assigns them to a START Project Leader (PL). The START PL then executes the TDD and TO assignments with the support of a Site Leader (SL).

EPA EPRB On-Scene Coordinator - The EPRB OSCs are Mr. Wing Chau, Mr. Marcus Holmes, and Ms. Sarah DeStefano. The OSCs will manage site activities, coordinate and communicate with other federal, state, and local agencies, and community groups; and initiate requests for contractor TDDs and TOs and provide technical direction to contractors under issued TDDs and TOs. The OSCs serve as the site Health and Safety Officers for their assigned sites; direct data collection and use, and coordinate the release of data to other federal agencies, states, local health departments and to the public; review, approve and implement site-specific SAPs; perform enforcement-related duties; prepare and/or oversee proper documentation as required by the Superfund Program; arrange for and secure site access from property owners; and manage and direct EPA contractors. The OSCs will be supported by Sharon Fennelly, EPRB Removals Section II Enforcement Coordinator.

EPA OEME Geoprobe® Sampling Team – The EPA OEME Geoprobe® Sampling Team [Sampling Team Number (No.) 2] provides direct technical support to EPA EPRB. OEME will be one of the three EPA sampling teams (one Geoprobe® Operator and one Geoprobe® Assistant) that will advance borings and obtain soil cores from the site.

EPA ERT Geoprobe® Sampling Team – The EPA ERT Geoprobe® Sampling Team (Sampling Team No. 4) provides direct technical support to the EPA EPRB. ERT will be one of the three EPA sampling teams (one Geoprobe® operator and one Geoprobe® assistant) that will advance borings and obtain soil cores from the site. ERT will also provide a geologist and an assistant to the geologist to classify the soil cores and personnel to decontaminate their equipment.

EPA ERT Field Mobile Laboratory - The EPA ERT Field Mobile Laboratory will provide an on-site chemist to field screen soil samples collected from borings for polychlorinated biphenyls (PCBs) and selected metals analyses following EPA OEME methods and protocols.

EPA OEME Field Mobile Laboratory - The EPA OEME Field Mobile Laboratory will provide an on-site chemist to field screen soil samples collected from borings for polychlorinated biphenyls (PCBs) and selected metals analyses following EPA OEME methods and protocols.

EPA Contract Laboratory Program (CLP) Laboratories – CLP laboratories established by the Sample Management Office (SMO) of OEME will be utilized to perform analyses on soil samples. CLP laboratories will conduct metals analyses utilizing a method modification for arsenic, barium, cadmium, chromium, and lead. The CLP method modification will incorporate some changes to more closely align the analysis with the QC requirements found in Table III A-1 in CAM-III.A. Throughout the remainder of this SAP, the generic term “metals” will be used to refer to the five metals for CLP analyses and field screening analyses by the EPA Field Mobile laboratory.

Delivery of Analytical Services (DAS) – DAS laboratories will be procured by START and utilized to perform confirmation analyses on soil samples. DAS laboratories will perform PCB analysis and semivolatile organic compound analysis (SVOC) for polycyclic aromatic hydrocarbons (PAHs) compounds only.

3.2 EPA Special Technical Training and Certifications

EPA New England has an established QA training program designed to ensure that regional management and staff, prime contractors, and other federal agency and state personnel are qualified to perform their quality-related responsibilities (*e.g.* chain-of-custody, record keeping, data review and evaluation, auditing) and assigned tasks. EPA New England complies with the National Training Policy as documented in the “Professional Development and Training Plan Guidelines for U.S. EPA On-Scene Coordinators”, July 2002 (Attachment J): “On-Scene Coordinators must participate in exercises and be trained as required by federal statutes, regulations, Agency directives, and regional policies to carry out their official duties. OSCs also participate in advanced exercises and training which enhance their knowledge, skills, and abilities of the OSC and those of the response community.”

3.3 Massachusetts Department of Environmental Protection (Southeast Regional Office)

The MassDEP Project Manager will be Molly Cote. Ms. Cote is the main point of contact for MassDEP and will provide direct oversight to the MassDEP contractor field sampling team members. The MassDEP field sampling team (Sampling Team No. 3) will be responsible for performing sampling activities consistent with this SAP at the Hetland Memorial Skating Rink property (Area 9). The Hetland Memorial Skating Rink property is owned by the Commonwealth of Massachusetts and operated by a private entity.

MassDEP is tasked with:

- Sampling activities at the Hetland Memorial Skating Rink property (Area 9);
- Providing sampling oversight and assistance to EPA, START, ERT, and OEME Sampling Teams at Areas 1-4, 7,8, and 11;
- Providing sampling oversight and assistance to the City of New Bedford at Area 5;
- Accepting and preserving soil samples from areas under investigation by Sampling Teams 1, 2, 3 and 4, for possible future dioxin laboratory analysis, as appropriate; and

- Providing assistance to EPA with regard to applicable state requirements and community support.

3.3.1 Hetland Memorial Skating Rink Property (Area 9)

MassDEP contractor assistance will be procured for the purpose of performing sampling activities consistent with this SAP. MassDEP contractors will prepare a Health and Safety Plan prior to the commencement of any field activities. MassDEP and contractors will determine sampling locations and mobilize/operate direct push (Geoprobe) drilling equipment in accordance with sections 6.0 - 9.0 of this SAP. A MassDEP Work Plan is located in Appendix D.

Sampling activities for dioxin may also be performed as described in Section 3.3.4 and Appendix D.

Activities to be conducted by MassDEP and its contractors may include:

- Site preparation: clearing of trees and shrubs to allow access to the rear portion of the property (wooded lot). Also determining appropriate sample collection locations.
- Sample collection, preservation, and delivery: collecting soil samples [utilizing direct push (Geoprobe)] and sediment samples (hand auger) from wetland portion of the lot. Samples will be appropriately prepared and delivered to START in the field.
- Survey: appropriate surveying of sample locations using a Global Positioning System (GPS).
- Data Analysis & Review: evaluating incoming data related to the proposed sampling effort.
- Securing of any necessary local/State permits.

3.3.2 Oversight of Sampling Activities by EPA/START Sampling Teams

MassDEP and its contractors will provide assistance to the EPA, START, ERT, and OEME Sampling Team members (Sampling Teams 1, 2 and 4) by way of field oversight and technical assistance during the course of the sampling activities at Areas 1 - 4, 7, 8, and 11.

3.3.3 Oversight of Sampling Activities by the City of New Bedford

MassDEP and its contractors will provide assistance to the City of New Bedford by way of field oversight and technical assistance during sampling activities at the Nemasket Street (former Bethel AME) property (Area 5). Please refer to section 3.6.

3.3.4 Dioxin Sample Collection and Preservation

MassDEP's contractor will be responsible for acceptance and preservation of soil and sediment samples from the EPA, ERT, and START sampling teams for possible future dioxin analysis. Soil samples will be collected for future analysis as part of this sampling effort as a way to defray and offset the cost of future mobilization should the determination be made that expanded dioxin sampling and analysis is necessary at the Parker Street Waste Site. Please refer to Section 5.4 and Appendix D.

3.3.5 Evaluation of Applicable State Requirements and Community Support

MassDEP will assist the EPA/START teams via review of existing and new (incoming) field and analytical data generated during the course of the sampling activities. It is anticipated that the Parker Street Waste Site investigation will generate over 2,000 soil and sediment samples by the end of May, 2010. MassDEP will evaluate validated data packages in consideration of MassDEP Massachusetts Contingency Plan 310 CMR 40.0000 (MCP) risk-based standards and risk assessment algorithms. MassDEP will also support community involvement activities for the Parker Street Waste Site.

3.3.6 Other MassDEP Site Activities

MassDEP will continue to provide regulatory oversight of the ongoing sampling and evaluation of volatile organic compounds (VOCs) in indoor air at the New Bedford High School property. MassDEP will execute initial mitigation measures, which include a seepage mitigation evaluation, crack sealing in areas unaffected by groundwater seepage, and an evaluation of intrusion through and around floor drains and infrequently used sinks. Also, air flow adjustments will be made and sub-slab soil gas and groundwater monitoring will be conducted. Please refer to Section 5.1.

3.4 Superfund Technical Assessment and Response Team (START)

The START team consists of a multi-disciplinary technical staff including chemists, geologists, engineers, biologists, environmental scientists, and administrative support personnel. The organization charts and lines of communication for START are shown in Figures 1 and 2. The START PM is responsible for the overall management of the START contract. A START PL and SL will be assigned to provide overall technical support to the project. START will directly support three sampling teams comprised of START, EPA OEME, EPA ERT, and START subcontracted personnel. START will also support MassDEP as necessary. In addition to the START PL and SL, START and Indefinite Delivery/Indefinite Quantity (ID/IQ) staff will include approximately 17 field personnel to ensure that field activities will be successfully completed. If the scope of work increases or decreases, START will, with EPA approval, adjust the number of personnel to meet the EPA's objectives for the project. START roles, responsibilities, and lines of communication are provided below and illustrated in Figures 1 and 2. The following section details the responsibilities and duties of START personnel.

Program Manager - The START PM is Mr. Mark J. McDuffee. Mr. McDuffee will be responsible for ensuring the quality of work performed by START at the Parker Street Waste Site. The PM interfaces directly with the EPA CO (Ms. Hilary Kelley), PO (Mr. John Carlson), EPRB Section Chief (Mr. Steve Novick), and OSCs Wing Chau, Marcus Holmes, and Sarah DeStefano. Mr. McDuffee is supported by technical and administrative staff in the Andover, MA START office, and Weston staff in other regional and national offices.

Project Leader - The Region I START PL is Mr. Eric Ackerman. Mr. Ackerman reports directly to the START PM. Mr. Ackerman will provide direct oversight to the START SL and field sampling team members. Mr. Ackerman will also be responsible for providing staffing resources to the project, assisting the SL with cost management, and reviewing and approving project deliverables. Mr. Ackerman is the main point of contact with the EPRB OSCs and START PM. Mr. Ackerman is directly responsible for preparing site-specific SAPs, health and safety plans (HASPs), coordinating field sampling activities, ensuring that staff adhere to the site-specific HASP and SAP, conducting air monitoring, maintaining field notes via a field log book and field notes, tracking START costs, ensuring that proper chain-of-custody documentation is maintained, conducting START safety and management audits, and preparing deliverables as requested by the OSCs.

Site Leader – The Region I START SL is Mr. Dennis Willette. The SL supports the PL as a main point of contact within the START team and with the EPA OSCs. Mr. Willette reports directly to the START PL and is directly responsible for assisting the PL in preparing site-specific SAPs, HASPs, coordinating field sampling activities, ensuring that staff adhere to the site-specific HASP and SAP, conducting air monitoring, maintaining field notes via a field log book and field notes, tracking START costs, ensuring that proper chain-of-custody documentation is maintained, and preparing deliverables as requested by the OSCs. The START SL is supported by the PL, Quality Assurance Officer (QAO), Health and Safety Officer (HSO), Subcontracts/Equipment Manager (EM), Lead Chemist, and Reports Manager (RM).

Sampling Teams – START will support a total of four field sampling teams. Direct support will be given to three of these teams. Sampling Team No. 1 will include two START subcontracted personnel (one Field Subcontractor Geoprobe® Operator and one Field Subcontractor Geoprobe® Assistant). In addition, START will provide one staff member for sampling location oversight to the Field Subcontractor Geoprobe® crew and one staff member for sample and equipment transport. Therefore, Sampling Team No. 1 will consist of four total staff. Sampling Team No. 2 will consist of two EPA OEME staff (one Geoprobe® Operator and one Geoprobe® Assistant) and one START staff member for sample and equipment transport. Sampling Team No. 4 will consist of EPA ERT personnel and its Scientific, Engineering, Response, & Analytical Services (SERAS) Contractor. Sampling Team No. 4 will consist of two ERT/SERAS staff (one Geoprobe® Operator and one Geoprobe® Assistant) and one ERT/SERAS staff member for sample and equipment transport. Sampling Team No. 3 will consist of MassDEP and their subcontractor personnel. START will indirectly support the MassDEP sampling crew by classifying the soil, collecting samples, and shipping the samples to various laboratories.

Decontamination Team – Two START staff, two START field subcontractor personnel, and two SERAS personnel will be dedicated entirely to operating a decontamination area, decontaminating various sampling equipment and tools, and collecting rinsate (equipment) blank samples for laboratory analysis to ensure that equipment is being decontaminated effectively.

Soil Classifiers and Samplers – START will provide two soil classifiers (Geologists or qualified staff) and two soil classification documenters for Sampling Team No. 1 (START), Sampling Team No. 2 (OEME), and Sampling Team No. 3 (MassDEP). ERT/SERAS will provide a soil classifier and documenter for Sampling Team No. 4 and to support other sampling teams as necessary. The soil classifiers will be responsible for screening macro-cores with a photoionization detector (PID) or flame ionization detector (FID), measuring the amount of recovery, and classifying the soil. The soil classification documenters will be responsible for recording the soil descriptions provided by the soil classifiers and for collecting the soil samples from the cores.

Data Management (SCRIBE and FORMS II Lite Staffers) - START will provide three staff members for providing chain-of-custody documentation and data management using SCRIBE and Field Operations and Records Management System (FORMS) II Lite software. These three staff members will be responsible for receiving soil samples from the three soil classification teams.

Shippers - START will provide three staff members for packaging and preparing START, MassDEP, and ERT/SERAS samples for dangerous goods shipment via Federal Express (FedEx) to EPA CLP Laboratories and/or for pick up by DAS Laboratory couriers.

3.5 START Special Technical Training Requirements/Certifications

Technical training of the START team is provided to ensure that technical, operational, and quality requirements are understood. The team has received general training including, but not limited to, the following: Health and Safety Training [40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations (HAZWOPER), 8-hour annual refresher OSHA, 8-hour supervisor, cardio-pulmonary resuscitation (CPR), first aid, and bloodborne pathogens training; and dangerous goods shipping training]; field sampling methods, Incident Command System (ICS) 100/200, equipment proficiency, and log book training; conflict of interest (COI) and confidential business information (CBI) training; procurement integrity/business ethics training; and software training (including EPA SCRIBE and FORMS II Lite data management tools). Certain START staff are proficient Geoprobe® operators and soil classifiers. START Team Members and ID/IQ personnel who conduct data validation of laboratory analytical data shall be qualified in accordance with EPA Region I Guidelines.

3.6 City of New Bedford

City of New Bedford personnel will be the lead agency investigating the city-owned properties and will assist the OSCs with addressing applicable statutes, regulations, policies, and community relations. The City of New Bedford and their contractor are responsible for sampling activities at Area 5 [Nemasket St. Property (former Bethel A.M.E. Property)], Area 6 [Right of Way (ROW) on Summit St. between Auburn St. and Hapwell St. (completed)], Area 7[data gap in the ROW on Durfee St. (completed)], and the site boundary near Area 10 (City of New Bedford Department of Public Works (DPW) Operations Facility). The City of New Bedford's proposed Work Plan is located in Appendix C and includes a complete description of their proposed scope of work. The proposed City of New Bedford's Work Plan is attached to this SAP to provide an overall view on how the Parker Street Waste Site boundaries and data gaps will be investigated. The attachment of these documents is to be used for informational purposes and does not constitute approval under this SAP. Approval of the proposed City of New Bedford's Work Plan will be conducted under the MassDEP and TSCA regulatory frameworks.

3.7 Citizens Leading Environmental Action Network (CLEAN)

CLEAN will be represented by their two consultants: Ian Phillips, Roux Associates, Inc. and Terry Boguski, E², Inc., Their responsibilities shall include attendance at meetings; distributing and interpreting information that describes EPA, MassDEP, City of New Bedford and their subcontractors' activities, progress, and results; and contributing SAP modifications.

4.0 SAP DISTRIBUTION

4.1 Project Team Members List

The following personnel were involved in planning and/or technical activities performed for this data collection activity.

| | |
|-----------------------|----------------------------------|
| Steve Novick | EPA EPRB Section II Chief |
| Wing Chau | EPA OSC |
| Marcus Holmes | EPA OSC |
| Sarah DeStefano | EPA OSC |
| Sharon Fennelly | EPA Enforcement Coordinator |
| Mark McDuffee | START PM |
| Eric Ackerman | START PL |
| George Mavris | START QAO |
| John Burton | START (Lead) Chemist |
| Dennis Willette | START SL |
| Dave Johnston | MassDEP Regional Director |
| Millie Garcia-Serrano | MassDEP Deputy Regional Director |

| | |
|----------------|----------------------------------------------------|
| Leonard Pinaud | MassDEP Site Management Chief |
| Molly Cote | Mass DEP Project Manager |
| Nora Conlon | OEME QA Chemist |
| Jerry Keefe | OEME Investigations and Analysis |
| Ed Gilbert | EPA ERT Project Manager |
| Scott Alfonse | New Bedford, Director of Environmental Stewardship |
| Terrie Boguski | E ² , Inc. |
| Ian Phillips | Roux Associates, Inc. |

4.2 SAP Distribution List

Each person listed below may receive a copy of the **approved** SAP. A copy of the SAP will also be retained in the site file.

| | |
|-----------------|----------------------------------------------------|
| Steve Novick | EPA EPRB Section II Chief |
| Wing Chau | EPA OSC |
| Marcus Holmes | EPA OSC |
| Sarah DeStefano | EPA OSC |
| Mark McDuffee | START PM |
| Eric Ackerman | START PL |
| George Mavris | START QAO |
| John Burton | START (Lead) Chemist |
| Dennis Willette | WESTON® START SL |
| Molly Cote | MassDEP Project Manager |
| Nora Conlon | OEME QA Chemist |
| Ed Gilbert | EPA ERT Project Manager |
| Scott Alfonse | New Bedford, Director of Environmental Stewardship |
| Terrie Boguski | E ² , Inc. |
| Ian Phillips | Roux Associates, Inc. |
| Anne Shoemaker | New Bedford Housing Authority |

5.0 PLANNING AND PROBLEM DEFINITION

5.1 Problem Definition

The Parker Street Waste Site is an approximately 105-acre area located in New Bedford, Bristol County, Massachusetts (See Appendix A: Figure 3, Site Location Map)] [3]. The site is located at Latitude 41° 38' 33" north and Longitude 70° 56' 44" west, as measured from the approximate center of the site. The estimated extent of the Parker Street Waste Site is believed to be bounded to the north by Durfee Street, to the east by Liberty Street and the Oak Grove Cemetery, to the south by Maxfield Street, and to the west by Summit Street. Located within the estimated bounds of the former waste site is the New Bedford High School campus, the recently constructed Keith Middle School (KMS), the Hetland Memorial Skating Rink property, Walsh Field, the new Andre McCoy Field (which is currently under construction), residential properties, Carabiner's

Indoor Climbing Facility, and two private apartment complexes (See Appendix A: Figure 4, Site Diagram).

In 2000, during an environmental due diligence investigation of the former McCoy field as a possible location for the new KMS, PCB levels above regulatory reporting limits were detected. BETA Group Inc., working on behalf of the City of New Bedford, remediated the site by removing PCB-contaminated soil and sediment and installing a 3-foot cap over the contaminated areas. The KMS was then constructed over the resulting 3-foot cap [2].

Throughout the course of the remediation, BETA Group, Inc. conducted several subsurface environmental investigations between 2004 and 2006. These investigations yielded a total of 447 sample locations, and suspected waste site fill material was identified at 350 locations [2].

Following the remediation of the former Andre McCoy field/current KMS location, TRC Environmental Corp. (TRC) was contracted by the City of New Bedford to conduct site investigations at 27 locations within the estimated bounds of the previous waste area. TRC conducted investigations at the New Bedford High School campus, Walsh Field area, McCoy Field area, 16 residential properties, one church, five city-owned right-of-way areas, one privately-owned commercial property, and one city-owned lot on Durfee St. Most of the investigatory work was completed throughout 2007 and 2008, with portions of the final reports completed by the end of year 2008 [4].

On September 30, 2009, EPA and MassDEP conducted a public meeting during which concerns regarding the scope and pace of the environmental assessment and cleanup of the waste site were voiced by residents and community leaders. As a result of these concerns, EPA and MassDEP committed to reviewing and evaluating the data collected by the City of New Bedford to identify areas warranting further investigation. In addition, EPA and MassDEP met with community representatives on October 16, 2009 to gather their comments prior to developing this SAP. Consistent with previous data collection efforts at the Site, data collected from this sampling effort will be evaluated to determine whether immediate remedial action is necessary at the Site. The sampling effort will focus resources in the 11 specific areas identified as data gap areas where further investigation is needed in order to expedite and refine the extent of contamination associated with the Parker Street Waste Site.

On January 29, 2010, MassDEP received notification of a release and/or threat of release of VOC in a groundwater monitoring well located on the New Bedford High School campus. Both vinyl chloride, at a concentration of 3.4 micrograms per liter [$\mu\text{g/L}$ or parts per billion (ppb)], and tetrachloroethylene (PCE), at 63 $\mu\text{g/L}$, were detected in monitoring well MW-7 located on the New Bedford High School property. Additionally, vinyl chloride was detected in a sample of standing water collected from a groundwater seep in the floor of the maintenance room inside the High School. The maintenance room floor is lower in elevation than adjacent areas frequented by students and faculty. Initial response actions taken by the City of New Bedford included a seepage mitigation evaluation, crack sealing in areas unaffected by groundwater seepage, and an evaluation of vapor intrusion through and around floor drains and infrequently used sinks. Air flow adjustments to the ventilation system and sub-slab soil gas and groundwater monitoring

were conducted. A written Immediate Response Action Plan for determination of the nature and extent of the release will be submitted to MassDEP for review by March 22, 2010 and will indicate if additional sampling for VOCs is necessary.

5.2 Site History and Background

According to historical topographical maps, the waste site was a wetland area linked to the Apponagansett Swamp prior to 1936. Subsequent maps revealed that the southern end of the site (Walsh Field area) was the first to be developed and was displayed as dry land in historical maps. The majority of activity suspected to be associated with the current waste site occurred in the 1950s and early 1960s and was located in the current New Bedford High School campus area. This waste material is suspected to have been spread while construction of the New Bedford High School's foundation occurred between 1968 and 1972 [4]. Further spread of fill-related material occurred during the construction of the former Andre McCoy field. The environmental hazards and contaminants of concern were brought to attention during more recent construction projects such as the construction of the new KMS and the new Andre McCoy field (currently under construction). A more extensive site history and background can be found in the TRC report entitled, *Interim Phase II Comprehensive Site Assessment, Parker St. Waste Site, New Bedford, MA, TRC Environmental Corp.*, July 2009, available on the City of New Bedford website. This document, as well as several other documents, may be downloaded from the City of New Bedford's website at <http://www.newbedford-ma.gov/McCoy/Keithmiddleschool.html>.

The current location of KMS is a historical wetland, and there is a small wetland located north of KMS across Durfee St. and behind the Hetland Memorial Skating Rink. There are approximately 15,000 persons within one half-mile of the site.

5.3 Contaminants of Concern

The contaminants of concern (COC) related to the Parker St. Waste Site are PCBs, PAHs, and the metals: arsenic, barium, cadmium, chromium, and lead. See SAP Table 2, Contaminants of Concern. Quality control acceptance limits and quantitation limits, for some analytical methods, are listed in Tables 1-7 of the *QAPP*. QC and method quantitation limits for other methods are addressed in Section 12.2.2 of the *QAPP*.

PCBs and metals are the primary COCs and the main indicators that contamination originating from the original landfill is present at various locations. PAHs are evaluated as a COC based on information gathered to date, but because PAHs are ubiquitous in developed or urban areas, the presence of PAHs alone in sampling results will not be used as an indicator of Site boundaries.

5.4 Other Target Analytes

At the time this SAP is being prepared, the contaminants of concern are limited to PCBs, PAHs, and metals which will be used to define the site boundaries. Dioxin can be associated with locations where burning occurred involving chlorinated compounds such as PCBs. Past evaluation for dioxin during the assessment of the Keith Middle School Site indicated the

presence of dioxin at levels slightly above the typical urban background concentration. Prior to remediation, the Keith Middle School Site exhibited higher PCB concentrations as compared to most other areas of the Site. The City of New Bedford has developed a draft dioxin sampling approach for the Parker Street Waste Site. The results from the implementation of the draft dioxin sampling plan proposed by the City of New Bedford will help determine whether there is a need for additional dioxin sampling at the Parker Street Waste Site

Soil samples for potential future dioxin compound analysis from each soil sampling location will be collected from the 0-1 foot sample interval and from the 1 -3 foot sample interval to evaluate current risk and the potential for Imminent Hazard conditions under the MCP. The samples will be received by MassDEP contractors from the EPA, OEME, ERT, and START Sampling Teams and will be stored securely for potential future analysis. Please refer to Appendix D.

5.5 Pre-Sampling/Scoping Meeting

EPA/START will conduct a pre-sampling/scoping meeting to discuss project objectives, field planning, analytical and QA/QC activities; establish schedules; and determine roles and responsibilities. START will maintain constant communication with the OSCs during the pre-sampling stage to ensure that sampling objectives will be met and representative data will be collected. EPA personnel will include the OSCs, OEME, and ERT/SERAS personnel, and may include the EPA Section Chief, and human health and ecological risk assessors. START personnel attending this meeting will include the PM, PL, SL, QAO, Lead Chemist, EM, HSO, and sampling team. MassDEP personnel may include the Project Manager and sampling team. The City of New Bedford personnel may include Director of Environmental Stewardship and his assistant. CLEAN personnel may include their two consultants: Ian Phillips, Roux Associates, Inc. and Terry Boguski, E², Inc.

The pre-sampling/scoping meeting will be held at least one week prior to sampling activities and all attendees will be required to sign an attendance sheet. During the pre-sampling/scoping meeting, the START PL, START SL, and OSCs will discuss, at a minimum, the following items:

- Site background and operational history.
- Contaminants of concern.
- Sampling methodology, sample preservation, QC samples [rinsate, duplicates, matrix spike/matrix spike duplicate (MS/MSD), performance evaluation (PE)].
- Archiving of soil and sediment samples for potential future analyses.
- Team member roles and responsibilities.
- Lines of communication and logistics (lead person/point of contact, distribution of phone/pager numbers to appropriate personnel, coordinating meeting/departure times, expected duration/lodging issues, food/water availability, number and type of vehicles, field subcontractors, and budget management).
- Sample shipment and delivery (environmental vs. dangerous goods, identifying primary and secondary FedEx Offices).

- Documentation (log books, Chain of Custody forms, and modifications to site-specific SAP).
- Documentation roles and responsibilities (*i.e* preparing reports, boring logs, *etc.*).
- Health and safety issues (chemical, physical, biological, and radiological hazards; levels of protection; decontamination; investigation-derived waste (IDW) issues; DigSafe notification requirements; air monitoring).
- Equipment Issues (sufficient quantity, types of instruments and equipment).
- Sampling teams providing their own sampling equipment, containers, *etc.*
- Data Validation.
- Other site-specific concerns.

Any issues or concerns discussed during the pre-sampling/scoping meeting will be addressed prior to initiation of field activities. Prior to conducting any on-site activities, all EPA, START, MassDEP, and START field subcontractors will review and sign the site-specific HASP. The EPA/START field team will establish a command post upwind of suspected source areas, if possible. START members will perform calibration and/or verification checks of air monitoring instruments and document background ambient air monitoring levels. Samples will be collected following the site-specific SAP and HASP. Any modifications to these guidelines will be documented in the SAP, field log books, or on Field Data Sheets, by START and EPA personnel.

6.0 Project Description and Schedule

Sampling activities by EPA OEME, EPA ERT/SERAS, START, START Field Subcontractors, and MassDEP are projected to occur over a 4 to 6 week period. There will be three EPA sampling teams: Sampling Team No. 1 will be comprised of START and START field subcontractor personnel, Sampling Team No. 2 will be comprised of EPA OEME and START personnel, and Sampling Team No. 4 will be comprised of EPA ERT/SERAS personnel. Sampling Team No. 3 will be comprised of MassDEP and its subcontractors.

The four sampling teams may advance borings at up to 425 sample locations (boring locations); however, based on a review of aerial maps, it has been calculated that approximately 347 primary sample stations will be advanced using Geoprobe® units. An additional 19 sediment boring locations will be advanced to approximately 3 ft below the sediment/water interface or ground surface (bgs) (if wetland is dry) using hand augers in a wetland area. Soil borings will be advanced to approximately 12 feet bgs using Geoprobe® units, and soil cores will be collected at 4-foot intervals using macro-core sleeves. Due to the amount of soil volume required for performing the necessary laboratory analyses, for storing (archiving) soil samples for potential future analysis, for providing split samples that may be requested from individual property owners, and for conducting field screening analysis, a minimum of two borings may be required at each sample location to obtain sufficient soil volume. The depths of these borings may be shallower or deeper than 12 ft bgs depending on the material (fill and native soil) encountered. Based on field screening results (for PCBs and metals) by on-site EPA and ERT/SERAS field chemists, or visual confirmation of fill material present in soil borings, additional borings may be advanced at 78 secondary sample locations by the sampling teams in Areas 1, 2, 3, and 11. During the first week of Geoprobe® operations, each team will monitor the ambient air around

the work area to ensure that there are no elevated levels of dust in the air. If after the first week of air monitoring there are no elevated levels of dust, air monitoring will be discontinued. Air monitoring may be re-implemented at the discretion of the OSCs.

After the macro-cores are removed from each 4-foot boring interval, macro-cores will be capped, labeled, and transported to a centralized area where they will be screened with a PID or FID and the soil classified using the Burmeister Soil Classification System. A minimum of five soil samples will be collected from each sample location. One sample will be collected from the 0- to 1-foot interval, one sample from the 1- to 3-foot interval, one sample from fill material, and if native material is encountered beneath the fill, two samples will be collected from the native material (one sample from the top interval of the native material and one sample from the bottom interval of the fill material). The samples collected from the bottom interval of native material will be stored at the laboratories performing the analyses and analyzed only if contaminants are detected in the soil sample collected from the top interval of the native material.

Samples collected from the 0- to 1-foot, 1- to 3-foot interval, fill material, and the top interval of native soil will be submitted to a CLP laboratory for metals analyses and a DAS laboratory for PCB and PAH analyses. Following analysis for PCBs and PAHs, the remaining soil from the 8-oz soil PAH and PCB sample containers from each interval will be consolidated into one 8-oz soil container from the interval by the laboratories and stored (archived) at the laboratories performing the analyses in accordance with EPA SW-846 Chapter 4. The samples may be analyzed in the future for additional parameters, including dioxin.

START will collect additional samples in 8-oz sample containers from the 0- to 1-foot and 1- to 3-foot intervals, at all sample locations, to be archived by MassDEP for potential future dioxin analyses.

At four areas (Areas 1, 2, 3, and 11), soil borings will be advanced and samples will be collected at the same intervals described above. All samples will be submitted to a CLP laboratory for metals analyses and to a DAS laboratory for PCB and PAH analyses. An additional soil sample will be collected from the top two sample intervals in these areas and sent to either the OEME or ERT mobile laboratory for field screening for PCBs and metals. A sample from the third interval, fill material, may be analyzed by an on-site mobile lab as determined necessary by an OSC. Based on field screening results and whether there was visual confirmation of fill material present in corresponding soil borings, an OSC, in consultation with MassDEP, will determine whether or not additional soil borings will be advanced on these properties.

Approximately 57 sediment samples will be collected from 19 locations in the wetland north of Durfee St. (Area 8) using hand augers. Sediment samples will be collected at the following intervals: 0 to 6-inches (in), 6-in to 2-feet, and 2- to 3-feet. These samples will be analyzed for PAHs, PCBs, and metals.

Soil and sediment samples will also be packaged and shipped as Dangerous Goods samples using an overnight carrier (FedEx) to EPA CLP Laboratories and/or picked up on site by a courier from the DAS laboratory performing the analysis.

Detection Limit (MDL) determined to be the laboratories' "best case" sensitivity for a given analytical Method.

- 3 - 10 times lower than AL
- 3 - 10 times higher than MDL
- Verified by the analysis of a standard at that concentration in the calibration curve.

may be based on regulatory standard, a referenced-based Clean up goal, technological limitation, etc.

To arrive at a site-specific action level, EPRB will consider existing Action Levels at the state and federal levels, and will consult with EPA and MassDEP risk assessors.

7.0 Project Quality Objectives

7.1 Project Objectives

Sufficient data will be obtained from soil and sediment samples collected at the site to support defensible decisions as to whether additional investigation and/or response actions pursuant to the applicable state and federal regulations are necessary and/or appropriate. Modifications to the number of soil and sediment samples collected will be approved through the OSC in consultation with MassDEP.

Project quality objectives (PQO) describe typical environmental decisions that need to be made at sites, and describe the level of data quality necessary to ensure those decisions are based on sound data. Typically, a systematic planning approach is used to define project objectives. In addition, the Data Quality Objectives (DQO) process as described in EPA QA/G-4 *Data Quality Objective Process* will be utilized to plan time-critical actions as determined by the EPA OSC. In those situations, statisticians may be included as members of the planning team.

All TDD and TO assignments that require measurement data will define the quantitative limits that the data are expected to meet in a site-specific SAP. These limits are established as part of the DQO determination process during the planning stages with the OSCs. This process includes the design and evaluation of equipment systems where the system is expected to perform within certain limits; *i.e.* environmental measurements that are traditionally associated with analytical laboratories.

7.1.1 Project Quality Objective Statements

The type, quantity and quality of data necessary to support a response action depend on the nature of the incident and the associated urgency of the response. All data collected for time-critical actions will be of adequate quality to support project objectives.

The following project objectives apply to this site investigation:

- To expedite the sampling process in order to adequately define the site boundaries with respect to the extent of contamination.
- To determine whether a removal action is warranted and if so whether the response should be classified as an emergency, time-critical, or non-time critical removal action.
- To determine if an imminent hazard exists at the site.

- ☒ To meet requirements for additional work under the MCP.
- ☒ To support a potential listing as a NPL site.

7.2 Measurement and Performance Criteria

Generic measurement and performance criteria described in Table 7-2 of the *QAPP* will be used to ensure that data are sufficiently sensitive, precise, accurate, and representative to support site decisions.

7.3 Decision Statements

Decision statements are the link between sample results and site actions. A decision statement describes what actions will be taken at the site when a removal AL is exceeded. Method quantitation limits will be low enough to ensure accurate quantitation at the removal AL. Refer to Table 7-1 of the *QAPP*. Table 7-1: Generic Decision Statements and Actions. EPA will utilize the *QAPP* for decision statements and EPA removal actions in consultation with MassDEP and the City of New Bedford.

7.4 Data Quality Indicators

The quality of organic and inorganic data used in to make decisions during a removal action will meet the generic measurement performance criteria (MPC) described in Table 7-2 of the *QAPP*. Data quality indicators (DQIs) are used to determine whether performance criteria are satisfied. Typical DQIs assessed are precision, accuracy, completeness, representativeness, comparability, and sensitivity. The basis for assessing each of these elements of data quality is discussed in the following subsections.

The criteria and QC samples will apply to most data collection activities conducted by EPRB. OSCs will select sampling and analytical procedures having QC acceptance limits that support the generic measurement performance criteria. When alternate MPC are required to support a Removal Action, they will be documented in the site-specific SAP. Also, when MPC are developed for measurement parameters other than chemistry parameters such as biological, radiological, or physical parameters, they will be documented in the SAP. The following subsections describe the DQIs used to characterize the quality of data that will be used by EPRB.

7.4.1 Sensitivity

Sensitivity is the ability of the method or instrument to detect the contaminant of concern and other target analytes at the level of interest. The analytical method and instruments used, and the action level or concentration of concern will determine whether detected and non-detected data are usable. Measurement sensitivity is critical to supporting appropriate site decisions. Project QL should be established at 3 to 10 times lower than the site action levels to compensate for potential errors at the QL, and 3 to 10 times greater than the laboratory method detection limit MDL.

Method sensitivity is demonstrated on an annual basis by determining the MDL per instrument by matrix per method. MDL values are included in Inorganic Data Packages on CLP Form 9, and are available for organic analyses from SMO. Method sensitivity is evaluated routinely through the analysis of Laboratory Fortified Blanks (LFB) spiked at the QL, Contract Required Quantitation Limit (CRQL) standards for Inorganics CLP Form 2B, and inclusion of a calibration standard at the PQL level for Organics.

7.4.2 Precision

Precision is a measure of the closeness of agreement among individual measurements. Precision is determined by relative percent difference (RPD) and/or standard deviation calculations.

Overall Precision - Precision associated with the entire sampling and analysis system will be evaluated. Overall precision will be determined by analysis of duplicate or replicate field samples. Duplicate sample precision data will be reported as RPD between the duplicate sample results. Sample precision for more than two replicates will be reported as relative standard deviation (RSD). For duplicate results x_1 and x_2 , the RPD is calculated as:

$$RPD = \left(\frac{|(x_1 - x_2)|}{(x_1 + x_2)/2} \right) \times 100\%$$

The following equations are used to calculate the **mean** (\bar{x}) and the **relative standard deviation** (RSD).

$$\% \text{ RSD} = \frac{S}{\bar{x}} \times 100 \%$$

and

$$S = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

where:

- x_i = each individual value used for calculating the mean
- \bar{x} = the mean of n values
- S = the standard deviation of the data set for x , and
- n = the total number of values.

Matrix spike/matrix spike duplicate (MS/MSD) analyses are typically performed to determine the precision and accuracy of organic analytical methods while MS/Duplicates (MS/Dups) are performed to determine the accuracy and precision for inorganic methods. The results of sample

spiking are used to calculate the quality control parameter for accuracy evaluation or the %R. The %R is defined as 100 times the spike sample result minus the unspiked sample result, divided by the spike added:

$$\%R = \frac{SSR - SR}{SA} \times 100 \%$$

where:

%R = the percent recovery,
SSR = the observed spiked sample concentration,
SR = the sample concentration, and
SA = the true concentration of the spike.

The RPDs for each compound are calculated using the following equation:

$$RPD = \left| \frac{MSR - MSDR}{(MSR + MSDR) / 2} \right| \times 100$$

where:

MSR = Matrix Spike result, or first replicate sample result.
MSDR = MSD result, or second replicate sample result.

Laboratory Precision - Precision specific to the analytical system will also be assessed. Laboratory duplicate samples and MS/MSD samples will be analyzed to evaluate precision for inorganic and organic analyses, respectively. Reproducibility requirements for biological identifications will be discussed in the SAP.

