ADDENDUM 3 TO THE
2005 CONSOLIDATED
REMEDIAL ACTION WORKPLAN

HATCO SITE
FORDS, NEW JERSEY

August 2009

Site Location:

Hatco Corporation
King George Post Road
Fords, New Jersey 08863

Prepared by:

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CERTIFICATION:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this Remedial Action Workplan Addendum and all attached documents, and based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information, and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Typed/Printed Name: **Sally Jones**

Title: **Vice President, Weston Solutions, Inc.**

Signature: Sally Jones

Date:

Sworn to and Subscribed Before Me on this 24th **day of** August **20**09.

Diane Henderson
Notary

DIANE HENDERSON
NOTARY PUBLIC OF NEW JERSEY
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Commission Expires 11/5/2012

TABLE OF CONTENTS

Section **Title** **Page**

1.0 INTRODUCTION 1-1

1.1 SITE BACKGROUND 1-2

2.0 RESPONSE TO OUTSTANDING ISSUES IN AUGUST 25, 2006 ADDENDUM TO THE AUGUST 18, 2005 CONSOLIDATED RAWP 2-1

2.1 GENERAL COMMENT 2 2-1
2.2 SPECIFIC COMMENT 2 2-1
2.3 SPECIFIC COMMENT 6 2-1

3.0 RESPONSE TO OUTSTANDING ISSUES IN SEPTEMBER 25, 2006 REVISED ADDENDUM TO THE AUGUST 18, 2005 CONSOLIDATED RAWP 3-1

3.1 SPECIFIC COMMENT 3 3-1

4.0 RESPONSE TO OUTSTANDING ISSUES IN AUGUST 8, 2007 RESPONSE TO THE NJDEP JUNE 7, 2007 NOTICE OF DEFICIENCY LETTER 4-1

4.1 NJDEP CORRECTIVE ACTION NO. 1 4-1
4.2 NJDEP CORRECTIVE ACTION NO. 2 4-1
4.3 NJDEP CORRECTIVE ACTION NO. 3 4-1
4.4 NJDEP CORRECTIVE ACTION NO. 4 4-1
4.5 NJDEP CORRECTIVE ACTION NO. 6 4-1
4.6 NJDEP CORRECTIVE ACTION NO. 7 4-1
4.7 NJDEP CORRECTIVE ACTION NO. 8 4-1
4.8 NJDEP CORRECTIVE ACTION NO. 9 4-2

5.0 SUMMARY OF 2007 – 2008 REMEDIAL ACTIVITIES 5-1

5.1 2007 VERIFICATION SAMPLING INVESTIGATION 5-1
5.1.1 Areas with PCBs Greater than 500 mg/kg 5-1
5.1.2 Areas with PCBs Less than 500 mg/kg 5-1
5.1.3 Areas with Non-PCB Contamination 5-2
5.1.4 LNAPL Plume Area 5-2
5.1.5 Off-Site Soils and Sediments 5-2
5.1.6 Extent of Engineered Cap 5-4
5.2 EXCAVATION PILOT STUDY 5-5
5.3 LNAPL PILOT STUDY 5-5
5.4 LAGOON REMEDIATION 5-5

6.0 SITE CONCEPTUAL MODEL REVISION 6-1

7.0 PROPOSED REMEDIAL ACTIONS FOR ON- AND OFF-SITE CONTAMINATION 7-1

7.1 REMEDIAL APPROACH SUMMARY 7-1
7.2 APPLICABLE CLEANUP STANDARDS 7-5
7.2.1 Remediation of PCBs 7-5
7.2.2 Remediation of Other Chemical Parameters 7-6

TABLE OF CONTENTS
(Continued)

Section	Title	Page
7.3	REMEDIAL APPROACH FOR LNAPL AREA	7-8
7.3.1	*Excavation and Off-site Disposal of LNAPL-Containing Soils*	*7-8*
7.4	REMEDIAL APPROACH FOR ON-SITE NON-LNAPL CONTAMINATION	7-8
7.4.1	*Areas with PCBs Greater than 500 mg/kg*	*7-9*
7.4.2	*Areas with PCBs Less than 500 mg/kg*	*7-9*
7.4.3	*Areas with Non-PCB Contamination*	*7-9*
7.4.4	*Revision to Cap Extent*	*7-9*
7.5	REMEDIAL APPROACH FOR OFF-SITE CONTAMINATION	7-10
7.5.1	*Channels A, B, C and Pond*	*7-10*
7.5.2	*Channel D*	*7-10*
7.6	REMEDIAL COSTS	7-10
8.0	**ADDITIONAL INVESTIGATION**	**8-1**
8.1	OFF-SITE POND INLET	8-1
8.2	OFF-SITE POND OUTLET CHANNEL	8-1
8.3	OFF-SITE SOIL BERM AND NEARBY FLOODPLAIN	8-1

LIST OF FIGURES

Figure	Title
1	Hatco Site Key Map Depicting Current Site Features
2	Soil For Re-Use
3	Results of Order of Magnitude Evaluation for Naphthalene
4	Data Defining the Horizontal Limits of LNAPL Area for Off-Site Disposal
5	Overburden Sample Results
6	Data Defining the Horizontal and Vertical Extent of Excavation - PCBs > 500 mg/kg
7	Data defining Extent of Excavation - PCBs < 500 mg/kg – North
8	Data defining Extent of Excavation - PCBs < 500 mg/kg – Middle
9	Data defining Extent of Excavation - PCBs < 500 mg/kg – South
10	Data Defining the Horizontal and Vertical Extent of Excavation – Non-PCBs
11	Data Defining the Extent of the Engineered Cap – Northwest
12	Data Defining the Extent of the Engineered Cap – Northeast
13	Data Defining the Extent of the Engineered Cap – Southeast
14	Data Defining the Extent of the Engineered Cap – Southwest
15	Analytical Results and Extent of Excavation Areas for Off-Site Properties– Channels A, B, C and Off-Site Pond – North
16	Analytical Results and Extent of Excavation Areas for Off-Site Properties– Channels A, B, C and Off-Site Pond – South
17	Analytical Results and Extent of Excavation Areas for Off-Site Properties– Channel D
18	Proposed Sample Locations for Channels A, B, C and Off-Site Pond

LIST OF ATTACHMENTS

Attachment	Title
1	Post-Excavation Sampling Plan
2	Excavation and Dewatering Methodology
3	Quality Assurance Project Plan
4	List of Anticipated Permits for Hatco Remediation
5	Air Monitoring Program and Benzene OP
6	Soil Re-Use Proposal
7	Project Schedule
8	2007 Data Progress Report (Electronic)

1.0 INTRODUCTION

On August 18, 2005, Weston Solutions, Inc. (Weston®) submitted a Consolidated Remedial Action Work Plan and Implementation Schedule (Consolidated RAWP) to the U.S. Environmental Protection Agency (USEPA) and the New Jersey Department of Environmental Protection (NJDEP) for the Hatco Corporation site located on King George Post Road in Fords, New Jersey (the Site). The Consolidated RAWP was based on a Draft RAWP prepared by URS Corporation on behalf of Hatco and responded to comments provided by USEPA and NJDEP in conditional approval letters for the Draft RAWP dated March 30, 2005 and February 17, 2005, respectively.

Weston is providing this Addendum No. 3 to the Consolidated RAWP. In addition to previously submitted documents, memoranda and agreements with the USEPA and NJDEP, Addendum No. 3 has been prepared in accordance with the following:

- Weston's August 2006 Addendum to the Consolidated RAWP;
- Weston's September 2006 Revised Addendum to the Consolidated RAWP;
- Weston's August 2007 Response to the June 2007 NJDEP Notice of Deficiency Letter;
- Results of a November 2007 meeting held with participation from the NJDEP, representatives of Chemtura (current Hatco property owner), and Weston;
- Results of a January 2009 meeting held with participation from the NJDEP, USEPA, representatives of Chemtura, representatives of ACE American Insurance Company (ACE) (the project remediation insurer), and Weston;
- USEPA's May 28, 2009 letter response to Weston's October 2008 Light Non-Aqueous Phase Liquid (LNAPL) Pilot Study Progress Report, January 2009 LNAPL Modeling Progress Report, and January 29, 2009 regulatory meeting;
- NJDEP's June 15, 2009 request for RAWP Addendum No. 3; and
- NJDEP's July 29, 2009 email request for further information.

Section 1 of this Addendum No. 3 provides an overview of recent regulatory correspondence and provides a brief site history. Sections 2 through 4 have been organized to respond to the unresolved items from the above-referenced documents, and Section 5 presents a summary of Weston's site investigation and remedial activities conducted since submittal of the Consolidated RAWP. These investigative activities provide the basis for the remedial approach outlined in subsequent sections of this document, which includes changes/suggestions associated with our November 2007 and January 2009 meetings. Section 6 provides an expanded site conceptual model, which has been revised by Weston based upon the results of recent investigations. Section 7 summarizes proposed remedial actions for both on-site and off-site contamination, along with associated remediation costs. Finally, Section 8 identifies off-site areas for further investigation as requested by the NJDEP in correspondence dated July 29, 2009; this is resultant from a site walk with the NJDEP on July 24, 2009.

This Addendum No. 3 also serves as the Engineering and Monitoring Plan required by the USEPA Region 2 March 2005 approval letter.

Please note, as agreed upon by NJDEP and USEPA, that the detailed design for the remediation has not been finalized yet. Weston has prepared this document in response to NJDEP's request

with the understanding that final design and permitting will be completed following receipt of regulatory approval of this document. Upon USEPA's and NJDEP's request, Weston can provide the design details in a subsequent progress report.

As discussed previously at our November 2007 meeting, the required information associated with the final grading and capping phase of the site remediation will be provided under separate cover as Addendum No. 4 to the Consolidated RAWP. Addendum No. 4 will also include Weston's proposed Post-Closure Maintenance and Monitoring program. Weston anticipates submitting Addendum No. 4 after the completion of active on-site and off-site excavation activities.

1.1 Site Background

The former and current manufacturing operations at the Site are, have been, and continue to be, the production of organic chemicals. During various time periods these chemicals have included phthalic anhydride, plasticizers, benzyl chloride, sebacic acid, capryl alcohol, synthetic lubricants and by-products of these chemicals. In the 1960s, certain aspects of these operations involved the use of heat transfer fluids containing PCBs.

The results of the previous remedial investigation preliminarily defined the limits of soil and groundwater contamination at the Site. PCBs, phthalate esters and benzene are the primary soil contaminants. The highest levels of soil contamination were found in the "Main Production Area" and the former "Muck Area," which are shown in Figure 1 of the 2007 Data Progress Report. Low levels of Site-related constituents were identified on off-site properties west and southwest of the Site.

Through the work of previous Site consultants, groundwater contamination was detected primarily in the immediate vicinity of a plume of LNAPL found in the subsurface at the Site. With minor exceptions, groundwater contamination is not found beyond the Site boundaries. Groundwater contamination is generally limited to the upper water-bearing zone. Previous investigation of Crows Mill Creek, which is situated west and southwest of the Site, identified the presence of PCBs in the sediment, in addition to other constituents of potential concern with respect to ecological impacts along a defined reach of the creek. These areas have been identified as Channels A, B, C, D and an off-site pond (Morris pond).

The Consolidated RAWP and subsequent addenda, including this Addendum No. 3, address Site and off-site areas with documented exceedances of the applicable NJDEP criteria, with two minor exceptions. In the northeastern portion of the property, there is a man-made pond which formed due to rainwater entering an area that was excavated in 1988, but not fully backfilled, of contaminated soil from the former Phthalic Anhydride Residue Area. This area was identified in the Consolidated RAWP as Area of Environmental Concern (AEC) 7A, and is identified in Weston documentation as the northeast pond. Weston is currently conducting additional sampling in this area and evaluating specific remedial alternatives/methodologies for removal and/or capping of contaminated sediment. Specific implementation will be addressed in a separate submission to the state.

In addition to the northeast pond, Weston will perform additional sampling within the off-site Morris pond and surrounding areas as directed by the NJDEP in their July 2009 correspondence

with Weston. This sampling is discussed in Section 8 of this Addendum No. 3. The northeast pond, as well as the Morris pond and off-site areas for further sampling, are identified in Figure 1.

2.0 RESPONSE TO OUTSTANDING ISSUES IN AUGUST 25, 2006 ADDENDUM TO THE AUGUST 18, 2005 CONSOLIDATED RAWP

2.1 General Comment 2

Weston performed a wetland delineation in the off-site properties adjacent to the Site along with soil and sediment PCB delineation sampling. The extent of the wetlands is shown in Figure 1. Based on the results of the sampling, Weston determined whether portions of the media adjacent to the Hatco property are wetlands sediment or floodplain soil. Further, Weston determined the extent of the soil and sediment removal within the wetlands based on the appropriate Remedial Action Objective (RAO) for the specific matrix. At the direction of the NJDEP, as discussed in Section 8.0, additional sampling will be performed.

Section 7.1 of this Addendum contains additional discussion on remediation of the wetlands. Weston plans on remediating the wetland areas impacted by Hatco's historical contamination to unrestricted use and will backfill the excavated areas with certified-clean fill to existing grade. Excavated areas will be restored with vegetation in accordance with the current application for a sitewide General Permit No. 4.

2.2 Specific Comment 2

The final extent of the cap has been determined by the field sampling delineation of PCB contamination discussed above. Figure 1 of this Addendum identifies the proposed extent of the cap; associated sampling results were included in the 2007 Data Progress Report submitted to NJDEP and USEPA on December 17, 2008. Additional information regarding the extent of the proposed cap is provided in Section 7.3.

Note that the extent of the cap in the northeast corner of the site has been revised in the vicinity of the northeast pond, so that the pond is not filled. Weston is currently conducting additional investigation in this area to determine the extent of contamination within the pond sediments. Once additional investigation has been completed, an amendment to this Addendum will be submitted to the NJDEP. Weston is currently planning to install a cap atop the bottom sediments of the pond to preserve an on-site aquatic resource.

2.3 Specific Comment 6

The proposed Post-Excavation Sampling Plan is provided in Attachment 1.

3.0 RESPONSE TO OUTSTANDING ISSUES IN SEPTEMBER 25, 2006 REVISED ADDENDUM TO THE AUGUST 18, 2005 CONSOLIDATED RAWP

3.1 Specific Comment 3

As stated above, Weston plans to remediate the off-site properties to unrestricted use to the extent determined by the verification sampling results. Weston will obtain access agreements from the two remaining property owners to allow Weston to pursue the remediation and will submit copies of the access agreements to NJDEP.

4.0 RESPONSE TO OUTSTANDING ISSUES IN AUGUST 8, 2007 RESPONSE TO THE NJDEP JUNE 7, 2007 NOTICE OF DEFICIENCY LETTER

4.1 NJDEP Corrective Action No. 1

Specific information regarding the remediation methodology for the areas of the LNAPL plume to be remediated via excavation is provided in Attachment 2 and discussed in Section 7.2. Additional information regarding remediation of LNAPL through recovery is provided in Weston's 2009 Interim Remedial Measure (IRM) RAWP for LNAPL, provided under separate cover.

4.2 NJDEP Corrective Action No. 2

Weston's 2007 Data Progress Report (dated December 17, 2008) provided the requested relevant information on the current and historical LNAPL plume delineation. Additional details for the proposed LNAPL recovery area, which includes TF1/P12 and MW50S, are provided in the IRM RAWP.

4.3 NJDEP Corrective Action No. 3

A revised site map showing historic AOCs was provided in the 2007 Data Progress Report.

The estimated volume of each environmental media to be remediated based on Weston's verification sampling is provided in Section 7.0.

The proposed Post-Excavation Sampling Plan is provided as Attachment 1. The Quality Assurance Project Plan is provided as Attachment 3.

4.4 NJDEP Corrective Action No. 4

A list of required permits to support the remediation is provided in Attachment 4.

Specific procedures for excavation, dewatering, material handling, and backfilling are provided in Attachment 2.

4.5 NJDEP Corrective Action No. 6

The Air Monitoring and Odor Control Program, including Weston's Standard Operating Procedure for working with benzene, is provided in Attachment 5.

4.6 NJDEP Corrective Action No. 7

The Revised Soil Reuse Proposal is provided in Attachment 6.

4.7 NJDEP Corrective Action No. 8

The proposed Post-Excavation Sampling Plan is provided in Attachment 1.

4.8 NJDEP Corrective Action No. 9

A revised project schedule is provided in Attachment 7.

5.0 SUMMARY OF 2007 – 2008 REMEDIAL ACTIVITIES

5.1 2007 Verification Sampling Investigation

Weston performed a verification sampling program both on-site and off-site from May through October 2007. Sampling and observations were conducted through a variety of means, including the use of Geoprobe direct-push methods and hand sampling methods. Over 1,200 soil borings were advanced to collect over 2,000 soil samples for analysis. Results of the program were reported in Weston's 2007 Data Progress Report, and are summarized below. For ease of reference, an electronic copy of the 2007 Data Progress Report is included on compact disc as Attachment 8.

Weston completed a verification sampling program to define the current extent of on-site LNAPL contamination and to delineate the horizontal and vertical extent of contamination previously detected at the Site. As part of the investigation, Weston collected soil samples for PCB analysis to delineate the extent of PCBs with concentrations above 500 milligrams per kilogram (mg/kg) dry weight. It should be noted that "dry weight" analysis was used to evaluate PCB concentrations in soil samples in accordance with 40 CFR 761.3. This is further discussed in Section 7.2, and has been commented on extensively by the USEPA in email correspondence. Weston also inspected soil samples for the presence of visible LNAPL.

In addition, Weston collected soil samples for contaminants associated with the four "scrape" areas to delineate the extent of non-PCB soil contamination for excavation and off-site disposal, and evaluated the extent of lower-level PCB contamination to determine engineered cap extent. As part of 2007 investigation activities, Weston also performed a UVIF-Cone Penetration Test (CPT) to determine the depth of visible LNAPL in the area north of Hatco's ZAA building. A summary of the CPT findings is presented in Section 5.1.4.

In locations where horizontal and/or vertical delineation could not be completed during 2007 sampling activities (as indicated on figures), delineation will be completed during remediation of these areas. This is further discussed in Section 7.0.

5.1.1 Areas with PCBs Greater than 500 mg/kg

Weston collected on-site soil samples for PCB analysis to delineate the extent of PCBs with concentrations above 500 mg/kg. Weston determined that the majority of the soils with PCBs with concentrations above 500 mg/kg contained or were adjacent to the visible LNAPL layer.

However, a total of 18 areas were determined to have PCBs greater than 500 mg/kg and no visible LNAPL as part of the 2007 investigation. The figures and tables provided in the 2007 Data Progress Report summarize Weston's verification sampling program for soils containing PCBs greater than 500 mg/kg. These locations are depicted as green polygons on Figure 1 of this Addendum.

5.1.2 Areas with PCBs Less than 500 mg/kg

A total of 74 areas containing PCBs less than 500 mg/kg were also identified beyond the LNAPL plume area during the 2007 investigation; these locations are further discussed below. One

additional historic location was identified and evaluated for remediation after completion of the 2007 investigation. The figures and tables provided in the 2007 Data Progress Report summarize Weston's verification sampling program for soils containing PCBs less than 500 mg/kg. These areas are depicted as yellow polygons on Figure 1 of this Addendum.

5.1.3 Areas with Non-PCB Contamination

Weston collected soil samples for contaminants associated with the four "scrape" areas to delineate the extent of non-PCB soil contamination for excavation and off-site disposal. Additional soils with non-PCB contamination beyond the extent of the proposed cap were also identified and evaluated as part of this investigation. These 43 locations are depicted as purple polygons on Figure 1 of this Addendum.

5.1.4 LNAPL Plume Area

The extent of the LNAPL plume was assessed by performing a visual inspection for the presence of LNAPL in soil samples collected during the 2007 verification sampling program described above. Soil borings were advanced by either hand augering or direct-push (Geoprobe) methods to determine the extent of visible LNAPL across the Site. These data were used to define the horizontal and vertical extent of visible LNAPL as well as to define the overburden soils which did not contain LNAPL. The horizontal extent of the LNAPL plume is depicted on Figure 1. As part of the LNAPL area investigation, Weston also conducted a ultraviolet-induced fluorescence UVIF-Cone Penetration Test (CPT) to assess the depth of LNAPL impacts in the area north of Hatco's ZAA building. The CPT testing was performed to corroborate LNAPL extent findings as determined through the Geoprobe investigation.