7.4.3 Accuracy/Bias

Accuracy is a measure of the agreement between an observed value and an accepted reference value. It is a combination of the random error (precision) and systematic error (bias), which are due to sampling and analytical operations. Accuracy is determined by percent recovery (%R) calculations. Performance Evaluation (PE) samples will be used, in accordance with the EPA New England PE Program to provide information to assess the accuracy of the analytical data generated. In addition, analytical accuracy will be measured by comparing the percent recoveries of analytes spiked into a laboratory control sample to method control limits. For volatile and semivolatile organic compounds, surrogate compound recoveries will also be used to assess accuracy and method performance for each sample analyzed. In addition, inorganic laboratory matrix spikes and organic MS/MSD samples will be analyzed to assess the impact of matrix interferences.

The results of sample spiking are used to calculate the quality control parameter for accuracy evaluation or the %R. The %R is defined as 100 times the spike sample result minus the unspiked sample result, divided by the spike added:

$$\%R = \frac{SSR - SR}{SA} \times 100 \%$$

where:

| | | |
|-----|---|-------------------------------------------|
| %R | = | the percent recovery, |
| SSR | = | the observed spiked sample concentration, |
| SR | = | the sample concentration, and |
| SA | = | the true concentration of the spike. |

The RPDs for each compound are calculated using the following equation:

$$RPD = \left| \frac{MSR - MSDR}{(MSR + MSDR) / 2} \right| \times 100$$

where:

| | | |
|------|---|--------------------------------------------------------|
| MSR | = | Matrix Spike result, or first replicate sample result. |
| MSDR | = | MSD result, or second replicate sample result. |

The results of these calculations are used in conjunction with other QC criteria to aid the data reviewer in applying professional judgment as necessary.

7.4.4 Representativeness

Representativeness is a measure of the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Simply, this is the degree to which samples represent the conditions for which they were taken. Sample representativeness will be achieved through appropriate sampling design and use of the standard sampling and analytical procedures. Representativeness will be evaluated through the use of field QA assessments.

7.4.5 Completeness

Completeness is a measure of the amount of valid data obtained compared to the amount of data that was planned to be collected. Completeness for critical samples must be 100%. Completeness will be calculated and reported for each analytical method, sample matrix and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results will be all results not qualified with an “R” flag. The “R” flag indicates the data are rejected and considered unusable for making site decisions. The requirement for completeness is 90 percent for soil samples. When samples cannot be analyzed for any reason (holding time violations in which resampling and analysis were not possible, samples spilled or broken, etc.), the numerator of this calculation becomes the number of valid

results minus the number of possible results not reported. The formula for calculation of completeness is:

$$\%Complete = \frac{ValidSample\ Results}{PlannedSample\ Results} \times 100\%$$
$$\%Complete = \frac{ValidSample\ Results - Results\ not\ Reported}{PlannedSample\ Results} \times 100\%$$

7.4.6 Comparability

Comparability is the confidence with which one data set can be compared to another data set. The number of matrices that are sampled and the range of field conditions encountered will be considered in determining comparability. Modifications to the number of matrices sampled will be approved through the OSCs in consultation with MassDEP. Comparability will be achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions and using standard and comprehensive reporting formats. Complete field documentation using standardized data collection forms will support the assessment of comparability. Analysis of PE samples and reports from audits will also be used to provide additional information for assessing the comparability of analytical data produced among laboratories.

Historical comparability will be achieved through consistent use of methods and documentation procedures throughout the project. The need for comparable data generated by different Agencies and local governments responding to the same emergency will be taken into account when choosing sampling and analytical methods.

7.4.7 Field Screening/Confirmatory Samples

Full protocol analysis will be performed to confirm field screening results. Screening/confirmatory comparability criteria will be established by the EPA OEME on-site mobile laboratory chemist and documented prior to data collection. Comparability will be determined for each matrix, analytical parameter, and concentration level. Comparability of field screening data to fixed laboratory results is critical in determining whether the field data will meet project objectives and support defensible site decisions. All samples screened in the field will be submitted for fixed laboratory confirmatory analysis to support field analytical screening procedures. Refer to Section 13.2 of the *QAPP* for further discussion.

8.0 SAMPLING DESIGN

Field personnel performing sampling activities will follow OSHA and EPA-specific health and safety procedures and protocols. Sampling activities will be conducted in accordance with this site-specific SAP. At a minimum, this site-specific SAP will include proper sampling design;

field procedures; reference to applicable SOPs; documentation; data objectives; analytical methods; sample container preparation; and sample volume, collection, preservation, holding times, chain of custody logs, and shipping requirements. The site-specific SAP will also detail the types and number of samples to be collected, matrices and parameters, and will provide a schedule for all activities, including field sampling.

Soil and sediment sampling activities will be conducted in accordance with the following EPA SOPs:

- EPRB SOP for Surface and Limited Subsurface Soil Sampling, EPRB SOP- 001, August 2002
- EPRB SOP for Sediment Sampling, EPRB SOP- 003, August 2002
- OEME SOP for Soil Core Sampling Using the Geoprobe®, OEME EIA SOP-2, June 2002

Sample preparation methods (including the use of sample containers and reagents for sample collection and preservation, transport, and storage) will be performed in accordance with the procedures and protocols described in this site-specific SAP, unless otherwise approved by the OSCs, with consultation of MassDEP, and specified in Table 1 of this SAP. Sample containers, preservatives, holding times, and other pertinent information for each of the matrices and laboratory analytical methods which are anticipated under this project are listed in Tables 2 through 4 of this SAP.

Sampling activities will be conducted by EPA OEME, ERT/SERAS, START (including ID/IQ), START Subcontractors, and MassDEP, over a 4 to 6 week period. There will be three EPA sampling teams. Sampling Team No. 1 will be comprised of START and START field subcontractor personnel, Sampling Team No. 2 will be comprised of EPA OEME and START personnel, and Sampling Team No. 4 will be comprised of ERT personnel and subcontractors. In addition, Sampling Team No. 3 will be comprised of MassDEP and their subcontractors.

A staging area will be established at a central fixed location yet to be determined. Decontaminated or disposable sampling equipment will be available in the staging area for the START, OEME, and MassDEP sampling teams, along with the necessary certified-clean sample bottles, sample coolers, and any required preservatives for the samples. ERT/SERAS will be providing their own sampling equipment and certified-clean sample bottles. As samples are collected from the macro-cores, they will be transferred to a sampling bowl, homogenized, and then transferred to the appropriate sample container directly from the sampling bowl into the sample container. Homogenization of soil samples is discussed in detail in Section 9.2. This will limit the possibility of the sample coming in contact with potentially contaminated surfaces in the immediate vicinity of the sample collection area. Sediment samples will be collected by placing the sediment from each of the three intervals directly into three separate large re-sealable plastic bags. The bags will be properly labeled and brought to the soil classification area, placed into stainless steel bowls, and homogenized. Sediment samples will be homogenized following the same procedures described for soil samples. Non-dedicated sampling scoops will then be used to transfer the sediment from the sampling bowls directly into the appropriate sample

containers. Any reusable (non-dedicated) sampling tools used will be decontaminated prior to re-use.

Borings will be advanced at approximately 347 sample locations by the four sampling teams to approximately 12 feet below ground surface (bgs) using different Geoprobe® units. Soil cores will be collected at 4-foot intervals using macro-core sleeves. Approximately 19 locations have been selected in a wetland area where sediment samples will be collected from 0-6 inches, 6 inches to 2 feet, and 2 to 3 feet intervals using hand augers. Grab soil samples will be collected from each of the five soil boring intervals, and three grab sediment samples will be collected from each sediment boring interval. Additional soil borings may be advanced at 78 sample locations by the Geoprobe® units depending on field screening results or visual confirmation of the presence of fill material in certain areas.

The number of samples collected will depend upon field conditions, urgency of the response action, real or potential threat to human health and/or the environment, and cost of sampling and analysis in conjunction with available funding. However, based on the number of the primary and secondary borings, between 1,735 and 2,125 soil samples will be collected from these borings. An additional 57 sediment samples will be collected from the hand augered locations in the wetland. These numbers do not include quality control (QC) [field duplicates, rinsate blanks, matrix spike/matrix spike duplicates (MS/MSD), or performance evaluation (PE) samples].

Refer to SAP Table 3, Sampling Locations and Sampling and Analysis Summary.

9.0 SAMPLING PROCEDURES AND REQUIREMENTS

In April 2010, the four separate sampling teams (e.g., three EPA and one MassDEP) will mobilize to the site to advance soil borings using different Geoprobe® (direct push drill rig) units and to collect surface and subsurface soil samples, and sediment samples. Smaller Geoprobe® units and hand augering methods will be used in areas where access is restricted to larger Geoprobe® units (see Figure 2, Sampling Teams). OEME and ERT/SERAS will also each mobilize an on-site mobile laboratory and chemist to conduct field screening.

PCBs and metals are the primary COCs and the main indicators that contamination originating from the original landfill is present at various locations. PAHs are evaluated as a COC based on information gathered to date, but because PAHs are ubiquitous in developed or urban areas, the presence of PAHs alone in sampling results will not be used as an indicator of Site boundaries.

The following table provides a breakdown of the areas and subareas to be sampled and the type of Geoprobe® units that can access the properties. Each specific area delineated on this table was selected by EPA and MassDEP as areas requiring further sampling and characterization to fill existing data gaps.

Soil borings will be advanced at approximately 347 sample locations, and approximately 1,735 (not including QC) soil samples will be collected for fixed laboratory analyses by CLP and DAS Laboratories. Sample location maps, showing the 11 areas and proposed soil boring locations,

are included as attachments to this SAP (Appendix A). These areas include private residences, public and private housing, and private businesses (these areas are not listed in order of priority):

- Area 1 – The southern boundary of the Parker Street Landfill footprint which includes sampling residential properties along Maxfield Street and Florence Street. Area 1 also includes the southwestern boundary of the Parker Street Landfill footprint which includes sampling residential properties along Hunter Street.
- Area 2 – The private housing complexes located on Parker Street and Hunter Street. The Carabiner’s Indoor Climbing facility.
- Area 3 – The New Bedford Housing Authority Complex named Parkdale. The housing frontage along Hathaway Blvd and triangular area within the complex. This triangular shaped area, approximately 160,000-square-feet, is located between Parker St., Summit St., and Hathaway Blvd.
- Area 4 - The residential/private properties on Hathaway Blvd, Ruggles Street, Greenwood Street, Summit Street, and Parker Street.
- Area 5 - The Nemasket Street (former Bethel A.M.E.) Property. The City of New Bedford will be conducting the site investigation and sampling of this area as described in their proposed Workplan.
- Area 6 - The ROW on Summit Street between Auburn Street and Hapwell Street. The City of New Bedford has already completed the sampling in this area.
- Area 7 – The Durfee Street residential properties and data gap in the ROW area on Durfee Street. The City of New Bedford has already completed the sampling of the ROW in this area.
- Area 8 – The wetland area between Durfee Street and Potter Street.
- Area 9 – The Hetland Memorial Skating Rink. North and northeastern Site footprint boundary: ROWs on Durfee and Liberty Streets. MassDEP will be the lead agency to collect soil and/or sediment samples from this area.
- Area 10 – The City of New Bedford DPW Operations Facility bordered by Liberty, Parker and Smith Streets. *The City has not proposed sampling for Area 10 as part of the SAP and instead will be including all of Area 10 as part of the Parker Street Waste Site. Additional sampling of Area 10 may be necessary as part of the continuing investigation and assessment of the site.*
- Area 11 – The southeast corner of the Parker Street Landfill footprint which includes the New Bedford Housing Authority complex named Westlawn.

Soil borings will be advanced to a depth of 12 feet unless site conditions dictate shallower or deeper depths to achieve project objectives. Soils will be classified using the Burmeister Soil Classification System. Soil samples will be collected from a minimum of five intervals from each sample location. As previously mentioned, due to the amount of soil volume required to perform the necessary laboratory analyses, storing (archiving) soil samples for potential future analysis, split samples that may be requested from property owners, and field screening analysis, a minimum of two borings may be required at each sample location to obtain sufficient soil volume.

One sample will be collected from the 0- to 1-foot interval, one from the 1- to 3-foot interval, one from fill material, and two from different intervals (top and bottom of the core) within native soil beneath the fill. The bottom samples collected from the native material will be stored at the laboratories performing the analyses and analyzed only if contaminants are detected in the top native soil sample. Bottom native material samples will only be collected for PCBs and Metals.

Samples collected from the 0- to 1-foot, 1- to 3-foot interval, fill material, and top of the native soil will be submitted for PCBs, PAHs, and metals analyses. The remaining soil from the 8-oz soil PAH and PCB sample containers from each interval will be consolidated into one 8-oz soil container from the interval by the laboratories and stored (archived) at the laboratories performing the analyses in accordance with EPA SW-846 Chapter 4. The samples may be analyzed in the future for additional parameters, including dioxin.

START will collect additional samples in 8-oz sample containers from the 0- to 1-foot and 1- to 3-foot intervals, at all sample locations, to be archived by MassDEP for potential future dioxin analyses.

At four areas (Areas 1, 2, 3, and 11), soil borings will be advanced and samples will be collected at the same intervals described above. All samples will be submitted to a CLP laboratory for metals analyses and a DAS laboratory for PCB and PAH analyses. An additional soil sample will be collected from the top two intervals at all sample locations in these areas and sent to either the OEME or ERT mobile laboratory for field screening for PCBs and metals. A sample from the third interval, fill material, may be analyzed by an on-site mobile lab as determined necessary by an OSC. Based on field screening results or visual confirmation of the presence of fill material, the OSCs, in consultation with MassDEP, will determine whether or not additional soil borings will be advanced in these four areas (Areas 1, 2, 3, and 11).

To ensure the safety of personnel during sampling activities, the buddy system, periodic air monitoring, and caution will be used throughout field activities. To minimize risks due to chemical exposure, dermal and respiratory protection may be required if air monitoring equipment indicates that the environment is unsafe. Field activities will follow the Site-Specific HASP, which further addresses the safety considerations of the property. Hazards identified in or around the site may include physical hazards (slips, trips, and falls). Additional potential hazards exist in association with advancing borings and cutting macro-core sleeve.

Since this project will consist mainly of extensive intrusive activities, subsurface utilities in the investigation areas must be identified. Each Geoprobe sampling crew will be required to contact DigSafe and the local water and sewer boards to have these utilities marked, at least 3 working days before any subsurface work is initiated. DigSafe Authorization Numbers for each property will then be recorded in the HASP.

PARKER STREET WASTE SITE
EPA SAMPLE BORING NUMBER/LOCATION/DESCRIPTION ESTIMATE
REVISION 4.0 DATED 17 FEBRUARY 2010

| AREA | SUB-AREA DESCRIPTION | TRUCK-MOUNT SAMPLE BORING LOCATIONS | TRACK-MOUNT GEOPROBE SAMPLE BORING LOCATIONS | TOTAL NUMBER OF SAMPLE BORING LOCATIONS | TOTAL NUMBER OF QUALITY CONTROL SAMPLES (MS/MSD, MS/MSDUP, FIELD DUPLICATES, RINSATE BLANKS, PEs) | TOTAL NUMBER OF SAMPLES (NOT INCLUDING QC SAMPLES) | NOTES |
|----------------|----------------------|-------------------------------------|----------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------|
| 1 | P-001 | 7 | 7 | 14 | 18 | 70 | |
| 1 | P-002 | 4 | 4 | 8 | 9 | 40 | |
| 1 | P-003 | 2 | 5 | 7 | 9 | 35 | |
| 1 | P-004 | 6 | 19 | 25 | 33 | 125 | |
| 1 | P-005 | 4 | 10 | 14 | 18 | 70 | |
| 1 | P-006 | 4 | 10 | 14 | 18 | 70 | |
| 1 | P-007 | 4 | 10 | 14 | 18 | 70 | |
| 1 | P-008 | 6 | 3 | 9 | 15 | 45 | |
| 1 | P-009 | 3 | 4 | 7 | 9 | 35 | |
| 1 | P-010 | 11 | 18 | 29 | 36 | 145 | |
| 1 | P-011 | 3 | 5 | 8 | 9 | 40 | |
| 1 | P-012 | 6 | 16 | 22 | 27 | 110 | |
| 2 | P-013 | 18 | 2 | 20 | 21 | 100 | |
| 2 | P-014 | 18 | 7 | 25 | 33 | 125 | |
| 3 | P-015 Tier I | 4 | 6 | 10 | 15 | 50 | |
| 3 | PT-015 Tier II | 14 | 22 | 36 | 42 | 180 | |
| 4 | P-016 | 3 | 5 | 8 | 9 | 40 | |
| 4 | P-017 | 5 | 7 | 12 | 15 | 60 | |
| 4 | P-018 | 3 | 6 | 9 | 15 | 45 | |
| 4 | P-019 | 3 | 5 | 8 | 9 | 40 | |
| 4 | P-020 | 4 | 4 | 8 | 9 | 40 | |
| 4 | P-021 | 7 | 4 | 11 | 15 | 55 | |
| 4 | P-022 | 14 | 0 | 14 | 18 | 70 | |
| 7 | P-023 | 2 | 6 | 8 | 9 | 40 | |
| 7 | P-024 | 4 | 8 | 12 | 15 | 60 | |
| 8 | P-025 | | | | 21 | 171 | Estimated 19 additional hand-auger sample locations |
| 9 | P-026 | 15 | 20 | 35 | 42 | 175 | State owned/ sampled. EPA will process and ship sampling for analyses. |
| 11 | P-027 Tier I | 8 | 4 | 12 | 15 | 60 | |
| 11 | PT-027 Tier II | 14 | 28 | 42 | 51 | 210 | |
| TOTALS: | | 196 | 245 | 441 | 573 | 2376 | |

| | Truck-Mount | Track-Mount | TOTAL Boring Locations | TOTAL QC Samples | Total Samples (Including QC Samples)* |
|-------------------------------------------------------------------------------------|-------------|-------------|------------------------|------------------|---------------------------------------|
| Current Projected Number of Soil Borings/Samples/QC Samples in Sampling Plan | 168 | 195 | 363 | 480 | 2466 |

* = Assumes 5 samples per boring location. A 5th sample, of native soil, will be collected as a contingency from every boring location. In the case that none of the contingency samples are sent for laboratory analyses the total sample number would be 1,388.

9.1 Advancement of Soil Borings

Subsurface soil samples will be collected using different Geoprobe® systems soil probing machines. These are truck and/or track-mounted, piston-driven devices which can be used to advance borings and collect soil in 4-ft sleeves. The sampling teams will advance borings in approximately 347 sample locations to approximately 12 bgs using these Geoprobe® units. Individual areas and properties will be assigned to the four Geoprobe® crews.

Prior to operation of the Geoprobe® machine, a thorough physical inspection of the carrier vehicle and unit should be conducted to ensure that the machine is in proper operating condition. Units will be inspected for hydraulic fluid leaks, and improperly stored or shifted equipment. The location of underground and overhead hazards, including high-tension utility lines, should be identified prior to extension of the Geoprobe® from the carrier vehicle. Knowledge of local, State, or Federal laws should be obtained regarding minimum distances from utility lines prior to intrusive activities. In addition, the location of private on-site septic systems, leach fields, and other sensitive areas should be obtained, when possible, to reduce potential hazards to sampling personnel and equipment and to minimize disturbance to the property condition.

Prior to conducting any on-site activities, all EPA and START personnel and field subcontractor employees will review and sign the site-specific HASP. The START field team will establish a command post upwind of suspected source areas, if possible. START members will perform calibration checks of air monitoring instruments and document background ambient air monitoring levels. The dedicated sampling teams will decontaminate all Geoprobe® sampling equipment prior to use [NOTE: Each Geoprobe team should mark/stamp their own equipment so that it can be tracked from the field, through the decontamination process, and back to the field]. Decontamination will be conducted in accordance with the HASP and applicable SOPs. Decontamination generally consists of an Alconox solution and a water wash, followed by a water rinse, isopropanol wash, and followed by a de-ionized water rinse. A hexane wash followed by a de-ionized water rinse will also be included in the decontamination procedure. The use of hexane will be discussed with the OSC and adequately addressed in via the HASP and SAP amendment/revision process.

Prior to beginning any subsurface activities, the Geoprobe® crews will inspect the property and locate markings identifying any subsurface utilities. The Geoprobe® crew will take steps to ensure that minimal damage is done to the ground. If necessary, plywood will be laid out to minimize any lawn damage. Prior to laying out any plywood, plastic sheeting will be placed directly on the ground surface to prevent direct contact between the plywood and surface. The plastic sheeting will be disposed of according the site-specific HASP and the plywood will be re-used as necessary. Proposed boring locations will be pre-marked using wooden stakes. Prior to any sample collection, the surface area at the sample location will be cleared of any extraneous material considered to be not relevant for sample analysis. If the sample location is on a lawn, the grass (divot) above where the boring will be advanced will be carefully removed and set aside to later be replaced. Additional measures may be required to advance the borings through pavement surfaces. It is anticipated that borings will be advanced to approximately 12 feet bgs; however, total depths may vary depending on meeting the objectives of the investigation. Since one of the objectives of the investigation is to determine the lateral and vertical extent of the landfill materials, borings will be advanced until native soil is encountered. If refusal is

encountered in any one location, **two** additional attempts will be made to advance the boring before abandoning the location and moving to a different location.

During the first week of Geoprobe® operations, each team will monitor the ambient air around the work area to ensure that there are no elevated levels of dust in the air. If after the first week of air monitoring there are no elevated levels of dust, air monitoring will be discontinued. Air monitoring may be re-implemented at the discretion of the OSCs.

Each Geoprobe® crew will maintain documentation in a log book and record information including, but not limited to: weather conditions, Geoprobe® type, Geoprobe® Operator, Geoprobe® Assistant, START Sampler/Oversight, START sample/equipment transporter, property location, boring number, time for beginning and ending borings, total depths reached, difficulties encountered (i.e. refusal etc.), depth to water table, ambient air monitoring readings, and PID/FID screening results on each core. It is anticipated that additional co-located (within a 2-ft radius of original boring) borings will be advanced to obtain the adequate volume for sample collection for all five sampling intervals.

Two end caps will be placed on each macro-core by the Geoprobe® crews and each macro-core will be clearly labeled with the following information: top and bottom of core, sample number (each property will be assigned a unique sample numbering scheme) and depth interval. Following the successful completion of each boring, the START Sampler Transporter will deliver the macro-cores to the START Soil Classifiers. Downhole Geoprobe® equipment will be taken to a decontamination area by the equipment transporters where it will be processed through the decontamination process and then returned to the Geoprobe® crew.

Prior to moving onto the next boring location, the completed borehole will be plugged using certified clean sand from the bottom of the borehole up to approximately 12 inches bgs, clean topsoil from 6 to 12 inches, and the divot (if one was removed) from 0 to 6 inches. If no divot was removed, clean topsoil will be placed from 0 to 12 inches bgs. The crew will periodically tamp the sand to ensure that it is packed into the hole. The topsoil will be tamped and brought to an even grade with the surrounding area. If groundwater is encountered, bentonite will be placed in the borehole to approximately 2 ft above the water level, and then the same procedure described above will be followed. If the Geoprobe® location is on pavement, the borehole will be filled with clean sand from the bottom of the borehole to approximately 3 inches bgs and with asphalt patch from 0 to 3 inches bgs. The Geoprobe® crew will then move to the next location and advance the next boring in the same manner described previously. If any damage occurs to individual lawns on properties where the START subcontracted Geoprobe was used, START will use the services of a subcontracted landscaper to repair the damages [NOTE: These services will only be available for the START Geoprobe crew, each Geoprobe crew should make their own arrangements to provide this type of service if deemed necessary]. Prior to leaving each individual property, the Geoprobe unit will be cleaned by brushing off any soil from the borehole they may have come into contact with any of the Geoprobe unit. If brushing the Geoprobe does not sufficiently clean the unit, then a tap sprayer and minimal amounts of water will be used to clean off any remaining soil

In some locations where space is limited, it may be necessary to manually advance the soil borings. If this necessary, borings will be advanced using either hand augers or an electric jack hammer. A GPS unit will be used to record the locations all Geoprobe® boring locations.

9.2 Sample Collection Procedures for Macro-cores

The START sample/equipment transporters will deliver the capped and marked macro-cores to the START and ERT/SERAS Soil Classifiers and Documenters who will be set up in a fixed area (yet to be determined). Since geologic information will be recorded during this activity, START and ERT/SERAS Geologists or qualified members will be assigned as Soil Classifiers. There will be three Soil Classification teams, two START and one ERT/SERAS (Figure 2). The macro-core will be placed on a table covered with polyethylene (poly) sheeting. The markings on the macro-core (property and depth interval) will be recorded on Field Data Sheets by the START Soil Classification Documenters. The vinyl end caps will be removed from the macro-core and the ends screened using a PID and/or FID. These readings will be recorded on the Field Boring Data Sheets. The macro-core will then be placed in a horizontal position on a macro-core liner holder which is clamped securely to the table. The macro-core liner is then cut using a liner cutting tool and screened along its entire length using a PID and/or FID. This reading is then recorded on the Field Boring Data Sheet. The soil within the macro-core is visually inspected and the amount of recovery is measured. The amount of recovery is divided into four equal sections, each section representing a 1-foot interval, and the four sections are marked on the macro-core with a sharpie. The top layer of the soil along the horizontal will be scraped using a clean sampling scoop or stainless steel knife to expose the true nature of the soil. A photograph will be taken of the macro-core and the Soil Classifier will then describe the soil in the macro-core using the Burmeister Soil Classification System. During the classification process, any discrete layers within the soil will be measured. Soil description (color, texture, materials, moisture content, odors, etc.) will be provided to the Soil Classification Documenter who will scribe the information onto a Field Boring Data Sheet.

Soil samples will be collected from five intervals in each of the borings. After the completion of soil description, the Soil Classification Documenter will take the 0 – 1 ft fraction of soil from the core and place it into a stainless steel bowl where it will be homogenized using a stainless steel (or disposable) scoop.

To increase data comparability, the soil sample interval (s) will be manually homogenized. The soil from each specific depth interval (or material, i.e. fill, native soil) will be placed into a stainless-steel bowl or other appropriate homogenization container, and mixed thoroughly using a non-dedicated, stainless steel scoop to obtain a homogeneous sample representative of the entire sampling interval. Homogenization will involve thoroughly mixing the soil in the stainless steel bowl, forming a cone, re-mixing to form a new cone, flattening cone, dividing soil into four quarters, re-mixing opposite quarters, reforming a cone, and repeating previous steps a minimum of five times until the soil is visually homogenized. Extraneous materials (rocks, leaves, twigs, glass, etc.) not relevant or vital for characterizing the sample will be removed from the soil and discarded.

Once thorough homogenization has been achieved for the soil from the 0 – 1 ft interval, the soil will be divided into four approximately equal piles. A non-dedicated sampling scoop will then be used to fill the sample containers. A grab sample will then be placed into two 8-oz (PCB and PAH analyses) and one 4-oz (metals). For locations where field screening will be conducted by the mobile laboratories, an additional 4-oz sample will be collected. The sample number, collection date, and collection time will be written on the container tops (jar lids). The sample

collection date and times will also be recorded on the Field Boring Data Sheets. The sample container for PAHs shall be filled first by scooping a small aliquot of soil from each of the four piles and placing the soil into the appropriate container until it is filled. This process shall then be repeated for the PCB and metals.

The 1 – 3 ft fraction of soil will then be placed into another stainless steel bowl and the process described for the 0 – 1 ft interval will be repeated. The next sampling interval will be determined by the presence of fill material. The fill material will be placed it into a stainless steel bowl and the process described for the previous intervals will be repeated. The next two soil samples will be collected from native soils. One soil sample will be collected from the top of core from the native soil material and one from the bottom of the core from the native soil. The sample collected from the bottom of the core will be kept in storage pending the results of the native soil material collected from the top of the core. If contamination is detected in top sample of native soil, then the bottom sample will be analyzed. After the samples are placed in jars, they will be placed in re-sealable plastic bags and stored on ice in a cooler until they are packaged for shipment or courier pickup. The macro-core sleeves will be cut into smaller sections and disposed of in accordance with the site-specific HASP.

Collection of soil samples for field duplicates, MS/MSD, and MS/Duplicates will be at a rate of 1 per 40 samples per property (see Section 13.1).

The samples collected from each sample location will be submitted to a CLP laboratory for metals analysis and a DAS laboratory for PCB and PAH analyses.

START and ERT/SERAS will obtain certified clean sample containers from commercial vendors for all sampling activities. The containers provided will be those described in *Specifications and Guidance for Contaminant-Free Sample Containers, EPA540/R-93/051, December 1992*. These containers are cleaned in accordance with EPA protocols. The appropriate number and type of sample bottles will be identified by START as specified by the proposed analyses for each sampling event. The sample volumes and types of containers for the analytes of interest are listed in Table 2, along with the holding times and preservatives required for each analysis. The certificates of cleanliness for the certified clean sample containers will be retained in the site file. Other sampling supplies will be clean and visually inspected prior to use.

Certificates of Cleanliness provided with boxes of certified-clean bottleware shall be filed in the site file as documentation that samples were collected into clean bottleware. Opened boxes of bottleware not accompanied by a Certificate of Cleanliness shall not be used for sampling. Sample collection documentation and the use of certified-clean bottleware are also discussed during pre-sampling meetings.

9.3 Hand Augering Procedures and Sediment Sample Collection

Sediment samples will be collected using hand augers. Hand augers consist of a series of extensions, “T” handle, and thin-wall tube sampler. If water is present in the wetland, surface water quality parameters (pH, temperature, specific conductance, and turbidity) will be recorded prior to sample collection. The surface of the sample area will be cleared of any debris, and the auger will be used to bore a hole to a desired sampling depth, and is then withdrawn, retaining the sediment from the desired depth. Sediment will be collected from the following depths: 0 to

6 inches, 6 inches to 2 feet, and 2 feet to 3 feet. Once the auger is withdrawn, the retained sediment will be placed into a 12 inch by 15 inch re-sealable polyethylene bag. The bags will be labeled with sample location number and the depth at which it was collected. This process will be repeated for all three depth intervals. A clean hand auger will be used at each discrete depth interval.

The bags containing the retained sediment will be transported to the soil classification area to be classified and sampled. Sampling and identification will consist of a geologist or qualified staff homogenizing the sediment in a stainless steel bowl. The same process described for homogenizing the soil samples will be used for the sediment samples. The sediments will also be classified using the Burmeister classification system. After classification is completed, samples will be transferred directly from the bowl to the sample containers and submitted for PAH, PCB, and metals analyses only. Samples for PAH and PCB analysis will be sent to DAS laboratories and samples for metals analysis will be sent to CLP laboratories. QC samples will be collected from the sediment samples at a rate of 1 per 40 samples.

The hand augers will be transported to the decontamination area and will undergo the same decontaminated procedures outlined for the Geoprobe® equipment.

9.4 Cleaning and Decontamination of Equipment/Sample Containers

Both dedicated and non-dedicated sampling equipment may be used during sampling activities. Decontamination of sampling equipment will be kept to a minimum in the field, and wherever possible, dedicated sampling equipment will be used.

Equipment decontamination will prevent the cross-contamination of samples. Preventing cross-contamination is important for avoiding the introduction of error and protecting the health and safety of personnel. Physical removal, washing, rinsing, and drying procedures will vary according to the sample parameters and equipment types. Non-dedicated equipment, such as down hole Geoprobe® parts, augers, stainless steel spatulas, and bowls, will be decontaminated before and after use at a dedicated decontamination area. Dedicated and/or disposable equipment, which does not require decontamination, may be utilized whenever possible to avoid the need for rinsate blanks, to prevent the cross-contamination of samples, and to reduce the volume of liquid waste generated on site.

All material and equipment will arrive on site in a clean condition. All non-dedicated equipment involved in field sampling activities will be decontaminated prior to and subsequent to collecting samples. During sampling activities, the decontamination teams will decontaminate the sampling equipment. Decontamination will be conducted in accordance with the applicable SOPs and the site-specific HASP. Decontamination generally consists of an Alconox™ and water wash followed by a deionized water rinse, followed by an isopropanol rinse, followed by a deionized water (DI) rinse, hexane wash, followed by a deionized water rinse and air drying. Recommended procedures for equipment decontamination, described below, will be followed where applicable. At the conclusion of each sampling location, the equipment will be brought to the designated decontamination area and thoroughly decontaminated using the following procedures.

- A physical removal technique will be used to remove any gross contamination present on the equipment. Typically, paper towels and brushes will be used for this purpose
- After removal of gross contamination, equipment will be washed with a non phosphate detergent solution (such as a 2% liquid NoxTM and tap water solution). The washed equipment will be rinsed with tap water (typically from a garden sprayer) to remove all the soap solution
- After removal of gross contamination, equipment will be washed with hexane. Typically, a squeeze bottle will be used to dispense the hexane.
- The equipment will be then be rinsed with isopropanol.
- The equipment will be rinsed a final time with DI water and allowed to air dry completely
- The equipment will be visually inspected

If the equipment is to be stored before use, the equipment will be sealed in a plastic bag for inorganics or aluminum foil for organics to prevent contamination before use. Equipment decontamination fluids and personal protective equipment (PPE) generated during sampling activities will be containerized and secured on site. Separate containers will be used for the aqueous wastes and for flammable, non-chlorinated solvents (hexane) wastes. Proper personal protection will be worn during decontamination procedures and will include gloves, eye protection, and splash-resistant protective clothing.

The effectiveness of the decontamination procedure will be documented through the use of equipment rinsate blanks, which will be collected at a frequency of one per property per day, or at a frequency of one per 40 samples per property.

Equipment decontamination fluids generated during sampling activities will be collected in properly labeled containers and staged in a secure area until final disposal. Separate containers will be used for aqueous wastes and for flammable, non-chlorinated solvents (hexane) wastes. Proper personal protective equipment (PPE) will be worn during decontamination procedures and will include gloves, eye protection, and splash-resistant protective clothing. Off-site disposal of decontamination wastes and contaminated PPE will be conducted through the Subcontract Agreement established by Region I START for disposal of investigation-derived wastes (IDW). Non-contaminated wastes will be tightly sealed, double-bagged, and disposed of in accordance with the site HASP.

9.5 Field Equipment Maintenance and Calibration

Field instruments and equipment must be calibrated or verified at prescribed intervals or as part of the operational use of the equipment. Calibration or verification information will be recorded in Field Data Sheets or log books maintained by each of the four sampling team. Equipment to be used in the field is calibrated or verified prior to the commencement of daily activities, and as needed in accordance with manufacturer's specifications as outlined in the owner's manual. Frequency of calibration or verification will be based on the type of equipment, inherent

stability, manufacturer's recommendations, EPA requirements, intended use, effect of error upon the measurement process, prior experience, or other criteria as directed by the PL or SL. Calibration and verification records will be documented and maintained in Field Data Sheets or bound log books which accompany staff in the field and in the site-specific HASP. Field personnel shall immediately report equipment failure or malfunction to their respective Equipment Managers.

Field equipment will be properly protected against inclement weather conditions during field activities. Each instrument is specially designed to maintain its operating integrity during variable temperature ranges that are representative of ranges that will be encountered during cold-weather working conditions. At the end of each working day, field equipment will be taken out of the field and placed in a secure cool, dry room for overnight storage.

The following paragraphs discuss the field equipment (sampling equipment and air monitoring instruments) used, and calibration or verification procedures and frequencies for the field equipment used in conjunction with the site HASP (air quality screening equipment) or for field screening purposes.

Calibration or verification failures will be documented by the field crews in the log books, and the equipment will not be used until it is re-calibrated or -verified successfully or the equipment is sent to the vendor for repair. If equipment fails or becomes inoperable during use, it will be removed from service and sent to the vendor for repairs.

Standard equipment that will be used on site includes the following:

- MultiRAE multi gas meter
- Thermo-Environmental Instruments, Model TVA-1000B FID/PID
- Ludlum Model 19 MicroR Meter
- Trimble™ Pathfinder Pro XRS GPS with TSCI Data Logger
- PDR dust monitors

Field Instrument Calibration - Field sampling teams will be responsible for calibrating or verifying each instrument accompanying the teams into the field. The following information, at a minimum, will be recorded in Field Data Sheets or log books for each instrument:

- Name, model number, and manufacturer of device and/or instrument
- Instrument serial and/or identification (ID) number and date purchased or leased
- Frequency of calibration or verification
- Date of calibration or verification
- Results of calibration or verification, including initial setting, adjustments made, and final setting
- Calibration gases used, serial numbers, and expiration dates
- Name of person performing the calibration.

Calibration Failure - Equipment that fails calibration or verification or becomes inoperable during use will be removed from service and segregated to prevent inadvertent use. The equipment will be tagged to indicate that it is inoperable/out of calibration. The malfunctioning equipment will be sent to the vendor for repairs. The equipment will be not returned to active

service until it is functioning properly. Calibration failure will be recorded in the Field Data Sheets or instrument-specific log book. Such equipment must be repaired and satisfactorily recalibrated before further use.

Calibration Records – Field Data Sheets or log books must be monitored for each piece of equipment subject to calibration and maintenance. Records demonstrating the traceability of reference standards must also be maintained. The field staff performing the calibration must record all instrument calibration data in the Field Data Sheets or in a log book.

Records for all calibrated equipment must include the unit number and type of equipment; the date calibration was performed; the identity of the Team Member performing the calibration; the calibration standard used, including concentration, manufacturer, and lot numbers.

10.0 SAMPLE HANDLING, TRACKING, AND CUSTODY REQUIREMENTS

The sampling teams performing a particular sampling activity are required to maintain a field log book. The bound, numbered, and paginated logbook shall be filled out at the location where the borings are advanced. Field Data Sheets (Boring Logs) will be used at the location where the samples will be collected from the macro-cores. The log book and/or Field Data Sheets will contain the following sampling information: sample location map, sample numbers, sample collection times, sample locations, sample descriptions, sampling methods, weather conditions, field measurements, name of sampler (s), site-specific observations, and any deviations from protocols established in site-specific SAP or SOPs. All log book and Field Data Sheet entries will be entered legibly in permanent ink. If errors are made when completing the log book and/or Field Data Sheets, the errors will be crossed out with a single line, initialed, and dated by the sampler.

10.1 SAMPLE COLLECTION DOCUMENTATION

The containers with the soil samples collected from the macro-cores will be placed on ice in a sample cooler. The START data management team will utilize SCRIBE and Field Operations and Records Management System (FORMS) II Lite software programs to complete chain-of-custody documentation. SCRIBE is a software tool developed by the EPA's Environmental Response Team (ERT) to assist in the process of managing environmental data and FORM II Lite is a step-by-step program that generates labels, creates and customizes CLP Traffic Reports (TR) and COC reports, and electronically documents data needed prior to, during, and after field sampling activities.

SCRIBE outputs include labels for collected samples, COC generation and analytical laboratory result data reports. SCRIBE provides a flexible user interface to manage, query and view all this information. SCRIBE supports exporting electronic data for user services such as GIS tools and spreadsheets so that sampling data may be further analyzed and incorporated into report writing and deliverables.

The purpose of sample custody procedures is to document the history of sample containers and samples from the time of preparation of sample containers through sample collection, shipment,

and analysis. Sample custody is maintained when a sample is in a secure area or in view of, or under the control of, an authorized individual. Personnel responsible for maintaining sample custody will be identified in the site-specific SAP. For large sampling events, dedicated personnel will be responsible for sample management and custody. An item is considered to be in one's custody if any or all of the following apply:

- The sample is in the physical possession of an authorized party and the sample is in the view of the responsible party.
- The sample is secured by the responsible party to prevent tampering.
- The sample is secured by the responsible party in a restricted area.

The samples collected at the site will be shipped to pre-designated laboratories in accordance with either Department of Transportation (DOT) Hazardous Materials Regulations or International Air Transport Association (IATA) Dangerous Goods Regulations. Samples will be transported in a manner that will maintain their integrity, as well as protect against detrimental effects from sample breakage or leakage. The Weston Solutions, Inc. *Manual of Procedures for Shipping and Transporting Dangerous Goods* will be followed whenever samples are shipped.

START personnel will transport the cardboard boxes or plastic coolers to an overnight delivery service carrier, such as FedEx, for next-day delivery to the appropriate laboratories; or will arrange for a courier or the overnight delivery service carrier to pick up the cardboard boxes or plastic coolers on site.

10.1.1 Sample Numbering

In order to ensure proper chain-of-custody (COC) for each analytical mechanism, sample identification procedures will be used to ensure that each sample is assigned a unique identification number. Correct sample numbering ensures sample authenticity. A unique number will be assigned to each property to maintain anonymity, and soil boring locations for each area of the site will be assigned an SB-xx designation indicating the sequence of borings advanced. Unique numbers will range from P-01 to P-25 and are shown in the table in Section 9.0, Sampling Procedures and Requirements. Soil samples collected from the 0 – 1 foot interval will be designated with an “A”, those from the 1 – 3 foot interval a “B”, those from fill a “C”, and native soil top a “D”, and native soil bottom an “E”. For example, the five soil samples collected from the first boring advanced on property P-01 would be designated as *P-01-SB-01A* (0 – 1 ft), *P-01-SB-01B* (1 – 3 ft), *P-01-SB-01C* (fill), *P-01-SB-01D* (top native soil), and *P-01-SB-01E* (bottom of native soil).

On the two properties (Properties 15 and 25) where sampling may occur in two tiers, the unique numbers for Tier II will be PT-15 and PT-25. For example, the five soil samples collected from the first boring location on the second tier on property P-15 would be designated as *PT-15-SB-15A* (0 – 1 ft), *PT-15-SB-01B* (1 – 3 ft), *PT-15-SB-01C* (fill), *PT-15-SB-01D* (top native soil), and *PT-15-SB-01E* (bottom of native soil).

In addition, unique CLP numbers will be assigned to each sample. START will use SCRIBE and FORMS II Lite software to electronically generate sample tags, labels and chain of custody documentation.

10.1.2 Sample Labels

Samples will be identified with a label that will be attached directly to the container. Sample labels will be completed using waterproof ink. **[Note: Only the CLP or DAS number will be on the sample label. None of the other information will be on the sample label. All this information will be on the Sample TAG.]** The sample tags will contain the following information:

- Sample number
- Time and date of collection
- Parameters to be analyzed
- Preservative (if any)
- Sample source/location (Station Location)

10.1.3 Transfer of Custody and Shipment

Prior to sample shipment, the Traffic Record (TR)/COC record will be signed and dated by a member of the sampling team who verifies that the samples listed on the TR/COC are included in the cooler. **[Note: sampling personnel also sign the TR/COC].** After packaging has been completed, custody seals, signed and dated by a member of the sampling team, will be placed on the sample cooler across the space between the lid and the body of the sample cooler. Samples shall generally be shipped via courier or overnight delivery service within 24 hours of the conclusion of the day's sampling activities. START will make arrangements with DAS laboratories for weekend sample deliveries and EPA will do the same for CLP laboratories.

10.1.4 Chain-of-Custody Procedures

The COC documents will be shipped with the sample containers. These forms will be completed by field personnel with acknowledgment of time and date of transfer to the carrier or courier service, and will be placed within the shipping container. In addition, PE instructions and other pertinent documents will be included with the COC as part of the sample shipment. Laboratory custody procedures associated with sample receipt, storage, preparation, and analysis, as well as general security procedures, will be implemented in accordance with EPA requirements.

COC records must be prepared to accompany samples from the time of collection and throughout the shipping and analytical process. A COC record will be maintained from the time the sample is collected until its delivery to the laboratory. To maintain a record of sample collection, transfer between personnel, shipment, and receipt by the laboratory, a COC record will be filled out for each sample at each sampling location. Each individual in possession of the samples must sign and date the sample COC document. Each time the samples are transferred, the signatures of the persons relinquishing and receiving the samples, as well as the date and time, will be documented. A copy of the COC is retained in the site file. When samples (or groups of samples) are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal. Specific information regarding custody of the samples projected to be collected on the weekend will be noted in the field log book. The COC record will be considered completed upon receipt at the laboratory. The COC Record should not identify field duplicate QC samples to the laboratory. The COC record should include (at minimum) the following:

- Type (s) of analysis(es) to be performed
- Sample ID number
- Sample information
- Sample station location
- Sample collection dates and times
- Name(s) and signature(s) of sampler(s)
- Signature(s) of any individual(s) with control over samples
- Sample preservatives
- Type of samples (grab or composite)
- Remarks
- OSC contact information

A separate COC form must accompany each cooler for each daily shipment. Within the laboratory, the person responsible for sample receipt must sign and date the COC form; verify that custody seals are intact on shipping containers; compare samples received against those listed on the COC form; examine all samples for possible shipping damage, leakage, and improper sample preservation; note on the COC record or laboratory receiving documentation that specific samples were damaged; notify sampling personnel as soon as possible so that appropriate samples may be re-sampled; verify that sample holding times have not been exceeded; maintain laboratory COC documentation; and place the samples in appropriate laboratory storage. The laboratory may submit internal COC documentation with the data package, but does not provide START with the final disposition date of the samples.

11.0 Field Analytical Methods and Procedures

Field analytical tasks are those analytical activities that are performed on or near the site of investigation, not in a fixed commercial laboratory facility. Field analytical tasks for this project will include environmental sample analyses. Field analytical tasks generate either screening or definitive data; the difference being, definitive data are typically generated using standard EPA methods and are supported by prescribed quality control. Definitive data are suitable for final decision-making. Definitive data can be generated on-site in fully equipped field mobile laboratories. In contrast, screening data are typically semi-quantitative and/or semi-qualitative data that are used to support an intermediary or preliminary decision but eventually must be supported by definitive data before a project is complete, i.e. PCB screening data generated using screening methodologies. This section describes all field analytical methods and procedures that will be used routinely by OSCs. EPRB and OEME field analytical SOPs may be found in Appendix 5 and 6, respectively of the *QAPP*.

11.1 Field Analytical Methods and Standard Operating Procedures

For this project, the OSC has requested field analytical assistance from OEME and ERT/SERAS. Two field mobile laboratories and field analysts will be mobilized to the site to screen samples for PCBs and metals. All screened samples will be submitted for confirmatory analysis.

Field analytical methods and SOPs developed and used by EPRB and OEME to analyze commonly requested analytical parameters and matrices will be used. These SOPs summarize the method, list achievable quantitation limits and specify the frequency of calibration, acceptance criteria, QC samples, corrective action, maintenance, testing and inspection

procedures, and supplies. Field screening for PCBs and metals in soils will be conducted by EPA Chemist Scott Clifford using the following methods:

- EIASOP-FLDXRFNITON4 Environmental Metals Screening
- EIASOP-FLDPCB2 PCB Field Testing for Soil

The ERT/SERAS on-site chemist will also adhere to these SOPs. All modifications to field screening or definitive methods and SOPs and an explanation for those modifications will be documented by the field chemist. Modifications may include, but are not limited to:

- Modified target compound lists
- Modified quantitation limits
- Sample volume
- Solvent volume
- Dilution volume/factor

11.2 Field Instrument Calibration and Frequency

Field instruments shall be calibrated to establish quantitation limits and the range over which sample concentrations can be accurately quantitated. In general, instrument calibration procedures, frequency, quality control, acceptance criteria and corrective actions will be described in the specific SOP. In addition, calibration procedures are summarized for OEME and EPRB field analytical methods in Table 13-3 to 13-7 of the *QAPP*. At a minimum, instruments shall be calibrated initially prior to running any samples and at the end of the run sequence. A zero check with an analyte-free method blank will also be performed whenever applicable. A standards check with a calibration standard from a secondary source will be analyzed whenever necessary.

11.3 Calibration Standards

All standards used to calibrate field monitoring instrumentation will be certified by the manufacturer. Commercial standard solutions for field and laboratory uses will be traceable to NIST materials and must be obtained with their accompanying documentation. Any standards made from neat materials will be made from materials of at least 96 percent purity using balances with readability of at least 0.001 grams.

All standards made from neat materials will be made based upon weight. Standards from liquid neat materials will be made by adding the liquid to a tared volumetric flask at least half-filled with solvent and then adjusting the final volume. Standards will not be made based upon density. All standards and dilutions shall be made from pesticide or purge & trap grade solvents or ASTM Type II reagent grade water.

All standards are assigned unique tracking numbers and be entered into a bound standards notebook. All standards are labeled with the following:

- Standard number
- Description/concentration
- Initials of person who made the standard
- Date standard was made

- Expiration date

Standards will be stored and maintained in accordance with Table 11-4 of the *QAPP*.

11.4 Field Instrumentation/Equipment Maintenance, Testing and Inspection

EPRB and ERT/SERAS field equipment and instruments will be maintained, tested and inspected to ensure proper operating conditions at the time of deployment by the OSCs. Schedules and frequency of testing, maintenance and inspection of field analytical equipment and instrumentation are described in the appropriate SOPs. In addition, the SOPs describe the criteria for acceptable operating conditions and corrective actions. Maintaining, testing and inspecting field instrument is the responsibility of the field chemist. If the instrument is not functioning properly (i.e., the instrument will not zero, calibrate, hold a charge), it will be returned to the vendor for either repair or replacement.

Routine maintenance procedures, such as cleaning the PID lamp, are described in the manufacturer's operator's manual, pertinent sections of which are attached to instrument SOPs. All field instruments will be visually inspected prior to use. This includes an inspection of sensors, cables and associated connections to meters, corrosion at cable and/or battery ports, and battery power capacity. Any problems identified during the visual inspection are fixed prior to instrument use.

Instrument testing is performed during calibration activities. Any instruments that are not calibrated will be re-calibrated. If subsequent re-calibrations fail, then corrective actions outlined in the SOP are implemented. An instrument maintenance/inspection log is maintained and documents the date of inspection/maintenance, name of instrument, description of problem/maintenance activity and description of repair.

11.5 Field Analytical Inspection and Acceptance Requirements for Supplies

Field analytical supplies for commonly used field analytical procedures are itemized in the attached SOPs. The OSCs or OEME field chemist, and ERT/SERAS are responsible for ordering and maintaining their own supplies. In general, all field analytical supplies and reagents received at the site will be checked against the original purchase orders to make sure they are correct. Reagents will be inventoried and their use tracked in a Reagent/Standard logbook. The date that the calibration standards and reagents are opened will also be recorded. Reagent lot numbers, vendor, purity grade, and expiration dates will be tracked in the logbook. Certificates of analysis will be maintained in the analytical site file. Reagent blanks and/or method blanks will be routinely analyzed to monitor reagent quality. If reagents or standards have degraded or are contaminated, they will be replaced with new reagents and standards that meet criteria. Expiration dates will be checked at the end of each calendar quarter, and expired standards and reagents will be disposed of properly.

Other analytical supplies such as syringes can be checked visually to make sure they are acceptable for use. Extra supplies will be on hand to minimize down time of project operations.

11.6 Screening/Confirmatory Analyses

Confirmatory analysis will be performed by a DAS and CLP laboratories on all soil samples collected during this sampling event. Screening and confirmatory data will be evaluated as described in OSWER Directive 9360.4-10 November 1991. Field screening for PCBs and metals in soils will be conducted by EPA Chemist Scott Clifford and ERT/SERAS using the following methods:

- EIASOP-FLDXRFN3 Environmental Metals Screening
- EIASOP-FLDPCB2 PCB Field Testing for Soil

Confirmatory analysis will be conducted by CLP or DAS laboratories using:

- Aroclors by CAM-VA(Rev 1 9/14/2009)/ SW-846 Method 8082A
- Metals by ILM05.4 ICP-AES Modified

12.0 Fixed Laboratory Analytical Methods and Procedures

Analytical services shall be obtained from CLP laboratories for metals analyses utilizing a CLP method modification procedure, and DAS laboratories for PAH and PCB analyses. The DAS laboratories shall be experienced with Compendium of Analytical Methods (CAM). The DAS laboratories will provide validatable data packages that exceed the deliverable specifications found in CAM-VA, CAM-IIB and provide a SEDD electronic data deliverable in XML format. In accordance with the EPA Region I Data Validation Guidelines, a fully validatable data package must be provided for all analyses. CLP laboratories routinely provide this type of data deliverable.

The EPA OSCs ultimately determine whether a government laboratory shall provide analytical services in accordance with the Agency's Field and Analytical Services Teaming Advisory Committee (FASTAC) Strategy. The FASTAC strategy is EPA's Tiered approach to obtaining analytical services, with the Region's laboratory (OEME) as Tier 1 (i.e., primary laboratory services provider); the EPA's CLP RAS and NRAS laboratories as Tier 2; the Regional OEME analytical contracts as Tier 3; and the Regional Field Sampling Contractor subcontracted laboratory services (DAS laboratories) as Tier 4. The decision on which tier will be selected will be decided by the EPA OSCs and may be based on laboratory capacity, available extraction technologies, funding, turnaround time, and or detection limits.

Most of the time, the data are not time critical; therefore, a 21-day turnaround time is selected. CLP laboratories are routinely used because the methods used have firmly defined QC acceptance criteria and reporting criteria and the performance of the laboratory is monitored by EPA to ensure compliance. The DAS laboratories used for this project will provide validatable data packages that exceed the required analytical deliverables specified in CAM method VA (Rev 1 9/14/2009), IIB (Rev 1 9/9/2009), and a SEDD/ADR electronic data deliverable. Analyses for PAHs and PCBs will be performed in accordance with CAM-IIB (Rev 1 9/9/2009), and CAM-VA respectively (Rev 1 9/14/2009).

12.1 Fixed Laboratory Methods and Standard Operating Procedures

CLP analytical services are available to the OSC through OERR's Analytical Operations and Data Quality Center. Analytical services are described in the most current SOWs and are scheduled through the Regional Sample Control Coordinator (RSCC) located at OEME. CLP

laboratories are pre-qualified and laboratory SOPs are reviewed prior to contract award. SOPs to be used will be laboratory specific. Laboratory performance is monitored by the regional CLP Technical Project Officer (CLP-TPO) network and through the use of PE samples and laboratory audits. Low/medium inorganic analyses and low/medium organic analyses are available through the routine analytical services. The CLP TPO notifies OSRR by memorandum when new analytical services are available from Headquarters. Quality control acceptance limits, calibration requirements, contract required quantitation limits and applicable matrices are described at the following website: www.epa.gov/superfund/programs/clp/. EPA has determined that a method modification for ILM05.4 will be requested for this project. Alternatively DAS may be used to procure laboratory services to support EPA site work. The analytical services are described in the most recent CLP SOWs and or EPA methods and are scheduled through the use of FASTAC and an EPA contractor.

12.2 Selection of Fixed Laboratory Analytical Methods and Modifications

The most current version of CLP methods will be used to support the inorganic site data needs. The most current version of the Routine Analytical Services (RAS) CLP inorganic method is ILM05.4 (Inorganic). For this project EPA has determined that a contract method modification for ILM05.4 will be requested. The most current versions of CAM Methods IIB (Rev 1 9/9/2009), and VA (Rev 1 9/14/2009) will be used to support the PAH and PCB site data needs respectively. The updated CAM methods are currently in draft form and are based upon updated EPA SW-846 methods. Older versions of analytical methods or protocols may be selected on a site-by-site basis, and only after consultation with the OSCs, and approval of the site-specific SAP. Older methods and protocols may be desired when comparing current data to historical data. However, use of older protocols is not generally desired, and sufficient rationale must be provided to justify their use.

Analytical methods are selected based on the intended use of the data. Whenever possible, RAS CLP analytical services will be utilized and are the methods of choice for sample analyses. The CLP contract required quantitation limits (CRQLs) are below the action levels generally needed for removal site actions.

The laboratory methods to be used for inorganic analyses are described in the Inorganic Statement of Work ILM05.4. The organic analyses will be performed in accordance with CAM Methods IIB (Rev 1 9/9/2009), and VA (Rev 1 9/14/2009) which are based upon EPA-SW846 methods 3545A/8270D, and 3540C/8082A respectively. The following methods will be used:

- Metals by ILM05.4 ICP-AES
- Aroclors by CAM-VA (Rev 1 9/14/2009)/ EPA-SW846 method 8082A
- SVOC (PAHs) by CAM-IIB (Rev 1 9/9/2009)/ EPA-SW846 method 8270D

The identity, names, addresses, names of contact person, telephone numbers and fax numbers of the Individual Laboratories performing the analysis have not yet been determined, but will be included in this SAP once the RAS and DAS procurements have been completed.

12.3 Fixed Laboratory Instrument Calibration/Sensitivity

Inorganic instrument calibration criteria are to be met for CLP analyses, and may be verified during the data validation process. These criteria are specified in ILM05.4, and include calibration frequency, acceptance criteria, and corrective actions.

Organic instrument calibration criteria are to be met for DAS analyses, and may be verified during the data validation process. These criteria are specified in CAM-IIB (Rev 1 9/9/2009), and CAM-VA (Rev 1 9/14/2009), and include calibration frequency, acceptance criteria, and corrective actions.

Instrument sensitivity for a fixed laboratory method is demonstrated by MDL studies. MDL studies for non-CLP analyses are included as part of the data deliverables. Complete MDL studies are not required as a deliverable for CLP analyses, however inorganic MDL values are provided on Form 9. For low-level analyses where sensitivity must be evaluated at low levels using MDL studies, START shall request the laboratory MDL studies through the CLP PO. Instrument sensitivity is evaluated during data validation according to the "Region I Tiered Organic and Inorganic Data Validation Guidelines". Sample results may be qualified based on this parameter.

12.4 Instrument Calibration Standards

All purchased standards used to calibrate laboratory instruments will be certified by the manufacturer. Commercial standard solutions will be traceable to National Institute of Standards and Technology (NIST) materials and obtained with verifying documentation. Any standards made from neat materials will be made from materials of at least 96 percent purity using balances with readability of at least 0.001 grams.

All standards made from neat materials will be made based upon weight. Standards from liquid neat materials will be made by adding the liquid to a tared volumetric flask at least half-filled with solvent and then adjusting the final volume. Standards will not be made based upon density. All standards and dilutions will be made from pesticide or purge & trap grade solvents or ASTM Type II reagent grade water.

All standards will be assigned unique tracking numbers and be entered into a bound standards notebook. All standards must be labeled with:

- Standard number
- Description/concentration
- Initials of person who made the standard
- Date standard was made
- Expiration date

Standards will be stored and maintained in accordance with Table 12-4 of the *QAPP*.

12.5 Instrument Maintenance, Testing and Inspection

Laboratory SOPs describe procedures including frequency, operating criteria, corrective action and documentation activities that will be performed to verify that all equipment and

instrumentation are maintained, tested and inspected to ensure that they are available and in working order, and that all supplies are available and contaminant free.

13.0 Quality Control Activities

Quality control activities will be performed to ensure sampling and analytical tasks are conducted within specified acceptance ranges. This section describes the type and frequency of QC activities that will be performed to support data collection operations. It also describes acceptance criteria and corrective actions for when those criteria are not met.

13.1 Field Quality Control

Field QC samples will be collected and analyzed to ensure sample results are representative, accurate and precise. Table 13-1 of the *QAPP* describes the required type, frequency, QC criteria and associated corrective action for field QC samples that are typically used during environmental sample collection activities. The number of QC samples collected for each analytical parameter and concentration level are listed in Table 4 - Field Quality Control Summary, of this SAP.

At a minimum, the following field QC samples will be collected and analyzed when definitive data are generated:

- Field Duplicates - Environmental duplicate samples are collected to demonstrate the reproducibility of sampling technique and the variability of the sample matrix. The field duplicate analysis is in addition to the laboratory duplicate analysis. At a minimum, one field duplicate sample will be collected per each matrix at a frequency of 1 per 40 samples or per property, whichever is more frequent, for organic analyses and at a frequency of 1 per 20 samples for inorganic analyses. Field duplicates will be used to evaluate sampling precision.
- Equipment (Rinsate) Blanks - Equipment (rinsate) blanks are collected to assess cross-contamination brought about by improper decontamination procedures between sampling stations. Equipment rinsate blanks are required for non-dedicated sampling equipment. Daily equipment (rinsate) blanks will be collected for each type of sampling equipment. Rinsate blanks will be collected after field use of sampling equipment by pouring the appropriate rinsate solvent (e.g., DI water) over decontaminated sampling equipment. The rinsate is collected into appropriate sampling containers, preserved, and analyzed for the same parameters as the associated environmental samples (excluding physical parameters such as pH). Equipment rinsate blanks will be shipped with the samples collected the same day. The frequency of equipment rinsate blank collection is usually 1 blank per decontamination event per type of equipment per property, or 1 per 40 field samples per property.
- MS/MSD Analyses - To evaluate the effect of the sample matrix on the analytical methodology, samples for MS/MSD analysis will be collected at the minimum rate of 1 per batch of 40 or fewer samples in a case. These samples are spiked in the laboratory with the analyte(s) of interest and analyzed at the same dilution as the original sample. The %R and the RPD for each spiked compound is then calculated. MS/MSD analyses will be used to evaluate accuracy (via %R) and precision (via RPD). MS/MSD frequency

will be modified to reflect the field sampling effort and will be modified to a frequency of 1 per property or one per 40 samples per property, and should reflect different interval sampling depths (e.g. 0 – 1 ft, 1 – 3 ft, fill material depth, and native soils) and amount of recovery.

- MS/DUP Analyses - To evaluate the effect of the sample matrix on the analytical methodology, samples for MS/DUP analysis will be collected at the minimum rate of 1 per batch of 20 or fewer samples in a case. These samples are spiked in the laboratory with the analyte(s) of interest and analyzed at the same dilution as the original sample. The %R and the RPD for each spiked compound is then calculated. MS/DUP analyses will be used to evaluate accuracy (via %R) and precision (via RPD). MS/DUP frequency will be performed at a frequency of 1 per property or one per 20 samples per property, and should reflect different interval sampling depths (e.g. 0 – 1 ft, 1 – 3 ft, fill material depth, and native soils) and amount of recovery.
- Performance Evaluation Samples - Single-blind PE samples will be analyzed by the fixed laboratory at a frequency of one per matrix, per analytical parameter, per case, per laboratory. The PEs will be obtained from either the EPA Region I QA office or from a commercial vendor. The results of the laboratory analysis will be scored against the established limits. The PE sample is used to evaluate accuracy and bias. PE failure by the laboratory may trigger a Tier II validation.

13.2 Analytical Quality Control

Analytical quality control will include both field and fixed laboratory analytical QC checks. These include analysis of method blanks, reagent blanks, storage blanks, instrument blanks, laboratory duplicates, laboratory matrix spike and/or matrix spike duplicates, LCS, Laboratory Fortified Blanks (LFB), surrogates, and internal standards. Screening data differ from definitive data in the analytical methods, level of quality control performed and the degree of uncertainty associated with the sample results. In general, screening data has less rigorous QC and a greater degree of uncertainty. Only definitive data can be used by EPA for final site decisions documented in an Action Memorandum, Closure Memorandum, risk assessment, or site closure. Screening data are used for preliminary and intermediary site decisions.

All field screened samples will be analyzed using a confirmatory method at DAS and CLP laboratories. The following equation will be used to calculate the percent difference between screening and confirmatory data:

$$\% \text{ Difference (Confirmatory Analysis)} = \frac{C_1 - C_2}{C_1} \times 100\%$$

C_1 = Concentration determined by Confirmatory Analysis

C_2 = Concentration determined by Screening Analysis

Table 13-2 of the *QAPP* describes the required type, frequency, QC criteria and associated corrective action for typical QC samples analyzed to support field screening and definitive analytical activities. Additional QC activities required by the analytical method or procedures will also be performed. Field and fixed laboratories will generate their own control limits and implement corrective actions when laboratory-specific control limits are not met. The use of

laboratory-specific control limits will be evaluated and implemented on a project by project basis. The site-specific SAP will specify the type and number of QC samples that will be collected. In addition to tuning and calibration standards, the following QC samples will be analyzed:

- Laboratory duplicates
- Method and instrument blanks
- Laboratory Control Spikes, and Laboratory Control Spike Duplicates
- Laboratory fortified blank spiked at the quantitation limit
- Matrix spikes for inorganic and organic samples
- Matrix spike duplicates for organic samples
- PE samples
- Surrogate spikes for organic samples

13.3 Performance Evaluation Samples

Performance Evaluation (PE) samples will be analyzed for the following parameters:

- Aroclors - soil
- SVOC (PAHs) - soil
- Metals – soil

Refer to Attachment B of this SAP for a list of available PE samples. Based upon the number of PEs needed for a large sampling event, the QA unit should be consulted early in the planning stages to ensure that PE samples will be available.

14.0 Secondary Data Requirements

EPRB only uses data which have been directly generated during the site activity to support site decisions. EPRB does not use secondary data to make regulatory site decisions, such as whether a site meets National Contingency Plan (NCP) criteria for a removal response. However, historical site information is routinely used during preliminary assessments and site investigations to help define the scope of removal activities. When used, EPRB will ensure that these data are of known and documented quality.

Types of secondary data include:

- Historical site data - obtained from organization/facility records, and federal/state/local records pertaining to previous monitoring events, site assessments, investigations, site inspection reports, spill notification reports, legal actions, deeds and titles.
- Background information - obtained from organization/facility records, and federal/state/local records pertaining to site-specific industrial processes including hazardous manifests, MSD.
- Sheets, purchase orders (for chemicals), bill receipts, permits for discharge, etc.
- Geologic and topographic maps.
- Soil conservation surveys.
- Photographs, including aerial photographs.
- Literature file searches.

- Data bases (e.g., STORET, Dunn and Broadstreet, etc.).

The SAP will cite the title and date of the report, document, or data base from which any secondary data are obtained. The data generator, organizational affiliation, and data collection dates will also be documented.

14.1 Use of Secondary Data

Typically, secondary data will be used to develop a sampling and analysis plan or conceptual site model. A conceptual site model predicts how chemicals were released at a site, their transport mechanisms, and exposure routes for both ecological and human receptors. For example, historical data will be used to determine matrices, contaminants and other target analytes of concern and general geographic boundaries of the investigation site. Secondary data will also be used to make interim decisions such as where to sample and where to place monitoring wells.

14.2 Limitations on the Use of Secondary Data

Secondary data will be used at the discretion of the OSCs, taking into account the quality objectives of the current project and those under which the secondary data were collected. In general, the use of older historical data will be used with caution. Biased data can lead to decision errors; therefore the OSCs will assess the reliability and usefulness of previously collected data by reviewing associated quantitation limits, precision and accuracy QC information when time permits. Moreover, site conditions may have changed. If limitations on the use of secondary data exist, they will be documented in the appropriate reports.

15.0 DOCUMENTATION, RECORDS, AND DATA MANAGEMENT

Documentation, record keeping, and data management activities will be conducted in accordance with the *QAPP*, Section 15. A Data Information and Management Plan (DIMP) will be prepared by EPA and will discuss the collection, documentation, and use of the data collected.

Project information generated by START and ERT/SERAS will be documented in a format that is usable by project personnel. Project data and information will be tracked and managed from its inception in the field to its final storage area. Documents and records that will be managed include, but are not limited to, the following:

- Sample Collection Records (log books, Field Data Sheets, boring logs, bottle certification of cleanliness, field notes, data collection sheets, COC records, custody seals, sample tags, phone conversation records, airbills, and corrective action reports). Final boring logs will be prepared by START and ERT/SERAS for their respective soil borings.
- Field Analysis Records (COC, sample receipt forms/sample tracking forms, preparation and analysis forms and/or log books, tabulated data summary forms and raw data for field samples, standards, QC checks and QC samples).
- Project Data Assessment Records (field sampling audit checklists, field analytical audit checklists, fixed laboratory audit checklists, PE sample results, data validation reports, telephone conversation records, and corrective action reports).

Log books will be used for a variety of activities during the course of this project including, field notes; equipment maintenance, testing and inspection and calibration; analytical instrumentation maintenance, testing and inspection; and field testing instrumentation calibration and sample analysis.

Logbooks will be bound, field survey books or notebooks. Individual logbooks may be assigned to field personnel to a specific activity (e.g., Geoprobe® activities, instrument calibration, etc.). Log books will be properly identified with either the owner's name or site activity. Alternatively, when multiple or START personal log books are used, log book pages will be photocopied and included in the site file. All log book entries will be made in indelible ink and legibly written. Erasures are not permitted. If an incorrect entry is made, the error will be crossed out with a single strike mark, initialed, and dated. At a minimum the following information will be recorded in the logbook:

- Site name and location
- Dates (month/day/year) and times (military) of all entries made in logbooks/forms and user signatures
- Description of technical activity
- SOPs followed and description and explanation of any deviation from or modification to standard procedures
- Contractor and Subcontractor information

For specific field logbook procedures refer to Section 10.1.1.1 of the *QAPP*.

15.1 Field Laboratory Data Deliverables

Complete data packages will not be generated for field screening data. Laboratory data generated by the OEME field chemist will be retained by OEME and archived in accordance with standard procedures. Field analytical deliverables may include the following:

- Raw data (properly labeled with sample IDs, and any manual calculations)
- Daily Field QA/QC Form (summarizing duplicate results, LCS results and acceptable limits, and standard traceability form)
- Summary Table of results (listing sample ID, reporting units, and detection limits)

15.2 Fixed Laboratory Data Package Deliverables

All data packages obtained from fixed laboratories will require a Complete SDG File (CSF) inventory sheet, analytical narrative, EPA shipping/receiving documents and internal laboratory COC records, raw sample data, standards data, QC data, and miscellaneous data. The TAT for the data package will be 21 days from the date the samples were received by the laboratory.

The data reporting formats will be site-specific, and may include spreadsheets showing the laboratory results, text and tables summarizing analytical results, daily summary tables, and tables comparing screening results to laboratory results. Typical data reporting formats are discussed in the following sections.

The initial data deliverables from each laboratory will be evaluated at a Tier II level. The remainder of the analytical data will be validated at a Tier I plus level. Any additional SDGs in

which there is a data anomaly or PE samples fail Action Low or High will be selected for a Tier II validation. The organic data validated at a Tier I plus level will be qualified using SEDD stage 2A I XML file that will be loaded into ADR software. The inorganic data validated at a Tier I plus level will be evaluated manually. The ADR or manual review will evaluate the following items:

- Holding Times
- Temperature upon sample receipt
- Reporting Limits
- LCS/LCSD recoveries and precision
- MS/MSD/Dup recoveries and precision
- Method Blanks
- Surrogates

START, qualified ID/IQ personnel, and/or subcontractors will perform the organic data validation. The Quality Assurance Technical Support (QATS) contractor for the EPA will perform the inorganic data validation. The validators for both the organic and inorganic samples will prepare data validation memoranda and spreadsheets summarizing the analytical data. The START PL and SL will review the data validation memoranda and spreadsheets of analytical data for each SDG and prepare a summary of the analytical results and tables summarizing the data. This information is generally included in Site File Memorandum.

Since a large number of samples will be collected and field screening will be conducted for PCBs and metals, the screening data will be incorporated into summary tables along with the confirmation data, allowing for a comparison of the screening and analytical data.

15.3 Data Handling and Management

Inorganic data packages will be tracked by the START Lead Chemist or his designee. Validation of the data packages is tracked on the Region I START III Data Package and Validation Report. Data packages are separated into organic and inorganic SDGs. The inorganic analyses will be performed by EPA CLP laboratories using a method modification to satisfy WSC-CAM-III A criteria, and will be validated by QATS personnel at the level and frequency previously noted. The inorganic SDGs (hard copy data) will be shipped from EPA Region I directly to QATS for validation. START will be notified by EPA Region I that data were received for a specific SDG and sent to QATS to ensure that data are tracked appropriately. QATS will provide Data Validation Memoranda to the following personnel: Region I RSCC (Christine Clark), the laboratory designated TPO (varies by CLP laboratory), and the EPA site OSC's Wing Chau, Marcus Holmes, and Sarah DeStefano. EPA personnel will notify START that the inorganic DV memorandum for a specific SDG has been received for tracking purposes.

The organic data packages will be received and tracked by START personnel. The organic analyses will be performed by DAS laboratories, and will be validated by START, ID/IQ personnel, and/or subcontractors. All data will be electronically reviewed with qualifications to Tier I data based solely upon the electronic review. The electronic data review will be performed by START personnel, qualified ID/IQ personnel, and/or subcontractors. The Lead Chemist will assign an SDG for validation to a START chemist (ID/IQ or subcontractor), who completes the Data Validation Memorandum and the data validation worksheets per the deliverables requirement of the Region I, *EPA New England Data Validation Functional Guidelines for Evaluating Environmental Analyses*, December 1996.

Upon receipt of organic data packages data summary tables will be created by START staff or ID/IQ personnel. The organic data packages will be evaluated by START and EPA to determine if any action levels have been exceeded. These data summary tables display sample results for multiple samples on a single page. Data summary tables are matrix- and level-specific, and are included as attachments to the Data Validation Memorandum. The START chemist verifies the information presented on the data summary tables. Verified data include, but are not limited to, EPA and Laboratory Sample IDs, Station Location, SQLs/SDLs (sample results adjusted for sample size and percent moisture), dilutions, and contract required quantitation limits (CRQLs). Data qualifiers are applied by the Data Validator to the sample data displayed on the data summary tables during Tier II validation or as the result of the enhanced Tier I validation. The Data Validation Memorandum and the data summary tables are stored in the START local area network (LAN).

The Data Validation Memorandum and the data validation worksheets completed by the START Data Validator or ID/IQ personnel are assigned to an experienced START chemist for technical review. The Technical Reviewer discusses with the Data Validator any revisions to the Data Validation Memorandum as well as any corrections and/or clarifications. After the technical review is completed, the Data Validation Memorandum and associated deliverables go through a final review. The START Lead Chemist (or designee) conducts the final review prior to delivery of the completed Data Validation Memorandum to the EPA RSCC. Copies of the finalized Data Validation Memorandum are distributed to the EPA OSC.

15.4 Data Tracking and Control

Data generated by the OEME and ERT/SERAS field laboratories will be tracked by the START SL. Data generated by a fixed laboratory will be tracked by the Lead Chemist on the Region I START III Data Package and Validation Tracking Report.

In order to safeguard electronic data generated in the field, START personnel utilizing laptop computers at off-site locations will back up all files on at least a daily basis. While working at off-site locations, files will be backed up on a flash drive. The flash drives will be scanned for viruses before use on the laptop computers and especially before copying to the LAN. Flash drives will be kept in a secure location, separate from the laptop computers. Files generated in the field will be downloaded from laptop computers to the LAN when personnel return to the START Office.

15.5 Report/Deliverable Identification and Format

Each report and deliverable to EPA produced by START is assigned a unique five-digit Document Control Number (DCN) for tracking and identification purposes. A DCN log book is maintained by the START clerical staff that identifies each deliverable by document type (letter, memorandum, report, or other), task number, START member preparing the document, document submittal date, document description, EPA personnel receiving the document, document file name, and DCN. DCNs for Removal Program reports and deliverables are designated by R-xxxx.

15.6 Project Records

START will use its records management system to maintain, collect, and retrieve records. Project records will be maintained in the project TDD directory on the LAN system. Removal Program TDD files are established according to Region I START III protocols. A file folder, listing the TDD number and project name, will be created for each TDD (and subsequent TDD amendments) issued by the EPA PO or CO. Overall project records will include, but not limited to, the following:

- Technical Directive Documents (TDDs)
- Task Orders (TOs)
- Health and Safety Plan (HASP)
- Sampling and Analysis Plan (SAP)
- Photographs
- Field Notes, Drawings, Tabulations, etc
- Boring logs
- Correspondence (sent/received)
- Data Validation Memoranda
- Maps/Graphics
- Sample Documentation (chain-of-custody, airbills, shipping tags, cards, etc.)
- Analytical Results (raw data)
- Phone Conversation Records
- Electronic Data Files (CDs, diskettes, etc.)
- Reports (residential, Assessment, etc.)

The START Computer Officer maintains the computer database and has controls in place to back up Removal electronic files daily.

16.0 QUALITY ASSURANCE ASSESSMENTS AND CORRECTIVE ACTIONS

QA assessments are used to check that data collection activities are being conducted as planned, and will generate data that can support site decisions. The type, frequency and number of QA assessment activities performed will be described in the site-specific SAP. In response to QA assessment findings, timely and effective corrective actions will be implemented to ensure compliance with the SAP.

QA assessments for the OEME mobile laboratory will be conducted by regional QA Unit personnel and OEME-EIA chemists in accordance with the *Region 1, EPA New England England Assessment Program*, February 2002. To initiate a QA assessment the OSCs will submit an electronic Request for Assistance (RFA) Form to the RQAM, who will then forward it to the QA Assessment Coordinator. The QA Assessment Coordinator will contact the OSCs to determine the type of QA assessment needed and to schedule a mutually agreed upon date. A Lead Assessor is assigned to prepare a QA assessment plan and checklist, conduct the QA assessment, and provide verbal debriefings and document findings and response recommendations in a report to the OSC. The OSCs are responsible for ensuring that all deviations from the *QAPP* and critical deficiencies are addressed in a timely manner.