During two rounds of testing in November 2007 and January 2008, a total of 27 UVIF CPTs and 4 non-UVIF CPTs were performed within the Site by ConeTec, Inc of West Berlin, NJ. The UVIF-CPTs and CPTs were performed in order to meet two specific project goals:

1) To better define the LNAPL plume currently being investigated at the site and test the validity of the UVIF-CPT as an investigation technique; and

2) To better define the vertical distribution of LNAPL along the proposed alignment of LNAPL collection trenches and groundwater diversion walls (further discussed as part of the remedial design in the IRM RAWP).

Additional CPTs were performed as part of the January 2008 study to investigate subsurface conditions at proposed locations for a groundwater recharge structure to be used in support of excavation dewatering. The results of the second CPT study helped to better refine the existing site conceptual model. This is further discussed in Section 6.0.

5.1.5 Off-Site Soils and Sediments

Weston collected off-site soil samples for PCB analysis to delineate the extent of PCB concentrations that potentially migrated off of the Site. The results of the soil samples were compared to NJDEP's unrestricted soil standard for PCBs of 0.49 mg/kg. Additional information regarding applicable cleanup standards is included in Section 7.2. Similarly, Weston collected

off-site sediment samples in the stream Channels A, B, C and D, and in the off-site pond, for PCB analysis to delineate the extent of PCB concentrations that potentially emanated from the Site. The results of the sediment samples were compared to the site-specific sediment standard for PCBs of 1.0 mg/kg.

A number of sediment sample locations were also analyzed for bis(2-ethylhexyl)phthalate (BEHP), total organic carbon and pH. These sample locations were chosen to evaluate representative conditions along each stream channel. Sample results were compared to NJDEP's Lowest Effects Level (LEL) and Severe Effects Level (SEL) sediment screening values for BEHP; no similar criterion exists for total organic carbon or pH.

Comparison of soil and sediment samples to these soil standards and screening values was used to define the horizontal and vertical extent of soil and sediment contamination for the off-site properties. While sediment screening values were utilized for comparison, Weston has determined that the majority of BEHP concentrations exceeding the SEL are co-located with PCBs greater than 1 mg/kg across the offsite properties. Further discussion of this is provided in Section 7.5. Figure 1 depicts the locations of off-site investigation areas in relation to the Hatco property.

5.1.5.1 Channels A, B, C and Pond

Soil and sediment samples were collected in Channels A, B, and C to delineate historic contamination and to determine the extent of any potential contamination within the stream channels. Additional sampling was performed within the off-site pond. The channel and off-site pond samples, were collected in accordance with Weston's November 16, 2008 Sampling and Analysis Plan.

Pond samples were collected from approximately 1 to 5 feet from the edge of the pond, depending upon the location, with the exception of CP-1, which was located just above the pond inlet. Each sediment sample was collected from below the water column. Samples were collected at depths of 0-0.5 feet and 1-1.5 feet below pond bottom at each location.

<u>PCB Contamination</u>

PCB contamination above the applicable soil or sediment cleanup goal was identified in a total of 16 locations throughout Channels A, B, C and the pond. Borings were advanced by hand to determine the extent of contamination at these 16 locations. Remediation of these areas is discussed in Section 7.5. The extent of PCB contamination in Channels A, B C and the pond is presented in detail in Weston's 2007 Data Summary Progress Report.

<u>Non-PCB Contamination</u>

Non-PCB contamination, including bis(2-ethylhexyl)phthalate and naphthalene, was identified at two locations in Channels A, B and C during the 2007 sampling event. Limited delineation was performed at these locations due to field constraints. Delineation of these locations will be completed during remediation. Remediation of these areas, along with historic non-PCB contamination, is discussed in Section 7.5. The extent of non-PCB contamination in Channels A, B C and the pond is presented in detail in Weston's 2007 Data Summary Progress Report.

5.1.5.2 Channel D

Soil and sediment samples were collected in Channel D to delineate historic contamination and to determine the extent of any potential contamination within the stream channel. The channel samples were collected in accordance with Weston's November 16, 2008 Sampling and Analysis Plan.

Additional sampling of the Channel D property was performed in June of 2009 by EPEC Polymers. Weston has not been provided with a complete data set for review; therefore, EPEC findings are not incorporated in Weston's remedial approach outlined in Section 7.5.

PCB Contamination

Weston collected soil and sediment samples from Channel D boring locations during the 2007 verification sampling program to determine the vertical and horizontal extent of PCB contamination in soils and sediments within Channel D. Soil and sediment samples were collected to delineate historic exceedances as well as to determine the extent of potential contamination within the stream channels. The extent of contamination is depicted in Figure 1 of this Addendum. Two large areas have been identified for excavation in Channel D, as discussed in Section 7.5. Details regarding the extent of PCB contamination in Channel D are presented in Weston's 2007 Data Summary Progress Report.

Non-PCB Contamination

Non-PCB contamination was identified at multiple locations along the center line of the channel. All sample results for BEHP exceeded applicable NJDEP sediment criteria. Delineation of these locations will be completed during remediation. Remediation of these areas, as well as historic non-PCB contamination detected in Channel D, is discussed in Section 7.5. Non-PCB sample results (for BEHP, pH and total organic carbon) are depicted on Figure 6D of the 2007 Data Progress Report, included for reference in Attachment 8.

5.1.6 Extent of Engineered Cap

The limits of the engineered cap have been refined through Weston's verification sampling program. The limit of the engineered cap is depicted in Figure 1. A total of 74 on-site areas containing PCBs less than 500 mg/kg and above 2 mg/kg outside the LNAPL area were identified as part of the 2007 investigation will be excavated and backfilled with certified clean fill.

Forty-three non-PCB contaminated soil areas (including the original "scrape" areas) or soil areas with a combination of PCB and non-PCB contaminants beyond the extend of the engineered cap containing contaminants above NJDEP Non-Residential Soil Cleanup Criteria (NRSCC) were evaluated and will be excavated for off-site disposal; the excavations will be backfilled with certified clean fill. Remediation of these locations is further discussed in Section 7.3.

5.2 Excavation Pilot Study

Weston conducted a series of pilot excavations at the Site in December 2007 in order to develop a better understanding of soil and groundwater conditions that will be encountered during full scale remediation of site soils. The goals of the excavation pilot tests were:

- To assess the general nature of both vadose zone and saturated soils within the Light Non-Aqueous Phase Liquid (LNAPL) plume with regard to excavation, slope stability, drainage, material handling and LNAPL retention.
- To evaluate hydrologic conditions during excavation, including dewatering rates and methods, and sediment load.
- To assess the treatment system effectiveness for treatment of dewatering fluids and confirm treatment system influent design criteria.

Weston implemented test excavations at three separate locations and collected environmental and geotechnical samples from each. Samples of untreated and intra-process dewatering fluids were also collected. Results of this investigation are provided in Weston's May 2008 *Progress Report – First Pilot Study*.

5.3 LNAPL Pilot Study

Weston conducted eight additional pilot test excavations in order to assess the occurrence of LNAPL within fine-grained soils. The previous pilot excavations had shown that LNAPL readily drained from coarse-grained soil, with the residual soil containing PCB concentrations less than the site-specific cleanup goal of 500 mg/kg, suggesting that excavation and off-site disposal of these soils was not necessary and that the cleanup objectives could be met by on-site LNAPL removal. However, our understanding of LNAPL distribution included areas where the LNAPL existed within fine-grained soils and it was not known whether the LNAPL would readily drain from such soils, similar to what was observed with the coarse-grained soils. If it could be shown that the LNAPL effectively drained from fine-grained soils and that residual PCB concentrations would be below the cleanup goal, then a case could be made that on-site LNAPL removal would be a more efficient remedial option than would excavation and off-site disposal.

Results of this investigation are provided in Weston's October 2008 *Second Pilot Study Progress Report*. The findings from the eight test pits excavated within the LNAPL plume during the second pilot study were not consistent with the original Site Conceptual Model and as a result, the LNAPL Site Conceptual Model was modified to reflect the more recent findings. This is further discussed in Section 6.0.

5.4 Lagoon Remediation

Weston remediated the former wastewater lagoons in November and December 2007. A Progress Report for the former wastewater lagoons was developed in accordance with the NJDEP Technical Requirements for Site Remediation (TRSR) [NJAC 7:26E] and submitted under separate cover. All remedial and monitoring work was performed in accordance with the

USEPA-approved Lagoon Remediation Engineering and Monitoring Plan (E&M Plan) Plan dated 14 November 2007.

The selected remedy for the lagoons included:

- Dewatering of stormwater and removal of sediments atop the lagoon poly liners;
- Removal of the poly liners;
- Excavation of chemical waste sludges and contaminated sediments overlying the clay layer in the two lagoons;
- Off-site disposal of chemical waste sludges and contaminated sediments as TSCA waste;
- Conducting air monitoring and utilizing odor control measures;
- Collection of post-excavation samples for PCB analysis to verify that no material remaining in the lagoon area exceeded a concentration of 2.0 mg/kg dry weight PCBs;
- Backfilling the lagoon excavation area with a minimum of two feet of imported clean fill; and
- Restoration of the backfilled area with vegetation (hydro seeding) as specified in the Soil Erosion and Sediment Control (SESC) Plan approved by Freehold Soil Conservation District on 14 November 2007.

Weston collected a total of 141 post-excavation samples within and below the clay liner. Sampling procedures followed technical requirements as set forth in the NJDEP Field Sampling Procedures Manual (August 2005). In locations where post-excavation samples contained PCBs greater than 2 mg/kg, additional excavation was performed in 6-inch intervals, and additional post-excavation samples were collected. The excavations were backfilled with certified clean fill. Final grading of the former lagoons will be performed as part of the final site grading and capping, which will be completed upon the conclusion of intrusive remedial activities.

6.0 SITE CONCEPTUAL MODEL REVISION

The findings from the eight test pits excavated within the LNAPL plume were not consistent with the original Site Conceptual Model as described in the Consolidated RAWP. It was clear from the observations at each test pit, as well as from the laboratory results, that the mobile LNAPL is found only in coarse-grained sandy deposits. Although the LNAPL may have penetrated into the fine-grained silt and clay layers along root cavities, the volume of this material is very small and the PCB concentrations remain well below the 500 mg/kg dry weight cleanup goal. In addition, it was confirmed that the LNAPL readily drains from the sandy soils leaving residual PCB concentrations on the order of 1 to 60 mg/kg, again well below the cleanup goal of 500 mg/kg dry weight. In fact, none of the soil samples collected during this investigation exceeded 60 mg/kg PCB, even those saturated with a mixture of LNAPL and water. Based on these findings, it is apparent that the PCBs are confined primarily to the LNAPL and that removal of the mobile LNAPL will result in attainment of the cleanup goal.

Based on this new understanding of LNAPL distribution and migration, the most effective method of achieving the PCB cleanup goal is removal of the mobile LNAPL via pumping (i.e., active LNAPL recovery). Excavation would not be an effective means of removing the LNAPL, especially in southern areas of the site where it exists under confined conditions, because it would involve the removal and replacement of large amounts of soil that already meet the cleanup goal and also because it would potentially result in significant spreading of the mobile LNAPL when the confining clay/silt unit is breached. With a pumping system, removal of the mobile LNAPL can be more easily controlled, even under confined conditions, thereby eliminating any spreading.

The results of the two pilot excavation studies and the LNAPL modeling and recovery system design were submitted to NJDEP and USEPA in series of status reports in 2008 and early 2009. A meeting was held with NJDEP and USEPA on January 29, 2009 to discuss the results of these studies and request that USEPA reconsider its position that all LNAPL at the site should be excavated. On May 28, 2009, USEPA issued a letter to Weston rejecting the request to reconsider and reiterated its intention that the LNAPL should be excavated. USEPA did acknowledge that LNAPL excavation would not be feasible beneath existing buildings and infrastructure and allowed for active LNAPL recovery in those areas where excavation is not possible. NJDEP issued a letter dated June 15, 2009 concurring with USEPA and required that Weston submit an addendum (Addendum 3) to the Consolidated RAWP and an implementation schedule detailing the revised remediation approach by August 28, 2009.

Weston's 2009 IRM RAWP has been prepared and submitted under separate cover to address active recovery of LNAPL across the northern portion of the LNAPL plume. However, based on the USEPA's position stated above, Weston is proposing to excavate the lower (southern) portions of the LNAPL plume, both within the wetlands and in the active driveway portion of the Hatco facility, as depicted on Figure 3. This is further discussed below.

7.0 PROPOSED REMEDIAL ACTIONS FOR ON- AND OFF-SITE CONTAMINATION

7.1 Remedial Approach Summary

Soils, sediment, and groundwater at the Site have become impacted by PCBs and other chemical compounds as a result of historical releases from manufacturing operations. Most notably; a large area of LNAPL containing high concentrations of PCBs has been identified in the central portion of the property, and two former wastewater lagoons are present in the southern end of the site. Due to the wide range in concentrations, multiple impacted media, large contamination footprint, and site constraints including active manufacturing operations and wetlands, a variety of remediation approaches will be employed to meet regulatory cleanup goals:

- Impacted soil and sediment within on-site and off-site wetlands will be excavated to unrestricted use standards (0.49 mg/kg for soil and 1.0 mg/kg for sediment) and the wetlands will be restored. No deed restriction or cap is required for these areas. Soil and sediment removed will be placed on-site beneath an engineered cap (see below).

- The LNAPL plume will be remediated by a combination of active LNAPL recovery and excavation. The northern two-thirds of the LNAPL plume are located beneath existing structures or high-use areas that preclude excavation. As required by USEPA/NJDEP, LNAPL in this area will be removed via a series of active recovery wells and trenches and disposed off-site.

LNAPL in the southern one-third of the plume will be removed via excavation and disposed off-site. In the northern portion of the LNAPL plume, LNAPL will be removed to “non-noticeable” in accordance with the New Jersey Ground Water Quality Standards (N.J.A.C. 7:9-1 et. seq.). The metric for "non noticeable" is as follows:

> A bailer is placed in the well. When the bailer is removed, there is no evidence of free product on the inside or outside of the bailer or on the water surface.

Following LNAPL removal, confirmatory soil sampling will be performed to ensure that no soils containing PCBs at concentrations exceeding the site-specific 500 mg/kg dry weight cleanup goal remain within the footprint of the LNAPL plume. Any soils found with PCB concentrations greater than 500 mg/kg will be excavated and disposed off-site. An engineered cap will cover the full footprint of the LNAPL plume and a deed restriction will limit future disturbance of this area.

- On-site soils not associated with the LNAPL plume (either horizontally or vertically) that contain PCBs at concentrations exceeding 500 mg/kg dry weight will be excavated and disposed off-site.

On-site soils that contain PCBs at concentrations between the site-specific 500 mg/kg cleanup goal and the 2 mg/kg NJDEP industrial/commercial cleanup goal will be covered in-place with an engineered cap and a deed restriction enacted to limit disturbance of this area and restrict future uses to industrial/commercial.

- Numerous small isolated areas of soils containing PCBs greater than 2 mg/kg but less than 500 mg/kg will be excavated and placed under the engineered cap to minimize the cap footprint. These excavations will be backfilled with certified clean fill. Figure 2 depicts the soils designated for re-use.

- The two southern lagoons were excavated down to an underlying clay layer and all soils were disposed off-site. Remediation of this area is complete, although it has not been determined what the final disposition of this area will be. It may be backfilled with certified clean fill, or backfilled with excavated PCB soils from other portions of the site and included in the engineered cap footprint.

- Soils at the site that contain concentrations of compounds other than PCBs at concentrations that exceed NJDEP cleanup standards will be excavated and disposed off-site. These excavations will be backfilled with certified clean fill.

The specific proposed remedial actions for on-site and off-site areas of concern are provided in the following sections. Volumes for each type of contaminant media to be remediated as outlined in this Addendum are provided below, as discussed in Section 4.3 of this Addendum.

Location / Contaminant Type	**Volume for Offsite Disposal**	**Volume for Reuse**
On-site LNAPL (including wetlands)	11,986 cubic yards	12,576 cubic yards (overburden)
On-site PCBs > 500 mg/kg	915 cubic yards	--
On-site PCBs < 500 mg/kg	--	6724 cubic yards
On-site Non-PCBs (Scrape)	90 cubic yards	--
Off-site PCBs > 500 mg/kg	30 cubic yards	--
Off-site PCBs < 500 mg/kg (Channels A, B, C and pond)	--	714 cubic yards
Off-site PCBs < 500 mg/kg (Channel D)	--	2947 cubic yards
Off-site Non-PCBs (Scrape)	15 cubic yards	--

Additional information regarding mobilization activities, excavation and dewatering methods, waste management, decontamination methods, and site restoration, are included in Attachment 2. Attachment 1 provides complete description of the post-excavation sampling program.

In order to ensure that historical site contamination identified as part of previous investigations is addressed, Weston is providing this summary comparison of historical areas of concern to current remedial objectives.

Historic AEC Designations (as identified in Consolidated RAWP)	Description	Location	Remedial Approach	Report Section
AEC 1	Closed Former Lagoons	Southwest corner of site	Remediated through excavation; engineered cap (2 feet clean soils) already in place	5.4
AEC 2	Former Ponds Area	South of main production area	Excavation and engineered cap for southern ponds; LNAPL recovery and engineered cap for northern pond areas	7.3
AEC 3	Railroad Siding Area	Along rail lines in southern portion of site	Hot-spot removal and backfill with clean fill	7.4
AEC 4	Ester I Building and Acid Tank Farm	Northern part of main production area	LNAPL recovery and engineered cap	7.3
AEC 5	Ester II Building, Tank Farm and area to east and south	East of rail siding area	Hot-spot removal and backfill with clean fill	7.4
AEC 6	Phthalic Anhydride Process Area	West of northeast pond	Engineered cap	7.4
AEC 7	Phthalic Anhydride Residue Area	Northeast Pond	Re-sample and hot-spot removal	7.4
AEC 8	Tarry Area	Southeast corner of site	Hot-spot removal and backfill with clean fill	7.4
AEC 9A	Ester I Tank Farm	Northern part of main production area	LNAPL recovery and engineered cap	7.3
AEC 9B	Alcohol Tank Farm	Northernmost tank farm	LNAPL recovery and engineered cap	7.3
AEC 9Cs	Naphthalene Tank Farm	North of Ester II building and east of ZAA process area	Engineered cap	7.4
AEC 9D	Scales Tank Area	West of scale house, western side of site	LNAPL recovery and engineered cap	7.3
AEC 9E	No. 6 Fuel Oil Tank	North of maintenance building, south of employee parking lot	Engineered cap	7.4
AEC 10A	Current Drum and Waste Storage Area	West of ZAA building	LNAPL recovery and engineered cap	7.3
AEC 10B	Former Drum and Waste Storage Area (north of Warehouse 5)	Northeast corner of site, northwest of pond and north of Warehouse 5	Hot-spot removal and backfill with clean fill / engineered cap	7.4
AEC 10C	Former Drum and Waste Storage Area (west of Warehouse 4)	Western side of site, west of warehouse 4 and south of scale house tanks	LNAPL recovery and engineered cap	7.3

Historic AEC Designations (as identified in Consolidated RAWP)	Description	Location	Remedial Approach	Report Section
AEC 11A	UST Area (Maintenance Building)	Adjacent to maintenance building, northern side of site	Engineered cap	7.4
AEC 11B	Salt UST Area	East of Alcohol tank farm	LNAPL recovery and engineered cap	7.3
AEC 12	Transformers	East of Ester I building	LNAPL recovery and engineered cap	7.3
AEC 13	Southeast Fill Area	Southeastern side of site, north of Tarry area	Hot-spot removal and backfill with clean fill	7.4
AEC 14	Naphthalene Area	North of Northeast Pond	Hot-spot removal and backfill with clean fill	7.4
AEC 15	Site-wide Groundwater	Sitewide	Will be further evaluated after source area (LNAPL) removal as stated in 2005 Consolidated RAWP	--
AEC 16	Research and Development Laboratory	North side of side next to main entrance (current office area)	Hot-spot removal and backfill with clean fill	7.4
AEC 17	Clean Fill Area	Northeast side of site	--	--
AEC 18A	Pilot Plant I	North of alcohol tank farm	Engineered cap	7.4
AEC 18B	Pilot Plant II	North of scale house	Engineered cap	7.4
AEC 19	ZAA Process Area	ZAA building, middle of site	LNAPL recovery and engineered cap	7.3
AEC 20	Area East of Sling Tail Creek	East of Sling Tail Creek and Northeast pond	Re-sample and hot-spot removal	7.4
AEC 21A	Crows Mill Tributary	Channel B	Hot-spot removal and backfill with clean fill; wetlands restoration	7.5
AEC 21B	Sling Tail Creek	Eastern side of site	Re-sample and hot-spot removal	7.4
AEC 22	Sewer System	Throughout active portion of facility	Addressed through line replacement and remediation of adjacent soils	--
N/A	Northern LNAPL plume	Northern LNAPL plume	LNAPL recovery and engineered cap	7.2 / IRM RAWP
N/A	Soils/sediments with PCBs > 500 mg/kg	Various	Hot-spot removal and backfill with clean fill	7.3
N/A	Between former and currently proposed engineered cap boundaries (PCBs < 500 mg/kg only)	Various	Hot-spot removal and backfill with clean fill	7.3 and 7.4
Channels A,B,C	Channels A,B,C	West of site (PCBs < 500 mg/kg only)	Hot-spot removal and backfill with clean fill	7.5
Off-site Pond	Off-site Pond	Southwest of site	Hot-spot removal and backfill with clean fill	7.5
Channel D	Channel D	South of site across Industrial Avenue	Hot-spot removal and backfill with clean fill	7.5

Historic AEC Designations (as identified in Consolidated RAWP)	Description	Location	Remedial Approach	Report Section
Scrape Areas	Scrape Areas	Between former and currently proposed engineered cap boundaries (Non-PCB contaminants)	Hot-spot removal and backfill with clean fill	7.3

7.2 Applicable Cleanup Standards

7.2.1 Remediation of PCBs

7.2.1.1 On-Site Soils

Federal and State regulations provide specific requirements for the remediation of PCB-contaminated soil. Although the NJDEP promulgated new soil remediation standards in 2008, the previous NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) of 2 mg/kg will be utilized for onsite soils because there is less than an order of magnitude change between the former criteria and the new standard of 1.0 mg/kg. This cleanup standard will be used for all PCB-containing soils on site that will not be capped as part of a site engineering control.