A minimum of one field analytical Technical System Audits (TSAs) will be performed by EPA for all projects that involve generation of field analytical measurements. Generally, a review of

the field analytical procedures is combined with a field sampling TSA, described above. The following items will be checked:

- Field analytical technician personnel and training
- Analytical methods and procedures
- Analytical instrumentation and supplies
- Data handling, tracking and reporting
- Data verification and review
- Compliance with SOPs

Findings will be documented in a report to management. Corrective actions in response to audit findings will be initiated, implemented and checked according to the *QAPP*, Section 16.

Self-assessments will be conducted for START and its subcontractors, and prompt and effective corrective actions will be implemented if necessary to ensure that site activities are conducted as described in the approved site-specific SAP. A Site File Memorandum will be generated discussing results of the assessment and corrective actions taken. The Site File Memorandum will be submitted to the PO and OSCs.

16.1 Corrective Action Process

The corrective action process provides for detection and correction of deficiencies and deviations that may adversely impact data quality. Corrective action measures will address the root cause of the problem and focus on preventing recurrences. The following describes the steps in initiating, documenting, and implementing corrective actions and the personnel responsible.

Corrective actions may be initiated by the OSCs, or their designee, upon receipt of a formal assessment report or when a deviation or deficiency is discovered while performing data activities. START personnel are responsible for identifying and documenting deficiencies noted in the work of organizational personnel or their subcontractors and for taking immediate steps to initiate corrective actions. START will report deficiencies and corrective actions in a Site File Memorandum that will be submitted to the PO and OSC. The corrective action process is further discussed in the *QAPP*, Section 16.

17.0 Reports to Management

Project reports ensure that the OSCs and EPRB management are kept informed and periodically updated on the status of the on-going data collection activity, site decisions, and results of QA activities. Typical QA reports that will be generated include are listed in Table 17-1 of the *QAPP*. All QA and other reports to management are retained in the site file and subsequently sent to the regional Records Center where they are compiled and maintained in accordance with the *File Structure Guidance for Region 1 Superfund NPL Site Files, Superfund Removal Site Files and Federal Facility Site Files*, September 1997.

QA Management Reports will be prepared by START to ensure that START management and appropriate EPA representatives (OSCs) are periodically updated on the project status. These reports will include but are not limited to:

- Verbal status updates

- Daily sampling summaries
- Site File Memoranda
- Removal Assessment Reports
- Data Validation Memoranda

18.0 DATA REVIEW STEP 1: Verification

In order to ensure defensible site decisions, data will be reviewed for accuracy and precision prior to use. Data review includes three sequential steps (verification, validation and data usability assessment) and results in data of known and documented quality. During data review, sample results are qualified as either accepted or estimated, or they are rejected. Rejected data will not be used in making site decisions. Data qualifications and limitations on the use of the data will be documented in data validation reports and other reports to management. The TAT for data validation packages will be 21 days from the time the data are received from the laboratory.

Data collection activities, including sample collection and data generation, will be verified in accordance with the *QAPP*, Section 18.

18.1 Verification Procedures

Verification is the process of checking to make sure each step of the data collection activity is complete and conforms to planned and contractual requirements. Typical verification activities performed during an EPRB project and responsible entities are listed in Table 18-1 of the *QAPP*. Most verification checks for time-critical removal activities will be accomplished during routine contractor oversight by the OSCs. Corrective actions will be initiated as soon as possible to ensure data usability. Items that routinely undergo verification may also be selected for formal assessments based on the project quality objectives, refer to Section 16, of the *QAPP*.

Qualified staff (e.g., chemists and others) on the START staff are responsible for the external verification and validation of fixed laboratory analytical data in accordance with the validation criteria set forth in the *Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses, December 1996*. These guidelines specify a tiered system of data validation that allows the user to select a level of validation appropriate to the project quality objectives.

19.0 DATA REVIEW STEP 2: Validation

Data validation, the second step in the data review process, extends the qualification of data beyond completeness and contractual compliance to determine the quality of a specific data set. Data validators use QC sample results to evaluate the precision, accuracy and sensitivity of the reported data set. The validation process results in data being accepted, qualified, or rejected. Sample results are flagged accordingly.

The START Lead Chemist will assign validation of individual organic data packages to chemists on the staff. Inorganic data validation will be conducted by an ERT subcontractor, QATS. The START Lead Chemist is responsible for data validation performed by START personnel, ID/IQ

personnel, and/or subcontractors used to help support the START contract, and documents review of the Data Validation Memorandum and data tables, with a signature on the Data Validation Memorandum. All organic data generated by the Region I START III office will be reviewed by a qualified START member.

Data generated by a fixed laboratory will be reviewed in accordance with the *Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses*. The DQOs will state which level (Tier) validation will be required. The results of the validation will be summarized in a Data Validation Memorandum, and will be reviewed by the Lead Chemist for compliance with the *Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses, December 1996*. The data validator and Lead Chemist shall document the review of the sample data by signing and dating the Data Validation Memorandum and worksheets.

A Tier II data validation will be performed for a minimum 10% of the data for this project and will be required for all initial laboratory submittals. Tier II validation requires that calibrations, QC samples and PE sample results be assessed and applied to the data set. A Tier II validation results in qualification flags being applied to the data. A Data Validation Report will be prepared by the validator and provided to the OSCs. Data will also be validated at a Tier I plus level. Tier I plus level validation requires package completeness review, evaluation of QC items found in section 15.2, and the evaluation of the sample PE results. A Tier I plus validation results in the application of qualification flags to the data, and may trigger a Tier II validation as directed by the OSCs due to data anomalies, and/or PE failure. Refer to table 19-1 of the *QAPP* for tier level required for different types of projects. All site-specific tier modifications will be noted in the SAP. The TAT for data validation packages will be 21 days from the time the data are received from the laboratory.

Data will be validated in accordance with the *QAPP*, Section 19.

20.0 DATA REVIEW STEP 3: Data Usability Assessment

20.1 Assessing Data Usability

Prior to use, the OSCs will determine whether site data can support defensible site decisions. This usability determination is the final step in data review and involves assessing all the collected data against the project quality objectives that were initially set for sensitivity, precision, accuracy/bias, comparability, completeness and representativeness. Specifically, the OSC will determine if the right chemical, biological, radiological and physical parameters and matrices were tested, sufficient amount of data were collected, and whether data were sufficiently sensitive and representative to support a scientifically-based decision regarding the site. Data deficiencies will be weighed against project objectives, and a determination as to the usability of the data will be made and documented in a final report in accordance with the NCP. The need for additional sampling and/or changes in the sample design, sampling protocol, analytical protocol, and/or associated QC procedures for subsequent data collection activities will be described. The following steps will be performed: Data will be reviewed with respect to sampling design. Data anomalies will be investigated. The OSCs will determine if the data make sense from the point of view of the sample locations, background sample data, and previous use of the site.

- A preliminary review of field and QC sample results will be performed. Data validation and audit reports will be reviewed. The OSCs will determine whether validation and/or audit reports indicate any limitations in the use of field data.
- The matrices and parameters that were sampled will be reviewed. The OSCs will determine whether the appropriate affected matrices were sampled and the right type (parameters) of data were collected (i.e., chemical, biological, physical and/or radiological parameters)
- A completeness review will be performed, refer to “Completeness” on Table 20-1. The OSCs will determine if sufficient data were collected to support an Action or Closure memorandum and will determine whether critical data gaps require additional sampling .
- Statistical tests will be applied by data validators, data reviewers or contractors to determine whether the data quality indicators (accuracy, precision and sensitivity) meet measurement performance criteria set for project, refer to Table 20-1 of the *QAPP* for formulae that will be used to evaluate precision, accuracy/accuracy and sensitivity. If applicable, field and QC data will be tabulated, mapped and/or graphed to show trends and localized areas of contamination.

The OSCs, in consultation with MassDEP will determine whether site data adequately represents current site conditions to support decision-making. Conclusions will be drawn from the data and site decisions made.

The extent of the data usability assessment will depend on the exigencies and complexity of the project. Generally, data usability evaluations for EPRB activities will be summarized in a final report, as described in Section 17.1 of the *QAPP*

For certain high-profile response actions including incidents of regional, national or international significance, formal data assessment reports will be generated within 6 months of the response. These reports will outline the steps taken to evaluate the data and the conclusions drawn from that process.

When necessary, contractor support will be obtained to statistically analyze site data. The following software may be used to analyze and interpret data:

- Geostatistical Environmental Assessment Software (GeoEAS) is a collection of interactive software tools for performing two-dimensional geostatistical analyses of spatially distributed data.
- DataQUEST is designed to provide a quick and easy way for managers and analysts to perform baseline data quality assessment. The goal of the system is to allow those not familiar with standard statistical packages to review data and assumptions that are important in implementing the formal DQO Process.
- ASSESS is a software tool designed to calculate variances for quality assessment samples in a measurement process. The software performs the following functions; transforming the entire data set; producing scatter plots of the data; displaying error

bar graphs that demonstrate the variance, and generating reports of the results and header information.

- S PLUS, a commercially available statistical software program, designed to calculate variances for quality assessment samples in a measurement process. The software performs the following functions; transforming the entire data set; producing scatter plots of the data; displaying error bar graphs that demonstrate the variance; and generating reports of the results and header information.

20.2 Reconciling Data with User Needs

The OSCs will meet with technical personnel including hydrogeologists, risk assessors, ATSDR, and QA personnel to determine if the results of the data collection activity will support defensible actions. Typically, most final determinations regarding data usability will be made by the OSC with concurrence from their immediate supervisor. Data evaluation and determination of limitations of the data will be described in a final report.

The data obtained during this investigation will be evaluated to determine whether they satisfy the DQOs for the project. The validation process determines if the data satisfy the QA criteria. After the data pass the data validation process, comparison of the results with the DQOs is done. For example, if the DQOs specify that the data are to be compared to MCP cleanup criteria, the results can then be used to determine whether additional sampling is necessary to complete this investigation.

There will be times when the data do not meet the intended DQOs. These situations may be due to failure of the laboratory to adjust the extraction weight on high-moisture-content soil; failure of the detection limits of secondary contaminants of concern to meet the Action Limits; or poor correlation between field screening and laboratory results. In these situations, START will discuss with the EPA OSCs corrective action. These actions may include:

- Resampling for all or some of the parameters.
- Preparing a technical memorandum to the site file, detailing limitations to the data.
- Validating the data at a higher tier level to better qualify the results.
- Preparing a technical memorandum determining the bias of field results.

Statistical evaluation may be beneficial for Removal sites involving extensive environmental sampling and analysis. Confirmation samples are typically sent to a fixed laboratory for analysis, at a 10% frequency. Field analytical results can then be compared with fixed laboratory confirmation results to determine analytical bias. For these extensively sampled Removal sites, the site-specific SAP shall address the mathematical and/or statistical criteria for evaluating screening and confirmatory data comparability. All samples that undergo field screening analyses will have corresponding split samples analyzed at a fixed off-site laboratory.

SAP Table 1 - SAP Revision Form

Site: Parker Street Waste Site, New Bedford, Massachusetts

OSCs: Wing Chau, Marcus Holmes, and Sarah DeStefano

| Date | Rev. # | Proposed Change to SAP/QAPP | Reason for Change of Scope/Procedures | SAP Section Superseded | Requested By | Approved By |
|-------------|---------------|------------------------------------|----------------------------------------------|-------------------------------|---------------------|--------------------|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**SAP Table 2 - Contaminants of Concern
(Reference Limit and Evaluation Table)**

- 1) Complete separate table for each matrix. 2) List all Contaminants of Concern that will be analyzed for the project.
 3) Identify any Project Action Limits/Removal Action Limits (RALs). 4) List the Project Quantitation Limits/Reporting Limits required to meet project objectives.
 5) List the MDLs and QLs of the published method and the MDLs and QLs achievable by the laboratory.
 6) Check to make sure that the achievable laboratory QLs are less than or equal to the Project Quantitation Limits and that Project Quantitation Limits are at least two to five times less than the Project Action Levels. (Refer to *QAPP* Section 6 for guidance.)

Matrix: Soil

Fixed Laboratory Method/SOP: CAM-VA (Rev 1 9/14/2009)/ EPA-SW846 method 8082A

| Contaminant of Concern | Project Action Level (Units) (wet or dry weight) or Removal Action Limits (RALs) | Project Quantitation Limit (PQLs) (Units) (wet or dry weight) <i>PQLs should be 3-10 times less than the RALs</i> | Analytical Method | | Achievable Laboratory Limits | |
|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------|
| | | | Published Method MDLs ¹ | Published Method QLs ¹ | Laboratory MDLs ² | Laboratory QLs ² <i>Lab QLs should be less than or equal to the PQLs</i> |
| PCB Aroclors 1016 1221 1232 1242 1248 1254 1260 1262 1268 | 2 milligrams per Kilogram (mg/Kg) | 33 micrograms per Kilogram (µg/Kg) | 5 – 20 µg/Kg | 33 µg/Kg | To Be Determined. Will vary by Laboratory | 33 µg/Kg |

SAP Table 2 - Contaminants of Concern (Continued)
(Reference Limit and Evaluation Table)

Matrix: Soil

Fixed Laboratory Method/SOP: CAM-IIB (Rev 1 9/9/2009)/ EPA-SW846 method 8270D

| Contaminant of Concern | Project Action Level (Units) (wet or dry weight) or Removal Action Limits (RALs) | Project Quantitation Limit (PQLs) (Units) (wet or dry weight) <i>PQLs should be 3-10 times less than the RALs</i> | Analytical Method | | Achievable Laboratory Limits | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------|
| | | | Published Method MDLs ¹ | Published Method QLs ¹ | Laboratory MDLs ² | Laboratory QLs ² <i>Lab QLs should be less than or equal to the PQLs</i> |
| Semivolatile Organic Compounds (PAH's) Naphthalene 2-Methylnaphthalene Acenaphthylene Acenaphthene Fluorene Phenanthrene Anthracene Fluoranthene Pyrene Benzo (a) anthracene Chrysene Benzo (b) fluoranthene Benzo (k) fluoranthene Benzo (a) pyrene Indeno (1,2,3-cd) pyrene Dibenzo (a,h) anthracene Benzo (g,h,i) perylene | 700 micrograms per Kilogram (µg/Kg) to 1000 milligrams per Kilogram (mg/Kg) | 330 µg/Kg | 35 – 92 µg/Kg | 330 µg/Kg | To Be Determined. Will vary by Laboratory | 330 µg/Kg |

**SAP Table 2 - Contaminants of Concern
(Reference Limit and Evaluation Table)**

- 1) Complete separate table for each matrix. 2) List all Contaminants of Concern that will be analyzed for the project.
 3) Identify any Project Action Limits/Removal Action Limits (RALs). 4) List the Project Quantitation Limits/Reporting Limits required to meet project objectives.
 5) List the MDLs and QLs of the published method and the MDLs and QLs achievable by the laboratory.
 6) Check to make sure that the achievable laboratory QLs are less than or equal to the Project Quantitation Limits and that Project Quantitation Limits are at least two to five times less than the Project Action Levels. (Refer to *QAPP* Section 6 for guidance.)

Matrix: Sediment

Fixed Laboratory Method/SOP: CAM-VA (Rev 1 9/14/2009)/ EPA-SW846 method 8082A (**Final Volume 2mL**)

| Contaminant of Concern | Project Action Level (Units) (wet or dry weight) or Removal Action Limits (RALs) | Project Quantitation Limit (PQLs) (Units) (wet or dry weight) <i>PQLs should be 3-10 times less than the RALs</i> | Analytical Method | | Achievable Laboratory Limits | |
|------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------|
| | | | Published Method MDLs ¹ | Published Method QLs ¹ | Laboratory MDLs ² | Laboratory QLs ² <i>Lab QLs should be less than or equal to the PQLs</i> |
| PCB Aroclors | | | | | | |
| 1016 | 60 micrograms per Kilogram (µg/Kg) | 7 micrograms per Kilogram (µg/Kg) | 1 – 4 µg/Kg | 7 µg/Kg | To Be Determined. Will vary by Laboratory | 7 µg/Kg |
| 1221 | | | | | | |
| 1232 | | | | | | |
| 1242 | | | | | | |
| 1248 | | | | | | |
| 1254 | | | | | | |
| 1260 | | | | | | |
| 1262 | | | | | | |
| 1268 | | | | | | |

SAP Table 2 - Contaminants of Concern (Continued)
(Reference Limit and Evaluation Table)

Matrix: Sediment

Fixed Laboratory Method/SOP: CAM-IIB (Rev 1 9/9/2009)/ EPA-SW846 method 8270D-(SIM)

| Contaminant of Concern | Project Action Level (Units) (wet or dry weight) or Removal Action Limits (RALs) | Project Quantitation Limit (PQLs) (Units) (wet or dry weight) <i>PQLs should be 3-10 times less than the RALs</i> | Analytical Method | | Achievable Laboratory Limits | |
|-----------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------|
| | | | Published Method MDLs ¹ | Published Method QLs ¹ | Laboratory MDLs ² | Laboratory QLs ² <i>Lab QLs should be less than or equal to the PQLs</i> |
| Semivolatile Organic Compounds (PAH's) | | | | | | |
| Naphthalene | 176 µg/Kg | | | | | |
| 2-Methylnaphthalene | Not Listed | | | | | |
| Acenaphthylene | Not Listed | | | | | |
| Acenaphthene | Not Listed | | | | | |
| Fluorene | 77 µg/Kg | | | | | |
| Phenanthrene | 204 µg/Kg | | | | | |
| Anthracene | 70 µg/Kg | | | | | |
| Fluoranthene | 423 µg/Kg | 3.3 µg/Kg | 0.5-2.5 µg/Kg | 3.3 µg/Kg | To Be Determined. Will vary by Laboratory | 3.3 µg/Kg |
| Pyrene | 195 µg/Kg | | | | | |
| Benzo (a) anthracene | 108 µg/Kg | | | | | |
| Chrysene | 166 µg/Kg | | | | | |
| Benzo (b) fluoranthene | Not Listed | | | | | |
| Benzo (k) fluoranthene | Not Listed | | | | | |
| Benzo (a) pyrene | 150 µg/Kg | | | | | |
| Indeno (1,2,3-cd) pyrene | Not Listed | | | | | |
| Dibenzo (a,h) anthracene | 33 µg/Kg | | | | | |
| Benzo (g,h,i) perylene | Not Listed | | | | | |

SAP Table 3 - Sampling Locations and Sampling and Analysis Summary

Site: Parker Street Waste Site, New Bedford, Massachusetts

OSCs: Wing Chau, Marcus Holmes, and Sarah DeStefano

| Sampling Location | Location ID Number ² | Matrix | Depth (Units) | Analytical Parameter | Number of Samples (Identify field duplicates and replicates) | Sampling SOP (SAP Section 9.1) | Sample Volume | Containers (Number, size and type) ³ | Preservation Requirements (chemical, temperature, light protected) | Maximum Holding Time (preparation/analysis) |
|-------------------|---------------------------------|--------|----------------------------|----------------------|--------------------------------------------------------------|--------------------------------|---------------|-------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------|
| P-xx-SB-xx-A | TBD | Soil | 0 – 1 feet | PCB Aroclors | 454 + 23 Dupl | EPRB SOP-001 | 8 ounces | 1 8-oz glass amber jar | Ice | NA/40 Days from extraction |
| P-xx-SB-xx-B | TBD | Soil | 1 – 3 feet | PCB Aroclors | 454 + 23 Dupl | EPRB SOP-001 | 8 ounces | 1 8-oz glass amber jar | Ice | NA/40 Days from extraction |
| P-xx-SB-xx-C | TBD | Soil | TBD (Fill material) | PCB Aroclors | 454 + 23 Dupl | EPRB SOP-001 | 8 ounces | 1 8-oz glass amber jar | Ice | NA/40 Days from extraction |
| P-xx-SB-xx-D | TBD | Soil | TBD (Native Soil - Top) | PCB Aroclors | 454 + 23 Dupl | EPRB SOP-001 | 8 ounces | 1 8-oz glass amber jar | Ice | NA/40 Days from extraction |
| P-xx-SB-xx-E | TBD | Soil | TBD (Native Soil - Bottom) | PCB Aroclors | 454 + 23 Dupl | EPRB SOP-001 | 8 ounces | 1 8-oz glass amber jar | Ice | NA/40 Days from extraction |
| P-xx-SB-xx-A | TBD | Soil | 0 – 1 feet | SVOCs (PAHs) | 454 + 23 Dupl | EPRB SOP-001 | 8 ounces | 1 8-oz glass amber jar | Ice | 14 Days/40 Days |
| P-xx-SB-xx-B | TBD | Soil | 1 – 3 feet | SVOCs (PAHs) | 454 + 23 Dupl | EPRB SOP-001 | 8 ounces | 1 8-oz glass amber jar | Ice | 14 Days/40 days |
| P-xx-SB-xx-C | TBD | Soil | TBD (Fill material) | SVOCs (PAHs) | 454 + 23 Dupl | EPRB SOP-001 | 8 ounces | 1 8-oz glass amber jar | Ice | 14 Days/40 Days |
| P-xx-SB-xx-D | TBD | Soil | TBD (Native Soil - Top) | SVOCs (PAHs) | 454 + 23 Dupl | EPRB SOP-001 | 8 ounces | 1 8-oz glass amber jar | Ice | 14 Days/40 Days |
| P-xx-SB-xx-A | TBD | Soil | 0 – 1 feet | Metals | 454 + 23 Dupl | EPRB SOP-001 | 4 ounces | 1 4-oz glass amber jar | Ice | 180 Days |
| P-xx-SB-xx-B | TBD | Soil | 1 – 3 feet | Metals | 454 + 23 Dupl | EPRB SOP-001 | 4 ounces | 1 4-oz glass amber jar | Ice | 180 Days |
| P-xx-SB-xx-C | TBD | Soil | TBD (Fill material) | Metals | 454 + 23 Dupl | EPRB SOP-001 | 4 ounces | 1 4-oz glass amber jar | Ice | 180 Days |
| P-xx-SB-xx-D | TBD | Soil | TBD (Native Soil - Top) | Metals | 454 + 23 Dupl | EPRB SOP-001 | 4 ounces | 1 4-oz glass amber jar | Ice | 180 Days |
| P-xx-SB-xx-E | TBD | Soil | TBD (Native Soil - Bottom) | Metals | 454 + 23 Dupl | EPRB SOP-001 | 4 ounces | 1 4-oz glass amber jar | Ice | 180 Days |

Notes:

- 1) Sampling Locations are designated in generic terms in this table. There will be between 347 - 425 boring locations. For a complete listing of sample boring locations see Table in Section 9.0 of this SAP.
- 2) CLP sample numbers will be assigned to each sample in the field.
- 3) An additional 8-Oz glass amber jar will be collected at the A and B interval for all locations to be archived by MassDEP for potential future dioxin analysis.

SAP Table 3A - Sampling Locations and Sampling and Analysis Summary

Site: Parker Street Waste Site, New Bedford, Massachusetts
OSCs: Wing Chau, Marcus Holmes, and Sarah DeStefano

| Sampling Location | Location ID Number ² | Matrix | Depth (Units) | Analytical Parameter | Number of Samples (Identify field duplicates and replicates) | Sampling SOP (SAP Section 9.1) | Sample Volume | Containers (Number, size and type) ³ | Preservation Requirements (chemical, temperature, light protected) | Maximum Holding Time (preparation/analysis) |
|-------------------|---------------------------------|----------|---------------|----------------------|--------------------------------------------------------------|--------------------------------|---------------|-------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------|
| WETL-SB-01-A | TBD | Sediment | 0 – 0.5 feet | PCB Aroclors | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | NA/40 Days |
| WETL-SB-01-B | TBD | Sediment | 0.5 – 2 feet | PCB Aroclors | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | NA/40 Days |
| WETL-SB-01-C | TBD | Sediment | 2 – 3 feet | PCB Aroclors | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | NA/40 Days |
| through | | | | | | | | | | |
| WETL-SB-19-A | TBD | Sediment | 0 – 0.5 feet | PCB Aroclors | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | NA/40 Days |
| WETL-SB-19-B | TBD | Sediment | 0.5 – 2 feet | PCB Aroclors | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | NA/40 Days |
| WETL-SB-19-C | TBD | Sediment | 2 – 3 feet | PCB Aroclors | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | NA/40 Days |
| WETL-SB-01-A | TBD | Sediment | 0 – 0.5 feet | SVOC (PAH) | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | 14/40 Days |
| WETL-SB-01-B | TBD | Sediment | 0.5 – 2 feet | SVOC (PAH) | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | 14/40 Days |
| WETL-SB-01-C | TBD | Sediment | 2 – 3 feet | SVOC (PAH) | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | 14/40 Days |
| through | | | | | | | | | | |
| WETL-SB-19-A | TBD | Sediment | 0 – 0.5 feet | SVOC (PAH) | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | 14/40 Days |
| WETL-SB-19-B | TBD | Sediment | 0.5 – 2 feet | SVOC (PAH) | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | 14/40 Days |
| WETL-SB-19-C | TBD | Sediment | 2 – 3 feet | SVOC (PAH) | 19 + 1 Dupl | EPRB SOP-003 | 8 ounces | 1 8-oz glass amber jar | Ice | 14/40 Days |
| WETL-SB-01-A | TBD | Sediment | 0 – 0.5 feet | Metals | 19 + 1 Dupl | EPRB SOP-003 | 4 ounces | 1 4-oz glass amber jar | Ice | 180 Days |
| WETL-SB-01-B | TBD | Sediment | 0.5 – 2 feet | Metals | 19 + 1 Dupl | EPRB SOP-003 | 4 ounces | 1 4-oz glass amber jar | Ice | 180 Days |
| WETL-SB-01-C | TBD | Sediment | 2 – 3 feet | Metals | 19 + 1 Dupl | EPRB SOP-003 | 4 ounces | 1 4-oz glass amber jar | Ice | 180 Days |
| through | | | | | | | | | | |
| WETL-SB-19-A | TBD | Sediment | 0 – 0.5 feet | Metals | 19 + 1 Dupl | EPRB SOP-003 | 4 ounces | 1 4-oz glass amber jar | Ice | 180 Days |
| WETL-SB-19-B | TBD | Sediment | 0.5 – 2 feet | Metals | 19 + 1 Dupl | EPRB SOP-003 | 4 ounces | 1 4-oz glass amber jar | Ice | 180 Days |
| WETL-SB-19-C | TBD | Sediment | 2 – 3 feet | Metals | 19 + 1 Dupl | EPRB SOP-003 | 4 ounces | 1 4-oz glass amber jar | Ice | 180 Days |

Notes:

- 1) Sampling Locations are designated in generic terms in this table. There will be between 347 - 425 boring locations. For a complete listing of sample boring locations see Table in text.
- 2) CLP sample numbers will be assigned to each sample in the field.
- 3) An additional 8-Oz glass amber jar will be collected at the A and B interval for all locations to be archived by MassDEP for potential future dioxin analysis.

SAP Table 1 - SAP Revision Form

Site: Parker Street Waste Site, New Bedford, Massachusetts
OSCs: Wing Chau, Marcus Holmes, and Sarah DeStefano

| Date | Rev. # | Proposed Change to SAP/QAPP | Reason for Change of Scope/Procedures | SAP Section Superseded | Requested By | Approved By |
|-------------|---------------|--------------------------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------|---------------------|--------------------|
| 5/6/2010 | X | Frequency of rinsate blank collection for organics and inorganics. | Clarify field procedures for collecting rinsate blanks. | Sections 9.4 (p. 42) and 13.1(p. 53), and Table 4 (p.76). | START | |
| | | | | | | |

Revision No. X, 6 May 2010

Section 9.4, Cleaning and Decontamination of Equipment/Sample Containers, page 42

The effectiveness of the decontamination procedure will be documented through the use of equipment rinsate blanks, which will be collected at a frequency of one per property or at a frequency of one per 40 samples per property for organic analyses; and at a frequency of one per 20 samples for organic analyses.

13.1 Field Quality Control, page 53

Equipment (Rinsate) Blanks - Equipment (rinsate) blanks are collected to assess cross-contamination brought about by improper decontamination procedures between sampling stations. Equipment rinsate blanks are required for non-dedicated sampling equipment. Equipment (rinsate) blanks will be collected for each type of sampling equipment. Rinsate blanks will be collected after field use of sampling equipment by pouring the appropriate rinsate solvent (e.g., DI water) over decontaminated sampling equipment. The rinsate is collected into appropriate sampling containers, preserved, and analyzed for the same parameters as the associated environmental samples (excluding physical parameters such as pH). Equipment rinsate blanks will be shipped with the samples collected the same day. The frequency of equipment rinsate blank collection for organic analyses will be one rinsate blank per decontamination event per type of equipment per property, or one rinsate blank per 40 field samples per property; and for inorganic analyses, will be one rinsate blank per decontamination event per 20 field samples per property.

SAP Table 4, Field Quality Control Summary, page 76

Site: Parker Street Waste Site, New Bedford, Massachusetts

OSCs: Wing Chau, Marcus Holmes, and Sarah DeStefano

| Matrix | Analytical Parameter | Analytical Method/ SOP Reference | No. of Sampling Locations | No. of Field Duplicate Pairs | Organic | | Inorganic | | No. of VOA Trip Blanks | No. of Equip. Blanks | No. of Confirmatory Samples | No. of PE Samples | Total No. of Samples to Lab |
|----------|----------------------|--------------------------------------------------|---------------------------|------------------------------|-----------|------------|-------------------|-----------|------------------------|----------------------|-----------------------------|-------------------|-----------------------------|
| | | | | | No. of MS | No. of MSD | No. of Duplicates | No. of MS | | | | | |
| Soil | PCB Aroclors | CAM-VA (Rev 1 9/14/2009)/ EPA-SW846 method 8082A | 1,735 to 2,125 | 43- 54* | 43- 54** | 43- 54** | ----- | ----- | ----- | 43- 54* | ----- | 87 - 107 | 1,951 – 2,394 |
| Soil | SVOCs (PAHs) | CAM-IIB (Rev 1 9/9/2009)/ EPA-SW846 method 8270D | 1,735 to 2,125 | 43- 54* | 43- 54** | 43- 54** | ----- | ----- | ----- | 43- 54* | ----- | 87 - 107 | 1,951 – 2,394 |
| Soil | Metals | ILM05.4 ICP-AES modification number xxxxxx | 1,735 to 2,125 | 87 - 107 | | | 87- 107 | 87- 107 | ----- | 87-107# | ----- | 87 - 107 | 2,039 – 2,500 |
| Sediment | PCB Aroclors | CAM-VA (Rev 1 9/14/2009)/ EPA-SW846 method 8082A | 57 | 2 | 2 | 2 | ----- | ----- | ----- | 1 | ----- | 3 | 65 |
| Sediment | SVOC (PAHs) | CAM-IIB (Rev 1 9/9/2009)/ EPA-SW846 method 8270D | 57 | 2 | 2 | 2 | ----- | ----- | ----- | 1 | ----- | 3 | 65 |
| Sediment | Metals | ILM05.4 ICP-AES modification number xxxxxx | 57 | 2 | ----- | ---- | 3 | 3 | ----- | 1 | ----- | 3 | 65 |

Note:

If samples will be collected at different depths at the same location, count each discrete sampling depth as a separate sampling location/station.

MS = Matrix Spike

MSD = Matrix Spike Duplicate

* Rinsate, and field duplicate samples will be collected at a rate of one per property or 1 per 40 samples per property for organics.

Rinsate, and field duplicate samples will be collected at a rate of one per property or 1 per 20 samples per property for inorganics.

** MS/MSD samples will be collected at a rate of one per property or 1 per 40 samples or per property for organics at varied depths.

SAP Table 4 - Field Quality Control Summary

Site: Parker Street Waste Site, New Bedford, Massachusetts
OSCs: Wing Chau, Marcus Holmes, and Sarah DeStefano

| Matrix | Analytical Parameter | Analytical Method/ SOP Reference | No. of Sampling Locations | No. of Field Duplicate Pairs | Organic | | Inorganic | | No. of VOA Trip Blanks | No. of Equip. Blanks | No. of Confirmatory Samples | No. of PE Samples | Total No. of Samples to Lab |
|----------|----------------------|--------------------------------------------------|---------------------------|------------------------------|-----------|------------|-------------------|-----------|------------------------|----------------------|-----------------------------|-------------------|-----------------------------|
| | | | | | No. of MS | No. of MSD | No. of Duplicates | No. of MS | | | | | |
| Soil | PCB Aroclors | CAM-VA (Rev 1 9/14/2009)/ EPA-SW846 method 8082A | 1,735 to 2,125 | 43- 54* | 43- 54** | 43- 54** | ----- | ----- | ----- | 43- 54* | ----- | 87 - 107 | 1,951 – 2,394 |
| Soil | SVOCs (PAHs) | CAM-IIB (Rev 1 9/9/2009)/ EPA-SW846 method 8270D | 1,735 to 2,125 | 43- 54* | 43- 54** | 43- 54** | ----- | ----- | ----- | 43- 54* | ----- | 87 - 107 | 1,951 – 2,394 |
| Soil | Metals | ILM05.4 ICP-AES modification number xxxxxx | 1,735 to 2,125 | 87 - 107 | | | 87- 107 | 87- 107 | ----- | 43-54* | ----- | 87 - 107 | 2,039 – 2,500 |
| Sediment | PCB Aroclors | CAM-VA (Rev 1 9/14/2009)/ EPA-SW846 method 8082A | 57 | 2 | 2 | 2 | ----- | ----- | ----- | 1 | ----- | 3 | 65 |
| Sediment | SVOC (PAHs) | CAM-IIB (Rev 1 9/9/2009)/ EPA-SW846 method 8270D | 57 | 2 | 2 | 2 | ----- | ----- | ----- | 1 | ----- | 3 | 65 |
| Sediment | Metals | ILM05.4 ICP-AES modification number xxxxxx | 57 | 2 | ----- | ---- | 3 | 3 | ----- | 1 | ----- | 3 | 65 |

Note:
 If samples will be collected at different depths at the same location, count each discrete sampling depth as a separate sampling location/station.

MS = Matrix Spike

MSD = Matrix Spike Duplicate

* Rinsate, and field duplicate samples will be collected at a rate of one per property or 1 per 40 samples per property.

** MS/MSD samples will be collected at a rate of one per property or 1 per 40 samples or per property for organics at varied depths.

REFERENCES

- [1] U.S. Environmental Protection Agency, New England. 2005. *Emergency Planning and Response Branch, Generic Program Quality Assurance Project Plan*. 16 June.
- [2] BETA Group Inc., *Final Completion and Inspection Report*, 2006
- [3] USGS (U.S. Geological Survey). Year (Photorevised Edition). Quadrangle Name, State (7.5-minute series topographic map).
- [4] TRC Environmental Corp., *Interim Phase II Comprehensive Site Assessment, Parker St. Waste Site, New Bedford, MA*, July 2009.
- [5] U.S. Environmental Protection Agency. 2005. Published Mean Detection Limits (MDLs). SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.
- [6] U.S. Environmental Protection Agency. 2007. Published Laboratory Mean Detection Limits (MDLs) and Quantitation Limits (QLs). Office of Environmental Measurement and Evaluation, Region I Laboratory.
- [7] U.S. Environmental Protection Agency. 2007. Published Laboratory Quantitation Limits (QLs). Office of Environmental Measurement and Evaluation, Region I Laboratory and US EPA Contract Laboratory Program (CLP) Statement of Work (SOW) SOM01.2
- [8] MassGIS (Massachusetts Geographic Information Systems). 2007. 1:5,000 Color Digital Orthophoto Imagery, RE: Image Number 101862. Available from <http://www.mass.gov/mgis.com>. Internet accessed 19 February 2007.
- [9] Massachusetts Department of Environmental Protection. 2007. Bureau of Waste Site Cleanup, WSC-CAM, Section IIB, Revision No. 5, *Quality Assurance and Quality Control Requirements for SW-846 Method 8270C, Semivolatile Organic Compounds by Gas Chromatography (GC) for the Massachusetts Contingency Plan (MCP)*. 20 December.
- [10] Massachusetts Department of Environmental Protection. 2007. Bureau of Waste Site Cleanup, WSC-CAM, Section VA, Revision No. 4, *Quality Assurance and Quality Control Requirements for SW-846 Method 8082, Polychlorinated Biphenyls (PCBs) by Gas Chromatography (GC) for the Massachusetts Contingency Plan (MCP)*. 20 August.
- [11] Massachusetts Department of Environmental Protection. 2004. Bureau of Waste Site Cleanup, WSC-CAM, Section VIIA, Revision No. 3.2, *Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Response Actions Conducted under the Massachusetts Contingency Plan (MCP)*. 21 May.

- [12] Massachusetts Department of Environmental Protection. 2004. Bureau of Waste Site Cleanup, WSC-CAM, Section IIIA, Revision No. 5, *Quality Assurance and Quality Control Requirements and Performance Standards for SW-846 Method 6010B, Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) for the Massachusetts Contingency Plan (MCP)*. 28 May.