7.2.1.1.1 Attainment of PCB Remediation Standards (PCB Dry Weight Criterion Issues)

In accordance with the provisions set forth by the USEPA under TSCA and the corresponding regulations known as the PCB "Mega Rule," the USEPA will allow soils containing up to 500 mg/kg PCBs to remain on site provided they are placed under the engineered cap. The USEPA Region 2 approved this PCB remedy and action levels in their March 30, 2005 approval letter. All soils containing greater than 500 mg/kg PCBs (dry weight) will be excavated for off-site disposal at an approved TSCA disposal facility. Based upon discussion with USEPA regarding the definition of "dry weight", Weston determined that, in accordance with the Applicability section [40 CFR 761.1 b(4)] of 40 CFR Parts 750 and 761, *Disposal of Polychlorinated Biphenyls*, each material phase should be tested for PCB differently.

For non-liquid PCB materials (like soil), the Applicability section clearly states the dry weight basis should be used (i), but for liquid PCB materials (like water or NAPL), the wet weight should be used (ii). 40 CFR 761.3 provides definitions for liquid phase and non-liquid phase materials. In short, the paint filter test is used to differentiate between the two. Weston believes that LNAPL would fall under liquid phase PCB. Because the soil and LNAPL containing PCBs at the Site are co-located, the contaminant is contained in a multiphase material. Section (iii) states that multiphase materials (those containing both liquid and non-liquid phases) shall be separated and analyzed as separate phases. Therefore, the non-liquid phase would be analyzed by dry weight methods and the liquid phase would be analyzed by the wet weight method.

The Consolidated RAWP referenced in the USEPA's March 30, 2005 RAWP approval letter provided for separate concentrations of non-liquid PCBs and liquid PCBs (i.e., LNAPL). In its approval letter, USEPA mandated excavation only on a "dry weight" basis. With regard to those

non-liquid PCBs to which the definition of "dry weight" applies, Weston agrees that the procedure for determining the weight of such PCBs is to exclude the weight of water. However, looking to the definition of "dry weight" for guidance as to how to address liquid PCBs is neither instructive nor appropriate.

Weston believes that the Applicability section supports our interpretation of the 2005 Approval Letter to mean that the excavation directive applies only to non-liquid materials, because USEPA specifically applies the term "dry weight" for the PCB materials; which as stated in 761.1 b(4), only applies to non-liquid materials. Thus, we believe that excavation is not required for liquid phase under the 2005 approval letter [LNAPL as measured using wet-weight methods as specified under 40 CFR 761.1 b(4)(ii)]. This would be consistent with USEPA approval of our approach as presented in the Consolidated RAWP, which specifies LNAPL recovery followed by hotspot soil removal.

7.2.1.2 Off-Site Soils and Sediments

Off-site soils containing PCBs greater than 0.49 mg/kg will be excavated for re-use in accordance with the Soil Reuse Plan. Again, because there is less than an order of magnitude change from the previous NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC) [0.49 mg/kg] and the new NJDEP Soil Remediation Standard of 0.2 mg/kg, the RDCSCC will be utilized. This will allow for unrestricted use of the remediated off-site properties. There has been no change to the previously proposed and approved PCB cleanup value for off-site sediment of 1 mg/kg, and this standard will be applied to all off-site sediments.

7.2.2 Remediation of Other Chemical Parameters

7.2.2.1 On-Site Soils

Non-PCB soil contamination at the Site which will be remediated through excavation primarily consists of the following parameters:

- Arsenic;
- Naphthalene;
- Bis(2-ethylhexyl)phthalate; and
- Benzo(a)pyrene.

NJDEP's NRDCSCC for these chemical parameters were compared to the 2008 Standards. The NRDCSCC were used because the Site is currently industrial and non-residential use is expected to continue (i.e., through application of institutional controls). An order-of-magnitude change in naphthalene cleanup levels dictates the use of the 2008 Soil Remediation Standards as the cleanup value for that compound, 17 mg/kg. All other non-PCB contaminants will be remediated in accordance with the NRDCSCC. Results of the order of magnitude evaluation for naphthalene are depicted on Figure 3.

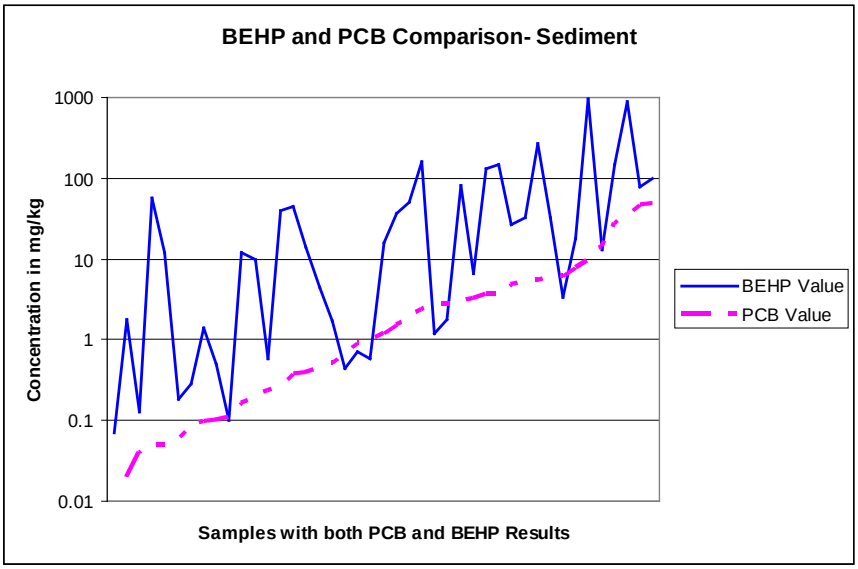
7.2.2.2 Off-Site Soils and Sediments

Since off-site soils and sediments will not be capped or subject to institutional controls at the completion of remedial activities, Weston will remediate PCB-containing materials to unrestricted use (0.49 mg/kg for soil and 1.0 mg/kg for sediment). Naphthalene in soils will be remediated to the new 2008 Soil Remediation Standard of 6 mg/kg for unrestricted use.

BEHP concentrations in sediments were compared to the NJDEP SEL of 0.75 mg/kg for evaluation, but will not be remediated to that value, as it is not promulgated. Other non-PCB contaminants will be remediated to the RDCSCC. Results of the order-of-magnitude evaluation for off-site soils are presented in Figure 3.

Weston performed an in-depth review of existing soil and sediment data in which samples were analyzed for both PCBs and BEHP, both on and off site. Weston tabulated and graphed sediment sample BEHP and PCB concentrations in log scale to evaluate the distribution of these contaminants and determine if there is any correlation in concentrations of each compound.

The results of this exercise indicate that a large percentage of soils and sediments contaminated with BEHP above the SRS or SEL are co-located with soils/sediments containing elevated concentrations of PCBs and will be removed as part of PCB area excavation (where PCBs are excavated to 1.0 mg/kg). A review of the graph below indicates that the majority of sediment containing BEHP over 0.75 mg/kg will be removed with PCB excavation (PCBs greater than 1.0 mg/kg in sediment).



A small percentage of sediment with BEHP above the SEL, however, is not co-located with elevated PCBs and will be removed via hotspot excavation and post-excavation sample collection.

7.3 Remedial Approach for LNAPL Area

The LNAPL plume at the Site will be remediated via two distinct methods – active recovery and excavation. An Interim Remedial Measure (IRM) has been proposed in order to remove LNAPL containing PCBs from areas of the Site where excavation of this material is not feasible due to the presence of existing infrastructure or where excavation would adversely impact Hatco's operations. Based on the results of the two pilot studies, removal of the LNAPL is expected to reduce soil PCB concentrations within the LNAPL plume to below the site-specific cleanup goal of 500 mg/kg dry weight. The LNAPL thickness will be reduced to "non-noticeable" in accordance with the New Jersey Ground Water Quality Standards (N.J.A.C. 7:9-1 et. seq.).

Specific information regarding the IRM is presented in Weston's 2009 IRM RAWP, submitted previously. Weston will evaluate the potential for residual contamination in the former ponds upon completion of active LNAPL recovery and verify with a comprehensive post-excavation sampling program, as depicted in Figure 2 of the IRM, entitled "Post-IRM Confirmation Sampling Program". The following section discusses only LNAPL excavation for the southern portion of the LNAPL plume. The figures and tables provided in the 2007 Data Progress Report summarize the results of Weston's verification sampling program for areas impacted by LNAPL.

7.3.1 Excavation and Off-site Disposal of LNAPL-Containing Soils

Two main areas of LNAPL-impacted soils will be excavated for offsite disposal. These areas are depicted in Figure 4 with an estimated volume of approximately 11,986 cubic yards. Weston will excavate the overburden layer that contains PCBs with concentrations below 500 mg/kg and has no visible LNAPL; this material will be segregated from the material to be excavated for off-site disposal. The overburden material will be reused as backfill in accordance with the Revised Soil Reuse Proposal, provided in Attachment 6. Analytical results for overburden soils are presented on Figure 5. Specific information regarding excavation and dewatering methods, materials handling, and backfilling is provided in Attachment 2.

Confirmatory post-excavation soil samples will be collected and analyzed for PCBs in accordance with the proposed Post-Excavation Sampling Plan (provided as Attachment 1). Post-excavation samples for all on-site excavations will be collected in accordance with the requirements set forth in the NJDEP TRSR, with one exception. A variance for post-excavation sampling frequency is included as part of the proposed Post-Excavation Sampling Plan, provided in Attachment 1.

7.4 Remedial Approach for On-Site Non-LNAPL Contamination

All soils that exceed the applicable cleanup standard and lie beyond the extent of the engineered cap, will be excavated. These excavated areas will be backfilled with certified clean fill. Confirmatory post-excavation samples will be collected for each excavation area and analyzed as outlined below. Specific information regarding excavation and dewatering methods, materials handling, and backfilling for these excavations is provided in Attachment 2.

7.4.1 Areas with PCBs Greater than 500 mg/kg

A total of 11 areas were determined to have PCBs greater than 500 mg/kg and no visible LNAPL. These areas will be excavated for off site disposal and backfilled with certified clean fill; excavation locations are depicted in Figure 1. Samples that define the extent of excavation are shown in Figure 6.

Confirmatory post-excavation soil samples will be collected and analyzed for PCBs in accordance with the proposed Post-Excavation Sampling Plan (provided as Attachment 1).

7.4.2 Areas with PCBs Less than 500 mg/kg

Weston identified a total of 71 areas containing PCBs less than 500 mg/kg beyond the proposed extent of the engineered cap. These areas are shown on Figure 1 as yellow polygons and will be excavated for on-site re-use as backfill underneath the cap. Analytical data defining the extent of excavation for these locations are shown on Figures 7 through 9.

These excavations will be backfilled with certified clean fill. Confirmatory post-excavation soil samples will be collected and analyzed for PCBs in accordance with the proposed Post-Excavation Sampling Plan (provided as Attachment 1).

7.4.3 Areas with Non-PCB Contamination

A total of 39 areas with non-PCB contamination above the applicable cleanup standards have been identified onsite, beyond the proposed extent of the engineered cap. While approximately 20 scrape area excavations were identified as part of the 2007 verification sampling program, additional non-PCB exceedances, particularly for naphthalene, have been identified across the site as part of the required order of magnitude assessment. These non-PCB areas, shown on Figure 1, will be excavated for offsite disposal, and will be backfilled with certified clean fill.

Figure 10 depicts sample information utilized to determine the horizontal and vertical extents of contamination for excavation. Confirmatory post-excavation soil samples will be collected and analyzed for applicable contaminants in accordance with the proposed Post-Excavation Sampling Plan (provided as Attachment 1).

7.4.4 Revision to Cap Extent

Based upon the results of the 2007 verification sampling, Weston has revised the proposed cap extent at the Site. While the Consolidated RAWP proposed a cap across the majority of on-site property and a portion of off-site properties, excavation of soils and sediments exceeding cleanup criteria (as outlined in this RAWP Addendum) allow for reduction of the proposed cap extent to that depicted in Figure 1. Weston performed a detailed evaluation of all the historical and 2007 samples that fall between the previous cap extent and the revised cap extent. The results of this evaluation were presented in the 2007 Data Progress Report (Attachment 8).

Figures 11 through 14 of this Addendum provide information regarding sample data which help to define the extent of the proposed cap. Information regarding on-site areas proposed for

excavation beyond the edge of the cap is provided in previous sections of this report. Off-site remediation, which allows unrestricted use of off-site properties, is discussed below.

7.5 Remedial Approach for Off-Site Contamination

7.5.1 Channels A, B, C and Pond

The limits of off-site soil and sediment contamination have been defined by Weston's verification sampling program (with some exceptions) as indicted in Figure 1.

Based upon the results of the 2007 sample collection, Weston has identified a total of 22 off-site soil and sediment areas in Channels A, B, C, D and the Pond area that contain PCBs or BEHP above unrestricted use for the appropriate media. Remediation methodology for these locations is specified in Attachment 2. Soils and sediments impacted by PCBs above 0.49 mg/kg (for soil) and 1.0 mg/kg (for sediment) will be excavated and backfilled with certified clean fill. Additionally, the majority of sediments containing BEHP above applicable sediment values will be excavated as part of PCB removal, as discussed above. The excavated materials will be reused on site in accordance with the Soil Reuse Proposal (Attachment 6), and placed underneath the engineered cap.

The figures and tables provided in the 2007 Data Progress Report summarize the results of Weston's verification sampling program for Channels A, B, C and the Pond. Additionally, Figures 15 and 16 depict both historical analytical results and samples that define the extent of each excavation for these off-site areas of concern. Confirmatory post-excavation soil samples will be collected and analyzed for applicable contaminants in accordance with the proposed Post-Excavation Sampling Plan (provided as Attachment 1).

7.5.2 Channel D

Two separate excavation areas have been identified in Channel D as a result of Weston's 2007 verification sampling program, as shown on Figure 20. Soils and sediments impacted by PCBs above 0.49 mg/kg (for soil) and 1.0 mg/kg (for sediment) will be excavated and backfilled with certified clean fill. Additionally, the majority of sediments containing BEHP above applicable sediment values will be excavated as part of PCB removal, as discussed above. The excavated materials will be reused on site in accordance with the Soil Reuse Proposal (Attachment 6), and placed underneath the engineered cap. The figures and tables provided in the 2007 Data Progress Report summarize the results of Weston's verification sampling program for Channel D.

Detailed information regarding excavation, backfilling and restoration activities is provided in Attachment 2. Confirmatory post-excavation soil samples will be collected and analyzed for PCBs in accordance with the proposed Post-Excavation Sampling Plan (provided as Attachment 1).

7.6 Remedial Costs

A summary of remediation costs for the Site is provided below.

- LNAPL Recovery (covered in IRM RAWP): $1.6M
- Excavation: $1.8M
- Transportation and Disposal: $2.0M
- Operation and Maintenance: $3.9M
- Cap Construction: $1.7M

These estimated costs total $11 M over the anticipated remediation schedule.

8.0 ADDITIONAL INVESTIGATION

Based on the results of a site visit with the NJDEP Case Team on 24 July 2009, and an email received from Case Manager Lynn Vogel on 29 July 2009, Weston will perform additional investigation in Channels A, B, C and the off-site pond, to better determine the extent of off-site contamination. Discussion regarding each sample area is provided below.

8.1 Off-Site Pond Inlet

In order to better determine potential contaminant migration into the off-site pond from Channel C, an array of five surficial sediment samples will be collected from the pond inlet where Channel C enters the pond, as specified by the NJDEP. At two of these five locations, a surface water sample will be collected. The proposed sample locations are depicted on Figure 18. Samples will be analyzed for PCBs and BEHP.

8.2 Off-Site Pond Outlet Channel

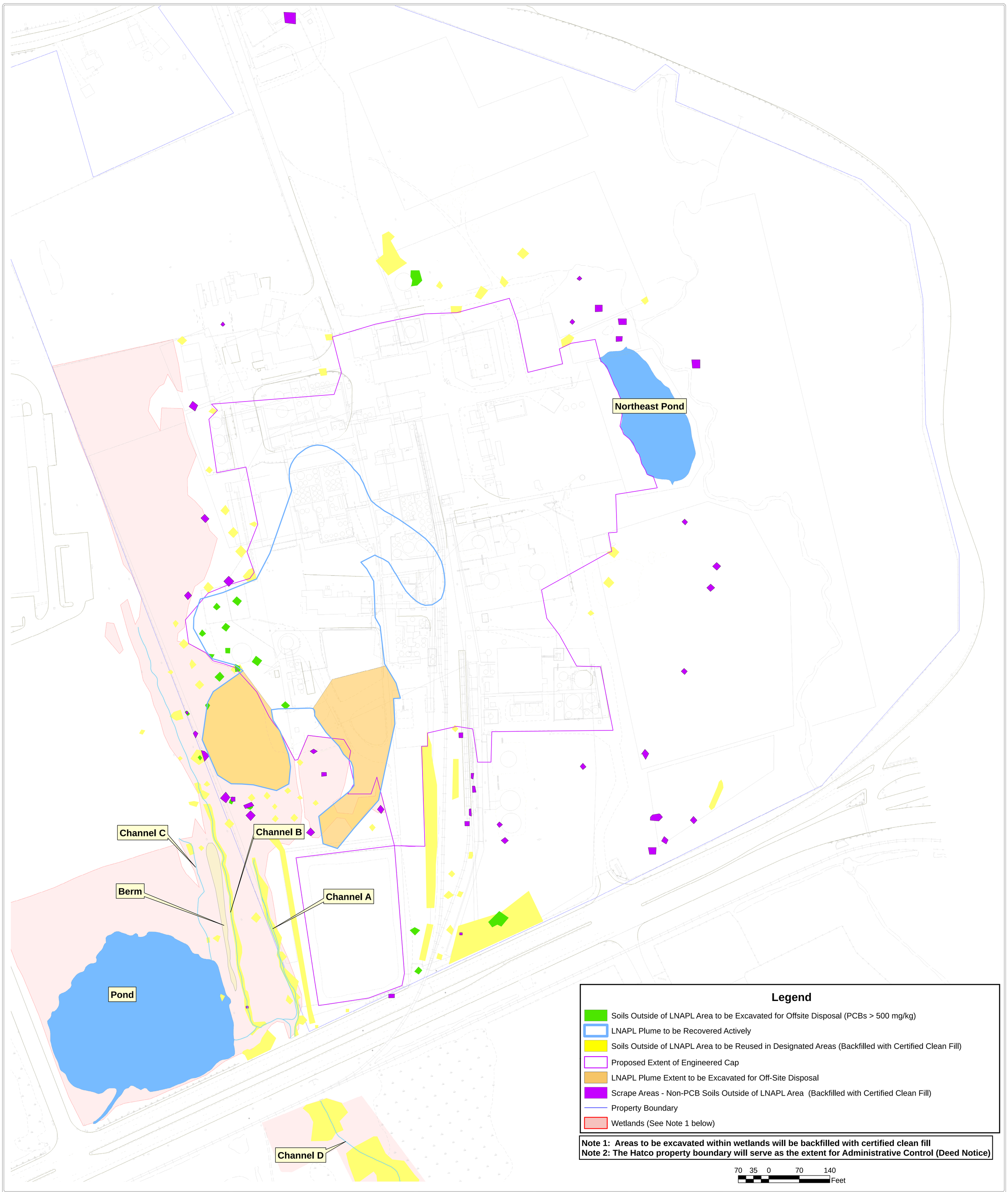
To ensure no potential contaminant migration from the pond outlet into Channel B or A, Weston will collect surficial sediment and surface water samples from one location just downgradient of the pond outlet, as directed by the NJDEP. Samples will be analyzed for PCBs and BEHP.

8.3 Off-Site Soil Berm and Nearby Floodplain

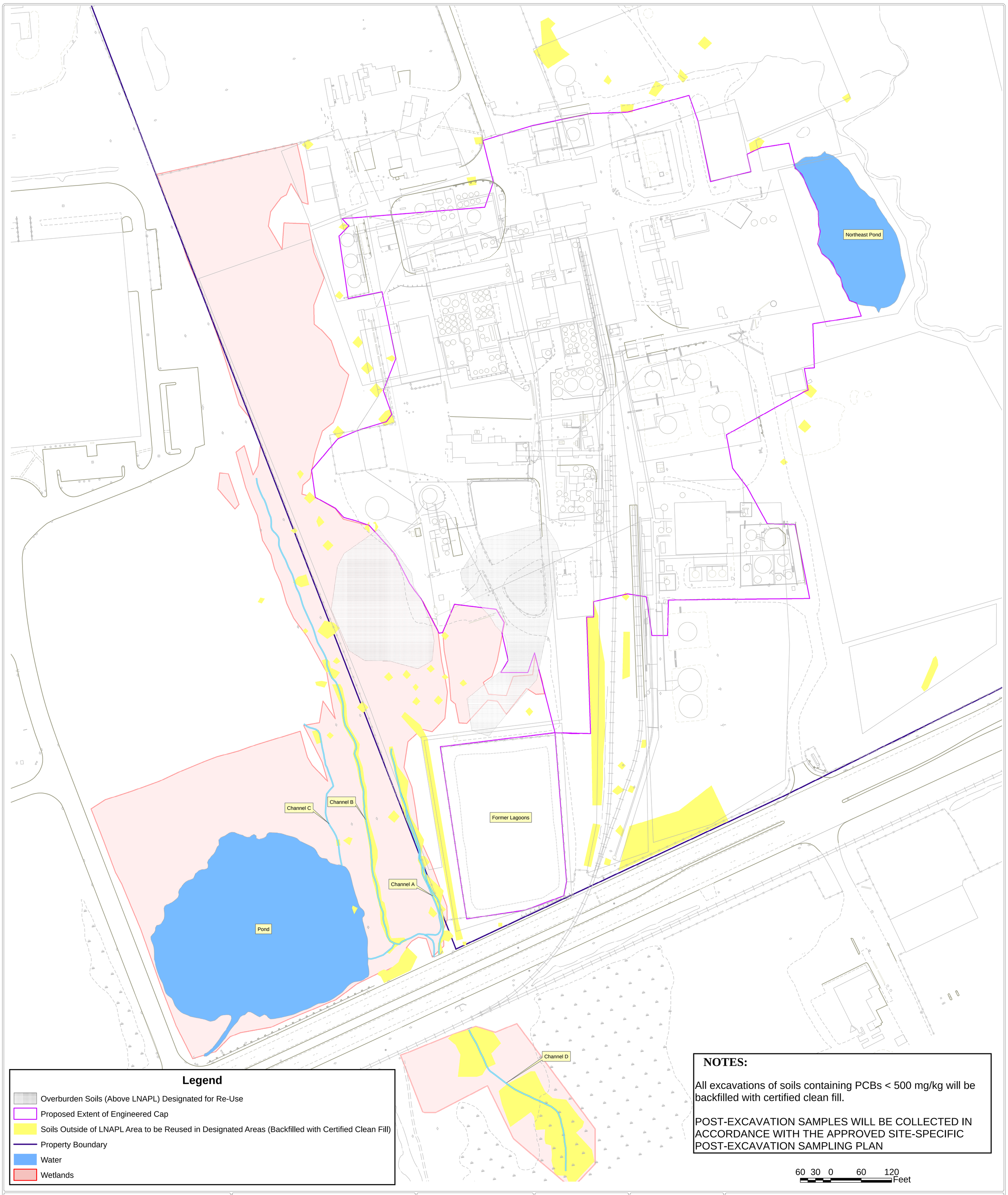
Weston performed a detailed review of historical aerial photographs and available topographic data to determine the lateral extent of a topographically elevated soil berm between Channel B and the off-site pond; this berm was identified in the field by the NJDEP on 24 July 2009. Review of historical aerial photographs for the property indicate that the berm was constructed prior to 1954 (the date of the earliest aerial photograph obtained by Weston), therefore prior to Hatco's initiation of site operations in 1959.

However, to ensure there is no potential contaminant source contained within the berm or the adjacent floodplain, Weston will perform additional soil sampling in a transect, as indicated in Figure 18. The soil samples along the elevated portion of the berm will be collected from 2 to 2.5 feet below ground surface (bgs) and analyzed for soil contaminant exceedences which have historically been detected on the Site, as instructed by the NJDEP. Samples collected from the floodplain will be collected from 0 – 0.5 feet bgs to assess potential overland migration of contaminants, and analyzed similarly to the berm samples.

FIGURES



DRAWING TITLE: Site Map with Extent of Current Features	CLIENT NAME: Weston Solutions, Inc.	N W E S	REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow	Weston Solutions, Inc. 205 Campus Drive Edison, New Jersey 08837-3939 TEL: (732) 417-5800 Fax: (732) 417-5801 http://www.westonsolutions.com
	PROJECT NAME: Hatco Remediation		DRAWING: PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3/06768_Key_Map.mxd	CHECKED BY: A. Garrison	
			REVISION No. 0	CONTRACT No. DELIVERY ORDER NO.	
FIGURE: 1 / SCALE: 1 inch = 70 feet / DATE: 07/10/2009			WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes DATE CREATED: 06/30/2009	



DRAWING TITLE: Soil For Re-Use	CLIENT NAME: Weston Solutions Inc.	N W E S	REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow	WESTON SOLUTIONS
	PROJECT NAME: Hatco Remediation		DRAWING PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3/06772_Soil_For_Reuse.mxd	CHECKED BY: A. Garrison	
			REVISION No. 1	CONTRACT No. / DELIVERY ORDER NO.	
FIGURE: 2 / SCALE: 1 inch = 60 feet / DATE: 07/10/2009			WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes / DATE CREATED: 06/30/2009	Weston Solutions, Inc.

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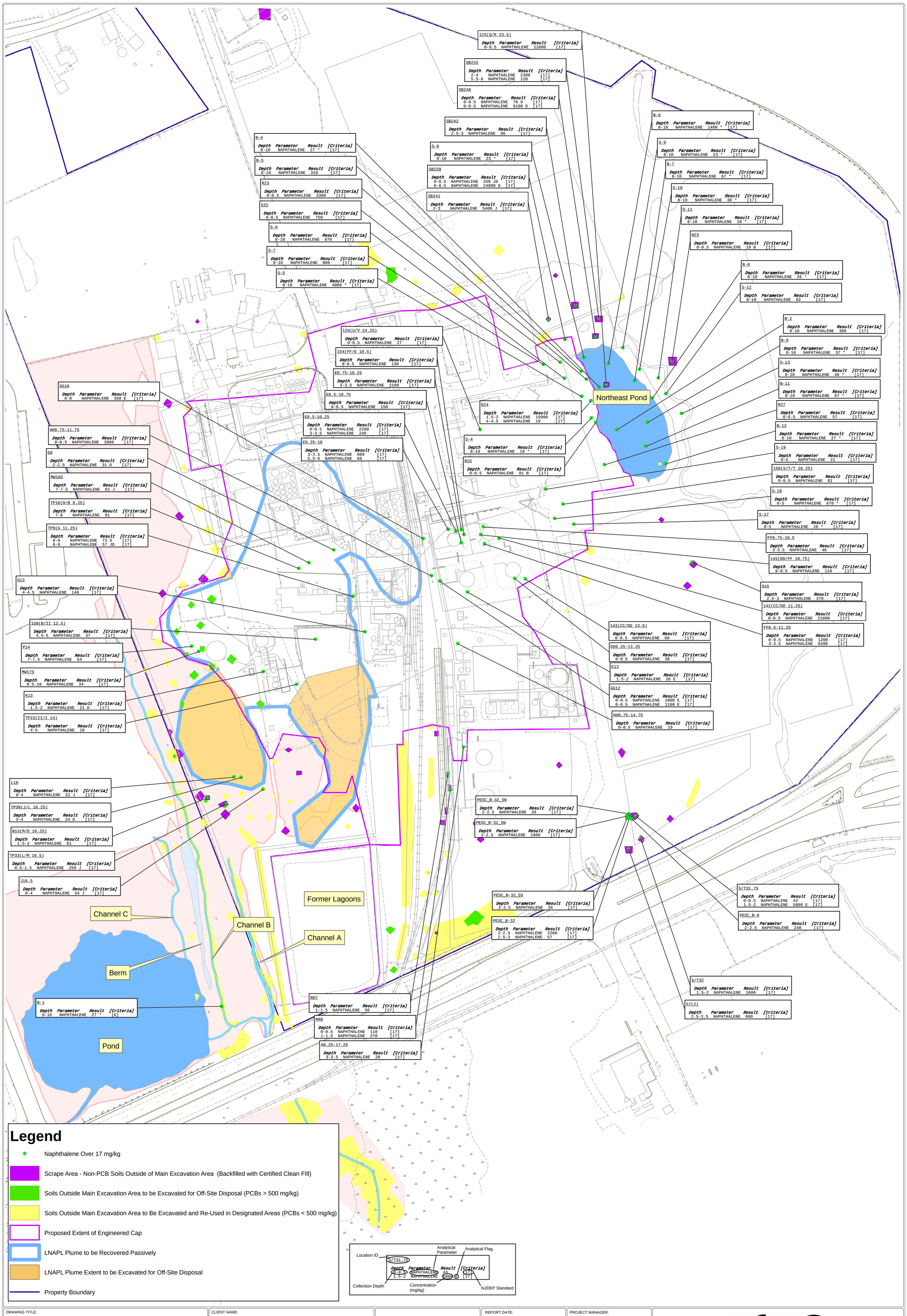

DRAWING TITLE:	CLIENT NAME:		REPORT DATE:	PROJECT MANAGER:
Results of Order of Magnitude Evaluation for Naphthalene	Weston Solutions, Inc.	N W E S	August 2009	D. Kopcow
	PROJECT NAME:		DRAWING: PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3/06794_NAP_Exceedances.mxd	CHECKED BY: A. Garrison
	Hatco Remediation		REVISION No. 0	CONTRACT No. / DELIVERY ORDER NO.
FIGURE: 3 / SCALE: 1 inch = 100 feet / DATE: 07/10/2009			WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes / DATE CREATED: 07/10/2009

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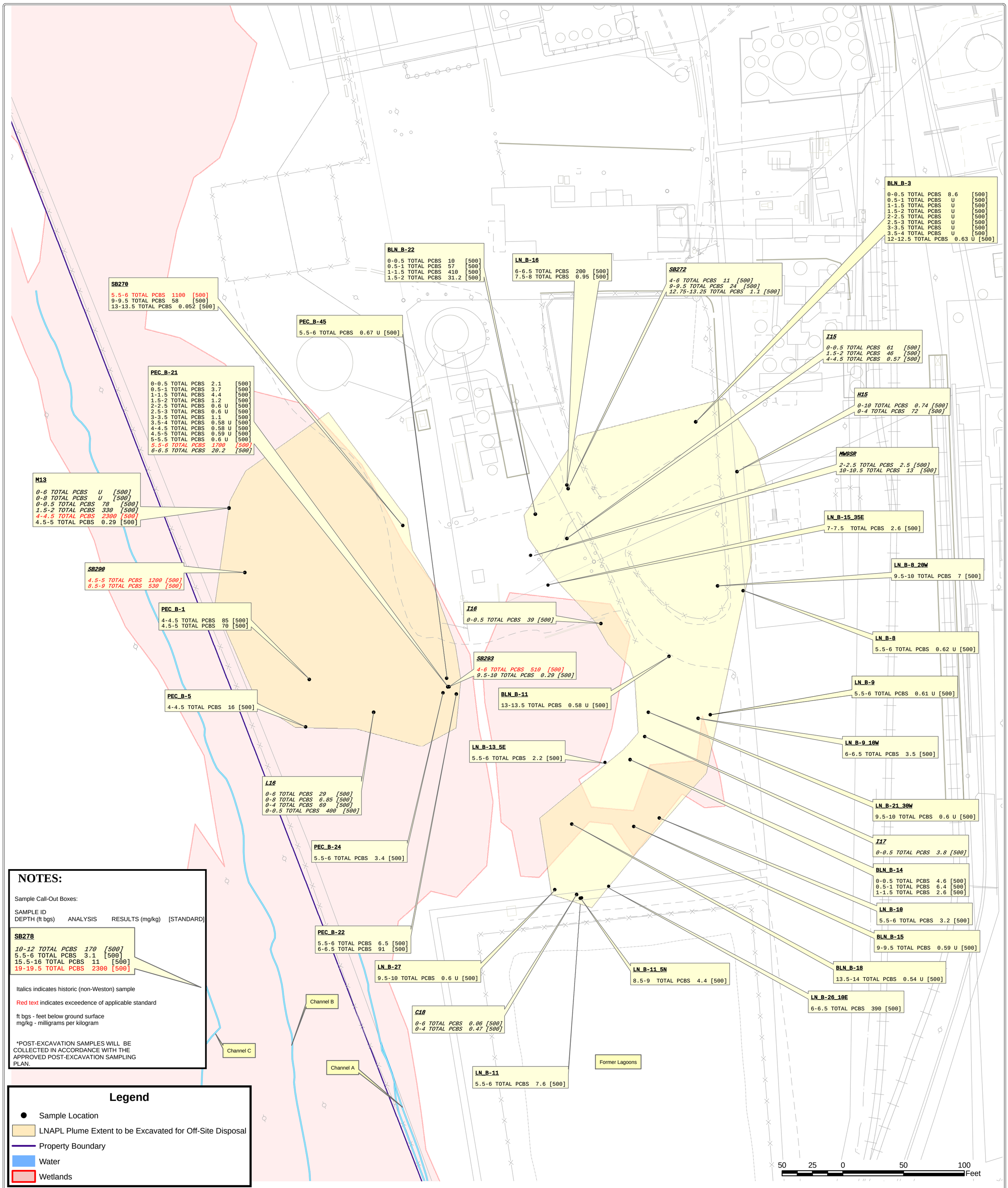

NOTES:

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

SB278
10-12 TOTAL PCBS 170 [500]
5.5-6 TOTAL PCBS 3.1 [500]
15.5-16 TOTAL PCBS 11 [500]
19-19.5 TOTAL PCBS 2300 [500]

Italics indicates historic (non-Weston) sample

Red text indicates exceedence of applicable standard

ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

*POST-EXCAVATION SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH THE APPROVED POST-EXCAVATION SAMPLING PLAN.

Legend

- Sample Location
- LNAPL Plume Extent to be Excavated for Off-Site Disposal
- Property Boundary
- Water
- Wetlands

DRAWING TITLE: Data Defining the Horizontal Limits of LNAPL Area for Off-Site Disposal	CLIENT NAME: Weston Solutions, Inc.	N W E S	REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow
	PROJECT NAME: Hatco Remediation		DRAWING PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3/06769_EX_Area.mxd	CHECKED BY: A. Garrison
			REVISION No. 0	CONTRACT No. / DELIVERY ORDER NO.
FIGURE: 4 / SCALE: 1 inch = 50 feet / DATE: 07/10/2009			WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes / DATE CREATED: 06/30/2009

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NOTES:

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

SB278

10-12 TOTAL PCBS 170 [500]
5.5-6 TOTAL PCBS 3.1 [500]
15.5-16 TOTAL PCBS 11 [500]
19-19.5 TOTAL PCBS 2300 [500]

Italics indicates historic (non-Weston) sample

Red text indicates exceedence of applicable standard

ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

*POST-EXCAVATION SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH THE APPROVED POST-EXCAVATION SAMPLING PLAN.

II14
0-4 TOTAL PCBS 150 [500]
0-6 TOTAL PCBS 220 [500]
1.5-2 TOTAL PCBS 42 [500]

BLN_B-3
0-0.5 TOTAL PCBS 8.6 [500]
0.5-1 TOTAL PCBS U [500]
1-1.5 TOTAL PCBS U [500]
1.5-2 TOTAL PCBS U [500]
2-2.5 TOTAL PCBS U [500]
2.5-3 TOTAL PCBS U [500]
3-3.5 TOTAL PCBS U [500]
3.5-4 TOTAL PCBS U [500]

LN_B-7
5.5-6 TOTAL PCBS 320 [500]

SB296
4.5-6 TOTAL PCBS 11 [500]

BLN_B-5
0-0.5 TOTAL PCBS 46 [500]
0.5-1 TOTAL PCBS 23.8 [500]
1-1.5 TOTAL PCBS 4.9 [500]

BLN_B-6
0-0.5 TOTAL PCBS 15.3 [500]
0.5-1 TOTAL PCBS 28 [500]
1-1.5 TOTAL PCBS 52 [500]
1.5-2 TOTAL PCBS U [500]
2-2.5 TOTAL PCBS 1.6 [500]
2.5-3 TOTAL PCBS 2.7 [500]
3-3.5 TOTAL PCBS U [500]
3.5-4 TOTAL PCBS U [500]

II15
0-6 TOTAL PCBS 0.46 [500]
1.5-2 TOTAL PCBS 2.00 [500]

BLN_B-22
0-0.5 TOTAL PCBS 10 [500]
0.5-1 TOTAL PCBS 57 [500]
1-1.5 TOTAL PCBS 410 [500]
1.5-2 TOTAL PCBS 31.2 [500]

J14
0-0.5 TOTAL PCBS 59 [500]
2-2.5 TOTAL PCBS 3.9 [500]

L14
0-8 TOTAL PCBS 0.7 [500]
0-6 TOTAL PCBS 21.6 [500]
0-0.5 TOTAL PCBS 56 [500]

L13
0-10 TOTAL PCBS 0.39 [500]
0-6 TOTAL PCBS 0.73 [500]
0-6 TOTAL PCBS 1.2 [500]
0-0.5 TOTAL PCBS 120 [500]
2-2.5 TOTAL PCBS 57 [500]
2-2.5 TOTAL PCBS 99 [500]

M14
0-0.5 TOTAL PCBS 430 [500]

I15
0-0.5 TOTAL PCBS 61 [500]
1.5-2 TOTAL PCBS 46 [500]
4-4.5 TOTAL PCBS 0.57 [500]

LN_B-8
5.5-6 TOTAL PCBS 0.62 U [500]

SB297
4-4.5 TOTAL PCBS 0.35 [500]

I16
0-0.5 TOTAL PCBS 39 [500]

PEB_B-25
0.5-1 TOTAL PCBS 1.6 [500]

PEB_B-28
0.5-1 TOTAL PCBS U [500]

PEB_B-26
0.5-1 TOTAL PCBS U [500]

PEB_B-27
0.5-1 TOTAL PCBS 3 [500]

PEC_B-17
1.5-2 TOTAL PCBS 51 [500]
2-2.5 TOTAL PCBS 4.5 [500]

PEC_B-1
4-4.5 TOTAL PCBS 85 [500]
4.5-5 TOTAL PCBS 70 [500]

PEC_B-20
1.5-2 TOTAL PCBS 22 [500]
2-2.5 TOTAL PCBS 17 [500]

PEC_B-21
0-0.5 TOTAL PCBS 2.1 [500]
0.5-1 TOTAL PCBS 3.7 [500]
1-1.5 TOTAL PCBS 4.4 [500]
1.5-2 TOTAL PCBS 1.2 [500]
2-2.5 TOTAL PCBS 0.6 U [500]
2.5-3 TOTAL PCBS 0.6 U [500]
3-3.5 TOTAL PCBS 1.1 [500]
3.5-4 TOTAL PCBS 0.58 U [500]
4-4.5 TOTAL PCBS 0.58 U [500]
4.5-5 TOTAL PCBS 0.59 U [500]
5-5.5 TOTAL PCBS 0.6 U [500]

PEC_B-2
4-4.5 TOTAL PCBS 140 [500]

PEC_B-4
4-4.5 TOTAL PCBS 210 [500]
4.5-5 TOTAL PCBS 70 [500]