Appendix A

Site Location Map
Site Diagrams

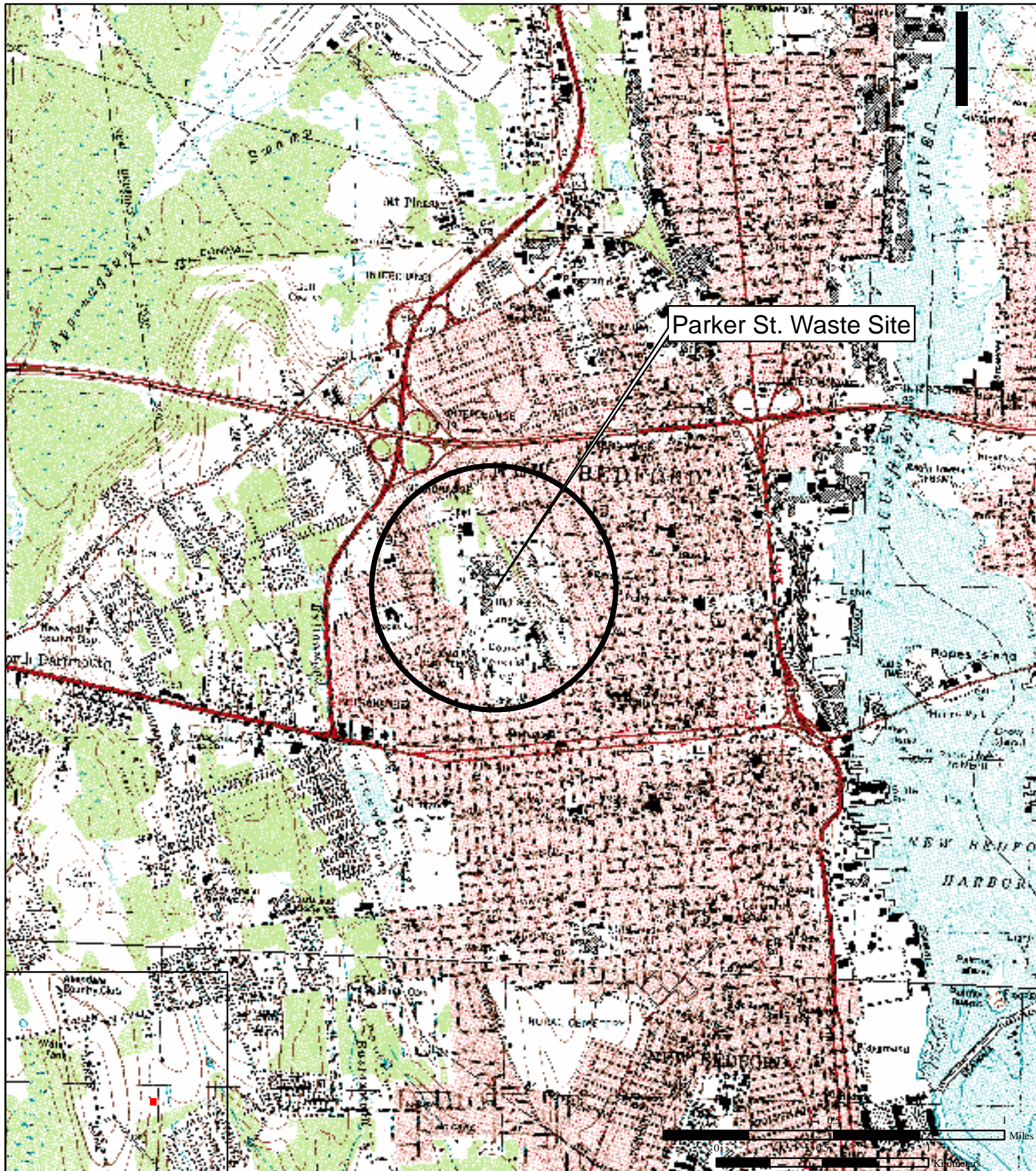


Figure 3

Site Location Map

**Parker St. Waste Site
New Bedford, MA**

**EPA Region I
Superfund Technical Assessment and
Response Team (START) III
Contract No. EP-W-05-042**

TDD Number: 09-10-0001
Created by: D. Willette
Created on: 11 November 2009
Modified by: D. Willette
Modified on: 25 January 2010

Data Sources:

Topos: MicroPath/USGS
 Quadrangle Name(s): L41070E8
 All other data: START





Figure 4

Site Diagram

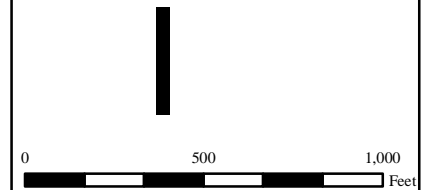
**Parker St. Waste Site
New Bedford, MA**

**EPA Region I
Superfund Technical Assessment and
Response Team (START) III
Contract No. EP-W-05-042**

TDD Number: 09-10-0001
Created by: D. Willette
Created on: 11 November 2009
Modified by: D. Willette
Modified on: 30 March 2010

LEGEND

- Estimated Site Boundary
- EPA Sample Area
- City of New Bedford Sample Area
- MassDEP Sample Area



Data Sources: TRC Environmental Corp.
 Imagery: MassGIS
 Topos: MicroPath
 All other data: START



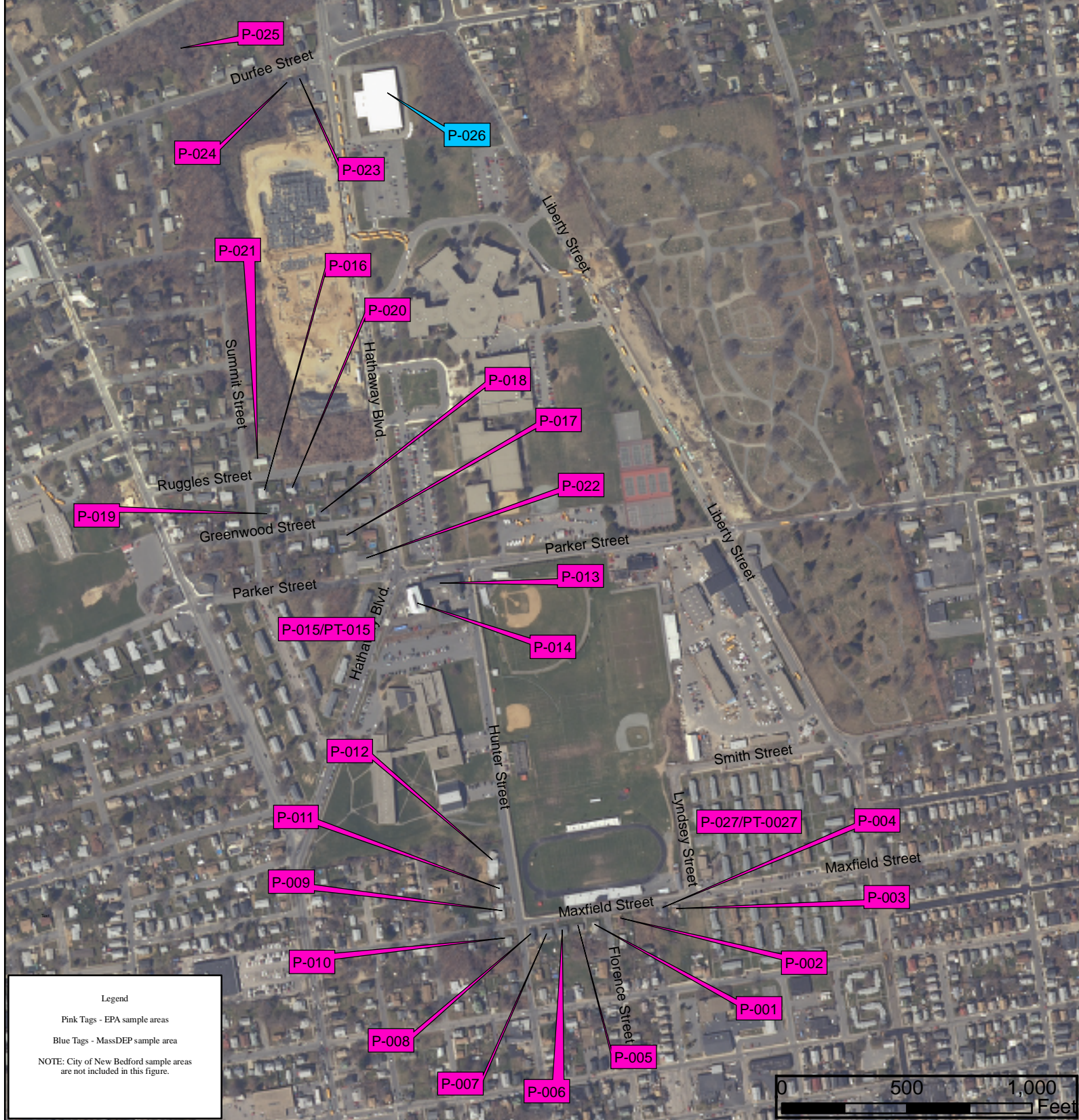


Figure 4A

Properties for Proposed Sampling

**Parker St. Waste Site
New Bedford, MA**

**EPA Region I
Superfund Technical Assessment and
Response Team (START) III
Contract No. EP-W-05-042**

TDD Number: 09-10-0001

Created by: D. Willette

Created on: 5 January 2010

Modified by: D. Willette

Modified on: 30 March 2010

Data Sources:

Topos:
 Quadrangle Name(s):
 All other data: START



Appendix B

Superfund Performance Evaluation Sample Index

For EPA PE Samples call:

Leo Corben

617.918.8630

or

Steve Stodola

617.918.8634

START REVISED
SUPERFUND PERFORMANCE EVALUATION SAMPLE LIST

| CATALOG NUMBER | DESCRIPTION |
|----------------|-------------------------------------------------------------------------------|
| 90-001 | Volatile Organics in Water at Low/Medium Concentration |
| 95-001 | Volatile Organics in Water at Low/Medium Concentration |
| 05-004 | Volatile Organics in Water at Low/Medium Concentration |
| 91-001 | Volatile Organics in Water at Low Concentration |
| 05-003 | Volatile Organics in Water at Trace Concentration |
| 03-006 | Volatiles in Soil, Full Volume, Closed System (10-Day Holding Time) |
| 05-008 | Volatiles in Soil, Full Volume, Closed System (10-Day Holding Time) |
| 90-002 | Semivolatile Organics in Water at Low/Medium Concentration |
| 95-002 | Semivolatile Organics in Water at Low/Medium Concentration |
| 05-005 | Semivolatile Organics in Water at Low/Medium Concentration |
| 91-002 | Semivolatile Organics in Water at Low Concentration |
| 01-016 | Semivolatile Organics in Soil |
| 05-009 | Semivolatile Organics in Soil |
| 90-003 | Pesticides/PCBs in Water at Low/Medium Concentration |
| 95-003 | Pesticides/PCBs in Water at Low/Medium Concentration |
| 05-006 | Pesticides in Water at Low/Medium Concentration |
| 91-003 | Pesticides/PCBs in Water at Low Concentration |
| 03-008 | Pesticides in Soil |
| 05-001 | Pesticides in Soil at Low/Medium Concentration |
| 05-002 | Pesticides in Soil at High Concentration |
| 05-007 | Aroclors in Water |
| 91-013 | Aroclor 1248 in Soil |
| 04-005 | Aroclor 1254 in Soil |
| 91-011 | Aroclor 1260 in Soil |
| 03-003 | Toxaphene in Water |
| 03-004 | Toxaphene in Soil |
| 98-002 | Organics in Water at L/M Concentration (VOC, SVOC, Pest.) |
| 95-008 | Low Concentration Organics in Water (VOC, SVOC, Pest.) |
| 01-001 | Low Concentration Organics in Water (VOC, SVOC, Pest.) |
| 03-007 | 1,4-Dioxane in Water for Volatile Analysis |
| 03-010 | 1,4-Dioxane in Water for Semivolatile Analysis |

START REVISED
SUPERFUND PERFORMANCE EVALUATION SAMPLE LIST
(continued)

| CATALOG NUMBER | DESCRIPTION |
|----------------|----------------------------------------------|
| 90-004 | Metals in Water at Low/Medium Concentration |
| 95-017-W | Metals in Water at Low/Medium Concentration |
| 99-004 | Metals in Water at Low/Medium Concentration |
| 03-009 | ICP-MS Metals in Water |
| 90-005 | Metals in Soil at Low/Medium Concentration |
| 95-017-S | Metals in Soil at Low/Medium Concentration |
| 99-005 | Metals in Soil at Low/Medium Concentration |
| 03-002 | Mercury in Water at Low/Medium Concentration |
| 90-006 | Cyanide in Water at Low/Medium Concentration |
| 03-001 | Cyanide in Water at Low/Medium Concentration |
| 99-008 | Cyanide in Soil at Low/Medium Concentration |

Other PE Samples are also available for the following parameters:

- Chlorinated Dioxins/Furans
- Industry-specific metals categories

Please contact Leo Corben at 617-918-8630, or a START chemist for more information.

Appendix C

Proposed City of New Bedford Work Plan

TRC
Wannalancit Mills
650 Suffolk Street
Lowell Massachusetts 01854

Main 978.970.5600
Fax 978.453.1995

Memorandum

To: Scott Alfonse and Cheryl Henlin, City of New Bedford
From: David M. Sullivan, LSP CHMM, TRC Environmental Corporation
CC: Jeffrey Saunders, TRC Environmental Corporation
Subject: Proposed Nemasket Lots Investigation Approach
Date: March 3, 2010

The following outlines the proposed technical approach for initiating an environmental investigation of the Nemasket Street Lots. The approach proposed herein is an initial step in an iterative approach to the evaluation of this portion of the Parker Street Waste Site (PSWS). An iterative approach is consistent with prior environmental investigative activities undertaken by TRC Environmental Corporation (TRC), where available data were used to help define the initial stages of environmental investigation. Subsequent stages of investigation, where warranted, will be further defined by the incremental data collected from each investigative effort and will be designed to address specific data gaps, test hypotheses, or evaluate risk, as determined necessary for the investigation at that time.

Nemasket Technical Approach

The data collection described herein is an interim step toward the implementation of a remedy for the subject parcels. TRC will plan, implement and oversee the clearing and investigative work at the Nemasket Street lots (the former Bethel AME property). The Nemasket Street lots parcel identifications are summarized below and illustrated on Figure 1.

| | |
|----------|----------|
| 069 0092 | 069 0093 |
| 069 0086 | 069 0100 |
| 069 0088 | 069 0099 |
| 069 0091 | 069 0097 |

Clearing. The City of New Bedford (City) is prepared to perform clearing at the Nemasket Street lots to the degree necessary to facilitate access for geophysics equipment and a backhoe or excavator for test pit inspections of the subsurface. No additional disturbance of the subsurface is proposed

(i.e., no grubbing) as part of the clearing activity. An appropriately qualified contractor will be retained to clear small vegetative growth from the area using power equipment (a vehicle mounted brush hog). Larger growth will be addressed with chainsaws (manual labor). All vegetation will be cut/removed flush to the ground surface.

Dust monitoring and dust suppression consistent with soil removal work conducted by TRC at other areas of the Parker Street Waste Site (PSWS) will be implemented as a precaution to monitor and minimize/mitigate potential nuisance conditions.

All vegetation will be removed from the site for disposal as solid waste or managed through off-site composting, subject to appropriate regulatory approval. Alternatively, the vegetative matter may be chipped and spread on the lots to stabilize exposed surfaces.

Geophysics. Prior to test pit exploration of the Nemasket Street lots, TRC will oversee the implementation of a combined Ground Penetrating Radar (GPR) and Electromagnetic Induction (EMI) investigation of the parcels. The purpose of this investigation is to help locate medium to large buried metallic objects. The geophysics contractor will employ an SIR System-3000 and/or SIR System-2000 GPR unit with multiple antennas (depending upon the application/conditions). The systems have a real-time display and collection of data is recorded on a flash card which is downloaded and edited after the survey is completed. Real-time data acquisition will allow the marking of detected items in the field. For the EMI investigation, an EM Profiler EMP-400 electromagnetic induction tool will be utilized that will also provide real-time data collection allowing the marking of detected subsurface anomalies.

The results of the GPR/EMI investigation will be evaluated and anomalies warranting further investigation will be evaluated by test pit exploration.

Test Pit Exploration. The number of test pits to be excavated will depend in part on the results of the geophysics investigation.

The test pit excavation conducted previously at the site generally measured approximately 2-feet wide by 8-feet long and, if feasible, test pits were excavated until native soil material (e.g., peat material) was encountered (i.e., approximately 7 to 9-feet below grade). A similar protocol will be followed at the Nemasket Street lots unless site data/conditions require an alternative approach.

The soil will be removed from each test pit in approximately 1-foot flights. The material will be temporarily stockpiled on polyethylene sheeting for observation. As each flight is removed, the material will be examined using hand tools and identifiable or potentially identifiable fill material will be segregated, field documented and photographed by TRC's field geologist/engineer. A subset of the identifiable or potentially identifiable material, where identified, will be retained for further expert forensic analysis. TRC will evaluate and log the geologic character of the soil samples consistent with the Burmeister (1958) method (consistent with the PSWS soil boring program conducted prior by TRC).

Air monitoring will be performed using a combination of real-time dust monitoring upwind and downwind of the work area. The dust monitoring will consist of TSI Dustrak™ units (or equivalent) equipped with size-selective inlet for particles of 10 micrometers in diameter or less (PM10). Background samples will be collected for at least 15 minutes at each location prior to the start of site activities and the dust monitoring instruments will be zeroed daily before use and at the end of the day. Data will be logged at 60-second intervals and monitored periodically by field personnel. Data will be downloaded daily. In addition, volatile organic compound (VOC) air monitoring will be

performed using a photo-ionization detector (PID) to monitor for the presence of VOCs within the work area breathing zone.

Following completion, each test pit will be immediately backfilled with the stockpiled material, taking care to minimize mixing of horizons. All excavated material will be returned to the original test pit location. Each test pit will be subsequently surveyed by Land Planning, Incorporated of Hanson, Massachusetts. The locations will be plotted on an aerial photograph obtained from the Massachusetts Geographic Information System, and may also be incorporated into line drawings of the area.

Soil Sampling. No soil borings are proposed at this time. The City proposes to design a soil boring program to evaluate and initially delineate impacts from waste disposal activity that is guided by the results of the geophysics work, as well as the results of prior soil sampling conducted by BETA.

During the test pit investigation, TRC will conduct field screening of soil samples based on visual and olfactory observations, jar headspace readings using an appropriate calibrated PID, and professional judgment. Screening will be conducted consistent with TRC Standard Operating Procedures (SOPs) and general industry practice. TRC field investigators may collect soil samples for analysis to supplement the findings of the test pit program. Sample decisions will be based on professional judgment in consultation with the Licensed Site Professional (LSP). Where a soil sampling decision is made, one or more of the following analytical methods will be utilized for soil analysis, consistent with prior work conducted by TRC at the PSWS:

- Polychlorinated biphenyls (PCBs) as Aroclors by SW-846 Method 8082
- Polyaromatic hydrocarbons (PAHs) by SW-846 Method 8270C
- Massachusetts Contingency Plan (MCP) Metals/Hg – antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, thallium, vanadium, zinc and mercury by SW-846 Methods 6010B/7471A.

In addition, soil sampling may include the following analysis for dioxins and PCB congeners, consistent with TRC's recommended technical approach for dioxins at the PSWS (see Attachment A).

- Chlorinated dioxin/dibenzofuran congeners by SW-846 Method 8290 to evaluate the presence/absence of these compounds
- PCB congeners by SW-846 Method 1668A to establish a basis for correlation and to evaluate the potential presence of PCB dioxin-like congeners.

As a contingency, TRC is prepared to submit soil samples for VOC analysis contingent upon the results of field screening and professional judgment. TRC will notify the City when such judgments are made. The following analytical method will be specified in such an event:

- VOCs by Method SW-846 Method 8260B.

We look forward to discussing this memorandum with you at your earliest convenience.

ATTACHMENT A

RECOMMENDED TECHNICAL APPROACH FOR DIOXIN EVALUATION

PARKER STREET WASTE SITE, NEW BEDFORD, MASSACHUSETTS

March 2, 2010

Introduction

TRC Environmental Corporation (TRC) prepared this Recommended Technical Approach (RTA) document for the following purposes:

1. To document an initial evaluation of the potential for the presence of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), collectively referred to as dioxin compounds, at various portions of the Parker Street Waste Site (PSWS);
2. To highlight available dioxin (e.g., PCDDs/PCDFs) compound soil analytical data collected from the Keith Middle School (KMS) portion of the PSWS by a prior consultant; and
3. To provide a suggested framework for further data collection.

The PSWS is located in the general vicinity of New Bedford High School (NBHS), Keith Middle School (KMS) and Walsh Field in New Bedford, Massachusetts. The PSWS is a listed site regulated under the Massachusetts Contingency Plan (310 CMR 40.0000), tracked under primary Release Tracking Number (RTN) 4-15685, and is also regulated under the United States Environmental Protection Agency (EPA) through the Toxic Substances Control Act (TSCA; 40 CFR Part 761 et.seq.) where regulated concentrations of polychlorinated biphenyls (PCBs) are present. Please see attached Figure 1 for a map illustrating geographic features identified in this RTA Document.

Summary

TRC recommends the collection of soil and fill samples for dioxin compound analysis from the PSWS, in collaboration with the Office of Research and Standards (ORS) of the Massachusetts Department of Environmental Protection (MassDEP) and EPA, to evaluate the potential presence of dioxin compounds, estimate the potential risk posed by the presence of any detected dioxin compounds, and assess the relationship between any detected dioxin compounds and potential precursor compounds and other contaminants. TRC proposed framework for data collection is described herein.

Note that based upon the available evidence, TRC does not believe that sampling for dioxin compounds south of Parker Street, particularly at the Walsh Field and former Keith Junior High School (KJHS) portion of the PSWS, is warranted. This is based on the absence of significant concentrations of precursor compounds¹ (i.e., chlorinated organic compounds such as PCBs, chlorobenzenes and chlorophenols) and site-specific historical information. This history indicates that waste disposal activities at Walsh pre-date the disposal of dioxin compound precursors such as polychlorinated biphenyls (PCBs) and the intensive use of such precursor compounds by the City of New Bedford industrial base. However, other portions of the PSWS include chemical contaminants, principally PCBs, which could serve, under appropriate conditions, as precursors to dioxin compounds.

¹ Precursors are foundation molecules to dioxin compound formation from which PCDDs/PCDFs can form from the thermal breakdown and molecular rearrangement of precursor ring compounds, which are defined as chlorinated aromatic hydrocarbons that have a structural resemblance to the PCDD/PCDF molecules.

Background Information on Dioxin

PCDDs and PCDFs are tricyclic aromatic compounds with similar chemical and physical properties. They are ubiquitous in the environment² (EPA, 2006). However, they do not generally occur naturally³, nor are they intentionally produced. PCDDs/PCDFs also result as incidental by-products from processes that manufacture or use chlorine containing chemicals.⁴ There are 75 positional isomers of PCDDs and 135 positional isomers of PCDFs (ECH 88, 1989). The term “dioxin-like” includes congeners of PCDDs and PCDFs having chlorine atoms in the 2, 3, 7, and 8 positions on the molecule, and certain coplanar-substituted polychlorinated biphenyls (PCBs). The term “dioxin-like” refers to the fact that these compounds have similar chemical structure and physical-chemical properties and invoke a similar toxic response (EPA, 2006).

Because of the hydrophobic nature and resistance to metabolism of dioxin-like chemicals, they tend to persist and bioaccumulate in the fatty tissues of animals and humans. Consequently, the principal route of chronic population exposure is through the dietary consumption of animal fats, fish, shellfish, and dairy products. Dioxin-like compounds are persistent in soils and sediments, with environmental half-lives ranging from years to several decades (EPA, 2006).

Evaluation of Available Information

The following provides an evaluation of available information on PSWS disposal activity, site history/timeline, available PSWS dioxin data, distribution of detected compounds, and dioxin precursor compounds and burning activity.

Disposal Activity

Much of the information about disposal activities at the PSWS is derived from visible information such as aerial photographs that show the progression of deposition across the area. Additional information is available from newspaper accounts.

Generally, municipal waste was disposed of east of Hathaway Boulevard, and industrial waste was disposed of west of Hathaway Boulevard, although municipal wastes and construction debris such as large boulders were also disposed of west of Hathaway Boulevard. During the time period when the disposal activity took place, the municipal waste was not necessarily separated from industrial waste so trash trucks could have picked up a mix of wastes.

² The major identified sources of environmental releases of dioxin-like compounds are grouped into six broad categories: combustion sources, metals smelting, refining and process sources, chemical manufacturing sources, natural sources, and environmental reservoirs (EPA, 2006). Some of the major known sources of atmospheric impacts by PCDDs/PCDFs are industrial activities in which a combustion process is involved (Abad et al., 2002). Burning of domestic refuse in backyard burn barrels has emerged as the largest source of dioxin emissions to the U.S. environment (EPA, 2006). Consequently, atmospheric deposition represents a source of PCDDs/PCDFs onto the surface of soils. In addition, the presence of PCDDs/PCDFs on vegetation surfaces is due to the retention of PCDDs/PCDFs by direct deposition of airborne particles or absorption of vapor-phase contaminants, including those attributable to evaporation from soils (Abad et al., 2002).

³ The evidence for the widespread existence of natural sources of dioxin compounds is quite weak. Recent studies suggest that PCDDs/PCDFs can form under certain environmental conditions (e.g., composting) from the action of microorganisms on chlorinated phenolic compounds. Similarly, PCDDs/PCDFs have been reported to form during photolysis of highly chlorinated phenols. Certain clays used in ceramics (e.g., ball clay) are believed to have become impacted by dioxin as a result of natural processes, but the source of the impacts remains unknown. Some have suggested that volcanoes may be a natural source, though there is no reliable evidence that volcanoes produce and emit significant amounts of dioxin during eruptions (EPA, 2006).

⁴ PCDDs/PCDFs can be formed as an unintentional byproduct where chlorine reacts with organic chemicals with similar structural features to dioxins under high temperatures.

Trash and ash were used to fill in the swampy wetland areas that originally comprised the site and were eventually spread for redevelopment. Wastes disposed included tires, industrial wastes, bottles, rusted cars, coal ash, curbing, big boulders, cement, cans, batteries, ash, trees, and tanned leather.

As discussed below, wastes disposed of at Walsh Field tend to be older than those at present-day New Bedford High School (NBHS) based on aerial photographic analysis.

Distribution of Detected Compounds

The compounds detected at the PSWS generally consist of PCBs, heavy metals, and polyaromatic hydrocarbons (PAHs). A “picture” of the geographic distribution of the impacts in soil has emerged from the nearly 3,000 soil samples collected for chemical analysis from the PSWS (exclusive of the investigative work conducted at KMS by others). Some compounds are relatively ubiquitous and some are found in only a portion of the site.

Ubiquitous contaminants include lead and PAHs. Lead is found across the PSWS including Walsh Field, NBHS, and some residential and commercial properties evaluated to date.

Other contaminants have very limited geographic distribution. For example, arsenic was detected in surface soil at the two baseball diamonds at Walsh Field, but not elsewhere at similar depths and concentrations.

Overall contaminant distribution patterns have also been identified, with Parker Street serving as a geographic “dividing line”.

South of Parker Street. To the south of Parker Street (i.e., Walsh Field and the former Keith Junior High School [KJHS]), heavy metals such as lead, cadmium and arsenic as well as PAHs are commonly detected. However, PCBs are not detected at concentrations of significance south of Parker Street. For example, prior to the work conducted at the site by TRC, a previous consultant collected 69 soil samples from Walsh Field for PCB analysis, primarily from depth sequences within the contaminated fill. Most of the results were non-detect, with the highest PCB concentration detected in Walsh Field soil at 0.19 mg/kg. Other organic contaminants are generally not found in soil samples collected south of Parker Street. Based on risk evaluations conducted to date, risk-contributing compounds south of Parker Street generally include lead, cadmium, and arsenic, with lesser contributions by some PAHs, dibenzofuran (non-chlorinated), acenaphthylene, and diesel range organics.

North of Parker Street. To the north of Parker Street (i.e., NBHS, KMS, and some residential properties), contaminants such as barium and PCBs are more prevalent. Risk-contributing chemicals to the north of Parker Street, using the NBHS campus as an example, include PCBs, cadmium, lead, benzo(a)pyrene, dibenz(a,h)anthracene, benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, arsenic, barium, cadmium, chromium, and lead, with prevalence varying by location. (Recently, volatile organic compounds (VOCs) have come under evaluation at NBHS, also.)

Site History/Timeline

Apparent impacts at the PSWS are evident as early as 1936 based on a review of aerial images. In 1961, the disposal activity had stopped and the site had vegetative cover probably due to Corp of Engineers grading of the site about 1960 to create the Liberty Gardens. In 1963, the site continued to have a vegetative cover. By 1971, the construction of NBHS was in progress. Fill material displaced by the construction of the NBHS was deposited to the west of Hathaway Boulevard at the location of the KMS (which also appears to have been impacted by PSWS-related waste management practices).

Walsh Field athletic areas are also depicted in the earliest available aerial photographs, including 1936. Walsh Field appears as a fully developed and maintained athletic complex in the 1950s. The absence of significant concentrations of PCBs (< 0.19 mg/kg) in Walsh Field soil/fill and evidence of the early development of the athletic complex relative to PSWS disposal activity suggest that waste deposition at Walsh Field pre-dated the disposal of significant quantities of PCBs.

Available PSWS Dioxin Data

On October 15, 2009, KMS dioxin compound soil data were provided to TRC by EPA in tabulated form. TRC's initial review of the tabulated dioxin compound data noted the following:

- Results for a number of samples expressed as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) Toxic Equivalents (TEQs) (see attached tables) exceed the Method 1 S-1 soil cleanup standard of 20 picograms per gram (pg/g) or parts per trillion (ppt). However, the concentrations presented are not alarming from a risk assessment perspective as they would correspond to less than a 1 in 100,000 cancer risk for a residential exposure scenario. Additional information is needed to determine the representativeness of the data (e.g., biased-high, low, etc.).
- The TCDD TEQs (last column in the multi-page table) appear to have been calculated using the 1998 World Health Organization (WHO) toxicity equivalency factors (TEFs) for dioxin compounds. MassDEP has developed TEFs (MassDEP, 1991) that differ from those developed by the WHO. ORS will likely want the MassDEP TEFs or updated WHO TEFs (van den Berg, 2006) used to calculate the dioxin TEQs. However, WHO only developed TEFs for dioxin/dibenzofuran congeners with chlorines in the 2, 3, 7 and 8 positions (those congeners included in the tabulated data). MassDEP has developed TEFs for all dioxin/dibenzofuran congeners, even those that do not have chlorines in each of the 2, 3, 7 and 8 positions.

TRC notes further that congener/isomer-specific analyses data (if available) can be used to examine PCDD/PCDF profiles found in soils. Profiles represent a valuable tool in identifying precursor compounds (e.g., thermal formation) as well as potential sources of PCDDs/PCDFs. In addition, congener/isomer-specific data (e.g., actual PCDD/PCDF concentrations found in soil samples) and not TEF-weighted data can be used for comparison to PCDD/PCDF concentrations found in soils both in the US and worldwide. Such comparisons allow us to place PSWS data in perspective and answer the question: How do PCDD/PCDF data in PSWS soils compare to global background concentrations?

Given the fate and transport behavior of dioxin compounds, which in large part is very similar to PCBs and PAHs (strong tendency to partition to solid phases, very low water solubility and very low volatility), TRC does not believe that the remedial approaches proposed for the PSWS (i.e., prevent exposure) will be significantly affected.

Precursor Compounds and Burning Activity

Dioxin compounds may be formed as part of a burning/combustion process under appropriate conditions. The presence of ash at the PSWS suggests the presence of burned materials.

The available soils data indicate that PCBs are the only PCDD/PCDF precursor compounds at PSWS. The available analytical data provide no indication of the presence of any other chlorinated organic compounds with the potential to serve as dioxin precursors in significant concentrations. This is based on analysis for VOCs, semivolatile organic compounds (SVOCs), pesticides, and PCBs conducted by the prior consultant and TRC.

The highest concentrations of PCBs detected at PSWS have been detected at KMS, the KMS wetland, the Nemasket Street Lots (former Bethel AME parcels), and some residential locations. For example, PCBs detected in excess of 100 milligrams per kilogram (mg/kg) have been detected in soil samples collected from the following locations:

- KMS (pre-remediation)
- Nemasket Street Lots (Former Bethel AME parcels)
- 101 Greenwood Street

PCBs in excess of 50 mg/kg have been detected at the following locations:

- 128 Ruggles Street
- 102 Greenwood Street
- NBHS (two locations)

Anecdotal evidence indicates that products of waste burning, whether on-site or waste that had been burned/incinerated off-site, were disposed of at the PSWS. Subsequent filling and grading activity is likely to have displaced the impacts of burning activity (such as the transfer of fill material from the vicinity of the NBHS building to the KMS grounds). Based upon the history of the area that indicates some waste burning, it would be expected that select metals, as well as PAHs, would be present at elevated concentrations in the ash due to the burning of trash. Hence, the presence of enriched metals and PAH concentrations (as well as PAH profiles) could be another indicator of waste combustion. The presence of elevated concentrations of PCBs (see above samples) in combination with elevated concentrations of pyrogenic PAHs and selected metals could serve as useful chemical criteria for identifying candidate sites where soil samples would be collected to undergo PCDD/PCDF analyses.

Conclusions

- Dioxins are unlikely to be present in Walsh Field fill and soil because deposition at Walsh Field pre-dated the disposal of PCB wastes at the PSWS. Absent combustion activity in the presence of chlorinated organic precursor compounds such as PCBs, dioxin compound formation is not expected to be an important process at this location.
- Dioxin compound precursors at the PSWS are principally associated with PCBs. The available analytical data provide no indication of the presence of any other chlorinated organic compounds in significant concentrations.

- The highest concentrations of PCBs have been detected at KMS (pre-remediation), the Nemasket Street Lots, a few residential parcels, and localized areas on the NBHS campus.
- Artifacts of burning (the presence of ash, metal enrichment, and PAHs) are generally ubiquitous in fill material at the PSWS. However, the combination of burning artifacts (ash, metals enrichment, and PAHs) and precursor chemicals (e.g., PCBs) is found to the north of Parker Street.

Recommendations

TRC recommends the following activities:

- The collection of soil and fill samples for dioxin compound analysis from select locations at the PSWS. These data would be used for the following:
 - Evaluate the presence of dioxin compounds at the PSWS.
 - Estimate the potential risks posed by the presence of measured concentrations of PCDDs/PCDFs.

In developing an investigation program for an area targeted for PCDD/PCDF soil sampling, TRC will review relevant soil data from the area focusing principally on metals results, PAH and SVOC data, and PCB (homolog or aroclor) results to develop a process for sample selection. As noted above, artifacts of burning include the presence of ash, metal enrichment, and PAHs. Soil samples with elevated results, in particular those with concentrations greater than regulatory limits for PCBs and/or PAHs and/or metals may be used to identify a population of samples for potential PCDD/PCDF analyses. The specifics of the sampling program will be tailored to the specifics of each area targeted for evaluation.