PEC_B-3
4-4.5 TOTAL PCBS 160 [500]
4.5-5 TOTAL PCBS 100 [500]

PEC_B-5
4-4.5 TOTAL PCBS 16 [500]

PEC_B-8
4-4.5 TOTAL PCBS 36 [500]

PEC_B-6
4-4.5 TOTAL PCBS 0.62 U [500]

PEC_B-7
4-4.5 TOTAL PCBS 0.64 U [500]

PEC_B-19
1.5-2 TOTAL PCBS 170 [500]
2-2.5 TOTAL PCBS 120 [500]

L16
0-6 TOTAL PCBS 29 [500]
0-8 TOTAL PCBS 6.85 [500]
0-4 TOTAL PCBS 69 [500]
0-0.5 TOTAL PCBS 400 [500]

I17
0-0.5 TOTAL PCBS 3.8 [500]

BLN_B-14
0-0.5 TOTAL PCBS 4.6 [500]
0.5-1 TOTAL PCBS 6.4 [500]
1-1.5 TOTAL PCBS 2.6 [500]

BLN_B-12
0-0.5 TOTAL PCBS 5.6 [500]
1-1.5 TOTAL PCBS 4 [500]

BLN_B-16
0.5-1 TOTAL PCBS 47 [500]
1-1.5 TOTAL PCBS 4.3 [500]
1.5-2 TOTAL PCBS 17 [500]
2-2.5 TOTAL PCBS 20 [500]
2.5-3 TOTAL PCBS 33 [500]

Former Lagoons

Channel C

Channel B

Channel A

Pond

Legend

- Soil Sample Locations
- LNAPL Plume Extent to be Excavated for Off-Site Disposal
- Property Boundary
- Water
- Wetlands

40 20 0 40 Feet

DRAWING TITLE: Overburden Sample Results	CLIENT NAME: Weston Solutions, Inc.	N W E S	REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow
	PROJECT NAME: Hatco Remediation		DRAWING: PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3/06770_LNAPL_Plume.mxd	CHECKED BY: A. Garrison
			REVISION No. 1	CONTRACT No. / DELIVERY ORDER NO.
FIGURE: 5 / SCALE: 1 inch = 30 feet / DATE: 07/10/2009			WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes / DATE CREATED: 06/30/2009

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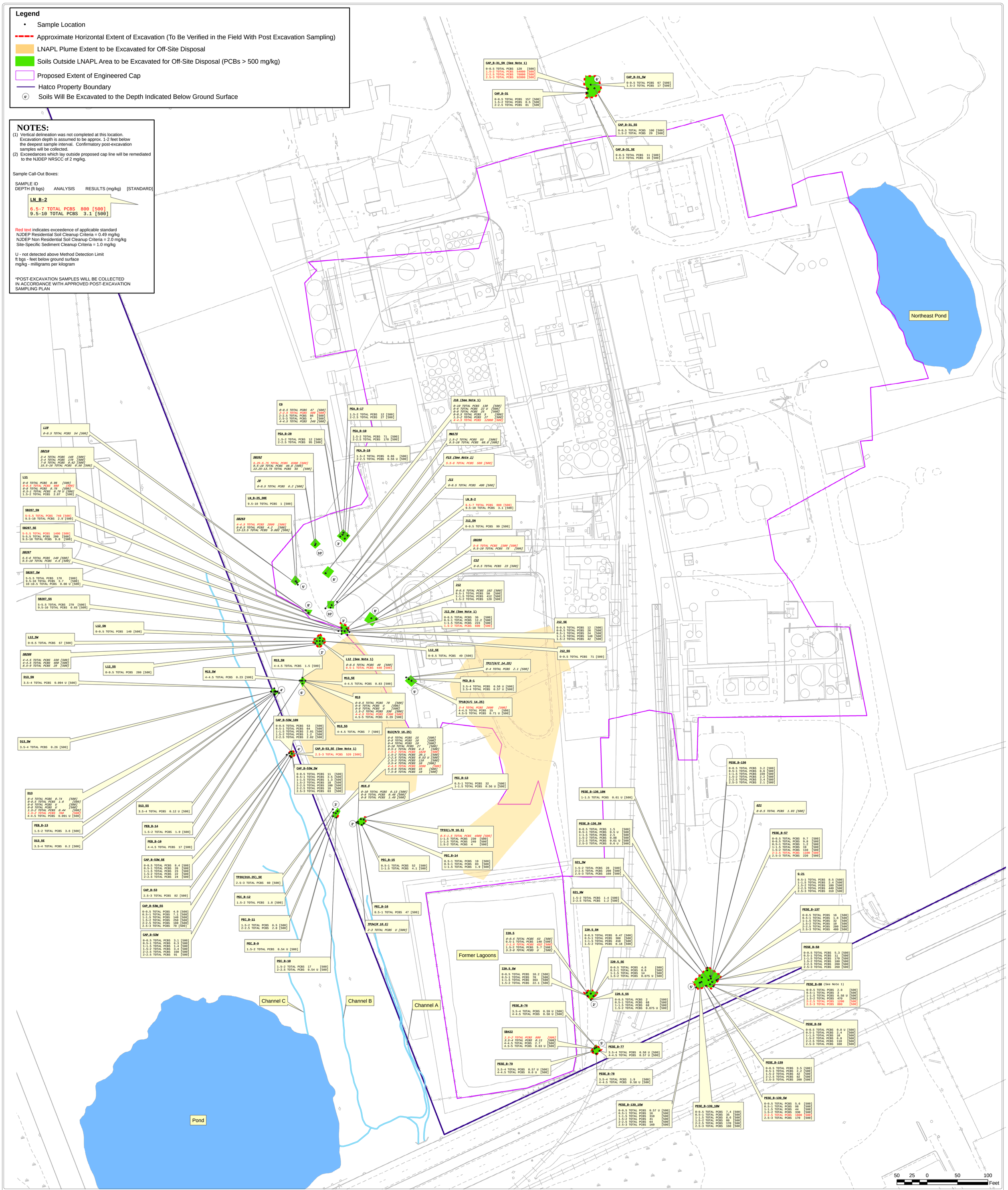

DRAWING TITLE: Data Defining the Horizontal and Vertical Extent of Excavation - PCBs > 500 mg/kg	CLIENT NAME: Weston Solutions, Inc.	N / W / E / S	REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow
	PROJECT NAME: Hatco Remediation		DRAWING: PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3/06771_500_PCB_Ex.mxd	CHECKED BY: A. Garrison
			REVISION No. 0	CONTRACT No. DELIVERY ORDER NO.
FIGURE: 6 / SCALE: 1 inch = 50 feet / DATE: 07/10/2009			WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes DATE CREATED: 06/30/2009

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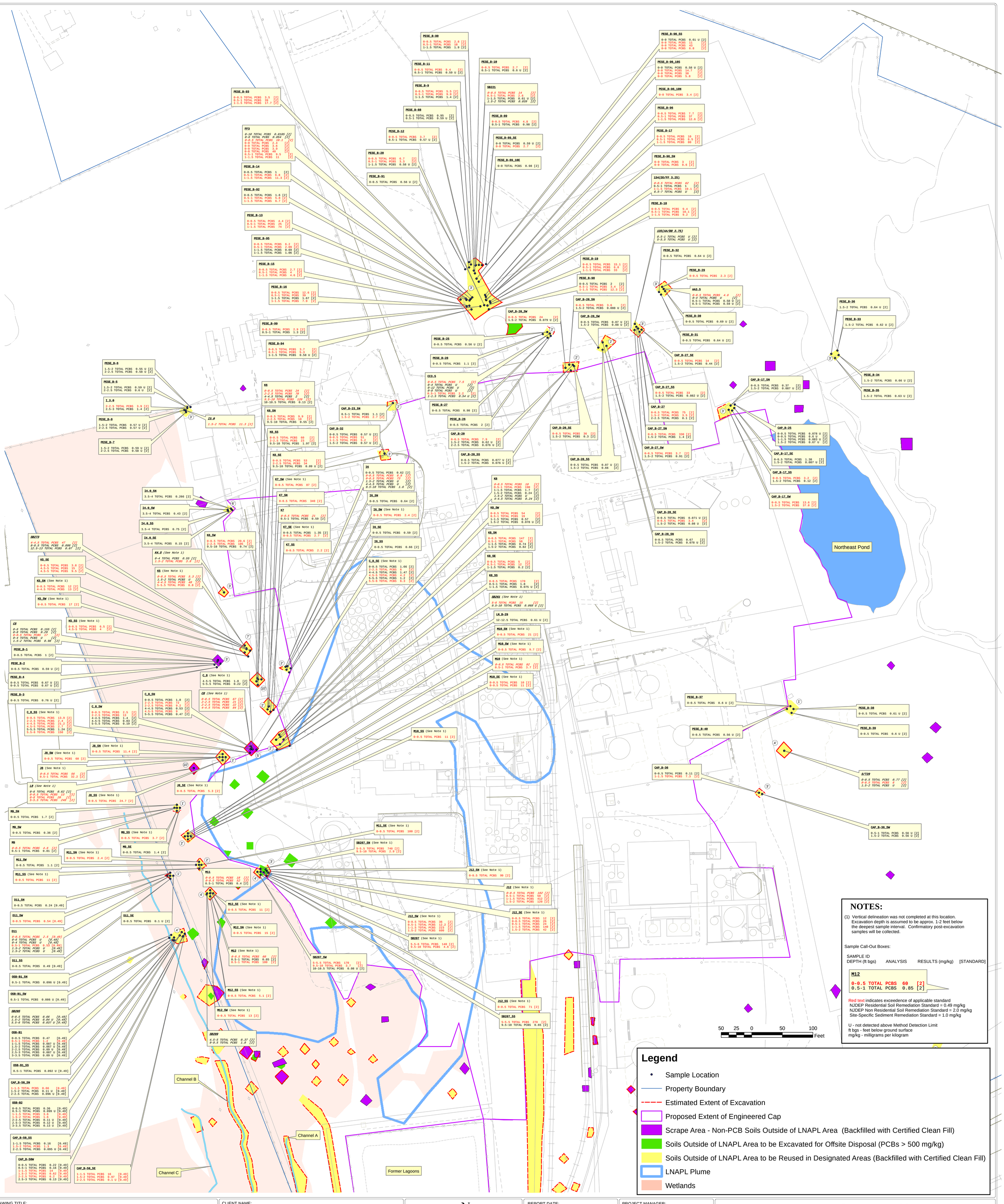

DRAWING TITLE:

Data defining Extent of Excavation - PCBs < 500 mg/kg – North

FIGURE: 7

SCALE: 1 inch = 50 feet

DATE: 07/10/2009

CLIENT NAME: Weston Solutions, Inc.

PROJECT NAME: Hatco Remediation

N W E S

REPORT DATE: August 2009

DRAWING: 06805_Scrape_Area_N.mxd

PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3

REVISION No. 0

WORK ORDER No. 13067.001.002.8013

PROJECT MANAGER: D. Kopcow

CHECKED BY: A. Garrison

CONTRACT No.

DELIVERY ORDER NO.

DRAWN/MODIFIED BY: J. Lynes

DATE CREATED: 07/13/2009

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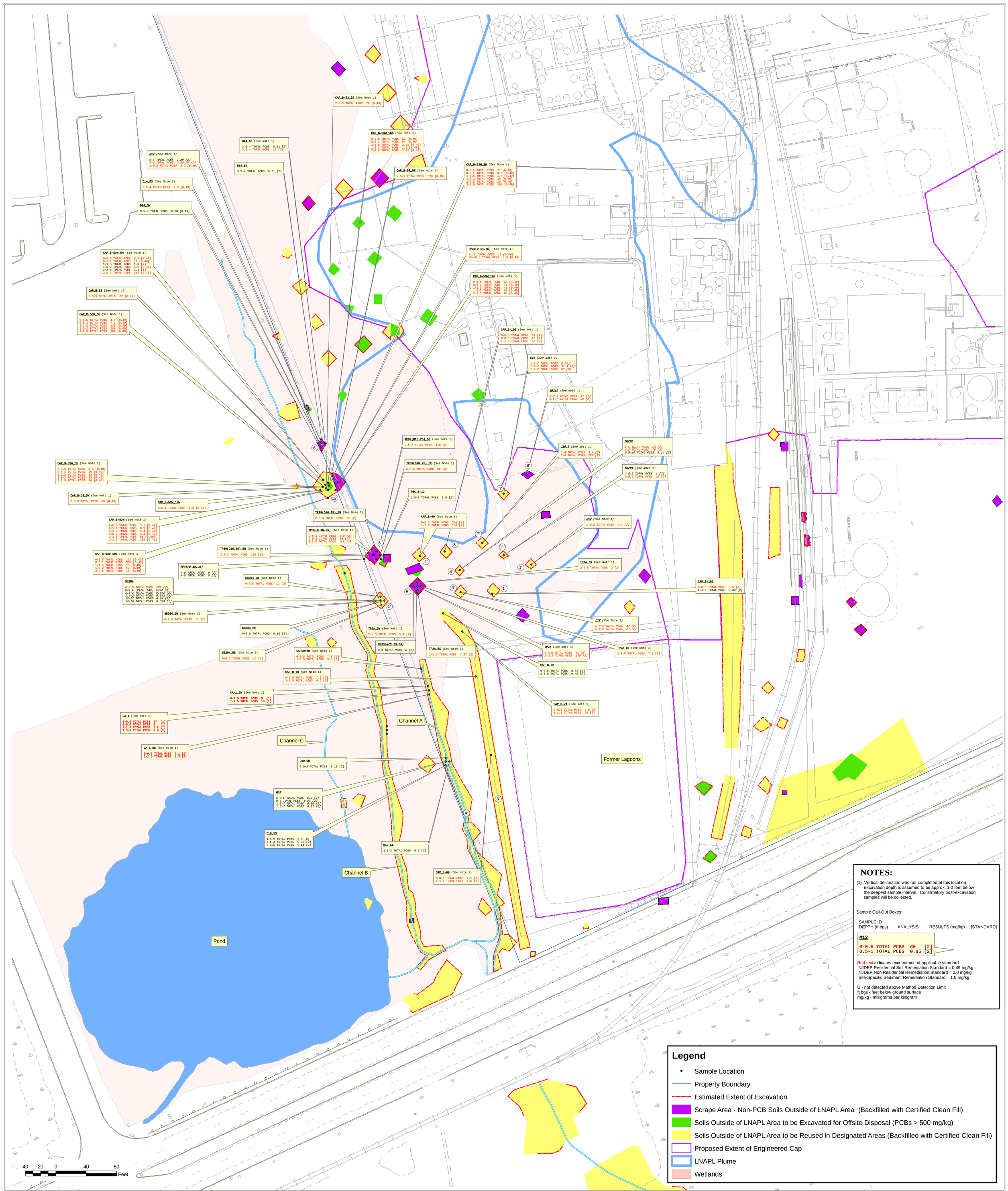

NOTES:

(1) Vertical delineation was not completed at this location. Excavation depth is assumed to be approx. 1-2 feet below the deepest sample interval. Confirmatory post-excavation samples will be collected.

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

M12
0-0.5 TOTAL PCBS 60 [2]
0.5-1 TOTAL PCBS 0.85 [2]

Red text indicates exceedence of applicable standard
NJDEP Residential Soil Remediation Standard = 0.49 mg/kg
NJDEP Non Residential Remediation Standard = 2.0 mg/kg
Site-Specific Sediment Remediation Standard = 1.0 mg/kg

U - not detected above Method Detection Limit
ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

Legend

- Sample Location
- Property Boundary
- Estimated Extent of Excavation
- Scrape Area - Non-PCB Soils Outside of LNAPL Area (Backfilled with Certified Clean Fill)
- Soils Outside of LNAPL Area to be Excavated for Offsite Disposal (PCBs > 500 mg/kg)
- Soils Outside of LNAPL Area to be Reused in Designated Areas (Backfilled with Certified Clean Fill)
- Proposed Extent of Engineered Cap
- LNAPL Plume
- Wetlands

DRAWING TITLE: Data defining Extent of Excavation - PCBs < 500 mg/kg – Middle	CLIENT NAME: Weston Solutions, Inc.	N W E S	REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow
	PROJECT NAME: Hatco Remediation		DRAWING: 06806_Scrape_Area_M.mxd PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3	CHECKED BY: A. Garrison
			REVISION No. 0	CONTRACT No. DELIVERY ORDER NO.
FIGURE: 8 / SCALE: 1 inch = 40 feet / DATE: 07/10/2009			WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes DATE CREATED: 07/13/2009

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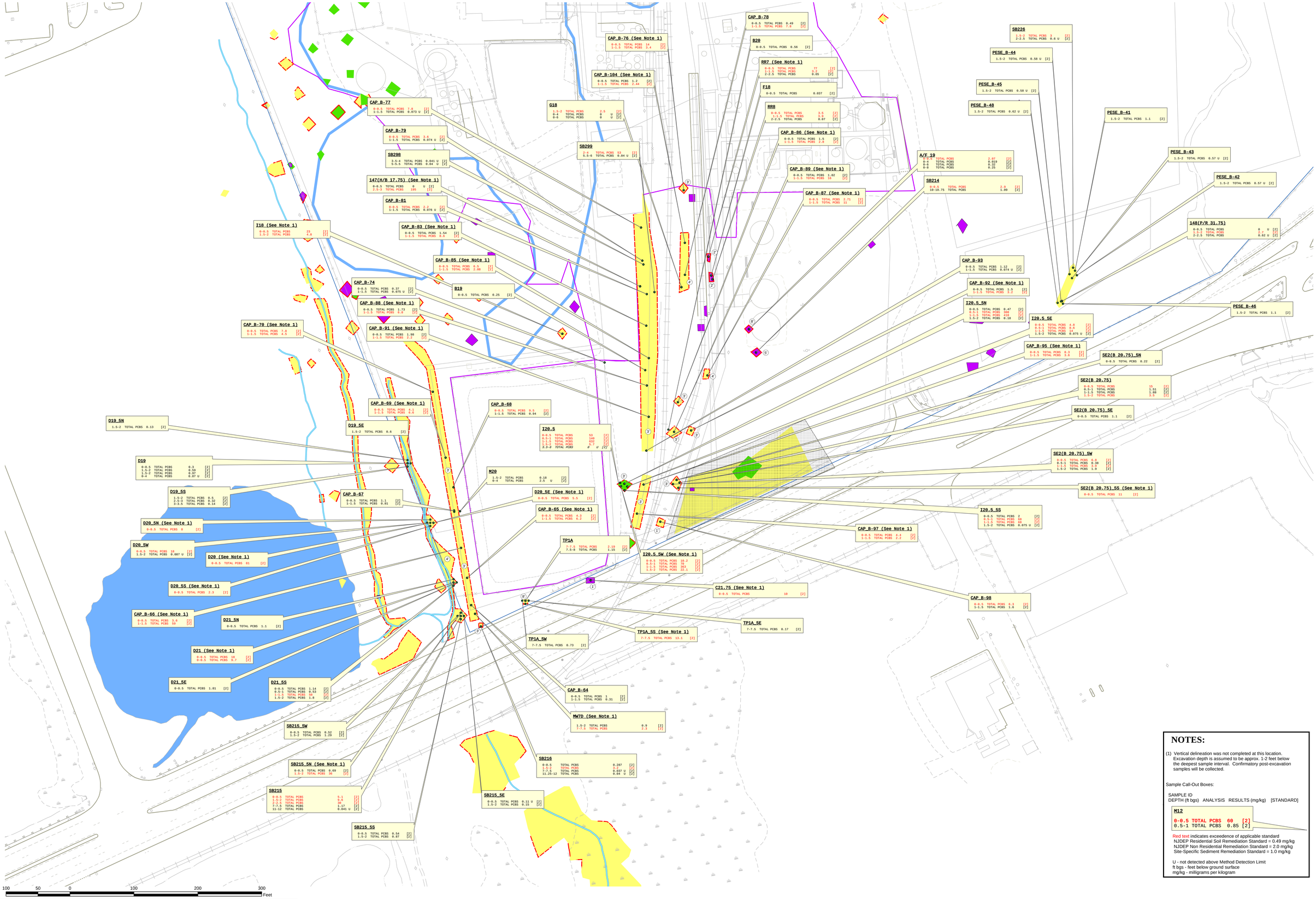

NOTES:

(1) Vertical delineation was not completed at this location. Excavation depth is assumed to be approx. 1-2 feet below the deepest sample interval. Confirmatory post-excavation samples will be collected.

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

M12
0-0.5 TOTAL PCBS 60 [2]
0.5-1 TOTAL PCBS 0.85 [2]

Red text indicates exceedence of applicable standard
NJDEP Residential Soil Remediation Standard = 0.49 mg/kg
NJDEP Non Residential Remediation Standard = 2.0 mg/kg
Site-Specific Sediment Remediation Standard = 1.0 mg/kg

U - not detected above Method Detection Limit
ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

Legend

- Refer to Figure 9 - Detail for sample results in this area
- Soils will be excavated to depth indicated below ground surface
- Sample Location
- Channels
- Estimated Extent of Excavation
- Property Boundary
- Scrape Area - Non-PCB Soils Outside of LNAPL Area (Backfilled with Certified Clean Fill)
- Soils Outside of LNAPL Area to be Excavated for Offsite Disposal (PCBs > 500 mg/kg)
- Soils Outside of LNAPL Area to be Reused in Designated Areas (Backfilled with Certified Clean Fill)
- Proposed Extent of Engineered Cap
- LNAPL Plume
- Water

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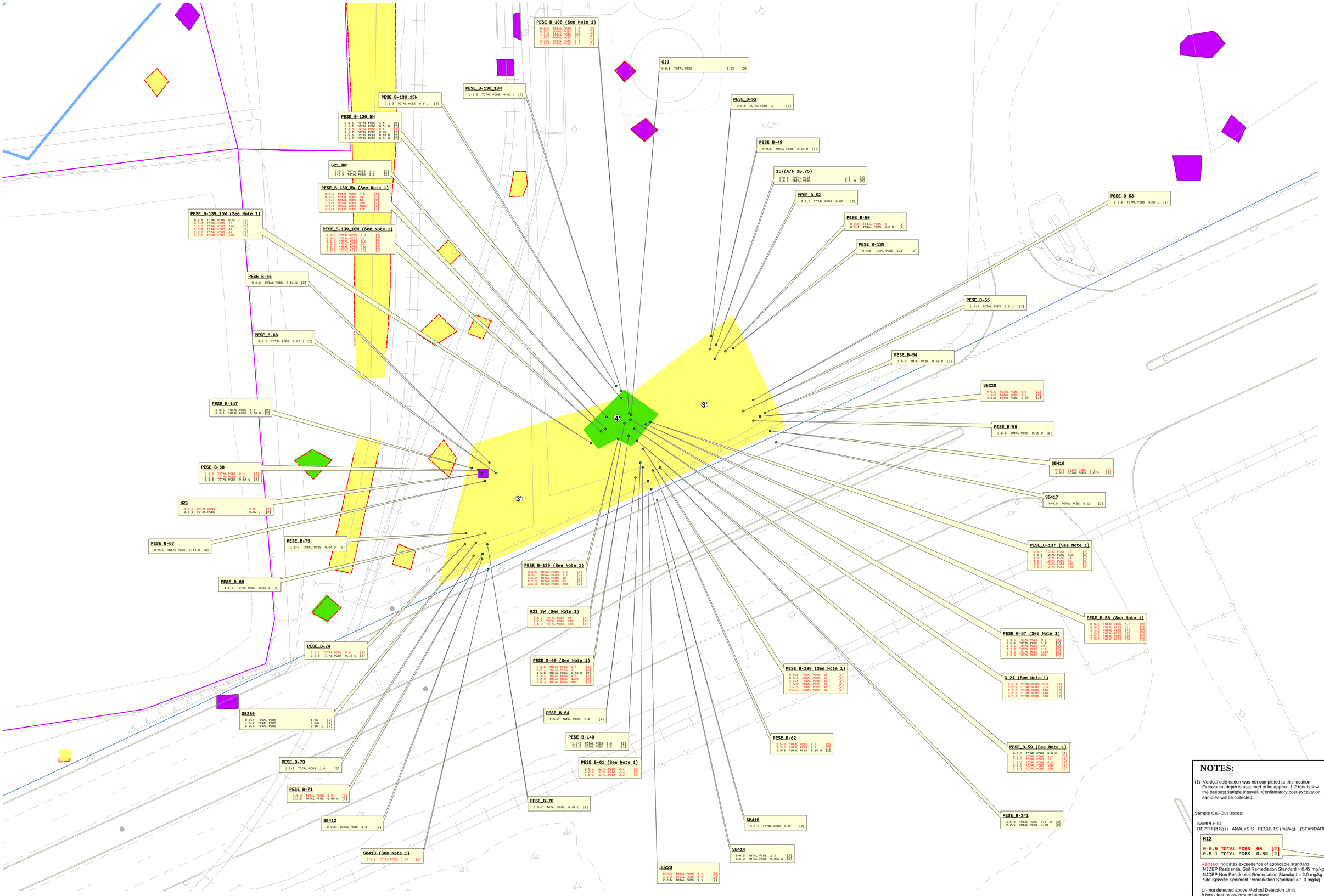
N W E S

PE Number

REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow	CLIENT NAME: Weston Solutions Inc.	DRAWING TITLE: Data Defining Extent of Excavation - PCBs < 500 mg/kg - South
DRAWING PATH: 06807_Scrape_S 0809RAWP_Add3	CHECKED BY: A.Garrison		
REVISION No. 0	CONTRACT No. / DELIVERY ORDER NO.	PROJECT NAME: Hatco Remediation	
WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: A. Garrison / DATE CREATED: 08/25/09		FIGURE: 9 / SCALE: 1" = 50' / DATE: 08/25/09



NOTES:

(1) Vertical delineation was not completed at this location. Excavation depth is assumed to be approx. 1-2 feet below the deepest sample interval. Confirmatory post-excavation samples will be collected.

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

M12
0-0.5 TOTAL PCBS 60 [2]
0.5-1 TOTAL PCBS 0.85 [2]

Red text indicates exceedence of applicable standard
NJDEP Residential Soil Remediation Standard = 0.49 mg/kg
NJDEP Non Residential Remediation Standard = 2.0 mg/kg
Site-Specific Sediment Remediation Standard = 1.0 mg/kg

U - not detected above Method Detection Limit
ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

20 10 0 20 40 60
Feet

Legend

- Sample Location
- Channels
- Estimated Extent of Excavation
- Property Boundary
- Scrape Area - Non-PCB Soils Outside of LNAPL Area (Backfilled with Certified Clean Fill)
- Soils Outside of LNAPL Area to be Excavated for Offsite Disposal (PCBs > 500 mg/kg)
- Soils Outside of LNAPL Area to be Reused in Designated Areas (Backfilled with Certified Clean Fill)
- Proposed Extent of Engineered Cap
- LNAPL Plume

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N W E S

REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow	CLIENT NAME: Weston Solutions Inc.	DRAWING TITLE: Data Defining Extent of Excavation - PCBs < 500 mg/kg - South Detail
DRAWING PATH: 06984_Scrape_Area_S_detail.mxd	CHECKED BY: A. Garrison		
REVISION No. 0	CONTRACT No. / DELIVERY ORDER NO.	PROJECT NAME: Hatco Remediation	
WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: A. Garrison / DATE CREATED: 08/25/09		FIGURE: 9 - Detail / SCALE: 1" = 20' / DATE: 08/25/09

NOTES:

(1) Vertical delineation was not completed at this location. Excavation depth is assumed to be approx. 1-2 feet below the deepest sample interval. Confirmatory post-excavation samples will be collected.

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

K3.75

0-4 BENZO(A)PYRENE	*U*	*[0.66]*
0-4 BIS(2-ETHYLHEXYL) PHTHALATE	*8.6 BE*	*[210]*
0-4 NAPHTHALENE	*0.028 J*	*[4200]*
0-0.5 BENZO(A)PYRENE	U	[0.66]
0-0.5 NAPHTHALENE	U	[17]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	**530 BE**	**[210]**
0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	0 J	[210]

Italics indicates historic (non-Weston) sample

Red text indicates exceedence of applicable standard

NJDEP Non-Residential Soil Cleanup Criteria:
Arsenic - 20 mg/kg
Benzo(A)pyrene - 0.66 mg/kg
Bis(2-ethylhexyl) phthalate - 210 mg/kg
Naphthalene - 17 mg/kg (2008 SRS)

ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

*POST-EXCAVATION SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH APPROVED POST-EXCAVATION SAMPLING PLAN

FF34 (See Note 1)

1.5-2 BENZO(A)PYRENE	*1.2*	*[0.66]*
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE	0.19 J	[210]
1.5-2 NAPHTHALENE	U	[17]

Z4 (See Note 1)

0-0.5 BENZO(A)PYRENE	*1.1*	*[0.66]*
0-10 BIS(2-ETHYLHEXYL) PHTHALATE	0.88 B	[210]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	1.8	[210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE	0.44 B	[210]
0-10 NAPHTHALENE	0.05 J	[17]
0-0.5 NAPHTHALENE	2.6	[17]

SB242

2.5-3	ARSENIC	6.77	[20]
5-5.5	ARSENIC	3.15	[20]
2.5-3	BENZO(A)PYRENE	2.5 U	[0.66]
5-5.5	BENZO(A)PYRENE	0.12 U	[0.66]
2.5-3	BIS(2-ETHYLHEXYL) PHTHALATE	2.5 U	[210]
5-5.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.13 U	[210]
2.5-3	*NAPHTHALENE*	*96*	*[17]*
5-5.5	NAPHTHALENE	0.044 J	[17]

SB241

2-3 ARSENIC	3.43 J	[20]
2-3 ARSENIC	6.38 J	[20]
5.5-6 ARSENIC	1.38	[20]
2-3 BENZO(A)PYRENE	120 U	[0.66]
2-3 BENZO(A)PYRENE	130 U	[0.66]
5.5-6 BENZO(A)PYRENE	0.11 U	[0.66]
2-3 BIS(2-ETHYLHEXYL) PHTHALATE	120 U	[210]
2-3 BIS(2-ETHYLHEXYL) PHTHALATE	130 U	[210]
5.5-6 BIS(2-ETHYLHEXYL) PHTHALATE	0.11 U	[210]
2-3 NAPHTHALENE	*52000 JD*	*[17]*
2-3 NAPHTHALENE	*5400 J*	*[17]*
5.5-6 NAPHTHALENE	0.13	[17]

SB243 (See Note 1)

2-4	ARSENIC	6.38	[20]
5.5-6	ARSENIC	4.14	[20]
2-4	BENZO(A)PYRENE	130 U	[0.66]
5.5-6	BENZO(A)PYRENE	2.6 U	[0.66]
2-4	BIS(2-ETHYLHEXYL) PHTHALATE	130 U	[210]
5.5-6	BIS(2-ETHYLHEXYL) PHTHALATE	2.6 U	[210]
2-4	*NAPHTHALENE*	*2300*	*[17]*
5.5-6	*NAPHTHALENE*	*120*	*[17]*

B3 (See Note 1)

2-2.5 BENZO(A)PYRENE	*0.94*	*[0.66]*
2-2.5 NAPHTHALENE	0.03	[17]

K3.75

0-0.5 BENZO(A)PYRENE	U	[0.66]
0-4 BENZO(A)PYRENE	U	[0.66]
0-8 BENZO(A)PYRENE	U	[0.66]
0-12 BENZO(A)PYRENE	U	[0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE	8.6	[210]
0-8 BIS(2-ETHYLHEXYL) PHTHALATE	9.6	[210]
0-12 BIS(2-ETHYLHEXYL) PHTHALATE	4.1 B	[210]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	*530 BE*	*[210]*
0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	0.18 J	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	56	[210]
0-0.5 NAPHTHALENE	U	[17]
0-4 NAPHTHALENE	0.028 J	[17]
0-8 NAPHTHALENE	U	[17]
0-12 NAPHTHALENE	U	[17]

PESC_B-21

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	0.33 J	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.4 U	[210]

SB240 (See Note 1)

0-0.5	ARSENIC	5.87	[20]
0-0.5	ARSENIC	6.06	[20]
0-0.5	BENZO(A)PYRENE	0.39 J	[0.66]
0-0.5	BENZO(A)PYRENE	12 U	[0.66]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	2.5	[210]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	12 U	[210]
0-0.5	*NAPHTHALENE*	*78 D*	*[17]*
0-0.5	*NAPHTHALENE*	*8100 D*	*[17]*

N23

0-0.5	BENZO(A)PYRENE	0 U	[0.66]
2-2.5	BENZO(A)PYRENE	0 U	[0.66]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	1.9	[210]
2-2.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.87 B	[210]
0-0.5	*NAPHTHALENE*	*19 B*	*[17]*
2-2.5	NAPHTHALENE	0.02	[17]

PESC_B-22

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	0.13 J	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.21 J	[210]

PESC_B-24

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	0.26 J	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	56	[210]

PESC_B-23

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	0.44	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.1 J	[210]

O15 (See Note 1)

0-0.5 BENZO(A)PYRENE	*9.6*	*[0.66]*
0.5-1 BENZO(A)PYRENE	1.4	[0.66]
2-2.5 BENZO(A)PYRENE	2.9	[0.66]
2-2.5 BENZO(A)PYRENE	U	[0.66]
2.5-3 BENZO(A)PYRENE	U	[0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	U	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	U	[210]
2.5-3 BIS(2-ETHYLHEXYL) PHTHALATE	U	[210]
0-0.5 NAPHTHALENE	8.1	[17]
2-2.5 NAPHTHALENE	7.3	[17]
2.5-3 NAPHTHALENE	*370*	*[17]*

C5 (see Note 1)

0-6 ARSENIC	*0.61 JN*	*[20]*
0-6 BENZO(A)PYRENE	*0.2 J*	*[0.66]*
0-6 BIS(2-ETHYLHEXYL) PHTHALATE	*0.21 J*	*[210]*
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE	*220 E*	*[210]*
0-6 NAPHTHALENE	*0.21 J*	*[17]*

P28.5 (See Note 1)

0-0.5 BENZO(A)PYRENE	*0.51*	*[0.66]*
0-0.5 BENZO(A)PYRENE	*0.73*	*[0.66]*
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	*0.45*	*[210]*
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	*0.49*	*[210]*
0-0.5 NAPHTHALENE	*0.72*	*[17]*
0-0.5 NAPHTHALENE	*1.1*	*[17]*

PESC_B-13

0.5-1 BENZO(A)PYRENE	0.043 U	[0.66]
2-2.5 BENZO(A)PYRENE	0.041 U	[0.66]

PESC_B-14

0.5-1 BENZO(A)PYRENE	0.041 U	[0.66]
2-2.5 BENZO(A)PYRENE	0.04 U	[0.66]

SB265 (see Note 1)

5.5-6 BIS(2-ETHYLHEXYL) PHTHALATE	410 J	[210]

PESC_B-16

0.5-1 BENZO(A)PYRENE	0.048 J	[0.66]
2-2.5 BENZO(A)PYRENE	0.04 U	[0.66]

123(O/P 29.25)

0-0.5 BENZO(A)PYRENE	*12*	*[0.66]*
2-2.5 BENZO(A)PYRENE	0.042 U	[0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	14	[210]
0-0.5 NAPHTHALENE	2.8 J	[17]

C8 (See Note 1)

2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	*230*	*[210]*
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	*310*	*[210]*

PESC_B-15

0.5-1 BENZO(A)PYRENE	0.041 U	[0.66]
2-2.5 BENZO(A)PYRENE	0.039 U	[0.66]

PESC_B-17 (See Note 1)

0.5-1 BENZO(A)PYRENE	0.89	[0.66]
2-2.5 BENZO(A)PYRENE	2.3	[0.66]

L8 (see Note 1)

0-6 BIS(2-ETHYLHEXYL) PHTHALATE	*3.9 E*	*[210]*
0-8 BIS(2-ETHYLHEXYL) PHTHALATE	*480 BE*	*[210]*

PESC_B-20 (See Note 1)

0.5-1 BENZO(A)PYRENE	3	[0.66]
2-2.5 BENZO(A)PYRENE	2.6	[0.66]

PESC_B-18 (See Note 1)

0.5-1 BENZO(A)PYRENE	1.6	[0.66]
2-2.5 BENZO(A)PYRENE	2	[0.66]

PESC_B-19 (See Note 1)

0.5-1 BENZO(A)PYRENE	1.8	[0.66]
2-2.5 BENZO(A)PYRENE	1.4	[0.66]

D13 (See Note 1)

0-6 BIS(2-ETHYLHEXYL) PHTHALATE	*10 E*	*[210]*
0-4 BIS(2-ETHYLHEXYL) PHTHALATE	*160 E*	*[210]*
0-8 BIS(2-ETHYLHEXYL) PHTHALATE	*8.2 B*	*[210]*
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE	*11000*	*[210]*
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE	*30 B*	*[210]*

SB219 (See Note 1)

2-2.5 ARSENIC	4.1	[20]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	*470 JD*	*[210]*
6.5-7 BIS(2-ETHYLHEXYL) PHTHALATE	*240 JD*	*[210]*

RR7

0-0.5 ARSENIC	2.5	[20]
2-2.5 ARSENIC	1.9	[20]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	*6000*	*[210]*
1-1.5 BIS(2-ETHYLHEXYL) PHTHALATE	*3400*	*[210]*
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	5.8	[210]
1-1.5 NAPHTHALENE	50	[17]
2-2.5 NAPHTHALENE	0.29 J	[17]

118(S/S/T 30.75)

0-0.5 BENZO(A)PYRENE	0.23	[0.66]
5.5-6 BENZO(A)PYRENE	ND	[0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	1.2	[210]
5.5-6 BIS(2-ETHYLHEXYL) PHTHALATE	0.43	[210]
0-0.5 NAPHTHALENE	0.07	[17]
5.5-6 NAPHTHALENE	ND	[17]

122(P/R 30.25) (See Note 1)

0-0.5 ARSENIC	9.8	[20]
0-0.5 BENZO(A)PYRENE	*0.99*	*[0.66]*
0-8 BIS(2-ETHYLHEXYL) PHTHALATE	0.23	[210]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.5	[210]
0-0.5 NAPHTHALENE	0.39	[4200]

PESC_B-32_5N (See Note 1)

2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	2.6	[210]
2-2.5 NAPHTHALENE	*26*	*[17]*

TP25(D 14.75) (See Note 1)

9-10 BIS(2-ETHYLHEXYL) PHTHALATE	*740*	*[210]*
9-10 NAPHTHALENE	11	[17]

S/T31

0-0.5 ARSENIC	*97.6*	*[20]*
0.5-1 ARSENIC	2.4	[20]
2-2.5 ARSENIC	1 U	[20]
0-0.5 BENZO(A)PYRENE	0.107 J	[0.66]
1.5-2 BENZO(A)PYRENE	U	[0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	9.7 B	[210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE	0.42 B	[210]
0-0.5 NAPHTHALENE	0.061 J	[4200]
1.5-2 NAPHTHALENE	U	[4200]

S/T31.75 (See Note 1)

0-8 BENZO(A)PYRENE	U	[0.66]
0-4 BENZO(A)PYRENE	U	[0.66]
0-0.5 BENZO(A)PYRENE	U	[0.66]
1.5-2 BENZO(A)PYRENE	U	[0.66]
0-8 BIS(2-ETHYLHEXYL) PHTHALATE	0.11 JB	[210]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE	0.23 JB	[210]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	11 BA	[210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE	*540 JBA*	*[210]*
0-8 NAPHTHALENE	0.15 J	[17]
0-4 NAPHTHALENE	0.4	[17]
0-0.5 NAPHTHALENE	*43*	*[17]*
1.5-2 NAPHTHALENE	5800 E	[17]

SB292

5-5.5 BIS(2-ETHYLHEXYL) PHTHALATE	*2400 JD*	*[210]*
9-9.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.6 J	[210]

RR5 (See Note 1)

1-1.5 BERYLLIUM	*2.2*	*[2]*

PESC_B-9

0.5-1 ARSENIC	12.1	[20]
2-2.5 ARSENIC	1 U	[20]

PESC_B-5

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	1.8	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	3.6	[210]
0.5-1 NAPHTHALENE	0.22 J	[17]
2-2.5 NAPHTHALENE	0.7	[17]

B13(M/D 16.25)

1.5-2 ARSENIC	3	[20]
0-8 BIS(2-ETHYLHEXYL) PHTHALATE	*1500 BE*	*[210]*
0-4 BIS(2-ETHYLHEXYL) PHTHALATE	*2500 BE*	*[210]*
0-10 BIS(2-ETHYLHEXYL) PHTHALATE	*290 DBA*	*[210]*
0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	2.3 B	[210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE	*400*	*[210]*
2.5-3 BIS(2-ETHYLHEXYL) PHTHALATE	100 D	[210]
0-10 NAPHTHALENE	0.99 JB	[17]
0-8 NAPHTHALENE	3.9 J	[17]
0.5-1 NAPHTHALENE	0.13 J	[17]
1.5-2 NAPHTHALENE	*61*	*[17]*
2.5-3 NAPHTHALENE	2.5	[17]