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TABLE X
SUMMARY OF SOIL ANALYSES FOR
CHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS
 McCoy Field
 New Bedford, Massachusetts

| Sample ID | 2,3,7,8-TCDD pg/g | | TCDD TEQ | 1,2,3,7,8-PeCDD pg/g | | TCDD TEQ | 1,2,3,4,7,8-HxCDD pg/g | | TCDD TEQ | 1,2,3,7,8,9-HxCDD pg/g | | TCDD TEQ | 1,2,3,4,6,7,8-HpCDD pg/g | | TCDD TEQ |
|-------------------------------------|----------------------|---|----------|-------------------------|---|----------|---------------------------|---|----------|---------------------------|------|----------|-----------------------------|------|----------|
| TCDD TEF _{DTP-WHO98} ----> | 1 | | | 1 | | | 0.1 | | | 0.1 | | | 0.01 | | |
| Q4-A & B | 0.2 | U | 0.1 | 0.3 | U | 0.15 | 1.4 | J | 0.14 | 6.2 | 0.62 | 5.2 | 0.52 | 117 | 1.17 |
| Q16 A & B | <i>0.8</i> | J | 0.8 | 2.2 | J | 2.2 | 3.4 | J | 0.34 | 16.8 | 1.68 | 10.2 | 1.02 | 629 | 6.29 |
| Q24 A & B | 1.4 | J | 1.4 | 3.6 | J | 3.6 | 6.7 | | 0.67 | 44.2 | 4.42 | 23.5 | 2.35 | 1790 | 17.9 |
| Q37 A, B, & C | <i>0.68</i> | J | 0.68 | 2.1 | J | 2.1 | 3.6 | J | 0.36 | 9.3 | 0.93 | 9 | 0.9 | 237 | 2.37 |
| Duplicate 11 | 2.8 | | 2.8 | 6 | | 6 | 5.2 | | 0.52 | 34.1 | 3.41 | 24.1 | 2.41 | 1310 | 13.1 |
| Duplicate 13 | 0.95 | J | 0.95 | 3.2 | J | 3.2 | 2.6 | J | 0.26 | 9 | 0.9 | 7.9 | 0.79 | 146 | 1.46 |
| Q6-Embankment A & B | 0.66 | J | 0.66 | 2.5 | J | 2.5 | 2.3 | J | 0.23 | 8 | 0.8 | 7 | 0.7 | 129 | 1.29 |
| Q11-Embankment A & | 0.4 | J | 0.4 | 1.8 | J | 1.8 | 2.2 | J | 0.22 | 5.8 | 0.58 | 6 | 0.6 | 106 | 1.06 |
| Arithmetic Mean | | | 0.97 | | | 2.69 | | | 0.34 | | 1.67 | | | 1.16 | 5.58 |
| Maximum | | | 2.8 | | | 6 | | | 0.67 | | 4.42 | | | 2.41 | 17.9 |
| Method 1 S-1 Soil standard | | | 4 | | | 4 | | | 4 | | 4 | | | 4 | 4 |
| Method 1 S-2 Soil standard | | | 6 | | | 6 | | | 6 | | 6 | | | 6 | 6 |
| Method 1 S-3 Soil standard | | | 20 | | | 20 | | | 20 | | 20 | | | 20 | 20 |
| Upper Concentration Limit | | | 200 | | | 200 | | | 200 | | 200 | | | 200 | 200 |

pg/g = picograms per grams (parts per trillion).
 U = Undetected at quantitation limit presented.
 J = Estimated concentration below calibration range.
 C = Value reported from confirmatory analysis.
 D = Value reported from dilution analysis.
 X = Interference from diphenyl ethers.
 Value in italics = Estimated most probable concentration (EMPC)

TABLE X
SUMMARY OF SOIL ANALYSES FOR
CHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS
McCoy Field
New Bedford, Massachusetts

| Sample ID | 1,2,3,4,6,7,8,9- OCDD pg/g | TCDD TEQ | 2,3,7,8-TCDF pg/g | TCDD TEQ | 1,2,3,7,8-PeCDF pg/g | TCDD TEQ | 2,3,4,7,8-PeCDF pg/g | TCDD TEQ | 1,2,3,4,7,8- HxCDF pg/g | TCDD TEQ | 1,2,3,6,7,8- HxCDF pg/g | TCDD TEQ |
|------------------------------------------------|----------------------------------|----------|----------------------|----------|-------------------------|----------|-------------------------|----------|-------------------------------|----------|-------------------------------|----------|
| TCDD TEF _{DFP-WHO₉₈} ----> | 0.0001 | | 0.1 | | 0.05 | | 0.5 | | 0.1 | | 0.1 | |
| Q4-A & B | 1260 | 0.126 | 8.2 C | 0.82 | 0.1 U | 0.0025 | 14.7 | 7.35 | 93.7 | 9.37 | 33.3 | 3.33 |
| Q16 A & B | 4690 D | 0.469 | 11.1 C | 1.11 | 0.1 U | 0.0025 | 11.5 | 5.75 | 36.5 | 3.65 | 17 | 1.7 |
| Q24 A & B | 12160 D | 1.216 | 15.7 C | 1.57 | 0.1 U | 0.0025 | 16.3 | 8.15 | 44.2 | 4.42 | 18.9 | 1.89 |
| Q37 A, B, & C | 3020 | 0.302 | 5.2 C | 0.52 | 0.08 U | 0.002 | 5.6 | 2.8 | 23.7 | 2.37 | 9.9 | 0.99 |
| Duplicate 11 | 10210 D | 1.021 | 18.4 C | 1.84 | 0.2 U | 0.005 | 19.3 | 9.65 | 51.9 | 5.19 | 22.2 | 2.22 |
| Duplicate 13 | 1400 | 0.14 | 13 C | 1.3 | 0.1 U | 0.0025 | 17.6 | 8.8 | 34.4 | 3.44 | 16.8 | 1.68 |
| Q6-Embankment A & B | 1190 | 0.119 | 11.2 C | 1.12 | 0.6 U | 0.015 | 9.9 | 4.95 | 29.6 | 2.96 | 13.5 | 1.35 |
| Q11-Embankment A & | 1640 | 0.164 | 5.3 C | 0.53 | 0.05 U | 0.00125 | 5.8 | 2.9 | 11.4 | 1.14 | 6.2 | 0.62 |
| Arithmetic Mean | | 0.44 | | 1.10 | | 0.004 | | 6.29 | | 4.07 | | 1.72 |
| Maximum | | 1.22 | | 1.84 | | 0.015 | | 9.65 | | 9.37 | | 3.33 |
| Method 1 S-1 Soil standard | | 4 | | 4 | | 4 | | 4 | | 4 | | 4 |
| Method 1 S-2 Soil standard | | 6 | | 6 | | 6 | | 6 | | 6 | | 6 |
| Method 1 S-3 Soil standard | | 20 | | 20 | | 20 | | 20 | | 20 | | 20 |
| Upper Concentration Limit | | 200 | | 200 | | 200 | | 200 | | 200 | | 200 |

pg/g = picograms per gram
U = Undetected at quantitati
J = Estimated concentration
C = Value reported from con
D = Value reported from dil
X = Interference from diphei
Value in italics = Estimated r

TABLE X
SUMMARY OF SOIL ANALYSES FOR
CHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS
McCoy Field
New Bedford, Massachusetts

| Sample ID | 2,3,4,6,7,8- HxCDF pg/g | TCDD TEQ | 1,2,3,7,8,9- HxCDF pg/g | TCDD TEQ | 1,2,3,4,6,7,8- HpCDF pg/g | TCDD TEQ | 1,2,3,4,7,8,9- HpCDF pg/g | TCDD TEQ | 1,2,3,4,6,7,8,9- OCDF pg/g | TCDD TEQ | Sample Total TCDD pg/g | Lab sheet TEQs pg/g |
|-------------------------------------|-------------------------------|----------|-------------------------------|----------|---------------------------------|----------|---------------------------------|----------|----------------------------------|----------|------------------------------|---------------------------|
| TCDD TEF _{DFP-WHO98} ----> | 0.1 | | 0.1 | | 0.01 | | 0.01 | | 0.0001 | | | |
| Q4-A & B | 19.1 | 1.91 | <i>5.8</i> X | 0.58 | 76.3 | 0.763 | 27.3 | 0.273 | 156 | 0.0156 | 27.2 | 28.7 |
| Q16 A & B | 16.4 | 1.64 | <i>7.5</i> X | 0.75 | 172 | 1.72 | 12.1 | 0.121 | 276 | 0.0276 | 29.3 | 32.6 |
| Q24 A & B | 20.2 | 2.02 | <i>8.6</i> X | 0.86 | 346 | 3.46 | 20.3 | 0.203 | 1320 | 0.132 | 54.3 | 64.6 |
| Q37 A, B, & C | 8.4 | 0.84 | <i>4.2</i> XJ | 0.42 | 99.7 | 0.997 | 8.2 | 0.082 | 220 | 0.022 | 16.7 | 18.6 |
| Duplicate 11 | 22.4 | 2.24 | <i>10.4</i> X | 1.04 | 310 | 3.1 | 18.2 | 0.182 | 628 | 0.0628 | 54.8 | 61.6 |
| Duplicate 13 | 20.9 | 2.09 | <i>10.9</i> X | 1.09 | 108 | 1.08 | 8.5 | 0.085 | 128 | 0.0128 | 27.3 | 27.1 |
| Q6-Embankment A & B | 14.8 | 1.48 | <i>10.1</i> X | 1.01 | 88.8 | 0.888 | 6.2 | 0.062 | 100 | 0.01 | 20.1 | 20.2 |
| Q11-Embankment A & B | 8.5 | 0.85 | <i>3.8</i> XJ | 0.38 | 45.6 | 0.456 | 3.3 J | 0.033 | 58.4 | 0.00584 | 11.7 | 12.4 |
| Arithmetic Mean | | 1.63 | | 0.77 | | 1.56 | | 0.13 | | 0.036 | 30.2 | 33.2 |
| Maximum | | 2.24 | | 1.09 | | 3.46 | | 0.27 | | 0.132 | 54.8 | 64.6 |
| Method 1 S-1 Soil standard | | 4 | | 4 | | 4 | | 4 | | 4 | 4 | |
| Method 1 S-2 Soil standard | | 6 | | 6 | | 6 | | 6 | | 6 | 6 | |
| Method 1 S-3 Soil standard | | 20 | | 20 | | 20 | | 20 | | 20 | 20 | |
| Upper Concentration Limit | | 200 | | 200 | | 200 | | 200 | | 200 | 200 | |

pg/g = picograms per gram;
 U = Undetected at quantitati
 J = Estimated concentration
 C = Value reported from con
 D = Value reported from dilu
 X = Interference from dipher
 Value in italics = Estimated r

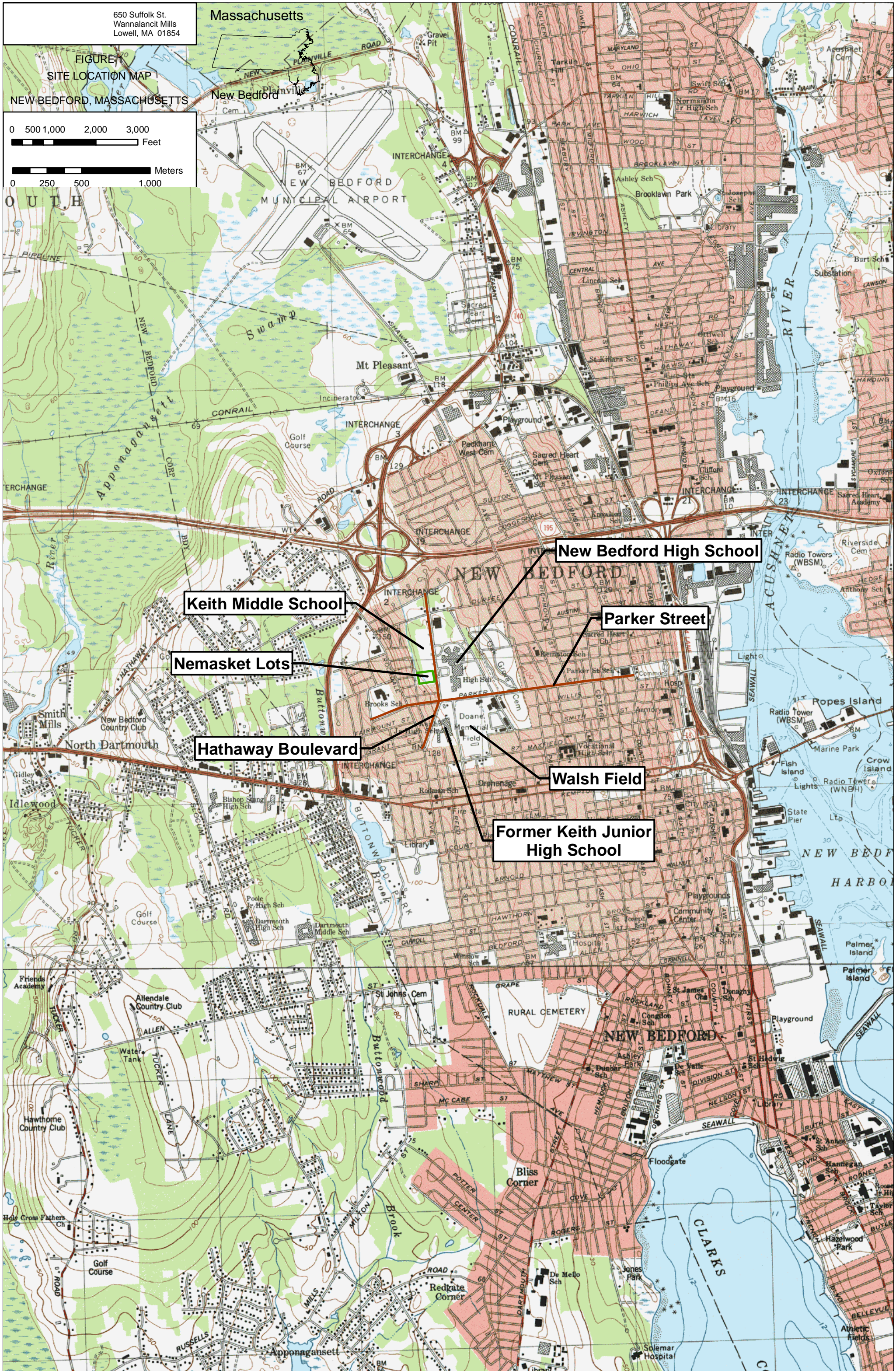
650 Suffolk St.
Wannalancit Mills
Lowell, MA 01854

Massachusetts

FIGURE 1
SITE LOCATION MAP
NEW BEDFORD, MASSACHUSETTS

0 500 1,000 2,000 3,000
Feet

0 250 500 1,000
Meters



New Bedford High School

Keith Middle School

Parker Street

Nemasket Lots

Hathaway Boulevard

Walsh Field

Former Keith Junior High School

TRC
Wannalancit Mills
650 Suffolk Street
Lowell Massachusetts 01854

Main 978.970.5600
Fax 978.453.1995

Memorandum

To: Scott Alfonse and Cheryl Henlin, City of New Bedford
From: David M. Sullivan, LSP CHMM, TRC Environmental Corporation
CC: Jeffrey Saunders, TRC Environmental Corporation
Subject: Proposed New Bedford High School Dioxin Investigation Technical Approach
Date: March 3, 2010

The following outlines the proposed technical approach for conducting an initial environmental investigation for polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), collectively referred to as dioxin compounds, in soil at the New Bedford High School (NBHS) campus. The approach proposed herein is an initial step in an iterative approach to the evaluation of dioxin in this portion of the Parker Street Waste Site (PSWS). An iterative approach is consistent with prior environmental investigative activities undertaken by TRC Environmental Corporation (TRC), where available data are used to help define the stages of environmental investigation. Subsequent stages of investigation, where warranted, are defined by the incremental data collected from each investigative effort and will be designed to address specific data gaps, test hypotheses, or evaluate risk, as determined necessary for the investigation at that time.

New Bedford High School Dioxin Investigation Technical Approach

TRC will plan, implement and oversee the dioxin-related investigative work at the NBHS Campus. The location of the NBHS Campus is illustrated on Figure 1.

Soil Boring Exploration. In developing a proposed soil sampling program for PCDDs/PCDFs at NBHS, TRC reviewed all soil data collected from the PSWS. As discussed in Attachment A (Recommended Technical Approach for Dioxin Evaluation), TRC's evaluation focused principally on metals results, PAH and SVOC results and PCB (homolog or aroclor) results as part of a process for sample selection. From this evaluation, TRC identified a population of samples from which sample locations were selected to undergo PCDD/PCDF analyses based on existing chemical signature and geographic coverage within that population of samples. Based on this evaluation, TRC identified the five previous sample locations listed below for further sampling and analysis (see Figure 2).

- HB-26
- HF-14
- HF-40
- HG-2
- HD-31D

At each location, TRC proposes to conduct sampling in the top foot of soil, the 1 to 3 foot depth zone, and the fill as set forth below:

- Top 1 foot – Evaluate current risk and the potential for Imminent Hazard conditions under the MCP.
- The 1 to 3 foot depth zone – Evaluate current risk under the MCP.
- Fill – Evaluate/characterize the primary contaminated media and the potential for the fill material to contribute to future risk.

For each sample, TRC proposes the following analytical suite:

- Chlorinated dioxin/dibenzofuran congeners by SW-846 Method 8290 to evaluate the presence/absence of these compounds
- PCB congeners by SW-846 Method 1668A to establish a basis for correlation and to evaluate the potential presence of PCB dioxin-like congeners.
- PCBs as Aroclors by SW-846 Method 8082 - To maintain consistency for comparison with the extensive historical data base.
- Polyaromatic hydrocarbons (PAHs) by SW-846 Method 8270C Massachusetts Contingency Plan (MCP) Metals/Hg – antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, thallium, vanadium, zinc and mercury by SW-846 Methods 6010B/7471A - To evaluate potential site-specific correlations with the presence of PCDDs/PCDFs.

TRC will conduct field screening of soil samples based on visual and olfactory observations, jar headspace readings using an appropriate calibrated PID, and professional judgment. Screening will be conducted consistent with TRC Standard Operating Procedures (SOPs) and general industry practice. TRC field investigators may collect soil samples for analysis to supplement the findings of the soil boring program. Sample decisions will be based on professional judgment in consultation with the Licensed Site Professional (LSP). Where a soil sampling decision is made, one or more of the following analytical methods will be utilized for soil analysis, consistent with prior work conducted by TRC at the PSWS:

As a contingency, TRC is prepared to submit soil samples for VOC analysis contingent upon the results of field screening and professional judgment. TRC will notify the City when such judgments are made. The following analytical method will be specified in such an event:

- VOCs by Method SW-846 Method 8260B.

We look forward to discussing this memorandum with you at your earliest convenience.

ATTACHMENT A

RECOMMENDED TECHNICAL APPROACH FOR DIOXIN EVALUATION

PARKER STREET WASTE SITE, NEW BEDFORD, MASSACHUSETTS

March 2, 2010

Introduction

TRC Environmental Corporation (TRC) prepared this Recommended Technical Approach (RTA) document for the following purposes:

1. To document an initial evaluation of the potential for the presence of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), collectively referred to as dioxin compounds, at various portions of the Parker Street Waste Site (PSWS);
2. To highlight available dioxin (e.g., PCDDs/PCDFs) compound soil analytical data collected from the Keith Middle School (KMS) portion of the PSWS by a prior consultant; and
3. To provide a suggested framework for further data collection.

The PSWS is located in the general vicinity of New Bedford High School (NBHS), Keith Middle School (KMS) and Walsh Field in New Bedford, Massachusetts. The PSWS is a listed site regulated under the Massachusetts Contingency Plan (310 CMR 40.0000), tracked under primary Release Tracking Number (RTN) 4-15685, and is also regulated under the United States Environmental Protection Agency (EPA) through the Toxic Substances Control Act (TSCA; 40 CFR Part 761 et.seq.) where regulated concentrations of polychlorinated biphenyls (PCBs) are present. Please see attached Figure 1 for a map illustrating geographic features identified in this RTA Document.

Summary

TRC recommends the collection of soil and fill samples for dioxin compound analysis from the PSWS, in collaboration with the Office of Research and Standards (ORS) of the Massachusetts Department of Environmental Protection (MassDEP) and EPA, to evaluate the potential presence of dioxin compounds, estimate the potential risk posed by the presence of any detected dioxin compounds, and assess the relationship between any detected dioxin compounds and potential precursor compounds and other contaminants. TRC proposed framework for data collection is described herein.

Note that based upon the available evidence, TRC does not believe that sampling for dioxin compounds south of Parker Street, particularly at the Walsh Field and former Keith Junior High School (KJHS) portion of the PSWS, is warranted. This is based on the absence of significant concentrations of precursor compounds¹ (i.e., chlorinated organic compounds such as PCBs, chlorobenzenes and chlorophenols) and site-specific historical information. This history indicates that waste disposal activities at Walsh pre-date the disposal of dioxin compound precursors such as polychlorinated biphenyls (PCBs) and the intensive use of such precursor compounds by the City of New Bedford industrial base. However, other portions of the PSWS include chemical contaminants, principally PCBs, which could serve, under appropriate conditions, as precursors to dioxin compounds.

¹ Precursors are foundation molecules to dioxin compound formation from which PCDDs/PCDFs can form from the thermal breakdown and molecular rearrangement of precursor ring compounds, which are defined as chlorinated aromatic hydrocarbons that have a structural resemblance to the PCDD/PCDF molecules.

Background Information on Dioxin

PCDDs and PCDFs are tricyclic aromatic compounds with similar chemical and physical properties. They are ubiquitous in the environment² (EPA, 2006). However, they do not generally occur naturally³, nor are they intentionally produced. PCDDs/PCDFs also result as incidental by-products from processes that manufacture or use chlorine containing chemicals.⁴ There are 75 positional isomers of PCDDs and 135 positional isomers of PCDFs (ECH 88, 1989). The term “dioxin-like” includes congeners of PCDDs and PCDFs having chlorine atoms in the 2, 3, 7, and 8 positions on the molecule, and certain coplanar-substituted polychlorinated biphenyls (PCBs). The term “dioxin-like” refers to the fact that these compounds have similar chemical structure and physical-chemical properties and invoke a similar toxic response (EPA, 2006).

Because of the hydrophobic nature and resistance to metabolism of dioxin-like chemicals, they tend to persist and bioaccumulate in the fatty tissues of animals and humans. Consequently, the principal route of chronic population exposure is through the dietary consumption of animal fats, fish, shellfish, and dairy products. Dioxin-like compounds are persistent in soils and sediments, with environmental half-lives ranging from years to several decades (EPA, 2006).

Evaluation of Available Information

The following provides an evaluation of available information on PSWS disposal activity, site history/timeline, available PSWS dioxin data, distribution of detected compounds, and dioxin precursor compounds and burning activity.

Disposal Activity

Much of the information about disposal activities at the PSWS is derived from visible information such as aerial photographs that show the progression of deposition across the area. Additional information is available from newspaper accounts.

Generally, municipal waste was disposed of east of Hathaway Boulevard, and industrial waste was disposed of west of Hathaway Boulevard, although municipal wastes and construction debris such as large boulders were also disposed of west of Hathaway Boulevard. During the time period when the

² The major identified sources of environmental releases of dioxin-like compounds are grouped into six broad categories: combustion sources, metals smelting, refining and process sources, chemical manufacturing sources, natural sources, and environmental reservoirs (EPA, 2006). Some of the major known sources of atmospheric impacts by PCDDs/PCDFs are industrial activities in which a combustion process is involved (Abad et al., 2002). Burning of domestic refuse in backyard burn barrels has emerged as the largest source of dioxin emissions to the U.S. environment (EPA, 2006). Consequently, atmospheric deposition represents a source of PCDDs/PCDFs onto the surface of soils. In addition, the presence of PCDDs/PCDFs on vegetation surfaces is due to the retention of PCDDs/PCDFs by direct deposition of airborne particles or absorption of vapor-phase contaminants, including those attributable to evaporation from soils (Abad et al., 2002).

³ The evidence for the widespread existence of natural sources of dioxin compounds is quite weak. Recent studies suggest that PCDDs/PCDFs can form under certain environmental conditions (e.g., composting) from the action of microorganisms on chlorinated phenolic compounds. Similarly, PCDDs/PCDFs have been reported to form during photolysis of highly chlorinated phenols. Certain clays used in ceramics (e.g., ball clay) are believed to have become impacted by dioxin as a result of natural processes, but the source of the impacts remains unknown. Some have suggested that volcanoes may be a natural source, though there is no reliable evidence that volcanoes produce and emit significant amounts of dioxin during eruptions (EPA, 2006).

⁴ PCDDs/PCDFs can be formed as an unintentional byproduct where chlorine reacts with organic chemicals with similar structural features to dioxins under high temperatures.

disposal activity took place, the municipal waste was not necessarily separated from industrial waste so trash trucks could have picked up a mix of wastes.

Trash and ash were used to fill in the swampy wetland areas that originally comprised the site and were eventually spread for redevelopment. Wastes disposed included tires, industrial wastes, bottles, rusted cars, coal ash, curbing, big boulders, cement, cans, batteries, ash, trees, and tanned leather.

As discussed below, wastes disposed of at Walsh Field tend to be older than those at present-day New Bedford High School (NBHS) based on aerial photographic analysis.

Distribution of Detected Compounds

The compounds detected at the PSWS generally consist of PCBs, heavy metals, and polyaromatic hydrocarbons (PAHs). A “picture” of the geographic distribution of the impacts in soil has emerged from the nearly 3,000 soil samples collected for chemical analysis from the PSWS (exclusive of the investigative work conducted at KMS by others). Some compounds are relatively ubiquitous and some are found in only a portion of the site.

Ubiquitous contaminants include lead and PAHs. Lead is found across the PSWS including Walsh Field, NBHS, and some residential and commercial properties evaluated to date.

Other contaminants have very limited geographic distribution. For example, arsenic was detected in surface soil at the two baseball diamonds at Walsh Field, but not elsewhere at similar depths and concentrations.

Overall contaminant distribution patterns have also been identified, with Parker Street serving as a geographic “dividing line”.

South of Parker Street. To the south of Parker Street (i.e., Walsh Field and the former Keith Junior High School [KJHS]), heavy metals such as lead, cadmium and arsenic as well as PAHs are commonly detected. However, PCBs are not detected at concentrations of significance south of Parker Street. For example, prior to the work conducted at the site by TRC, a previous consultant collected 69 soil samples from Walsh Field for PCB analysis, primarily from depth sequences within the contaminated fill. Most of the results were non-detect, with the highest PCB concentration detected in Walsh Field soil at 0.19 mg/kg. Other organic contaminants are generally not found in soil samples collected south of Parker Street. Based on risk evaluations conducted to date, risk-contributing compounds south of Parker Street generally include lead, cadmium, and arsenic, with lesser contributions by some PAHs, dibenzofuran (non-chlorinated), acenaphthylene, and diesel range organics.

North of Parker Street. To the north of Parker Street (i.e., NBHS, KMS, and some residential properties), contaminants such as barium and PCBs are more prevalent. Risk-contributing chemicals to the north of Parker Street, using the NBHS campus as an example, include PCBs, cadmium, lead, benzo(a)pyrene, dibenz(a,h)anthracene, benzo(a)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, arsenic, barium, cadmium, chromium, and lead, with prevalence varying by location. (Recently, volatile organic compounds (VOCs) have come under evaluation at NBHS, also.)

Site History/Timeline

Apparent impacts at the PSWS are evident as early as 1936 based on a review of aerial images. In 1961, the disposal activity had stopped and the site had vegetative cover probably due to Corp of Engineers grading of the site about 1960 to create the Liberty Gardens. In 1963, the site continued to have a vegetative cover. By 1971, the construction of NBHS was in progress. Fill material displaced by the construction of the NBHS was deposited to the west of Hathaway Boulevard at the location of the KMS (which also appears to have been impacted by PSWS-related waste management practices).

Walsh Field athletic areas are also depicted in the earliest available aerial photographs, including 1936. Walsh Field appears as a fully developed and maintained athletic complex in the 1950s. The absence of significant concentrations of PCBs (< 0.19 mg/kg) in Walsh Field soil/fill and evidence of the early development of the athletic complex relative to PSWS disposal activity suggest that waste deposition at Walsh Field pre-dated the disposal of significant quantities of PCBs.

Available PSWS Dioxin Data

On October 15, 2009, KMS dioxin compound soil data were provided to TRC by EPA in tabulated form. TRC's initial review of the tabulated dioxin compound data noted the following:

- Results for a number of samples expressed as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) Toxic Equivalents (TEQs) (see attached tables) exceed the Method 1 S-1 soil cleanup standard of 20 picograms per gram (pg/g) or parts per trillion (ppt). However, the concentrations presented are not alarming from a risk assessment perspective as they would correspond to less than a 1 in 100,000 cancer risk for a residential exposure scenario. Additional information is needed to determine the representativeness of the data (e.g., biased-high, low, etc.).
- The TCDD TEQs (last column in the multi-page table) appear to have been calculated using the 1998 World Health Organization (WHO) toxicity equivalency factors (TEFs) for dioxin compounds. MassDEP has developed TEFs (MassDEP, 1991) that differ from those developed by the WHO. ORS will likely want the MassDEP TEFs or updated WHO TEFs (van den Berg, 2006) used to calculate the dioxin TEQs. However, WHO only developed TEFs for dioxin/dibenzofuran congeners with chlorines in the 2, 3, 7 and 8 positions (those congeners included in the tabulated data). MassDEP has developed TEFs for all dioxin/dibenzofuran congeners, even those that do not have chlorines in each of the 2, 3, 7 and 8 positions.

TRC notes further that congener/isomer-specific analyses data (if available) can be used to examine PCDD/PCDF profiles found in soils. Profiles represent a valuable tool in identifying precursor compounds (e.g., thermal formation) as well as potential sources of PCDDs/PCDFs. In addition, congener/isomer-specific data (e.g., actual PCDD/PCDF concentrations found in soil samples) and not TEF-weighted data can be used for comparison to PCDD/PCDF concentrations found in soils both in the US and worldwide. Such comparisons allow us to place PSWS data in perspective and answer the question: How do PCDD/PCDF data in PSWS soils compare to global background concentrations?

Given the fate and transport behavior of dioxin compounds, which in large part is very similar to PCBs and PAHs (strong tendency to partition to solid phases, very low water solubility and very low volatility), TRC does not believe that the remedial approaches proposed for the PSWS (i.e., prevent exposure) will be significantly affected.

Precursor Compounds and Burning Activity

Dioxin compounds may be formed as part of a burning/combustion process under appropriate conditions. The presence of ash at the PSWS suggests the presence of burned materials.

The available soils data indicate that PCBs are the only PCDD/PCDF precursor compounds at PSWS. The available analytical data provide no indication of the presence of any other chlorinated organic compounds with the potential to serve as dioxin precursors in significant concentrations. This is based on analysis for VOCs, semivolatile organic compounds (SVOCs), pesticides, and PCBs conducted by the prior consultant and TRC.

The highest concentrations of PCBs detected at PSWS have been detected at KMS, the KMS wetland, the Nemasket Street Lots (former Bethel AME parcels), and some residential locations. For example, PCBs detected in excess of 100 milligrams per kilogram (mg/kg) have been detected in soil samples collected from the following locations:

- KMS (pre-remediation)
- Nemasket Street Lots (Former Bethel AME parcels)
- 101 Greenwood Street

PCBs in excess of 50 mg/kg have been detected at the following locations:

- 128 Ruggles Street
- 102 Greenwood Street
- NBHS (two locations)

Anecdotal evidence indicates that products of waste burning, whether on-site or waste that had been burned/incinerated off-site, were disposed of at the PSWS. Subsequent filling and grading activity is likely to have displaced the impacts of burning activity (such as the transfer of fill material from the vicinity of the NBHS building to the KMS grounds). Based upon the history of the area that indicates some waste burning, it would be expected that select metals, as well as PAHs, would be present at elevated concentrations in the ash due to the burning of trash. Hence, the presence of enriched metals and PAH concentrations (as well as PAH profiles) could be another indicator of waste combustion. The presence of elevated concentrations of PCBs (see above samples) in combination with elevated concentrations of pyrogenic PAHs and selected metals could serve as useful chemical criteria for identifying candidate sites where soil samples would be collected to undergo PCDD/PCDF analyses.

Conclusions

- Dioxins are unlikely to be present in Walsh Field fill and soil because deposition at Walsh Field pre-dated the disposal of PCB wastes at the PSWS. Absent combustion activity in the presence of chlorinated organic precursor compounds such as PCBs, dioxin compound formation is not expected to be an important process at this location.
- Dioxin compound precursors at the PSWS are principally associated with PCBs. The available analytical data provide no indication of the presence of any other chlorinated organic compounds in significant concentrations.

- The highest concentrations of PCBs have been detected at KMS (pre-remediation), the Nemasket Street Lots, a few residential parcels, and localized areas on the NBHS campus.
- Artifacts of burning (the presence of ash, metal enrichment, and PAHs) are generally ubiquitous in fill material at the PSWS. However, the combination of burning artifacts (ash, metals enrichment, and PAHs) and precursor chemicals (e.g., PCBs) is found to the north of Parker Street.

Recommendations

TRC recommends the following activities:

- The collection of soil and fill samples for dioxin compound analysis from select locations at the PSWS. These data would be used for the following:
 - Evaluate the presence of dioxin compounds at the PSWS.
 - Estimate the potential risks posed by the presence of measured concentrations of PCDDs/PCDFs.

In developing an investigation program for an area targeted for PCDD/PCDF soil sampling, TRC will review relevant soil data from the area focusing principally on metals results, PAH and SVOC data, and PCB (homolog or aroclor) results to develop a process for sample selection. As noted above, artifacts of burning include the presence of ash, metal enrichment, and PAHs. Soil samples with elevated results, in particular those with concentrations greater than regulatory limits for PCBs and/or PAHs and/or metals may be used to identify a population of samples for potential PCDD/PCDF analyses. The specifics of the sampling program will be tailored to the specifics of each area targeted for evaluation.

References

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TABLE X
SUMMARY OF SOIL ANALYSES FOR
CHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS
 McCoy Field
 New Bedford, Massachusetts

| Sample ID | 2,3,7,8-TCDD pg/g | | TCDD TEQ | 1,2,3,7,8-PeCDD pg/g | | TCDD TEQ | 1,2,3,4,7,8-HxCDD pg/g | | TCDD TEQ | 1,2,3,7,8,9-HxCDD pg/g | | TCDD TEQ | 1,2,3,4,6,7,8-HpCDD pg/g | | TCDD TEQ |
|-----------------------------------------------------------|----------------------|---|----------|-------------------------|---|----------|---------------------------|---|----------|---------------------------|------|----------|-----------------------------|------|----------|
| TCDD TEF _{D_{FP}-WHO₉₈} ----> | 1 | | | 1 | | | 0.1 | | | 0.1 | | | 0.01 | | |
| Q4-A & B | 0.2 | U | 0.1 | 0.3 | U | 0.15 | 1.4 | J | 0.14 | 6.2 | 0.62 | 5.2 | 0.52 | 117 | 1.17 |
| Q16 A & B | <i>0.8</i> | J | 0.8 | 2.2 | J | 2.2 | 3.4 | J | 0.34 | 16.8 | 1.68 | 10.2 | 1.02 | 629 | 6.29 |
| Q24 A & B | 1.4 | J | 1.4 | 3.6 | J | 3.6 | 6.7 | | 0.67 | 44.2 | 4.42 | 23.5 | 2.35 | 1790 | 17.9 |
| Q37 A, B, & C | <i>0.68</i> | J | 0.68 | 2.1 | J | 2.1 | 3.6 | J | 0.36 | 9.3 | 0.93 | 9 | 0.9 | 237 | 2.37 |
| Duplicate 11 | 2.8 | | 2.8 | 6 | | 6 | 5.2 | | 0.52 | 34.1 | 3.41 | 24.1 | 2.41 | 1310 | 13.1 |
| Duplicate 13 | 0.95 | J | 0.95 | 3.2 | J | 3.2 | 2.6 | J | 0.26 | 9 | 0.9 | 7.9 | 0.79 | 146 | 1.46 |
| Q6-Embankment A & B | 0.66 | J | 0.66 | 2.5 | J | 2.5 | 2.3 | J | 0.23 | 8 | 0.8 | 7 | 0.7 | 129 | 1.29 |
| Q11-Embankment A & | 0.4 | J | 0.4 | 1.8 | J | 1.8 | 2.2 | J | 0.22 | 5.8 | 0.58 | 6 | 0.6 | 106 | 1.06 |
| Arithmetic Mean | | | 0.97 | | | 2.69 | | | 0.34 | | 1.67 | | 1.16 | | 5.58 |
| Maximum | | | 2.8 | | | 6 | | | 0.67 | | 4.42 | | 2.41 | | 17.9 |
| Method 1 S-1 Soil standard | | | 4 | | | 4 | | | 4 | | 4 | | 4 | | 4 |
| Method 1 S-2 Soil standard | | | 6 | | | 6 | | | 6 | | 6 | | 6 | | 6 |
| Method 1 S-3 Soil standard | | | 20 | | | 20 | | | 20 | | 20 | | 20 | | 20 |
| Upper Concentration Limit | | | 200 | | | 200 | | | 200 | | 200 | | 200 | | 200 |

pg/g = picograms per grams (parts per trillion).
 U = Undetected at quantitation limit presented.
 J = Estimated concentration below calibration range.
 C = Value reported from confirmatory analysis.
 D = Value reported from dilution analysis.
 X = Interference from diphenyl ethers.
 Value in italics = Estimated most probable concentration (EMPC)

TABLE X
SUMMARY OF SOIL ANALYSES FOR
CHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS
McCoy Field
New Bedford, Massachusetts

| Sample ID | 1,2,3,4,6,7,8,9- OCDD pg/g | TCDD TEQ | 2,3,7,8-TCDF pg/g | TCDD TEQ | 1,2,3,7,8-PeCDF pg/g | TCDD TEQ | 2,3,4,7,8-PeCDF pg/g | TCDD TEQ | 1,2,3,4,7,8- HxCDF pg/g | TCDD TEQ | 1,2,3,6,7,8- HxCDF pg/g | TCDD TEQ |
|------------------------------------------------|----------------------------------|----------|----------------------|----------|-------------------------|----------|-------------------------|----------|-------------------------------|----------|-------------------------------|----------|
| TCDD TEF _{DFP-WHO₉₈} ----> | 0.0001 | | 0.1 | | 0.05 | | 0.5 | | 0.1 | | 0.1 | |
| Q4-A & B | 1260 | 0.126 | 8.2 C | 0.82 | 0.1 U | 0.0025 | 14.7 | 7.35 | 93.7 | 9.37 | 33.3 | 3.33 |
| Q16 A & B | 4690 D | 0.469 | 11.1 C | 1.11 | 0.1 U | 0.0025 | 11.5 | 5.75 | 36.5 | 3.65 | 17 | 1.7 |
| Q24 A & B | 12160 D | 1.216 | 15.7 C | 1.57 | 0.1 U | 0.0025 | 16.3 | 8.15 | 44.2 | 4.42 | 18.9 | 1.89 |
| Q37 A, B, & C | 3020 | 0.302 | 5.2 C | 0.52 | 0.08 U | 0.002 | 5.6 | 2.8 | 23.7 | 2.37 | 9.9 | 0.99 |
| Duplicate 11 | 10210 D | 1.021 | 18.4 C | 1.84 | 0.2 U | 0.005 | 19.3 | 9.65 | 51.9 | 5.19 | 22.2 | 2.22 |
| Duplicate 13 | 1400 | 0.14 | 13 C | 1.3 | 0.1 U | 0.0025 | 17.6 | 8.8 | 34.4 | 3.44 | 16.8 | 1.68 |
| Q6-Embankment A & B | 1190 | 0.119 | 11.2 C | 1.12 | 0.6 U | 0.015 | 9.9 | 4.95 | 29.6 | 2.96 | 13.5 | 1.35 |
| Q11-Embankment A & | 1640 | 0.164 | 5.3 C | 0.53 | 0.05 U | 0.00125 | 5.8 | 2.9 | 11.4 | 1.14 | 6.2 | 0.62 |
| Arithmetic Mean | | 0.44 | | 1.10 | | 0.004 | | 6.29 | | 4.07 | | 1.72 |
| Maximum | | 1.22 | | 1.84 | | 0.015 | | 9.65 | | 9.37 | | 3.33 |
| Method 1 S-1 Soil standard | | 4 | | 4 | | 4 | | 4 | | 4 | | 4 |
| Method 1 S-2 Soil standard | | 6 | | 6 | | 6 | | 6 | | 6 | | 6 |
| Method 1 S-3 Soil standard | | 20 | | 20 | | 20 | | 20 | | 20 | | 20 |
| Upper Concentration Limit | | 200 | | 200 | | 200 | | 200 | | 200 | | 200 |

pg/g = picograms per gram
U = Undetected at quantitati
J = Estimated concentration
C = Value reported from con
D = Value reported from dil
X = Interference from diphei
Value in italics = Estimated r

TABLE X
SUMMARY OF SOIL ANALYSES FOR
CHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS
McCoy Field
New Bedford, Massachusetts

| Sample ID | 2,3,4,6,7,8- HxCDF pg/g | TCDD TEQ | 1,2,3,7,8,9- HxCDF pg/g | TCDD TEQ | 1,2,3,4,6,7,8- HpCDF pg/g | TCDD TEQ | 1,2,3,4,7,8,9- HpCDF pg/g | TCDD TEQ | 1,2,3,4,6,7,8,9- OCDF pg/g | TCDD TEQ | Sample Total TCDD pg/g | Lab sheet TEQs pg/g |
|--------------------------------------------------|-------------------------------|----------|-------------------------------|----------|---------------------------------|----------|---------------------------------|----------|----------------------------------|----------|------------------------------|---------------------------|
| TCDD TEF _{DFP} -WHO ₉₈ ----> | 0.1 | | 0.1 | | 0.01 | | 0.01 | | 0.0001 | | | |
| Q4-A & B | 19.1 | 1.91 | <i>5.8</i> X | 0.58 | 76.3 | 0.763 | 27.3 | 0.273 | 156 | 0.0156 | 27.2 | 28.7 |
| Q16 A & B | 16.4 | 1.64 | <i>7.5</i> X | 0.75 | 172 | 1.72 | 12.1 | 0.121 | 276 | 0.0276 | 29.3 | 32.6 |
| Q24 A & B | 20.2 | 2.02 | <i>8.6</i> X | 0.86 | 346 | 3.46 | 20.3 | 0.203 | 1320 | 0.132 | 54.3 | 64.6 |
| Q37 A, B, & C | 8.4 | 0.84 | <i>4.2</i> XJ | 0.42 | 99.7 | 0.997 | 8.2 | 0.082 | 220 | 0.022 | 16.7 | 18.6 |
| Duplicate 11 | 22.4 | 2.24 | <i>10.4</i> X | 1.04 | 310 | 3.1 | 18.2 | 0.182 | 628 | 0.0628 | 54.8 | 61.6 |
| Duplicate 13 | 20.9 | 2.09 | <i>10.9</i> X | 1.09 | 108 | 1.08 | 8.5 | 0.085 | 128 | 0.0128 | 27.3 | 27.1 |
| Q6-Embankment A & B | 14.8 | 1.48 | <i>10.1</i> X | 1.01 | 88.8 | 0.888 | 6.2 | 0.062 | 100 | 0.01 | 20.1 | 20.2 |
| Q11-Embankment A & B | 8.5 | 0.85 | <i>3.8</i> XJ | 0.38 | 45.6 | 0.456 | 3.3 J | 0.033 | 58.4 | 0.00584 | 11.7 | 12.4 |
| Arithmetic Mean | | 1.63 | | 0.77 | | 1.56 | | 0.13 | | 0.036 | 30.2 | 33.2 |
| Maximum | | 2.24 | | 1.09 | | 3.46 | | 0.27 | | 0.132 | 54.8 | 64.6 |
| Method 1 S-1 Soil standard | | 4 | | 4 | | 4 | | 4 | | 4 | 4 | |
| Method 1 S-2 Soil standard | | 6 | | 6 | | 6 | | 6 | | 6 | 6 | |
| Method 1 S-3 Soil standard | | 20 | | 20 | | 20 | | 20 | | 20 | 20 | |
| Upper Concentration Limit | | 200 | | 200 | | 200 | | 200 | | 200 | 200 | |

pg/g = picograms per gram:
 U = Undetected at quantitati
 J = Estimated concentration
 C = Value reported from con
 D = Value reported from dilu
 X = Interference from diphe
 Value in italics = Estimated r