PESC_B-12

0.5-1 ARSENIC	0.78 B	[20]
2-2.5 ARSENIC	0.71 U	[20]

PESC_B-6

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	0.71 U	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	2.4	[210]
0.5-1 NAPHTHALENE	0.4 J	[17]
2-2.5 NAPHTHALENE	0.08 J	[17]

TP39(D 16.25) (See Note 1)

2.5-3 BIS(2-ETHYLHEXYL) PHTHALATE	*1200 D*	*[210]*
2.5-3 BIS(2-ETHYLHEXYL) PHTHALATE	200 D	[210]
2.5-3 NAPHTHALENE	0.25 J	[17]
2.5-3 NAPHTHALENE	0.92	[17]

113(II/I 17.75)

0-0.5 BENZO(A)PYRENE	U	[0.66]
2.5-3 BENZO(A)PYRENE	U	[0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	*200*	*[210]*
2.5-3 BIS(2-ETHYLHEXYL) PHTHALATE	11 B	[210]
0-0.5 NAPHTHALENE	U	[17
2.5-3 NAPHTHALENE	U	[17]

116(FF 18.5) (See Note 1)

0-0.5 BENZO(A)PYRENE	*1.8*	*[0.66]*
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.87	[210]
0-0.5 NAPHTHALENE	0.7	[17]

117(R/S 31.75) (See Note 1)

0-0.5 BENZO(A)PYRENE	U	[0.66]
2.5-3 BENZO(A)PYRENE	U	[0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	20	[210]
2.5-3 BIS(2-ETHYLHEXYL) PHTHALATE	*1100*	*[210]*
0-0.5 NAPHTHALENE	0.62	[17]
2.5-3 NAPHTHALENE	U	[17]

PESC_B-11

0.5-1 ARSENIC	1.5	[20]
2-2.5 ARSENIC	0.71 U	[20]

PESC_B-10

0.5-1 ARSENIC	8.1	[20]
2-2.5 ARSENIC	0.74 U	[20]

PESC_B-30

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	1.3	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	1.6	[210]
0.5-1 NAPHTHALENE	0.047 J	[17]
2-2.5 NAPHTHALENE	0.13 J	[17]

TP34(M 16.5) (See Note 1)

2-3 BENZO(A)PYRENE	*0.92*	*[0.66]*
2-3 BIS(2-ETHYLHEXYL) PHTHALATE	2.6	[210]
2-3 NAPHTHALENE	0.13 J	[17]

PESC_B-32_10W

2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.49	[210]
2.5-3 BIS(2-ETHYLHEXYL) PHTHALATE	0.17 J	[210]
2-2.5 NAPHTHALENE	1.7	[17]

S/T 31.75 (2007)

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	2.4	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	1.6	[210]
0.5-1 NAPHTHALENE	0.21 J	[17]
2-2.5 NAPHTHALENE	0.26 J	[17]

TP33(L/M 16.5) (See Note 1)

0.5-1.5 BIS(2-ETHYLHEXYL) PHTHALATE	*14000*	*[210]*
0.5-1.5 NAPHTHALENE	*250 J*	*[17]*

PESC_B-32_5W (See Note 1)

2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	210	[210]
2.5-3 BIS(2-ETHYLHEXYL) PHTHALATE	0.69 J	[210]
2-2.5 NAPHTHALENE	*1900*	*[17]*

PESC_B-7

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	6.2	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.095 J	[210]
0.5-1 NAPHTHALENE	0.57	[17]
2-2.5 NAPHTHALENE	0.13 J	[17]

SB208

0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	*310 J*	*[210]*
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE	*350 JD*	*[210]*
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE	*360 JD*	*[210]*
11-11.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.45 U	[210]

PESC_B-2

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	3.1	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	2.6	[210]

TP2A (see Note 1)

2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	*490*	*[210]*

PESC_B-32_5S (See Note 1)

2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	4.3	[210]
2-2.5 NAPHTHALENE	*34*	*[17]*

PESC_B-1

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	7.1	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.99	[210]

114(C/J 17.5) (See Note 1)

0-0.5 BENZO(A)PYRENE	U	[0.66]
5-5.5 BENZO(A)PYRENE	U	[0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	4.9 B	[210]
5-5.5 BIS(2-ETHYLHEXYL) PHTHALATE	*620*	*[210]*
0-0.5 NAPHTHALENE	U	[17]
5-5.5 NAPHTHALENE	U	[17]

PESC_B-32 (See Note 1)

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	52	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	*240*	*[210]*
2.5-3 BIS(2-ETHYLHEXYL) PHTHALATE	5	[210]
0.5-1 NAPHTHALENE	2 J	[17]
2-2.5 NAPHTHALENE	*2200*	*[17]*
2.5-3 NAPHTHALENE	57	[17]

PESC_B-3

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	1.6	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	3.7	[210]

RR5 (See Note 1)

1-1.5 BERYLLIUM	*2.2*	*[2]*

A/F 19 (see Note 1)

0-6 BIS(2-ETHYLHEXYL) PHTHALATE	*2400 BA*	*[210]*
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	*9600 D*	*[210]*

B-21 (see Note 1)

2.5-3.5 NAPHTHALENE	*660*	*[17]*

S/T32 (See Note 1)

1.5-2 BENZO(A)PYRENE	*U*	*[0.66]*
0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	2	[210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE	*700*	*[210]*
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.54 J	[210]
1.5-2 NAPHTHALENE	1600	[17]

RR8 (See Note 1)

0-0.5 ARSENIC	5.8	[20]
1-1.5 ARSENIC	2.7	[20]
2-2.5 ARSENIC	7.9	[20]
0-0.5 BENZO(A)PYRENE	*130*	*[0.66]*
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	*400*	*[210]*
1-1.5 BIS(2-ETHYLHEXYL) PHTHALATE	*2100*	*[210]*
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	6.4	[210]
0-0.5 NAPHTHALENE	*110*	*[17]*
1-1.5 NAPHTHALENE	*270*	*[17]*

C21.75 (See Note 1)

0-0.5 BENZO(A)PYRENE	*0.75*	*[0.66]*
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	*3*	*[210]*
0-0.5 NAPHTHALENE	*0.073*	*[17]*

PESC_B-4

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	3.2	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	0.47 J	[210]

RR9 (See Note 1)

0-0.5 ARSENIC	6.7	[20]
1-1.5 ARSENIC	7.1	[20]
2-2.5 ARSENIC	6.2 U	[20]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	4.8	[210]
1-1.5 BIS(2-ETHYLHEXYL) PHTHALATE	60	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	*310*	*[210]*
0-0.5 NAPHTHALENE	0.45 J	[17]
1-1.5 NAPHTHALENE	14	[17]

SB214

0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE	*4300 D*	*[210]*
5-6 BIS(2-ETHYLHEXYL) PHTHALATE	15 J	[210]
10-10.75 BIS(2-ETHYLHEXYL) PHTHALATE	47 J	[210]

57(2) (See Note 1)

2.5-3.5 BIS(2-ETHYLHEXYL) PHTHALATE	180	[210]
2.5-3.5 NAPHTHALENE	680	[17]

PESC_B-31

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	0.94	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	1.6	[210]
0.5-1 NAPHTHALENE	0.11 J	[17]
2-2.5 NAPHTHALENE	0.37 J	[17]

PESC_B-8 (See Note 1)

0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE	6.6	[210]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE	30	[210]
0.5-1 NAPHTHALENE	0.68	[17]
2-2.5 NAPHTHALENE	240	[17]

Legend

- Soil Sample Location
- (2') Soils will be excavated to the depth indicated below ground surface
- Approximate Horizontal Extent of Excavation (To Be Verified in the Field With Post Excavation Sampling)
- Excavation Area (Non-PCBs) for Off-Site Disposal
- Proposed Extent of Engineered Cap
- Wetland
- Hatco Property Boundary

100 50 0 100 200 Feet

DRAWING TITLE: Data Defining the Horizontal and Vertical Extent of Excavation – Non-PCBs	CLIENT NAME: Weston Solutions Inc.	N W E S	REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow
	PROJECT NAME: Hatco Remediation		DRAWING PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3/06797_Scrape_Area_Samples.mxd	CHECKED BY: A. Garrison
			REVISION No. 0	CONTRACT No. / DELIVERY ORDER NO.
FIGURE: 10 / SCALE: 1 inch = 100 feet / DATE: 07/10/2009			WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes / DATE CREATED: 07/10/2009

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25 12.5 0 25 50
Feet

Legend

- Sample Locations
- LNAPL Plume Extent to be Excavated for Off-Site Disposal
- Soils Outside LNAPL Area to Be Excavated for Off-site Disposal (PCBs > 500 mg/kg)
- Soils Outside LNAPL Area to Be Excavated for Off-site Disposal (Non-PCBs)
- Soils Outside LNAPL Area to Be Excavated and Re-Used in Designated Areas (PCBs < 500 mg/kg)
- Proposed Extent of Engineered Cap
- Wetland

CAP_B-23
0.5-1 TOTAL PCBS 4.9 [2]
1.5-2 TOTAL PCBS U [2]

CAP_B-23_5E
0.5-1 TOTAL PCBS 0.12 [2]

CAP_B-23_5N
0.5-1 TOTAL PCBS 1.1 [2]
1.5-2 TOTAL PCBS 2.7 [2]

CAP_B-23_5W
0.5-1 TOTAL PCBS 1.8 [2]

CAP_B-23_5S
0.5-1 TOTAL PCBS 0.47 [2]

CAP_B-29
0-0.5 TOTAL PCBS 0.42 [2]
1-1.5 TOTAL PCBS U [2]
1.5-2 TOTAL PCBS U [2]

CAP_B-20_5N
0-0.5 TOTAL PCBS 3.6 [2]

CAP_B-20_5W
0-0.5 TOTAL PCBS 24 [2]

CAP_B-21_10E
0-0.5 TOTAL PCBS 3.4 [2]

PESE_B-23
1.5-2 TOTAL PCBS 1.8 [2]

132(HH/A 3.75)
1-1.5 BENZO(A)PYRENE U [0.66]
5-5.5 BENZO(A)PYRENE U [0.66]
1-1.5 BIS(2-ETHYLHEXYL) PHTHALATE 5.3 [210]
5-5.5 BIS(2-ETHYLHEXYL) PHTHALATE 1.3 [210]
1-1.5 NAPHTHALENE U [17]
5-5.5 NAPHTHALENE U [17]

E3.75
0-6 BENZO(A)PYRENE U [0.66]
0-6 BIS(2-ETHYLHEXYL) PHTHALATE 0.055 JB [210]
0-6 NAPHTHALENE U [17]

A4
0-8 BENZO(A)PYRENE U [0.66]
0-0.5 BENZO(A)PYRENE U [0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE 0.81 B [210]
0-8 BIS(2-ETHYLHEXYL) PHTHALATE U [210]
0-8 NAPHTHALENE U [17]
0-0.5 NAPHTHALENE U [17]

A4.25
1.5-2 BENZO(A)PYRENE U [0.66]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 1.4 B [210]
1.5-2 NAPHTHALENE U [17]

H4
1.5-2 BENZO(A)PYRENE 0.027 J [0.66]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 0.081 JB [210]
1.5-2 NAPHTHALENE U [17]
1.5-2 TOTAL PCBS 0.075 [2]

B4
1.5-2 BENZO(A)PYRENE U [0.66]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 1.4 [210]
1.5-2 NAPHTHALENE U [17]
0-0.5 TOTAL PCBS 0.27 [2]
0-8 TOTAL PCBS U [2]
4-4.5 TOTAL PCBS 0.24 [2]

SB250
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE 24 D [210]
5.25-6 BIS(2-ETHYLHEXYL) PHTHALATE 0.65 U [210]
0-0.5 TOTAL PCBS 0.23 [2]

I4.0_5N
3.5-4 TOTAL PCBS 0.266 [2]

I4.0_5W
3.5-4 TOTAL PCBS 0.43 [2]

I4.0_5S
3.5-4 TOTAL PCBS 0.75 [2]

I4.0_5E
3.5-4 TOTAL PCBS 0.15 [2]

SB251
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE 2.9 [210]
5-6 BIS(2-ETHYLHEXYL) PHTHALATE 0.37 U [210]
0-0.5 TOTAL PCBS 0.044 [2]
5-6 TOTAL PCBS 0.15 [2]

G4.25
0-0.5 BENZO(A)PYRENE U [0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE 230 BD [210]
0-0.5 NAPHTHALENE U [17]
0-0.5 TOTAL PCBS 0.21 [2]

I4.0
0-4 BENZO(A)PYRENE 0.1 UJ [0.66]
1.5-2 BENZO(A)PYRENE U [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 5 [210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 6.9 BE [210]
0-4 NAPHTHALENE U [17]
1.5-2 NAPHTHALENE U [17]
0-4 TOTAL PCBS 4.0 [2]
4-4.5 TOTAL PCBS 8 [2]

149(II 4)
2-2.5 BENZO(A)PYRENE U [0.66]
5-5.5 BENZO(A)PYRENE U [0.66]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE 1.7 [210]
5-5.5 BIS(2-ETHYLHEXYL) PHTHALATE 0.25 [210]
2-2.5 NAPHTHALENE U [17]
5-5.5 NAPHTHALENE U [17]

K4.25
0-4 BENZO(A)PYRENE U [0.66]
1.5-2 BENZO(A)PYRENE U [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 0.42 J [210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 5 B [210]
0-4 NAPHTHALENE U [17]
1.5-2 NAPHTHALENE U [17]

I4.5
0-4 BENZO(A)PYRENE U [0.66]
1.5-2 BENZO(A)PYRENE 0.042 J [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 4.5 BD [210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 0.86 B [210]
0-4 NAPHTHALENE U [4200]
1.5-2 NAPHTHALENE 0.053 J [17]
0-4 TOTAL PCBS 1.11 [2]
1.5-2 TOTAL PCBS 21.9 [2]

106(II/I 4.75)
0-0.5 BENZO(A)PYRENE U [0.66]
5-6 BENZO(A)PYRENE U [0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE 32 [210]
5-6 BIS(2-ETHYLHEXYL) PHTHALATE 5.1 [210]
0-0.5 NAPHTHALENE U [4200]
5-6 NAPHTHALENE U [17]

K4.5
0-4 BENZO(A)PYRENE U [0.66]
1.5-2 BENZO(A)PYRENE U [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 2.2 [210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 97 E [210]
0-4 NAPHTHALENE U [17]
1.5-2 NAPHTHALENE U [17]
0-4 TOTAL PCBS 0.55 [2]
1.5-2 TOTAL PCBS 3.8 [2]

I5
1.5-2 BENZO(A)PYRENE U [0.66]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 0.41 [210]
1.5-2 NAPHTHALENE 0.04 J [17]
8-8.5 TOTAL PCBS 0.17 [2]

I6
1.5-2 BENZO(A)PYRENE 0.07 J [0.66]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 14 [210]
1.5-2 NAPHTHALENE 0.59 [17]
0-0.5 TOTAL PCBS 0.62 [2]
0-0.5 TOTAL PCBS 0.8 [2]
0-0.5 TOTAL PCBS 73 [2]
9.5-10 TOTAL PCBS 1.6 [2]

I6_5N
0-0.5 TOTAL PCBS 0.64 [2]

I6_5W
0-0.5 TOTAL PCBS 2.4 [2]

I6_5E
0-0.5 TOTAL PCBS 0.59 [2]

I6_5S
0-0.5 TOTAL PCBS 0.66 [2]

K7
0-0.5 TOTAL PCBS 21 [2]
0.5-1 TOTAL PCBS 0.59 [2]

C7
0-4 BENZO(A)PYRENE U [0.66]
1.5-2 BENZO(A)PYRENE U [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 7.6 [210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 60 [210]
0-4 NAPHTHALENE U [17]
1.5-2 NAPHTHALENE U [17]

K7_5W
0-0.5 TOTAL PCBS 87 [2]

K6_5E
0-0.5 TOTAL PCBS 53 [2]
2-2.5 TOTAL PCBS 34 [2]

K7_5N
0-0.5 TOTAL PCBS 340 [2]

K7_5E
0-0.5 TOTAL PCBS 2.7 [2]

K7_5S
0-0.5 TOTAL PCBS 2.2 [2]

K8_5E
0-0.5 TOTAL PCBS 5 [2]
0.5-1 TOTAL PCBS 12 [2]
1-1.5 TOTAL PCBS 0.2 [2]

K8_5N
0-0.5 TOTAL PCBS 147 [2]
0.5-1 TOTAL PCBS 58 [2]
1-1.5 TOTAL PCBS 0.74 [2]
1.5-2 TOTAL PCBS 0.82 [2]

C_8_5S
0-0.5 TOTAL PCBS 13.9 [2]
2-2.5 TOTAL PCBS 2.4 [2]
4-4.5 TOTAL PCBS 21.2 [2]
4.5-5 TOTAL PCBS 2.7 [2]
5-5.5 TOTAL PCBS 1.24 [2]
5.5-6 TOTAL PCBS 150 [2]

C_8_5W
0-0.5 TOTAL PCBS 2.5 [2]
2-2.5 TOTAL PCBS 13 [2]
4-4.5 TOTAL PCBS 1.4 [2]
4.5-5 TOTAL PCBS 0.83 [2]
5-5.5 TOTAL PCBS 0.19 [2]

K8_5S
0-0.5 TOTAL PCBS 170 [2]
0.5-1 TOTAL PCBS 1.8 [2]

J8_5N
0-0.5 TOTAL PCBS 11.4 [2]

J8_5W
0-0.5 TOTAL PCBS 60 [2]

I9
1.5-2 BENZO(A)PYRENE U [0.66]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 26 D [210]
1.5-2 NAPHTHALENE 0.17 J [17]
0-0.5 TOTAL PCBS 50 [500]
1.5-2 TOTAL PCBS 3.1 [500]
4-4.5 TOTAL PCBS 19 [500]

J8
0-0.5 TOTAL PCBS 56 [2]
0.5-1 TOTAL PCBS 32.2 [2]

K9
0-0.5 TOTAL PCBS 19 [500]

J8_5S
0-0.5 TOTAL PCBS 24.7 [2]

C_8_5E
0-0.5 TOTAL PCBS 1.66 [2]
2-2.5 TOTAL PCBS 6 [2]
4-4.5 TOTAL PCBS 1.47 [2]
4.5-5 TOTAL PCBS 4.2 [2]
5-5.5 TOTAL PCBS 1.2 [2]
5.5-6 TOTAL PCBS 6.3 [2]

K8_5W
0-0.5 TOTAL PCBS 54 [2]
0.5-1 TOTAL PCBS 19 [2]
1-1.5 TOTAL PCBS 0.57 [2]

J8_5E
0-0.5 TOTAL PCBS 5.3 [2]

LN_B-1_100N
1-1.5 TOTAL PCBS 14 [500]
1.5-2 TOTAL PCBS 16 [500]

M9_5E
0-0.5 TOTAL PCBS 1.4 [2]

NOTES:

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

K3.75
0-4 BENZO(A)PYRENE U [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 8.6 BE [210]
0-4 NAPHTHALENE 0.028 J [4200]
0-0.5 BENZO(A)PYRENE U [0.66]
0-0.5 NAPHTHALENE U [17]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE 530 BE [210]
0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE 0 J [210]

Italics indicates historic (non-Weston) sample

Red text indicates exceedence of applicable standard

NJDEP Non-Residential Soil Cleanup Criteria:
- Arsenic - 20 mg/kg
- Benzo(A)pyrene - 0.66 mg/kg
- Bis(2-ethylhexyl) phthalate - 210 mg/kg
- Naphthalene - 17 mg/kg (2008 SRS)
- PCBs - 2.0 mg/kg

ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

*POST-EXCAVATION SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH APPROVED POST-EXCAVATION SAMPLING PLAN

DRAWING TITLE: Data Defining the Extent of the Engineered Cap – Northwest	CLIENT NAME: Weston Solutions, Inc.	N W E S	REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow
	PROJECT NAME: Hatco Remediation		DRAWING: PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3/06783_Cap_NW_Border.mxd	CHECKED BY: A. Garrison
			REVISION No. 0	CONTRACT No. / DELIVERY ORDER NO.
FIGURE: 11 / SCALE: 1 inch = 25 feet / DATE: 07/10/2009			WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes / DATE CREATED: 07/07/2009