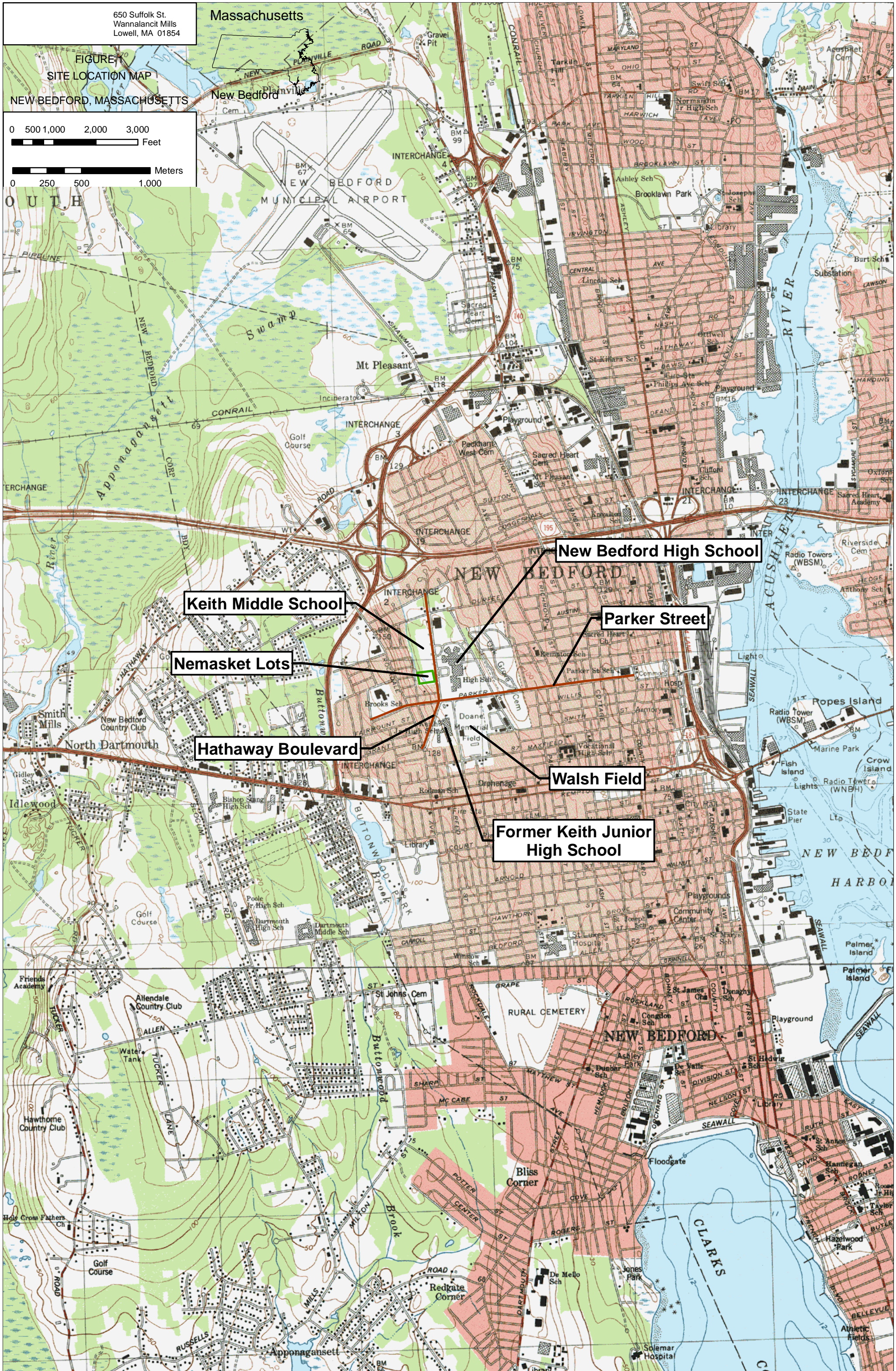
650 Suffolk St.
Wannalancit Mills
Lowell, MA 01854

Massachusetts

FIGURE 1
SITE LOCATION MAP
NEW BEDFORD, MASSACHUSETTS

0 500 1,000 2,000 3,000
Feet

0 250 500 1,000
Meters



New Bedford High School

Keith Middle School

Parker Street

Nemasket Lots

Hathaway Boulevard

Walsh Field

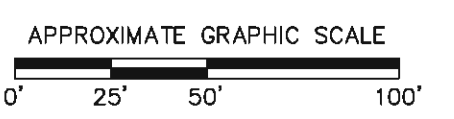
Former Keith Junior High School


LEGEND:



PROPOSED PCDD/PCDF SOIL SAMPLING LOCATIONS

NOTE:
ALL LOCATIONS APPROXIMATE.



| | |
|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| PARKER STREET WASTE SITE NEW BEDFORD, MASSACHUSETTS | |
| PROPOSED PCDD/PCDF NBHS SOIL SAMPLING LOCATIONS | |
|  TRC | Wannancott Mills 650 Suffolk Street Lowell, MA 01854 (978) 970-5600 |
| DRAWN BY: HWB | DATE: DEC 2009 |
| CHECKED BY: DMS | FIGURE 2 |

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, Massachusetts 01854

Main 978.970.5600
Fax 978.453.1995

Memorandum

To: Scott Alfonse and Cheryl Henlin, City of New Bedford
From: David M. Sullivan, LSP CHMM, TRC Environmental Corporation
CC: Jeffrey Saunders, TRC Environmental Corporation
Subject: Summary of Work Completed at Durfee and Summit Streets
Date: March 3, 2010

The following summarizes the procedures and analytical results associated with soil and groundwater sampling conducted by TRC Environmental Corporation (TRC) along the City of New Bedford (the "City") right-of-way (ROW) along Durfee Street and Summit Street in New Bedford, Massachusetts (see Figures 1). The subsurface soil investigation was performed to provide additional site characterization and delineate areas potentially impacted by the Parker Street Waste Site (PSWS). The groundwater sampling program was conducted concurrently by TRC to further evaluate groundwater conditions in the vicinity of the Keith Middle School (KMS) in support of TRC's wetland ecological evaluation. The data collected by TRC supplement data collected previously on behalf of the City by the BETA Group, Incorporated of Norwood, Massachusetts and by TRC in the surrounding area.

Soil Sampling Investigation

The subsurface soil investigation was conducted on December 17 and 18, 2009 and consisted of direct push soil borings using a truck-mounted direct push GeoProbe[®] drill rig to sample soil and to observe subsurface soil conditions. Drilling services and equipment were provided by New England Geotech, LLC of Jamestown, Rhode Island. Figure 1 illustrates the locations investigated by TRC along the Durfee Street (WSB-11 through WSB-15) and Summit Street (WSB-16 through WSB-19) ROWs using the above-described techniques. The soil boring locations were surveyed by Land Planning, Incorporated of Hanson, Massachusetts following TRC's sampling activities.

The investigative approach was intended to evaluate the presence or absence of fill, the vertical extent of impacts (if any), and the potential presence of impacts in soil and fill material that may be present. Borings were advanced and samples were collected until native overburden was encountered unless refusal was encountered first. Due to shallow refusal at one soil boring location (WSB-17), additional efforts were made to advance the boring to depth. Where native material was submitted for laboratory analysis, two samples of native material were typically collected in borings selected to characterize the native horizon. The lower native sample was retained for analysis contingent upon the results of the upper native horizon analysis in an attempt to delineate the vertical extent of potential impacts exceeding applicable standards, if present. The contingent native material was not analyzed if the native material interval above it was found to be uncontaminated (below cleanup

criteria) based on laboratory analysis or as directed by the TRC Licensed Site Professional (LSP). In this case, analysis of the contingent native samples was not warranted.

TRC conducted field screening of soil samples consisting of visual and olfactory observations, jar headspace readings using an appropriately calibrated photoionization detector (PID), and professional judgment, consistent with TRC Standard Operating Procedures (SOPs) and general industry practice. TRC employed the Massachusetts Department of Environmental Protection (MassDEP) jar headspace technique to screen for the presence of volatile organic compounds (VOCs) in soil. TRC also evaluated and logged the geologic character of the soil samples consistent with the Burmeister method. A subset of soil samples was subjected to chemical analysis at an off-site environmental laboratory. The following table summarizes the soil samples collected by TRC from the Durfee Street and Summit Street ROWs for laboratory analysis:

| Summary of Investigation Activities – December 2009 | | | | | |
|------------------------------------------------------------|---------------------|-----------------------------------------------------------------------------|-----------------------------|-------------------------|----------------------------------|
| Location | Soil Borings | Number of Soil Samples Submitted for Laboratory Analysis¹ | Analyses² | | |
| | | | PCBs³ | PAHs⁴ | MCP Metals/Hg⁵ |
| Durfee Street | 5 | 19 (4) | 19 | 19 | 19 |
| Summit Street | 4 | 16 (3) | 16 | 16 | 16 |

Notes:

¹ Contingency samples held by the laboratory listed in parentheses.

² Does not include quality assurance/quality control samples (e.g., duplicates).

³ Polychlorinated biphenyls (PCBs) as Aroclors by SW-846 Method 8082.

⁴ Polyaromatic hydrocarbons (PAHs) by SW-846 Method 8270C.

⁵ Massachusetts Contingency Plan (MCP) Metals/Hg - antimony, arsenic, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, thallium, vanadium, zinc and mercury by SW-846 Methods 6010B/7471A.

Soil samples for polychlorinated biphenyl (PCB) Aroclor analyses were submitted to Northeast Analytical Laboratories (NEA) of Schenectady, New York. Soil samples for Massachusetts Contingency Plan (MCP) metals and mercury and polyaromatic hydrocarbon (PAH) analyses were submitted to Con-Test Analytical Laboratory of East Longmeadow, Massachusetts. All samples were submitted under chain-of-custody.

The laboratory analytical results are summarized in Table 1. An analytical data map is included as Figure 1.

The subsurface material along both Durfee Street and Summit Street generally consisted of various sized sands and gravels. Limit fill material (trace to some coal and clinkers) was encountered at shallow depths at two of the soil boring locations along Summit Street (WSB-16 and WSB-19). All of the soil borings were screened with a PID using the MassDEP jar headspace method. PID screening results were consistently at background concentrations. Boring logs are included in Appendix A.

Groundwater Investigation

Two of the soil borings advanced within the Summit Street ROW (WSB-16 and WSB-19) were completed as permanent monitoring wells to evaluate groundwater conditions adjacent to the KMS wetland (see Figure 1). The monitoring well locations were surveyed by Land Planning following TRC's installation activities.

The monitoring wells (MW-9 and MW-10) were installed on December 18, 2009 at soil boring locations WSB-16 and WSB-19, respectively. Well construction logs are included in Appendix A. The monitoring wells were subsequently developed on December 21, 2009 using a Whale Mini Purge Pump and dedicated tubing. A LaMotte 2020 turbidity meter as used throughout development to monitor turbidity levels.

Following a stabilization period, TRC collected groundwater samples from the newly installed monitoring wells on January 7, 2010. Groundwater samples were collected following EPA Region I low stress (low flow) sampling guidelines. During purging activities, water quality parameters were monitored using a YSI 600XL Sonde and 650 MDS datalogger and a LaMotte 2020 turbidity meter. Water quality parameters were recorded on groundwater sampling log forms. Groundwater samples were collected after water quality parameters had stabilized in accordance with the low flow guidance.

Groundwater samples for polychlorinated biphenyl (PCB) Aroclor analyses were submitted to NEA of Schenectady, New York. Groundwater samples for total and dissolved (field filtered) MCP metals and mercury were submitted to Con-Test Analytical Laboratory of East Longmeadow, Massachusetts. All samples were submitted under chain-of-custody.

The results of the groundwater sample analysis from MW-9 and MW-10 are summarized in Table 2.

Please contact us if you have an questions.

Table 1
Summary of Analytical Results for Soil Samples - December 2009
Keith Middle School
New Bedford, Massachusetts

| Analysis | Analyte | Sample ID: | | | | | | WSB-11 | | | | | WSB-12 | | | | WSB-13 | | | | | |
|---------------------|------------------------|---------------------|----------|----------|----------|----------|------|------------|------------|-------------|-------------|--------------|------------|------------|--------------|------------|------------|------------|--------------|------------|------------|------------|
| | | Sample Depth (ft.): | | | | | | 0.5-1 | 1-3 | 1-3 | 4-5 | 7-8 | 0.5-1 | 1-3 | 4-5 | 7-8 | 0.5-1 | 1-3 | 5-6 | 7-8 | | |
| | | S-1/GW-2 | S-1/GW-3 | S-2/GW-2 | S-2/GW-3 | RC S-1** | TSCA | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | |
| PAHs | | | | | | | | | | | | | | | | | | | | | | |
| | 2-Methylnaphthalene | 80 | 300 | 80 | 500 | 0.7 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U |
| | Acenaphthene | 1,000 | 1,000 | 3,000 | 3,000 | 4 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U |
| | Acenaphthylene | 600 | 10 | 600 | 10 | 1 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Anthracene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Benz[a]anthracene | 7 | 7 | 40 | 40 | 7 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Benzo[a]pyrene | 2 | 2 | 4 | 4 | 2 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Benzo[b]fluoranthene | 7 | 7 | 40 | 40 | 7 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Benzo[g,h,i]perylene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Benzo[k]fluoranthene | 70 | 70 | 400 | 400 | 70 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Chrysene | 70 | 70 | 400 | 400 | 70 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Dibenz[a,h]anthracene | 0.7 | 0.7 | 4 | 4 | 0.7 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Fluoranthene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Fluorene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Indeno[1,2,3-cd]pyrene | 7 | 7 | 40 | 40 | 7 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Naphthalene | 40 | 500 | 40 | 1,000 | 4 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Phenanthrene | 500 | 500 | 1,000 | 1,000 | 10 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| | Pyrene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U | 0.19 U | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.18 U |
| PCB Aroclors | | | | | | | | | | | | | | | | | | | | | | |
| (mg/kg) | Aroclor 1016 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0547 U | 0.0526 U | 0.0513 U | 0.0574 U | 0.0535 U | 0.0523 U | 0.0519 U | 0.0566 U | 0.0526 U | 0.0516 U | 0.0514 U | 0.0564 U | 0.0529 U | 0.0529 U | 0.0529 U |
| | Aroclor 1221 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0547 U | 0.0526 U | 0.0513 U | 0.0574 U | 0.0535 U | 0.0523 U | 0.0519 U | 0.0566 U | 0.0526 U | 0.0516 U | 0.0514 U | 0.0564 U | 0.0529 U | 0.0529 U | 0.0529 U |
| | Aroclor 1232 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0547 U | 0.0526 U | 0.0513 U | 0.0574 U | 0.0535 U | 0.0523 U | 0.0519 U | 0.0566 U | 0.0526 U | 0.0516 U | 0.0514 U | 0.0564 U | 0.0529 U | 0.0529 U | 0.0529 U |
| | Aroclor 1242 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0547 U | 0.0526 U | 0.0513 U | 0.0574 U | 0.0535 U | 0.0523 U | 0.0519 U | 0.0566 U | 0.0526 U | 0.0516 U | 0.0514 U | 0.0564 U | 0.0529 U | 0.0529 U | 0.0529 U |
| | Aroclor 1248 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0547 U | 0.0526 U | 0.0513 U | 0.0574 U | 0.0535 U | 0.0523 U | 0.0519 U | 0.0566 U | 0.0526 U | 0.0516 U | 0.0514 U | 0.0564 U | 0.0529 U | 0.0529 U | 0.0529 U |
| | Aroclor 1254 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0547 U | 0.0526 U | 0.0513 U | 0.0574 U | 0.0535 U | 0.0523 U | 0.0519 U | 0.0566 U | 0.0526 U | 0.0516 U | 0.0514 U | 0.0564 U | 0.0529 U | 0.0529 U | 0.0529 U |
| | Aroclor 1260 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0547 U | 0.0526 U | 0.0513 U | 0.0574 U | 0.0535 U | 0.0523 U | 0.0519 U | 0.0566 U | 0.0526 U | 0.0516 U | 0.0514 U | 0.0564 U | 0.0529 U | 0.0529 U | 0.0529 U |
| | Total PCBs | 2 | 2 | 3 | 3 | 2 | 1 | 0.0547 U | 0.0526 U | 0.0513 U | 0.0574 U | 0.0535 U | 0.0523 U | 0.0519 U | 0.0566 U | 0.0526 U | 0.0516 U | 0.0514 U | 0.0564 U | 0.0529 U | 0.0529 U | 0.0529 U |
| Metals | | | | | | | | | | | | | | | | | | | | | | |
| (mg/kg) | Antimony | 20 | 20 | 30 | 30 | 20 | N/A | 4.4 U | 4.3 U | 4.1 U | 4.5 U | 4.4 U | 4.2 U | 4.2 U | 4.5 U | 4.5 U | 4.2 U | 4.3 U | 4.5 U | 4.3 U | 4.3 U | 4.3 U |
| | Arsenic | 20 | 20 | 20 | 20 | 20 | N/A | 3.2 | 2.9 | 2.6 U | 2.8 U | 2.8 U | 2.6 U | 3.3 | 2.8 U | 2.8 U | 2.6 U | 3.0 | 2.8 U | 2.7 U | 2.7 U | 2.7 U |
| | Barium | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 11 | 17 | 14 | 5.6 U | 10 | 6.6 | 18 | 14 | 14 | 29 | 14 | 12 | 10 | 10 | 10 |
| | Beryllium | 100 | 100 | 200 | 200 | 100 | N/A | 0.27 U | 0.27 U | 0.26 U | 0.28 U | 0.28 U | 0.26 U | 0.26 U | 0.28 U | 0.28 U | 0.26 U | 0.27 U | 0.28 U | 0.27 U | 0.28 U | 0.27 U |
| | Cadmium | 2 | 2 | 30 | 30 | 2 | N/A | 0.27 U | 0.27 U | 0.26 U | 0.28 U | 0.28 U | 0.26 U | 0.26 U | 0.28 U | 0.28 U | 0.26 U | 0.27 U | 0.28 U | 0.27 U | 0.28 U | 0.27 U |
| | Chromium | 30 | 30 | 200 | 200 | 30 | N/A | 4.9 | 5.1 | 4.0 | 2.3 | 2.7 | 2.8 | 5.2 | 6.0 | 2.3 | 5.5 | 5.1 | 4.9 | 2.4 | 2.4 | 2.4 |
| | Lead | 300 | 300 | 300 | 300 | 300 | N/A | 13 | 13 | 10 | 3.3 | 5.4 | 4.7 | 5.6 | 10 | 4.2 | 4.9 | 8.8 | 18 | 3.8 | 3.8 | 3.8 |
| | Nickel | 20 | 20 | 700 | 700 | 20 | N/A | 3.5 | 3.6 | 3.3 | 1.7 | 2.4 | 2.2 | 4.1 | 3.1 | 2.1 | 4.8 | 4.0 | 2.5 | 1.7 | 1.7 | 1.7 |
| | Selenium | 400 | 400 | 800 | 800 | 400 | N/A | 5.5 U | 5.4 U | 5.2 U | 5.6 U | 5.5 U | 5.3 U | 5.3 U | 5.6 U | 5.6 U | 5.2 U | 5.3 U | 5.6 U | 5.4 U | 5.4 U | 5.4 U |
| | Silver | 100 | 100 | 200 | 200 | 100 | N/A | 0.55 U | 0.54 U | 0.52 U | 0.56 U | 0.55 U | 0.53 U | 0.53 U | 0.56 U | 0.56 U | 0.52 U | 0.53 U | 0.56 U | 0.54 U | 0.54 U | 0.54 U |
| | Thallium | 8 | 8 | 60 | 60 | 8 | N/A | 3.3 U | 3.2 U | 3.1 U | 3.4 U | 3.3 U | 3.2 U | 3.2 U | 3.4 U | 3.4 U | 3.1 U | 3.2 U | 3.3 U | 3.3 U | 3.3 U | 3.3 U |
| | Vanadium | 600 | 600 | 1,000 | 1,000 | 600 | N/A | 9.8 | 9.3 | 6.3 | 5.6 U | 5.5 U | 5.3 U | 9.8 | 7.3 | 5.6 U | 8.1 | 8.8 | 6.1 | 5.4 U | 5.4 U | 5.4 U |
| | Zinc | 2,500 | 2,500 | 3,000 | 3,000 | 2,500 | N/A | 15 | 15 | 20 B | 11 B | 11 B | 15 | 14 | 12 | 8.1 | 19 | 12 | 11 | 6.9 | 6.9 | 6.9 |
| | Mercury | 20 | 20 | 30 | 30 | 20 | N/A | 0.020 U | 0.023 U | 0.021 U | 0.017 U | 0.047 | 0.015 U | 0.019 U | 0.031 | 0.017 U | 0.019 U | 0.026 U | 0.017 | 0.022 U | 0.022 U | 0.022 U |

Notes:
mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
B - Compound detected in associated method blank
NA - Sample not analyzed for the listed analyte.
N/A - Not applicable.
U - Compound was not detected at specified quantitation limit.
Values in **Bold** indicate the compound was detected.
Values shown in **Bold and shaded type** exceed one or more of the listed MassDEP Method 1 standards.
Values shown in **Bold and outlined** exceed TSCA but are less than the listed Method 1 standards.
PAHs - Polynuclear Aromatic Hydrocarbons.
PCB - Polychlorinated Biphenyl.
RC - Reportable Concentration.
TSCA - Toxic Substances Control Act criteria.
* - The sample exhibits altered PCB pattern; best possible Aroclor match reported.
** - For reference purpose only.

Table 1
Summary of Analytical Results for Soil Samples - December 2009
Keith Middle School
New Bedford, Massachusetts

| Analysis | Analyte | Sample ID: | | | | | | WSB-14 | | | | WSB-15 | | | | WSB-16 | | | |
|--------------------------------|------------------------|---------------------|----------|----------|----------|----------|------|------------|------------|------------|--------------|------------|------------|------------|----------------|---------------|-----------------|------------|------------|
| | | Sample Depth (ft.): | | | | | | 1-3 | 4-5 | 7-8 | 0.5-1 | 1-3 | 4-5 | 7-8 | 0.5-1 | 1-3 | 4-5 | 7-8 | |
| | | S-1/GW-2 | S-1/GW-3 | S-2/GW-2 | S-2/GW-3 | RC S-1** | TSCA | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/18/2009 | 12/18/2009 | 12/18/2009 | 12/18/2009 |
| PAHs | 2-Methylnaphthalene | 80 | 300 | 80 | 500 | 0.7 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 0.37 U | 0.39 U | 0.39 U | 0.19 U | |
| | Acenaphthene | 1,000 | 1,000 | 3,000 | 3,000 | 4 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 0.37 U | 0.39 U | 0.39 U | 0.19 U | |
| | Acenaphthylene | 600 | 10 | 600 | 10 | 1 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 0.38 | 0.39 U | 0.39 U | 0.19 U | |
| | Anthracene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 0.37 U | 0.39 U | 0.39 U | 0.19 U | |
| | Benzo[a]anthracene | 7 | 7 | 40 | 40 | 7 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 1.7 | 0.39 U | 0.39 U | 0.19 U | |
| | Benzo[a]pyrene | 2 | 2 | 4 | 4 | 2 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 2.2 | 0.39 U | 0.39 U | 0.19 U | |
| | Benzo[b]fluoranthene | 7 | 7 | 40 | 40 | 7 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 2.6 | 0.39 U | 0.39 U | 0.19 U | |
| | Benzo[g,h,i]perylene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 1.0 | 0.39 U | 0.39 U | 0.19 U | |
| | Benzo[k]fluoranthene | 70 | 70 | 400 | 400 | 70 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 1.1 | 0.39 U | 0.39 U | 0.19 U | |
| | Chrysene | 70 | 70 | 400 | 400 | 70 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 1.9 | 0.39 U | 0.39 U | 0.19 U | |
| | Dibenz[a,h]anthracene | 0.7 | 0.7 | 4 | 4 | 0.7 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 0.37 U | 0.39 U | 0.39 U | 0.19 U | |
| | Fluoranthene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 2.3 | 0.39 U | 0.39 U | 0.19 U | |
| | Fluorene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 0.37 U | 0.39 U | 0.39 U | 0.19 U | |
| | Indeno[1,2,3-cd]pyrene | 7 | 7 | 40 | 40 | 7 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 1.3 | 0.39 U | 0.39 U | 0.19 U | |
| | Naphthalene | 40 | 500 | 40 | 1,000 | 4 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 0.37 U | 0.39 U | 0.39 U | 0.19 U | |
| | Phenanthrene | 500 | 500 | 1,000 | 1,000 | 10 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 1.5 | 0.39 U | 0.39 U | 0.19 U | |
| | Pyrene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.18 U | 0.19 U | 0.18 U | 0.18 U | 0.17 U | 0.20 U | 0.20 U | 2.4 | 0.39 U | 0.39 U | 0.19 U | |
| PCB Aroclors (mg/kg) | Aroclor 1016 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0517 U | 0.0577 U | 0.0522 U | 0.0530 U | 0.0509 U | 0.0586 U | 0.0571 U | 0.0543 U | 0.173 U | 0.0572 U | 0.0558 U | |
| | Aroclor 1221 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0517 U | 0.0577 U | 0.0522 U | 0.0530 U | 0.0509 U | 0.0586 U | 0.0571 U | 0.0543 U | 0.173 U | 0.0572 U | 0.0558 U | |
| | Aroclor 1232 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0517 U | 0.0577 U | 0.0522 U | 0.0530 U | 0.0509 U | 0.0586 U | 0.0571 U | 0.0543 U | 0.173 U | 0.0572 U | 0.0558 U | |
| | Aroclor 1242 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0517 U | 0.0577 U | 0.0522 U | 0.0530 U | 0.0509 U | 0.0586 U | 0.0571 U | 0.0543 U | 0.173 U | 0.0572 U | 0.0558 U | |
| | Aroclor 1248 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0517 U | 0.0577 U | 0.0522 U | 0.0530 U | 0.0509 U | 0.0586 U | 0.0571 U | 0.0543 U | 0.173 U | 0.0572 U | 0.0558 U | |
| | Aroclor 1254 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0517 U | 0.0577 U | 0.0522 U | 0.0530 U | 0.0509 U | 0.0586 U | 0.0571 U | 0.864 * | 4.69 * | 0.0660 * | 0.0558 U | |
| | Aroclor 1260 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0517 U | 0.0577 U | 0.0522 U | 0.0530 U | 0.0509 U | 0.0586 U | 0.0571 U | 0.0543 U | 0.173 U | 0.0572 U | 0.0558 U | |
| | Total PCBs | 2 | 2 | 3 | 3 | 2 | 1 | 0.0517 U | 0.0577 U | 0.0522 U | 0.0530 U | 0.0509 U | 0.0586 U | 0.0571 U | 0.864 | 4.69 | 0.0660 * | 0.0558 U | |
| Metals (mg/kg) | Antimony | 20 | 20 | 30 | 30 | 20 | N/A | 4.2 U | 4.5 U | 4.3 U | 4.2 U | 4.1 U | 4.7 U | 4.7 U | 4.4 U | 4.5 U | 4.6 U | 4.4 U | |
| | Arsenic | 20 | 20 | 20 | 20 | 20 | N/A | 3.1 | 2.8 U | 3.0 | 2.8 | 3.3 | 3.0 U | 3.7 | 5.9 | 2.8 U | 2.9 U | 3.2 | |
| | Barium | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 17 | 9.9 | 45 | 9.4 | 10 | 8.1 | 29 | 63 | 18 | 15 | 11 | |
| | Beryllium | 100 | 100 | 200 | 200 | 100 | N/A | 0.26 U | 0.28 U | 0.27 U | 0.26 U | 0.26 U | 0.30 U | 0.29 U | 0.27 U | 1.4 U | 0.29 U | 0.27 U | |
| | Cadmium | 2 | 2 | 30 | 30 | 2 | N/A | 0.26 U | 0.28 U | 0.27 U | 0.26 U | 0.26 U | 0.30 U | 0.29 U | 0.27 U | 0.28 U | 0.29 U | 0.27 U | |
| | Chromium | 30 | 30 | 200 | 200 | 30 | N/A | 5.4 | 6.6 | 7.9 | 7.5 | 5.1 | 4.3 | 30 | 37 | 10 | 8.4 | 5.3 | |
| | Lead | 300 | 300 | 300 | 300 | 300 | N/A | 5.8 | 5.2 | 1.7 | 11 | 1.8 | 1.4 | 2.4 | 37 | 8.2 | 4.2 | 3.0 | |
| | Nickel | 20 | 20 | 700 | 700 | 20 | N/A | 3.8 | 2.3 | 5.7 | 2.9 | 2.3 | 2.2 | 13 | 16 | 7.6 | 4.2 | 4.3 | |
| | Selenium | 400 | 400 | 800 | 800 | 400 | N/A | 5.3 U | 5.7 U | 5.3 U | 5.2 U | 5.1 U | 5.9 U | 5.8 U | 5.5 U | 5.6 U | 5.7 U | 5.5 U | |
| | Silver | 100 | 100 | 200 | 200 | 100 | N/A | 0.53 U | 0.57 U | 0.53 U | 0.52 U | 0.51 U | 0.59 U | 0.58 U | 0.55 U | 0.56 U | 0.57 U | 0.55 U | |
| | Thallium | 8 | 8 | 60 | 60 | 8 | N/A | 3.2 U | 3.4 U | 3.2 U | 3.1 U | 3.1 U | 3.6 U | 3.5 U | 3.3 U | 3.4 U | 3.4 U | 3.3 U | |
| | Vanadium | 600 | 600 | 1,000 | 1,000 | 600 | N/A | 8.8 | 5.7 U | 12 | 7.6 | 8.9 | 6.0 | 24 | 28 | 21 | 12 | 9.0 | |
| | Zinc | 2,500 | 2,500 | 3,000 | 3,000 | 2,500 | N/A | 14 | 9.2 | 12 | 21 | 14 | 12 | 26 | 38 | 28 B | 15 | 9.8 | |
| | Mercury | 20 | 20 | 30 | 30 | 20 | N/A | 0.020 U | 0.019 U | 0.018 U | 0.026 | 0.013 U | 0.016 U | 0.016 U | 0.098 | 0.025 | 0.013 U | 0.021 U | |

Notes:
mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
B - Compound detected in associated method blank
NA - Sample not analyzed for the listed analyte.
N/A - Not applicable.
U - Compound was not detected at specified quantitation limit.
Values in **Bold** indicate the compound was detected.
Values shown in **Bold and shaded type** exceed one or more of the listed MassDEP Method 1 standards.
Values shown in **Bold and outlined** exceed TSCA but are less than the listed Method 1 standards.

PAHs - Polynuclear Aromatic Hydrocarbons.
PCB - Polychlorinated Biphenyl.
RC - Reportable Concentration.
TSCA - Toxic Substances Control Act criteria.
* - The sample exhibits altered PCB pattern; best possible Aroclor match reported.
** - For reference purpose only.

Table 1
Summary of Analytical Results for Soil Samples - December 2009
Keith Middle School
New Bedford, Massachusetts

| Analysis | Analyte | Sample ID: | | | | | | WSB-17 | | | | WSB-18 | | | | WSB-19 | | | | |
|---------------------|------------------------|---------------------|----------|----------|----------|----------|------|-------------|----------------|------------|------------|-------------|-------------|----------------|-------------|-------------|---------------|----------------|--------------|------------|
| | | Sample Depth (ft.): | | | | | | 0.5-1 | 1-3 | 4-5 | 7-8 | 0.5-1 | 1-3 | 1-3 | 4-5 | 7-8 | 0.5-1 | 1-3 | 4-5 | 7-8 |
| | | S-1/GW-2 | S-1/GW-3 | S-2/GW-2 | S-2/GW-3 | RC S-1** | TSCA | 12/17/2009 | 12/17/2009 | 12/18/2009 | 12/18/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/17/2009 | 12/18/2009 | 12/18/2009 | 12/18/2009 | 12/18/2009 |
| PAHs | | | | | | | | | | | | | | | | | | | | |
| | 2-Methylnaphthalene | 80 | 300 | 80 | 500 | 0.7 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.20 U | 0.20 U | 0.20 U | |
| | Acenaphthene | 1,000 | 1,000 | 3,000 | 3,000 | 4 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.20 U | 0.20 U | 0.20 U | |
| | Acenaphthylene | 600 | 10 | 600 | 10 | 1 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.20 U | 0.20 U | 0.20 U | |
| | Anthracene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.20 U | 0.20 U | 0.20 U | |
| | Benz[a]anthracene | 7 | 7 | 40 | 40 | 7 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.83 | 0.20 U | 0.20 U | |
| | Benzo[a]pyrene | 2 | 2 | 4 | 4 | 2 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.88 | 0.20 U | 0.20 U | |
| | Benzo[b]fluoranthene | 7 | 7 | 40 | 40 | 7 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 1.2 | 0.20 U | 0.20 U | |
| | Benzo[g,h,i]perylene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.45 | 0.20 U | 0.20 U | |
| | Benzo[k]fluoranthene | 70 | 70 | 400 | 400 | 70 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.45 | 0.20 U | 0.20 U | |
| | Chrysene | 70 | 70 | 400 | 400 | 70 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.91 | 0.20 U | 0.20 U | |
| | Dibenz[a,h]anthracene | 0.7 | 0.7 | 4 | 4 | 0.7 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.20 U | 0.20 U | 0.20 U | |
| | Fluoranthene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 2.0 | 0.20 U | 0.20 U | |
| | Fluorene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.20 U | 0.20 U | 0.20 U | |
| | Indeno[1,2,3-cd]pyrene | 7 | 7 | 40 | 40 | 7 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.52 | 0.20 U | 0.20 U | |
| | Naphthalene | 40 | 500 | 40 | 1,000 | 4 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.20 U | 0.20 U | 0.20 U | |
| | Phenanthrene | 500 | 500 | 1,000 | 1,000 | 10 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 0.78 | 0.20 U | 0.20 U | |
| | Pyrene | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 0.18 U | 0.38 U | 0.19 U | 0.19 U | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U | 1.5 | 0.20 U | 0.20 U | |
| PCB Aroclors | | | | | | | | | | | | | | | | | | | | |
| (mg/kg) | Aroclor 1016 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0539 U | 0.0530 U | 0.0509 U | 0.0535 U | 0.0544 U | 0.0560 U | 0.0562 U | 0.0538 U | 0.0538 U | 0.0561 U | 0.0594 U | 0.0600 U | |
| | Aroclor 1221 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0539 U | 0.0530 U | 0.0509 U | 0.0535 U | 0.0544 U | 0.0560 U | 0.0562 U | 0.0538 U | 0.0538 U | 0.0561 U | 0.0594 U | 0.0600 U | |
| | Aroclor 1232 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0539 U | 0.0530 U | 0.0509 U | 0.0535 U | 0.0544 U | 0.0560 U | 0.0562 U | 0.0538 U | 0.0538 U | 0.0561 U | 0.0594 U | 0.0600 U | |
| | Aroclor 1242 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0539 U | 0.0530 U | 0.0509 U | 0.0535 U | 0.0544 U | 0.0560 U | 0.0562 U | 0.0538 U | 0.0538 U | 0.0561 U | 0.0594 U | 0.0600 U | |
| | Aroclor 1248 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0539 U | 0.0530 U | 0.0509 U | 0.0535 U | 0.0544 U | 0.0560 U | 0.0562 U | 0.0538 U | 0.0538 U | 0.0561 U | 0.0594 U | 0.0600 U | |
| | Aroclor 1254 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0539 U | 0.348 * | 0.0509 U | 0.0535 U | 0.0544 U | 0.0560 U | 0.136 * | 0.0538 U | 0.0538 U | 1.37 * | 0.136 * | 0.0600 U | |
| | Aroclor 1260 | 2 | 2 | 3 | 3 | 2 | 1 | 0.0539 U | 0.0530 U | 0.0509 U | 0.0535 U | 0.0544 U | 0.0560 U | 0.0562 U | 0.0538 U | 0.0538 U | 0.0561 U | 0.0594 U | 0.0600 U | |
| | Total PCBs | 2 | 2 | 3 | 3 | 2 | 1 | 0.0539 U | 0.348 | 0.0509 U | 0.0535 U | 0.0544 U | 0.0560 U | 0.136 | 0.0538 U | 0.0538 U | 1.37 | 0.136 | 0.0600 U | |
| Metals | | | | | | | | | | | | | | | | | | | | |
| (mg/kg) | Antimony | 20 | 20 | 30 | 30 | 20 | N/A | 4.2 U | 4.6 U | 4.4 U | 4.4 U | 4.3 U | 4.7 U | 4.6 U | 4.3 U | 4.4 U | 4.8 U | 4.7 U | 4.8 U | |
| | Arsenic | 20 | 20 | 20 | 20 | 20 | N/A | 3.1 | 2.9 U | 6.2 | 2.8 U | 2.7 | 3.4 | 3.3 | 2.7 U | 2.7 U | 4.8 | 4.9 | 4.4 | |
| | Barium | 1,000 | 1,000 | 3,000 | 3,000 | 1,000 | N/A | 97 | 29 | 16 | 7.7 | 87 | 18 | 18 | 5.6 | 17 | 41 | 19 | 11 | |
| | Beryllium | 100 | 100 | 200 | 200 | 100 | N/A | 1.3 U | 1.4 U | 0.28 U | 0.28 U | 1.3 U | 1.5 U | 1.4 U | 0.27 U | 1.4 U | 0.30 U | 0.29 U | 0.30 U | |
| | Cadmium | 2 | 2 | 30 | 30 | 2 | N/A | 0.26 U | 0.29 U | 0.28 U | 0.28 U | 0.27 U | 0.30 U | 0.29 U | 0.27 U | 0.27 U | 0.30 U | 0.29 U | 0.30 U | |
| | Chromium | 30 | 30 | 200 | 200 | 30 | N/A | 67 | 14 | 7.4 | 4.7 | 50 | 10 | 8.3 | 3.2 | 8.9 | 15 | 11 | 8.9 | |
| | Lead | 300 | 300 | 300 | 300 | 300 | N/A | 5.2 | 29 | 3.3 | 1.8 | 8.5 | 26 | 24 | 2.0 | 3.1 | 120 | 27 | 8.6 | |
| | Nickel | 20 | 20 | 700 | 700 | 20 | N/A | 30 | 7.7 | 5.7 | 2.4 | 22 | 5.6 | 4.7 | 2.7 | 6.6 | 6.1 | 5.3 | 4.4 | |
| | Selenium | 400 | 400 | 800 | 800 | 400 | N/A | 5.3 U | 5.7 U | 5.5 U | 5.5 U | 5.3 U | 5.9 U | 5.7 U | 5.4 U | 5.5 U | 5.9 U | 5.8 U | 6.0 U | |
| | Silver | 100 | 100 | 200 | 200 | 100 | N/A | 0.53 U | 0.57 U | 0.55 U | 0.55 U | 0.53 U | 0.59 U | 0.57 U | 0.54 U | 0.55 U | 0.59 U | 0.58 U | 0.60 U | |
| | Thallium | 8 | 8 | 60 | 60 | 8 | N/A | 3.2 U | 3.4 U | 3.3 U | 3.3 U | 3.2 U | 3.6 U | 3.4 U | 3.2 U | 3.3 U | 3.6 U | 3.5 U | 3.6 U | |
| | Vanadium | 600 | 600 | 1,000 | 1,000 | 600 | N/A | 38 | 16 | 16 | 5.9 | 35 | 19 | 17 | 5.4 U | 10 | 19 | 18 | 14 | |
| | Zinc | 2,500 | 2,500 | 3,000 | 3,000 | 2,500 | N/A | 40 B | 28 B | 18 | 12 | 45 B | 28 B | 24 B | 10 B | 24 B | 43 | 23 | 24 | |
| | Mercury | 20 | 20 | 30 | 30 | 20 | N/A | 0.020 U | 0.034 | 0.020 U | 0.017 U | 0.023 U | 0.11 | 0.069 | 0.022 U | 0.017 U | 0.10 | 0.057 | 0.042 | |

Notes:
mg/kg - milligrams per kilogram (dry weight) or parts per million (ppm).
B - Compound detected in associated method blank
NA - Sample not analyzed for the listed analyte.
N/A - Not applicable.
U - Compound was not detected at specified quantitation limit.
Values in **Bold** indicate the compound was detected.
Values shown in **Bold and shaded type** exceed one or more of the listed MassDEP Method 1 standards.
Values shown in **Bold and outlined** exceed TSCA but are less than the listed Method 1 standards.
PAHs - Polynuclear Aromatic Hydrocarbons.
PCB - Polychlorinated Biphenyl.
RC - Reportable Concentration.
TSCA - Toxic Substances Control Act criteria.
* - The sample exhibits altered PCB pattern; best possible Aroclor match reported.
** - For reference purpose only.

Summary of Analytical Results for Groundwater Samples -- January 2010
Keith Middle School
New Bedford, Massachusetts

| Analysis | Analyte | Sample ID: | | MW-9 | | MW-10 |
|------------------------------------|--------------|--------------|--------|-----------------|-----------------|-----------|
| | | Sample Date: | | 1/7/2010 | 1/7/2010 | 1/7/2010 |
| | | GW-2 | GW-3 | | Field Dup | |
| PCBs (ug/L) | Aroclor 1016 | 5 | 10 | 0.0510 U | 0.0505 U | 0.0500 U |
| | Aroclor 1221 | 5 | 10 | 0.0510 U | 0.0505 U | 0.0500 U |
| | Aroclor 1232 | 5 | 10 | 0.0510 U | 0.0505 U | 0.0500 U |
| | Aroclor 1242 | 5 | 10 | 0.0495 J | 0.0500 J | 0.0500 U |
| | Aroclor 1248 | 5 | 10 | 0.0510 U | 0.0505 U | 0.0500 U |
| | Aroclor 1254 | 5 | 10 | 0.0235 J | 0.0311 J | 0.0500 U |
| | Aroclor 1260 | 5 | 10 | 0.0510 U | 0.0505 U | 0.0500 U |
| | Total PCBs | 5 | 10 | 0.0730 J | 0.0811 J | 0.0500 U |
| Metals, dissolved (ug/L) | Antimony | NS | 8,000 | 40 U | 40 U | 40 U |
| | Arsenic | NS | 900 | 8.2 | 10 | 5.0 U |
| | Barium | NS | 50,000 | 330 | 340 | 50 U |
| | Beryllium | NS | 200 | 2.5 U | 2.5 U | 2.5 U |
| | Cadmium | NS | 4 | 2.5 U | 2.5 U | 2.5 U |
| | Chromium | NS | 300 | 5.0 U | 5.0 U | 5.0 U |
| | Lead | NS | 10 | 7.5 U | 7.5 U | 7.5 U |
| | Mercury | NS | 20 | 0.10 U | 0.10 U | 0.10 U |
| | Nickel | NS | 200 | 6.7 | 6.8 | 5.0 U |
| | Selenium | NS | 100 | 25 U | 25 U | 25 U |
| | Silver | NS | 7 | 2.5 U | 2.5 U | 2.5 U |
| | Thallium | NS | 3,000 | 30 U | 30 U | 30 U |
| | Vanadium | NS | 4,000 | 25 U | 25 U | 25 U |
| | Zinc | NS | 900 | 99 | 94 | 17 |
| | Antimony | NS | 8,000 | 40 U | 40 U | 40 U |
| Metals, total (ug/L) | Arsenic | NS | 900 | 8.9 | 9.1 | 5.0 U |
| | Barium | NS | 50,000 | 360 | 360 | 50 U |
| | Beryllium | NS | 200 | 2.5 U | 2.5 U | 2.5 U |
| | Cadmium | NS | 4 | 2.5 U | 2.5 U | 2.5 U |
| | Chromium | NS | 300 | 5.0 U | 5.0 U | 5.0 U |
| | Lead | NS | 10 | 7.5 U | 7.5 U | 7.5 U |
| | Mercury | NS | 20 | 0.10 U | 0.10 U | 0.10 U |

Summary of Analytical Results for Groundwater Samples -- January 2010
Keith Middle School
New Bedford, Massachusetts

| Analysis | Analyte | Sample ID: | | MW-9 | | MW-10 |
|----------|----------|--------------|-------|------------|------------|-----------|
| | | Sample Date: | | 1/7/2010 | 1/7/2010 | 1/7/2010 |
| | | GW-2 | GW-3 | | Field Dup | |
| | Nickel | NS | 200 | 7.1 | 6.8 | 5.0 U |
| | Selenium | NS | 100 | 25 U | 25 U | 25 U |
| | Silver | NS | 7 | 2.5 U | 2.5 U | 2.5 U |
| | Thallium | NS | 3,000 | 30 U | 30 U | 30 U |
| | Vanadium | NS | 4,000 | 25 U | 25 U | 25 U |
| | Zinc | NS | 900 | 100 | 130 | 16 |

Notes:

ug/L - micrograms per liter.

J - Estimated value.

NA - Sample not analyzed for the listed analyte.

NS - No MassDEP standards exist for this compound.

U - Compound was not detected at specified quantitation limit.

Values in **Bold** indicate the compound was detected.

Values shown in Bold and shaded type exceed one or more of the list

| WSB-13 12/17/09 Constituent | 0.50 - 1.00 | 1.00 - 3.00 | 5.00 - 6.00 | 7.00 - 8.00 |
|-----------------------------------|-------------|-------------|-------------|-------------|
| BAP | 0.18 U | 0.18 U | 0.19 U | 0.18 U |
| Total PCBs | 0.0516 U | 0.0514 U | 0.0564 U | 0.0529 U |
| Arsenic | 2.6 U | 3.3 | 2.8 U | 2.7 U |
| Cadmium | 0.26 U | 0.27 U | 0.28 U | 0.27 U |
| Chromium | 5.5 | 5.1 | 4.9 | 2.4 |
| Lead | 4.9 | 8.8 | 18 | 3.8 |
| Nickel | 4.8 | 4.0 | 2.5 | 1.7 |

| WSB-14 12/17/09 Constituent | 1.00 - 3.00 | 4.00 - 5.00 | 7.00 - 8.00 |
|-----------------------------------|-------------|-------------|-------------|
| BAP | 0.18 U | 0.19 U | 0.18 U |
| Total PCBs | 0.0517 U | 0.0577 U | 0.0522 U |
| Arsenic | 3.1 | 2.8 U | 3.0 |
| Cadmium | 0.26 U | 0.28 U | 0.27 U |
| Chromium | 5.4 | 6.6 | 7.9 |
| Lead | 5.8 | 5.2 | 1.7 |
| Nickel | 3.8 | 2.3 | 5.7 |

| WSB-15 12/17/09 Constituent | 0.50 - 1.00 | 1.00 - 3.00 | 4.00 - 5.00 | 7.00 - 8.00 |
|-----------------------------------|-------------|-------------|-------------|-------------|
| BAP | 0.18 U | 0.17 U | 0.20 U | 0.20 U |
| Total PCBs | 0.053 U | 0.0509 U | 0.0586 U | 0.0571 U |
| Arsenic | 2.8 | 3.3 | 3.0 U | 3.7 |
| Cadmium | 0.26 U | 0.26 U | 0.30 U | 0.29 U |
| Chromium | 7.5 | 5.1 | 4.3 | 30 |
| Lead | 11 | 1.8 | 1.4 | 2.4 |
| Nickel | 2.9 | 2.3 | 2.2 | 13 |

| WSB-12 12/17/09 Constituent | 0.50 - 1.00 | 1.00 - 3.00 | 4.00 - 5.00 | 7.00 - 8.00 |
|-----------------------------------|-------------|-------------|-------------|-------------|
| BAP | 0.19 U | 0.18 U | 0.19 U | 0.18 U |
| Total PCBs | 0.0523 U | 0.0519 U | 0.0566 U | 0.0526 U |
| Arsenic | 2.6 U | 3.3 | 2.8 U | 2.8 U |
| Cadmium | 0.26 U | 0.26 U | 0.28 U | 0.28 U |
| Chromium | 2.8 | 5.2 | 6.0 | 2.3 |
| Lead | 4.7 | 5.6 | 10 | 4.2 |
| Nickel | 2.2 | 4.1 | 3.1 | 2.1 |

| WSB-11 12/17/09 Constituent | 0.50 - 1.00 | 1.00 - 3.00 | DUP 1.00 - 3.00 | 4.00 - 5.00 | 7.00 - 8.00 |
|-----------------------------------|-------------|-------------|--------------------|-------------|-------------|
| BAP | 0.19 U | 0.18 U | 0.18 U | 0.19 U | 0.18 U |
| Total PCBs | 0.0547 U | 0.0526 U | 0.0513 U | 0.0574 U | 0.0535 U |
| Arsenic | 3.2 | 2.9 | 2.6 U | 2.8 U | 2.8 U |
| Cadmium | 0.27 U | 0.27 U | 0.26 U | 0.28 U | 0.28 U |
| Chromium | 4.9 | 5.1 | 4.0 | 2.3 | 2.7 |
| Lead | 13 | 13 | 10 | 3.3 | 5.4 |
| Nickel | 3.5 | 3.6 | 3.3 | 1.7 | 2.4 |

| WSB-16 12/18/09 Constituent | 0.50 - 1.00 | 1.00 - 3.00 | 4.00 - 5.00 | 7.00 - 8.00 |
|-----------------------------------|-------------|-------------|-------------|-------------|
| BAP | 2.2 | 0.39 U | 0.39 U | 0.19 U |
| Total PCBs | 0.864 | 4.69 | 0.066 | 0.0558 U |
| Arsenic | 5.9 | 2.8 U | 2.9 U | 3.2 |
| Cadmium | 0.27 U | 0.28 U | 0.29 U | 0.27 U |
| Chromium | 37 | 10 | 8.4 | 5.3 |
| Lead | 37 | 8.2 | 4.2 | 3.0 |
| Nickel | 16 | 7.6 | 4.2 | 4.3 |

| WSB-17 12/17/09 Constituent | 0.50 - 1.00 | 1.00 - 3.00 | 4.00 - 5.00 | 7.00 - 8.00 |
|-----------------------------------|-------------|-------------|-------------|-------------|
| BAP | 0.18 U | 0.38 U | 0.19 U | 0.19 U |
| Total PCBs | 0.0539 U | 0.0348 | 0.0509 U | 0.0535 U |
| Arsenic | 3.1 | 2.9 U | 6.2 | 2.8 U |
| Cadmium | 0.26 U | 0.29 U | 0.28 U | 0.28 U |
| Chromium | 67 | 14 | 7.4 | 4.7 |
| Lead | 5.2 | 29 | 3.3 | 1.8 |
| Nickel | 30 | 7.7 | 5.7 | 2.4 |

| WSB-18 12/17/09 Constituent | 0.50 - 1.00 | 1.00 - 3.00 | DUP 1.00 - 3.00 | 4.00 - 5.00 | 7.00 - 8.00 |
|-----------------------------------|-------------|-------------|--------------------|-------------|-------------|
| BAP | 0.36 U | 0.20 U | 0.20 U | 0.18 U | 0.18 U |
| Total PCBs | 0.0544 U | 0.056 U | 0.136 | 0.0538 U | 0.0538 U |
| Arsenic | 2.7 | 3.4 | 3.3 | 2.7 U | 2.7 U |
| Cadmium | 0.27 U | 0.30 U | 0.29 U | 0.27 U | 0.27 U |
| Chromium | 50 | 10 | 8.3 | 3.2 | 8.9 |
| Lead | 8.5 | 26 | 24 | 2.0 | 3.1 |
| Nickel | 22 | 5.6 | 4.7 | 2.7 | 6.6 |

| WSB-19 12/18/09 Constituent | 0.50 - 1.00 | 1.00 - 3.00 | 4.00 - 5.00 | 7.00 - 8.00 |
|-----------------------------------|-------------|-------------|-------------|-------------|
| BAP | 0.88 | 0.20 U | 0.20 U | 0.20 U |
| Total PCBs | 1.37 | 0.136 | 0.06 U | 0.0587 U |
| Arsenic | 4.8 | 4.9 | 4.4 | 5.7 |
| Cadmium | 0.30 U | 0.29 U | 0.30 U | 0.29 U |
| Chromium | 15 | 11 | 8.9 | 14 |
| Lead | 120 | 27 | 8.6 | 7.1 |
| Nickel | 6.1 | 5.3 | 4.4 | 7.3 |

| Summary of Regulatory Comparison Criteria for Soil (mg/kg) | | | | | | |
|------------------------------------------------------------|----------|----------|----------|----------|--------|------|
| Contaminant | S-1/GW-2 | S-1/GW-3 | S-2/GW-2 | S-2/GW-3 | RC S-1 | TSCA |
| Names | | | | | | |
| Benzo(a)pyrene (BAP) | 2 | 2 | 4 | 4 | 2 | N/A |
| Total PCBs | 2 | 2 | 2 | 2 | 2 | 1 |
| Arsenic | 20 | 20 | 20 | 20 | 20 | N/A |
| Cadmium | 2 | 2 | 30 | 30 | 2 | N/A |
| Chromium | 30 | 30 | 200 | 200 | 30 | N/A |
| Lead | 300 | 300 | 300 | 300 | 300 | N/A |
| Nickel | 20 | 20 | 700 | 700 | 20 | N/A |

NOTES:
 MG/KG - MILLIGRAMS PER KILOGRAM (DRY WEIGHT).
 DUP - FIELD DUPLICATE SAMPLE.
 N/A - NOT APPLICABLE.
 PCBs - POLYCHLORINATED BIPHENYLS.
 RCS - REPORTABLE CONCENTRATIONS.
 TSCA - TOXIC SUBSTANCES CONTROL ACT.
 U - COMPOUND WAS NOT DETECTED AT SPECIFIED QUANTITATION LIMIT.

SAMPLE LOCATION SAMPLE DATE

| WSB-14 12/17/09 Constituent | 1.00 - 3.00 | 4.00 - 5.00 | 7.00 - 8.00 | 8.00 |
|-----------------------------------|-------------|-------------|-------------|--------|
| BAP | 0.18 U | 0.19 U | 0.18 U | 0.18 U |
| Total PCBs | 0.0517 U | 0.0577 U | 0.0522 U | |
| Arsenic | 3.1 | 2.8 U | 3.0 | |
| Cadmium | 0.26 U | 0.28 U | 0.27 U | |
| Chromium | 5.4 | 6.6 | 7.9 | |
| Lead | 5.8 | 5.2 | 1.7 | |
| Nickel | 3.8 | 2.3 | 5.7 | |

CONTAMINANT NAME (ABBREVIATION) SAMPLE DEPTH RANGE IN FEET

VALUES SHOWN IN PEACH BACKGROUND EXCEED ONE OR MORE OF THE LISTED MASS DEP METHOD 1 STANDARDS.

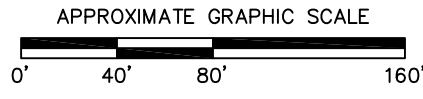
VALUES SHOWN IN YELLOW BACKGROUND EXCEED TSCA BUT ARE LESS THAN THE LISTED MASS DEP METHOD 1 STANDARDS.

SOIL BORING AND/OR SOIL SAMPLE LOCATION

SEDIMENT SAMPLE

SAMPLE LOCATION WITH EXCEEDANCE(S)

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.



**KEITH MIDDLE SCHOOL
WETLAND
NEW BEDFORD, MASSACHUSETTS
ANALYTICAL RESULTS SUMMARY MAP
DECEMBER WSB SAMPLES**

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

FIGURE 1

DRAWN BY: PZ DATE: JANUARY 2010
 CHECKED BY: JS



Wannalancit Mills
 650 Suffolk Street
 Lowell MA
 Telephone: 978-970-5600
 Fax: 978-453-1995

BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER New Bedford / 115058 SCREEN TYPE/SLOT NA
 BORING/WELL NUMBER WSB-11 FILTER PACK TYPE NA
 TRC GEOLOGIST H. Rizza SEAL TYPE NA
 DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows DEPTH TO WATER (Approximate Feet) 4
 DATE DRILLED 12/17/2009 TOTAL DEPTH (Feet) 10
 LOCATION KMS - Adjacent to culvert along Durfee St. GROUND ELEVATION (Feet) 87.51
 SAMPLING METHOD 48" Macrocore REFERENCE ELEVATION (Feet) NA
 DRILLING METHOD Direct Push - 5400 Truck Rig
 NOTES Sampled for MCP metals, PAHs & PCBs. (Hold WSB-11 (9-10))

| DEPTH (ft. BGL) | BLOW COUNTS | PEN/REC (INCHES) | CORE # | TRC ID | GRAPHIC LOG | LITHOLOGIC DESCRIPTION | Field Testing (ppm) | SAMPLE ID/TIME | WELL DIAGRAM |
|-----------------|-------------|------------------|--------|--------|-------------|------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------|------------------------------|
| 0 | | 48/34" | | S-1 | | 0-1" TOPSOIL 1-24" Tan fine to medium SAND, little gravel. | 0.0 | WSB-11 (0.5-1) 1115 | No Monitoring Well Installed |
| 1 | | | | | | 24-34" Tan to light-tan medium SAND, trace gravel, moist. | | WSB-11 (1-3) 1125 WSB-111 (1-3) 1220 DUP | |
| 2 | | | | | | 0-30" Tan medium to coarse SAND, trace gravel, moist. | 0.0 | WSB-11 (4-5) 1125 Plus MS/DUF | |
| 3 | | 48/30" | | S-2 | | 0-9" Dark-brown medium to coarse SAND, wet. | 0.0 | WSB-11 (7-8) 1130 | |
| 4 | | | | | | 9-11" Tan to brown fine SAND, some silt, wet. 11-21" Gray medium to coarse SAND, wet. | | WSB-11 (9-10) 1140 | |
| 5 | | | | | | End of Boring @ 10 feet | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | 24/21" | | S-3 | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |



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BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER New Bedford / 115058 SCREEN TYPE/SLOT NA
 BORING/WELL NUMBER WSB-12 FILTER PACK TYPE NA
 TRC GEOLOGIST H. Rizza SEAL TYPE NA
 DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows DEPTH TO WATER (Approximate Feet) 4
 DATE DRILLED 12/17/2009 TOTAL DEPTH (Feet) 10
 LOCATION KMS - 50' East of WSB-11 GROUND ELEVATION (Feet) 87.52
 SAMPLING METHOD 48" Macrocore REFERENCE ELEVATION (Feet) NA
 DRILLING METHOD Direct Push - 5400 Truck Rig
 NOTES Sampled for MCP metals, PAHs & PCBs. (Hold WSB-12 (9-10))

| DEPTH (ft. BGL) | BLOW COUNTS | PEN/REC (INCHES) | CORE # | TRC ID | GRAPHIC LOG | LITHOLOGIC DESCRIPTION | Field Testing (ppm) | SAMPLE ID/ TIME | WELL DIAGRAM |
|-----------------|-------------|------------------|--------|--------|-------------|---------------------------------------------------------------------------------------------------|---------------------|------------------------|------------------------------|
| 1 | | 48/30" | | S-1 | | 0-1" Brown TOPSOIL, grass at surface. 1-20" Tan medium SAND, little gravel, trace coal, moist. | 0.0 | WSB-12 (0.5-1) 1045 | No Monitoring Well Installed |
| 2 | | | | | | 20-30" Tan to gray fine to medium SAND, trace cobbles (rock), moist. | | WSB-12 (1-3) 1050 | |
| 3 | | | | | | 0-38" Tan to gray fine to medium SAND, trace gravel, wet. | 0.0 | WSB-12 (4-5) 1055 | |
| 4 | | 48/38" | | S-2 | | | | WSB-12 (7-8) 1100 | |
| 5 | | | | | | | | WSB-12 (9-10) 1105 | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | 24/24" | | S-3 | | 0-24" Gray to tan fine to medium SAND, wet. | 0.0 | | |
| 9 | | | | | | | | | |
| 10 | | | | | | End of Boring @ 10 feet | | | |



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BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER New Bedford / 115058 SCREEN TYPE/SLOT NA
 BORING/WELL NUMBER WSB-13 FILTER PACK TYPE NA
 TRC GEOLOGIST H. Rizza SEAL TYPE NA
 DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows DEPTH TO WATER (Approximate Feet) 5
 DATE DRILLED 12/17/2009 TOTAL DEPTH (Feet) 10
 LOCATION KMS - 50' East of WSB-12 GROUND ELEVATION (Feet) 87.94
 SAMPLING METHOD 48" Macrocore REFERENCE ELEVATION (Feet) NA
 DRILLING METHOD Direct Push - 5400 Truck Rig
 NOTES Sampled for MCP metals, PAHs & PCBs. (Hold WSB-13 (9-10))

| DEPTH (ft. BGL) | BLOW COUNTS | PEN/REC (INCHES) | CORE # | TRC ID | GRAPHIC LOG | LITHOLOGIC DESCRIPTION | Field Testing (ppm) | SAMPLE ID/ TIME | WELL DIAGRAM |
|-----------------|-------------|------------------|--------|--------|-------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------|------------------------------|
| 1 | | 48/36" | | S-1 | | 0-3" TOPSOIL, grass at surface. 3-9" Brown to tan fine to medium SAND, rock at 9-feet. 9-17" Tan medium to coarse SAND, moist. | 0.0 | WSB-13 (0.5-1) 1010 | No Monitoring Well Installed |
| 2 | | | | | | 17-19" Crushed ROCK. 19-36" Tan to gray fine to medium SAND, little fine gravel. | | WSB-13 (1-3) 1015 | |
| 4 | | 48/48" | | S-2 | | 0-19" Tan fine to medium SAND. | 0.0 | | |
| 6 | | | | | | 19-48" Gray medium SAND, some fine gravel, moist. | | WSB-13 (5-6) 1020 | |
| 8 | | 24/20" | | S-3 | | 0-20" Tan to brown fine to medium SAND, little fine gravel, | 0.0 | WSB-13 (7-8) 1025 | |
| 10 | | | | | | End of Boring @ 10 feet | | WSB-13 (9-10) 1030 | |



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BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER New Bedford / 115058 SCREEN TYPE/SLOT NA
 BORING/WELL NUMBER WSB-14 FILTER PACK TYPE NA
 TRC GEOLOGIST H. Rizza SEAL TYPE NA
 DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows DEPTH TO WATER (Approximate Feet) 5
 DATE DRILLED 12/17/2009 TOTAL DEPTH (Feet) 8
 LOCATION KMS - 50' East of WSB-13 GROUND ELEVATION (Feet) 88.04
 SAMPLING METHOD 48" Macrocore REFERENCE ELEVATION (Feet) NA
 DRILLING METHOD Direct Push - 5400 Truck Rig
 NOTES Sampled for MCP metals, PAHs & PCBs.

| DEPTH (ft. BGL) | BLOW COUNTS | PEN/REC (INCHES) | CORE # | TRC ID | GRAPHIC LOG | LITHOLOGIC DESCRIPTION | Field Testing (ppm) | SAMPLE ID/ TIME | WELL DIAGRAM |
|-----------------|-------------|------------------|--------|--------|-------------|--------------------------------------------------------------------------------------------------------------------|---------------------|-------------------|------------------------------|
| 1 | | 48/30 | | S-1 | | 0-1" ASPHALT and ROCKS at surface. 1-7" Tan medium SAND, some fine gravel. | 0.0 | | No Monitoring Well Installed |
| 2 | | | | | | 7-12" Tan fine SAND, some fine gravel, rock in middle. | | WSB-14 (1-3) 0945 | |
| 3 | | | | | | 12-30" Reddish-tan medium SAND, some fine gravel, | | | |
| 4 | | 48/48" | | S-2 | | 0-30" Tan fine SAND, some coarse sand, moist to wet. | 0.0 | WSB-14 (4-5) 0950 | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | 30-36" Tan to gray fine SAND, trace fine gravel, wet. | | | |
| 8 | | | | | | 36-48" Gray medium to coarse SAND, trace gravel. | | WSB-14 (7-8) 0955 | |
| | | | | | | End of Boring @ 8 feet (Note: material was very tight at 8-feet; had to stop to avoid jamming core barrel.) | | | |



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BORINGWELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER New Bedford / 115058 SCREEN TYPE/SLOT NA
 BORING/WELL NUMBER WSB-15 FILTER PACK TYPE NA
 TRC GEOLOGIST H. Rizza SEAL TYPE NA
 DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows DEPTH TO WATER (Approximate Feet) 5
 DATE DRILLED 12/17/2009 TOTAL DEPTH (Feet) 10
 LOCATION KMS - 50' East of WSB-14 GROUND ELEVATION (Feet) 88.34
 SAMPLING METHOD 48" Macrocore REFERENCE ELEVATION (Feet) NA
 DRILLING METHOD Direct Push - 5400 Truck Rig
 NOTES Sampled for MCP metals, PAHs & PCBs. (Hold WSB-15 (9-10))

| DEPTH (ft. BGL) | BLOW COUNTS | PEN/REC (INCHES) | CORE # | TRC ID | GRAPHIC LOG | LITHOLOGIC DESCRIPTION | Field Testing (ppm) | SAMPLE ID/ TIME | WELL DIAGRAM |
|-----------------|-------------|------------------|--------|--------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|------------------------------|
| 1 | | 48/33" | | S-1 | | 0-5" Brown medium SAND and fine GRAVEL, some roots, grass at surface. 5-7" Crushed ROCK. 7-33" Tan fine to medium SAND, trace gravel. | 0.0 | WSB-15 (0.5-1) 0900 | No Monitoring Well Installed |
| 2 | | | | | | | | WSB-15 (1-3) 0905 | |
| 3 | | | | | | | | | |
| 4 | | 48/48" | | S-2 | | 0-2" Tan fine SAND, trace fine gravel. 2-36" Tan fine to medium SAND, moist, no odor, no staining. | 0.0 | WSB-15 (4-5) 0915 | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | 24/24" | | S-3 | | 36-48" Brown medium SAND, trace gravel, moist, no odor, no staining. 0-12" Tan to brown fine to medium SAND. 12-18" Brown medium SAND. 18-24" Brown to gray coarse SAND, some gravel, weathered bedrock in tip, wet. End of Boring @ 10 feet | 0.0 | WSB-15 (7-8) 0920 | |
| 9 | | | | | | | | WSB-15 (9-10) 0930 | |
| 10 | | | | | | | | | |



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BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER New Bedford / 115058 SCREEN TYPE/SLOT Slotted
 BORING/WELL NUMBER WSB-16/MW-9 FILTER PACK TYPE Sand
 TRC GEOLOGIST H. Rizza SEAL TYPE Bentonite
 DRILLING CONTRACTOR/FOREMAN New England Geotech/Hayes Rembijas DEPTH TO WATER (Approximate Feet) 3
 DATE DRILLED 12/18/2009 TOTAL DEPTH (Feet) 12
 LOCATION KMS - Intersection of Summit and Hapwell Street GROUND ELEVATION (Feet) 87.88
 SAMPLING METHOD 48" Macrocore REFERENCE ELEVATION (Feet) NA
 DRILLING METHOD Direct Push - 6600 Truck Rig
 NOTES Sampled for MCP metals, PAHs & PCBs. (Hold WSB-16 (9-10))

| DEPTH (ft. BGL) | BLOW COUNTS | PEN/REC (INCHES) | CORE # | TRC ID | GRAPHIC LOG | LITHOLOGIC DESCRIPTION | Field Testing (ppm) | SAMPLE ID/ TIME | WELL DIAGRAM |
|-----------------|-------------|------------------|--------|--------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------|
| 0 | | | 60/36" | S-1 | | 0-2" Tan to brown medium to coarse SAND, leaves at surface. 2-3" Gray fine to medium SAND, little gravel. 3-5" Brown fine to medium SAND, some gravel, trace pieces of coal and slag. 5-6" ASPHALT. 6-7" Crushed ROCK. 7-14" Brown to tan fine SAND, little gravel, moist to wet. 14-16" Crushed ROCK. 16-36" Gray fine SAND and SILT, some gravel, moist. | 0.0 | WSB-16 (0.5-1) 0915 | <p>Bentonite Seal 2-inch PVC riser Sand Pack 10-foot, 10-slot PVC Screen</p> |
| 1 | | | | | | | | WSB-16 (1-3) 0920 | |
| 2 | | | | | | | | WSB-16 (4-5) 0935 | |
| 3 | | | | | | | | WSB-16 (7-8) 0940 | |
| 4 | | | | | | | | WSB-16 (9-10) 0945 | |
| 5 | | | 60/50" | S-2 | | 0-50" Tan to gray fine to medium SAND, some gravel, fining toward bottom. | 0.0 | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | End of Boring @ 10 feet | | | |
| 11 | | | | | | (Note: Drove casing to 12 feet to set well.) | | | |
| 12 | | | | | | | | | |



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BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER New Bedford / 115058 SCREEN TYPE/SLOT NA
 BORING/WELL NUMBER WSB-17 FILTER PACK TYPE NA
 TRC GEOLOGIST H. Rizza SEAL TYPE NA
 DRILLING CONTRACTOR/FOREMAN New England Geotech/Hayes Rembijas DEPTH TO WATER (Approximate Feet) 3.5
 DATE DRILLED 12/18/2009 TOTAL DEPTH (Feet) 10
 LOCATION KMS - 50' North of WSB-16 GROUND ELEVATION (Feet) 89.08
 SAMPLING METHOD 48" Macrocore REFERENCE ELEVATION (Feet) NA
 DRILLING METHOD Direct Push - 6600 Truck Rig
 NOTES Sampled for MCP metals, PAHs & PCBs. (Hold WSB-17 (9-10)) (0.5-1 and 1-3 samples collected 12/17/2009 on first attempt)

| DEPTH (ft. BGL) | BLOW COUNTS | PEN/REC (INCHES) | CORE # | TRC ID | GRAPHIC LOG | LITHOLOGIC DESCRIPTION | Field Testing (ppm) | SAMPLE ID/ TIME | WELL DIAGRAM |
|-----------------|-------------|------------------|--------|--------|-------------|-------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|------------------------------|
| 1 | | 60/48" | | S-1 | | 0-2" TOPSOIL. | 0.0 | WSB-17 (0.5-1) 1315 | No Monitoring Well Installed |
| 2 | | | | | | 2-12" Brown to gray fine to medium SAND, some gravel. | | WSB-17 (1-3) 1320 | |
| 3 | | | | | | 12-24" Brown fine SAND, some silt, trace fine gravel, moist to wet. | | | |
| 4 | | | | | | 24-36" Gray crushed GRANITE. | | | |
| 5 | | | | | | 36-48" Tan to orange fine SAND and GRAVEL. | | WSB-17 (4-5) 1130 | |
| 6 | | 60/60" | | S-2 | | 0-10" Brown fine SAND, saturated. | 0.0 | | |
| 7 | | | | | | 10-22" Brown medium to coarse SAND and GRAVEL. | | | |
| 8 | | | | | | 22-26" Crushed gray ROCK. | | WSB-17 (7-8) 1135 | |
| 9 | | | | | | 26-46" Brown medium to coarse SAND, some fine sand and gravel. | | WSB-17 (9-10) 1140 | |
| 10 | | | | | | 46-60" Tan to brown fine to coarse SAND. | | | |
| | | | | | | End of Boring @ 10 feet | | | |
| | | | | | | (Note: Hit refusal at this location at 4-feet on 12/17/2009. Attempted again on 12/18/2009 with a different drill rig.) | | | |



Wannalancit Mills
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BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER New Bedford / 115058 SCREEN TYPE/SLOT NA
 BORING/WELL NUMBER WSB-18 FILTER PACK TYPE NA
 TRC GEOLOGIST H. Rizza SEAL TYPE NA
 DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows DEPTH TO WATER (Approximate Feet) 4
 DATE DRILLED 12/17/2009 TOTAL DEPTH (Feet) 8
 LOCATION KMS - 50' North of WSB-17 GROUND ELEVATION (Feet) 90.14
 SAMPLING METHOD 48" Macrocore REFERENCE ELEVATION (Feet) NA
 DRILLING METHOD Direct Push - 5400 Truck Rig
 NOTES Sampled for MCP metals, PAHs & PCBs.

| DEPTH (ft. BGL) | BLOW COUNTS | PEN/REC (INCHES) | CORE # | TRC ID | GRAPHIC LOG | LITHOLOGIC DESCRIPTION | Field Testing (ppm) | SAMPLE ID/ TIME | WELL DIAGRAM |
|-----------------|-------------|------------------|--------|--------|-------------|-----------------------------------------------------------------------------|---------------------|-------------------------------------|------------------------------|
| 1 | | 48/29" | | S-1 | | 0-2" Brown TOPSOIL with roots and leaves. | 0.0 | WSB-18 (0.5-1) 1350 | No Monitoring Well Installed |
| 2 | | | | | | 2-8" Brown to gray fine SAND, some coarse sand and gravel. | | | |
| 3 | | | | | | 8-18" Gray to brown fine SAND, little gravel. | | | |
| 4 | | | | | | 18-29" Reddish-tan fine SAND, some gravel, crushed rock at bottom. | | | |
| 5 | | 48/35" | | S-2 | | 0-28" Tan medium to coarse SAND, little gravel, fining towards bottom, wet. | 0.0 | WSB-18 (4-5) 1415 Plus MS/DUP | |
| 6 | | | | | | | | | |
| 7 | | | | | | 28-35" Tan to gray fine to medium SAND, some crushed rock. | | WSB-18 (7-8) 1420 | |
| 8 | | | | | | End of Boring @ 8 feet (refusal) | | | |



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BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER New Bedford / 115058 SCREEN TYPE/SLOT Slotted
 BORING/WELL NUMBER WSB-19/MW-10 FILTER PACK TYPE Sand
 TRC GEOLOGIST H. Rizza SEAL TYPE Bentonite
 DRILLING CONTRACTOR/FOREMAN New England Geotech/Hayes Rembijas DEPTH TO WATER (Approximate Feet) 3.5
 DATE DRILLED 12/18/2009 TOTAL DEPTH (Feet) 10
 LOCATION KMS - 50' North of WSB-18 GROUND ELEVATION (Feet) 91.75
 SAMPLING METHOD 48" Macrocore REFERENCE ELEVATION (Feet) NA
 DRILLING METHOD Direct Push - 6600 Truck Rig
 NOTES Sampled for MCP metals, PAHs & PCBs. (Hold WSB-19 (9-10))

| DEPTH (ft. BGL) | BLOW COUNTS | PEN/REC (INCHES) | CORE # | TRC ID | GRAPHIC LOG | LITHOLOGIC DESCRIPTION | Field Testing (ppm) | SAMPLE ID/ TIME | WELL DIAGRAM |
|-----------------|-------------|------------------|--------|--------|-------------|-----------------------------------------------------------------------------------------------------------------|---------------------|------------------------|---------------------------------------------------------------------------------------------|
| 1 | | 60/31" | | S-1 | | 0-2" Brown TOPSOIL, some grass and leaves at surface. 2-10" Dark-brown fine SAND, some fill (coal and slag). | 0.0 | WSB-19 (0.5-1) 1040 | <p>Bentonite Seal 2-inch PVC riser</p> <p>Sand Pack 10-foot, 10-slot PVC Screen</p> |
| 2 | | | | | | 10-31" Tan to brown fine SAND, some medium SAND, little gravel, moist to wet. | | WSB-19 (1-3) 1045 | |
| 3 | | | | | | | | | |
| 4 | | 60/35" | | S-2 | | 0-10" Brown tan fine SAND and SILT. | 0.0 | WSB-19 (4-5) 1050 | |
| 5 | | | | | | | | | |
| 6 | | | | | | 10-35" Tan to gray fine to medium SAND, some silt and gravel, wet. | | WSB-19 (7-8) 1055 | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | End of Boring @ 10 feet (Note: Drove casing to 12-feet to set well.) | | WSB-19 (9-10) 1100 | |

Appendix D

MassDEP Work Plan

* MassDEP will provide their work plan as soon as it is available. It will be incorporated to this SAP through the SAP revision process by using the SAP Revision Form (SAP Table 1).