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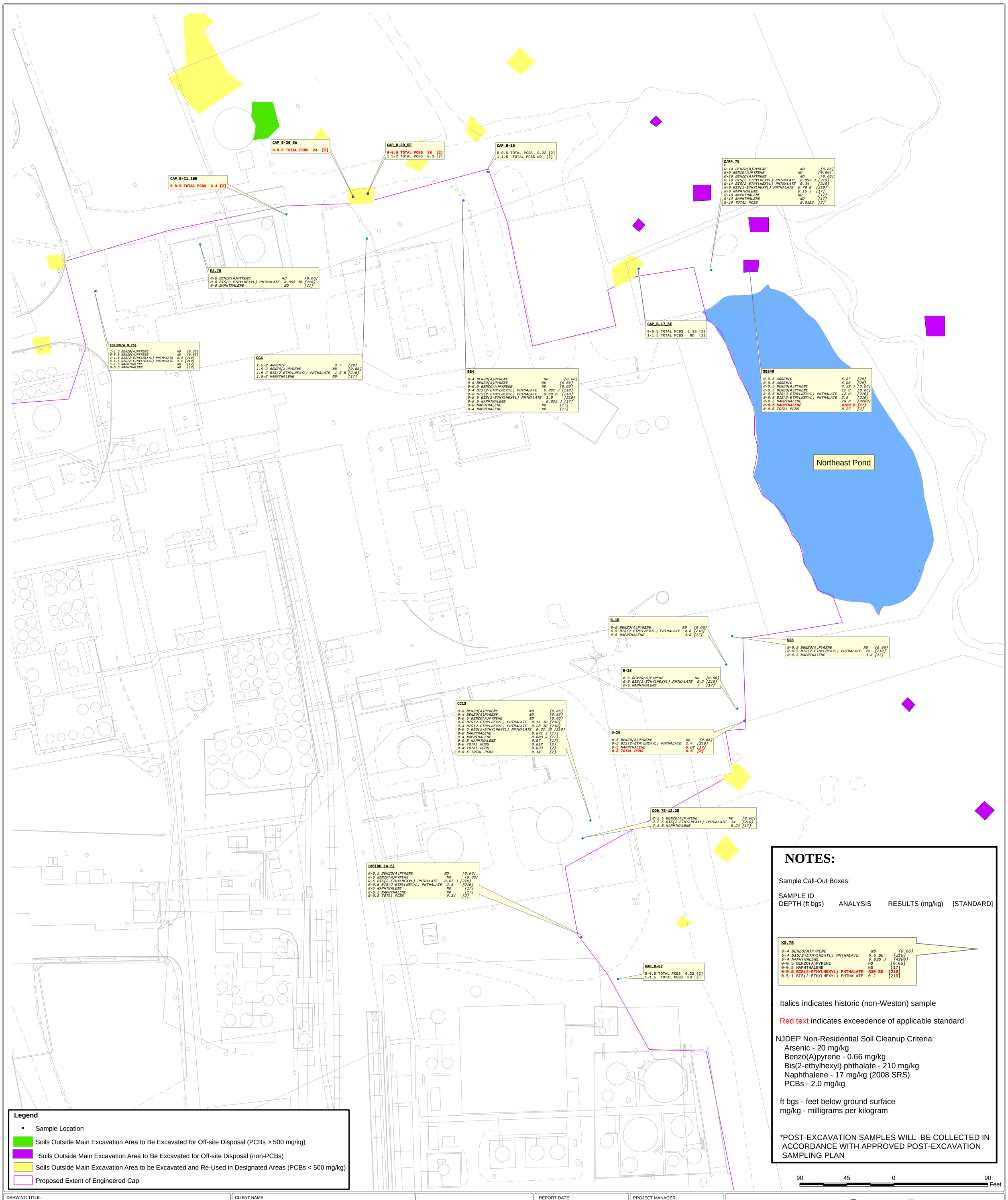

NOTES:

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

Italics indicates historic (non-Weston) sample

Red text indicates exceedence of applicable standard

NJDEP Non-Residential Soil Cleanup Criteria:
- Arsenic - 20 mg/kg
- Benzo(A)pyrene - 0.66 mg/kg
- Bis(2-ethylhexyl) phthalate - 210 mg/kg
- Naphthalene - 17 mg/kg (2008 SRS)
- PCBs - 2.0 mg/kg

ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

*POST-EXCAVATION SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH APPROVED POST-EXCAVATION SAMPLING PLAN

Legend
- Sample Location
- Soils Outside Main Excavation Area to Be Excavated for Off-site Disposal (PCBs > 500 mg/kg)
- Soils Outside Main Excavation Area to Be Excavated for Off-site Disposal (non-PCBs)
- Soils Outside Main Excavation Area to be Excavated and Re-Used in Designated Areas (PCBs < 500 mg/kg)
- Proposed Extent of Engineered Cap

90 45 0 90 Feet

DRAWING TITLE: Data Defining the Extent of the Engineered Cap – Northeast	CLIENT NAME: Weston Solutions, Inc.	N W E S	REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow
	PROJECT NAME: Hatco Remediation		DRAWING: PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3/06792_Cap_NE_Border.mxd	CHECKED BY: A. Garrison
			REVISION No. 0	CONTRACT No. DELIVERY ORDER NO.
FIGURE: 12 / SCALE: 1 inch = 45 feet / DATE: 07/10/2009			WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes DATE CREATED: 07/07/2009

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NOTES:

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

K3.75

0-4	*BENZO(A)PYRENE*	*U*	*[0.66]*
0-4	*BIS(2-ETHYLHEXYL) PHTHALATE*	*8.6 BE*	*[210]*
0-4	*NAPHTHALENE*	*0.028 J*	*[17]*
0-0.5	BENZO(A)PYRENE	U	[0.66]
0-0.5	NAPHTHALENE	U	[17]
0-0.5	**BIS(2-ETHYLHEXYL) PHTHALATE**	**530 BE**	**[210]**
0.5-1	BIS(2-ETHYLHEXYL) PHTHALATE	0 J	[210]

Italics indicates historic (non-Weston) sample

Red text indicates exceedence of applicable standard

NJDEP Non-Residential Soil Cleanup Criteria:
- Arsenic - 20 mg/kg
- Benzo(A)pyrene - 0.66 mg/kg
- Bis(2-ethylhexyl) phthalate - 210 mg/kg
- Naphthalene - 17 mg/kg (2008 SRS)
- PCBs - 2.0 mg/kg

ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

*POST-EXCAVATION SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH APPROVED POST-EXCAVATION SAMPLING PLAN

F16.5

1.5-2	*ARSENIC*	*155*	*[20]*
1.5-2	*BENZO(A)PYRENE*	*0.088 J*	*[0.66]*
1.5-2	*BIS(2-ETHYLHEXYL) PHTHALATE*	*0.11 JB*	*[210]*
1.5-2	*NAPHTHALENE*	*0.061 J*	*[17]*
1.5-2	*TOTAL PCBS*	*0.19*	*[2]*

130(DD 14.5)

0-0.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-6	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-6	*BIS(2-ETHYLHEXYL) PHTHALATE*	*0.07 J*	*[210]*
0-0.5	*BIS(2-ETHYLHEXYL) PHTHALATE*	*2.3*	*[210]*
0-6	*NAPHTHALENE*	*ND*	*[17]*
0-0.5	*NAPHTHALENE*	*ND*	*[17]*
0-0.5	*TOTAL PCBS*	*0.34*	*[2]*

CAP_B-37

0-0.5	TOTAL PCBS	0.33 [2]
1-1.5	TOTAL PCBS	ND [2]

DD16

0-0.5	*BENZO(A)PYRENE*	*0.39 J*	*[0.66]*
0-4	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-8	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-8	*BIS(2-ETHYLHEXYL) PHTHALATE*	*0.15 JB*	*[210]*
0-4	*BIS(2-ETHYLHEXYL) PHTHALATE*	*0.47 B*	*[210]*
0-0.5	*BIS(2-ETHYLHEXYL) PHTHALATE*	*2.8 B*	*[210]*
0-0.5	*NAPHTHALENE*	*ND*	*[17]*
0-8	*NAPHTHALENE*	*ND*	*[17]*
0-4	*NAPHTHALENE*	*ND*	*[17]*
0-4	*TOTAL PCBS*	*0.19*	*[2]*
0-6	*TOTAL PCBS*	*0.21*	*[2]*
0-0.5	***TOTAL PCBS***	***3.5***	***[2]***

G17

0-0.5 TOTAL PCBS 0.18 [2]

CAP_B-76

0-0.5	**TOTAL PCBS**	**14 [2]**
1-1.5	**TOTAL PCBS**	**3.4 [2]**

CAP_B-10

0-0.5	TOTAL PCBS	0.87 [2]
1.5-2	TOTAL PCBS	0.91 [2]

CAP_B-75

0-0.5	TOTAL PCBS	0.3 [2]
1-1.5	TOTAL PCBS	ND [2]

RR4

0-0.5	*ARSENIC*	*2.1*	*[20]*
1-1.5	*ARSENIC*	*25*	*[20]*
2-2.5	*ARSENIC*	*ND*	*[20]*
0-0.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
1-1.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
2-2.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-0.5	*BIS(2-ETHYLHEXYL) PHTHALATE*	*5.4*	*[210]*
1-1.5	*BIS(2-ETHYLHEXYL) PHTHALATE*	*1*	*[210]*
2-2.5	*BIS(2-ETHYLHEXYL) PHTHALATE*	*4.2*	*[210]*
0-0.5	*NAPHTHALENE*	*ND*	*[17]*
1-1.5	*NAPHTHALENE*	*ND*	*[17]*
2-2.5	*NAPHTHALENE*	*ND*	*[17]*
0-0.5	*TOTAL PCBS*	*0.073*	*[2]*
2-2.5	*TOTAL PCBS*	*0.059*	*[2]*

DD18

0-2	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-2	*BIS(2-ETHYLHEXYL) PHTHALATE*	*0.39 B*	*[210]*
0-2	*NAPHTHALENE*	*ND*	*[17]*

H16.5

0-2	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-0.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-0.5	***BIS(2-ETHYLHEXYL) PHTHALATE***	***5000 BD***	***[210]***
0-2	*BIS(2-ETHYLHEXYL) PHTHALATE*	*61 D*	*[210]*
0-0.5	*NAPHTHALENE*	*ND*	*[17]*
0-2	*NAPHTHALENE*	*ND*	*[17]*
0-0.5	***TOTAL PCBS***	***150***	***[2]***
0-2	***TOTAL PCBS***	***5.6***	***[2]***

A0.5-17

0-0.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
3-3.5	***BENZO(A)PYRENE***	***1***	***[0.66]***
0-0.5	***BIS(2-ETHYLHEXYL) PHTHALATE***	***1100***	***[210]***
3-3.5	*BIS(2-ETHYLHEXYL) PHTHALATE*	*10*	*[210]*
0-0.5	*NAPHTHALENE*	*ND*	*[17]*
3-3.5	*NAPHTHALENE*	*4.4*	*[17]*

CAP_B-7

0-0.5	TOTAL PCBS	1.6 [2]
1.5-2	TOTAL PCBS	ND [2]

A17

0-0.5	*ARSENIC*	*4.3*	*[20]*
0-0.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-0.5	*BIS(2-ETHYLHEXYL) PHTHALATE*	*42 BDA*	*[210]*
0-0.5	*NAPHTHALENE*	*ND*	*[17]*
0-0.5	*TOTAL PCBS*	*0.25*	*[2]*

SE1(HH/A 17.25)

0-0.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-0.5	***BIS(2-ETHYLHEXYL) PHTHALATE***	***43000***	***[210]***
0-0.5	*NAPHTHALENE*	*ND*	*[4200]*
0-0.5	***TOTAL PCBS***	***3.7***	***[2]***

CAP_B-77

0-0.5	**TOTAL PCBS**	**7.8 [2]**
1-1.5	TOTAL PCBS	ND [2]

CAP_B-79

0-0.5	**TOTAL PCBS**	**3.6 [2]**
1-1.5	TOTAL PCBS	ND [2]

CAP_B-81

0-0.5	**TOTAL PCBS**	**2.2 [2]**
1-1.5	TOTAL PCBS	ND [2]

RR5

0-0.5	*ARSENIC*	*2.4*	*[20]*
1-1.5	*ARSENIC*	*3.8*	*[20]*
2-2.5	*ARSENIC*	*1*	*[20]*
0-0.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
1-1.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
2-2.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-0.5	*BIS(2-ETHYLHEXYL) PHTHALATE*	*3.8*	*[210]*
1-1.5	*BIS(2-ETHYLHEXYL) PHTHALATE*	*0.11 J*	*[210]*
2-2.5	*BIS(2-ETHYLHEXYL) PHTHALATE*	*0.55 J*	*[210]*
0-0.5	*NAPHTHALENE*	*ND*	*[17]*
1-1.5	*NAPHTHALENE*	*ND*	*[17]*
2-2.5	*NAPHTHALENE*	*ND*	*[17]*
0-0.5	*TOTAL PCBS*	*0.997*	*[2]*
2-2.5	*TOTAL PCBS*	*0.031*	*[2]*

147(H/B 17.75)

0-0.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
2.5-3	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-0.5	*BIS(2-ETHYLHEXYL) PHTHALATE*	*0.089*	*[210]*
2.5-3	*BIS(2-ETHYLHEXYL) PHTHALATE*	*15*	*[210]*
0-0.5	*NAPHTHALENE*	*ND*	*[17]*
2.5-3	*NAPHTHALENE*	*0.071*	*[17]*
2.5-3	***TOTAL PCBS***	***195***	***[2]***

SB299

2-4 TOTAL PCBS 53 [2]

CAP_B-80

0-0.5	TOTAL PCBS	0.59 [2]
1-1.5	TOTAL PCBS	0.83 [2]

SB300

2.5-3 TOTAL PCBS 0.073 [2]

CAP_B-83

0-0.5	TOTAL PCBS	1.54 [2]
1-1.5	**TOTAL PCBS**	**8.6 [2]**

113(II/I 17.75)

0-0.5	*BENZO(A)PYRENE*	*ND*	*[0.66]*
2.5-3	*BENZO(A)PYRENE*	*ND*	*[0.66]*
0-0.5	***BIS(2-ETHYLHEXYL) PHTHALATE***	***280***	***[210]***
2.5-3	*BIS(2-ETHYLHEXYL) PHTHALATE*	*11 B*	*[210]*
0-0.5	*NAPHTHALENE*	*ND*	*[17]*
2.5-3	*NAPHTHALENE*	*ND*	*[17]*

CAP_B-82

0-0.5	TOTAL PCBS	0.96 [2]
1-1.5	TOTAL PCBS	0.32 [2]

CAP_B-85

0-0.5	**TOTAL PCBS**	**6.5 [2]**
1-1.5	**TOTAL PCBS**	**2.08 [2]**

CAP_B-73

0-0.5	TOTAL PCBS	U [2]
1-1.5	TOTAL PCBS	1.4 [2]

CAP_B-74

0-0.5	TOTAL PCBS	0.37 [2]
1-1.5	TOTAL PCBS	ND [2]

B19

0-0.5 TOTAL PCBS 0.25 [2]

Former Lagoons

Legend

- Soil Sample Locations
- Proposed Extent of Engineered Cap
- Soils Outside Main Excavation Area to be Excavated and Re-Used in Designated Areas (PCBs < 500 mg/kg)
- Soils Outside Main Excavation Area to be Excavated For Off-Site Disposal (Non-PCBs)

40 20 0 40 80 Feet

DRAWING TITLE: Data Defining the Extent of the Engineered Cap – Southeast	CLIENT NAME: Weston Solutions, Inc.	N W E S	REPORT DATE: August 2009	PROJECT MANAGER: D. Kopcow
	PROJECT NAME: Hatco Remediation		DRAWING: PATH: P:\Hatco\GIS\MXD\0809_RAWP_Add3\06791_Cap_SE_Border.mxd	CHECKED BY: A. Garrison
			REVISION No. 0	CONTRACT No. DELIVERY ORDER NO.
FIGURE: 13 / SCALE: 1 inch = 40 feet / DATE: 07/10/2009			WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes / DATE CREATED: 07/07/2009

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NOTES:

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

K3.75
0-4 BENZO(A)PYRENE ND [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 8.6 BE [210]
0-4 NAPHTHALENE 0.028 J [17]
0-0.5 BENZO(A)PYRENE ND [0.66]
0-0.5 NAPHTHALENE ND [17]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE 530 BE [210]
0.5-1 BIS(2-ETHYLHEXYL) PHTHALATE 0 J [210]

Italics indicates historic (non-Weston) sample

Red text indicates exceedence of applicable standard

NJDEP Non-Residential Soil Cleanup Criteria:
- Arsenic - 20 mg/kg
- Benzo(A)pyrene - 0.66 mg/kg
- Bis(2-ethylhexyl) phthalate - 210 mg/kg
- Naphthalene - 17 mg/kg (2008 SRS)
- PCBs - 2.0 mg/kg

ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

*POST-EXCAVATION SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH APPROVED POST-EXCAVATION SAMPLING PLAN

25 12.5 0 25 50 Feet

J8_5E
0-0.5 TOTAL PCBS 5.3 [2]

C_8_5E
0-0.5 TOTAL PCBS 1.66 [2]
2-2.5 TOTAL PCBS 6 [2]
4-4.5 TOTAL PCBS 1.47 [2]
4.5-5 TOTAL PCBS 4.2 [2]
5-5.5 TOTAL PCBS 1.2 [2]
5.5-6 TOTAL PCBS 6.3 [2]

LN_B-22_95E
7-7.5 TOTAL PCBS 340 [500]

K9
0-0.5 TOTAL PCBS 19 [500]

LN_B-1_100N
1-1.5 TOTAL PCBS 14 [500]
1.5-2 TOTAL PCBS 16 [500]

L9
0-4 ARSENIC 10.5 [--]
0-4 BENZO(A)PYRENE U [0.66]
1.5-2 BENZO(A)PYRENE U [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 1700 [210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 27 BE [210]
0-4 NAPHTHALENE U [4200]
1.5-2 NAPHTHALENE 0.19 J [4200]
0-0.5 TOTAL PCBS 160 [500]
0-4 TOTAL PCBS 5.7 [500]

L11
0-8 BENZO(A)PYRENE U [0.66]
1.5-2 BENZO(A)PYRENE U [0.66]
0-8 BIS(2-ETHYLHEXYL) PHTHALATE 3.3 BE [210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 9.5 B [210]
0-8 NAPHTHALENE 0.038 J [4200]
1.5-2 NAPHTHALENE 1.6 J [4200]
0-6 TOTAL PCBS 0.90 [500]
0-8.5 TOTAL PCBS 600 [500]
0-8 TOTAL PCBS 8.76 [500]
1.5-2 TOTAL PCBS 2.87 [500]

BLN_B-20
0-0.5 TOTAL PCBS 28 [500]
0.5-1 TOTAL PCBS 53 [500]

M10_5E
0-0.5 TOTAL PCBS 10 [2]

J12_5N
0-0.5 TOTAL PCBS 99 [2]

J12
0-0.5 TOTAL PCBS 102 [2]
0.5-1 TOTAL PCBS 50 [2]
1-1.5 TOTAL PCBS 412 [2]
1.5-2 TOTAL PCBS 120 [2]

PEA_B-13
0-0.5 TOTAL PCBS 2 [2]

J12_5E
0-0.5 TOTAL PCBS 26 [2]
0.5-1 TOTAL PCBS 24 [2]
1-1.5 TOTAL PCBS 140 [2]
1.5-2 TOTAL PCBS 42 [2]

C14
0-4 BENZO(A)PYRENE U [0.66]
0-6 BENZO(A)PYRENE U [0.66]
1.5-2 BENZO(A)PYRENE U [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 65 BE [210]
0-6 BIS(2-ETHYLHEXYL) PHTHALATE 7.7 BE [210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 150 D [210]
0-4 NAPHTHALENE U [4200]
0-6 NAPHTHALENE U [4200]
1.5-2 NAPHTHALENE 0.22 J [4200]
0-4 TOTAL PCBS 0.57 [500]
0-6 TOTAL PCBS 0.73 [500]
0-0.5 TOTAL PCBS 140 [500]
1.5-2 TOTAL PCBS 7.1 [500]
2.5-3 TOTAL PCBS 200 [500]

J12_5S
0-0.5 TOTAL PCBS 71 [2]

J13
0-6 BENZO(A)PYRENE U [0.66]
0-8 BENZO(A)PYRENE U [0.66]
1.5-2 BENZO(A)PYRENE U [0.66]
0-6 BIS(2-ETHYLHEXYL) PHTHALATE 16 BE [210]
0-8 BIS(2-ETHYLHEXYL) PHTHALATE 3.3 B [210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 14 D [210]
0-6 NAPHTHALENE U [4200]
0-8 NAPHTHALENE U [4200]
1.5-2 NAPHTHALENE U [4200]
0-0.5 TOTAL PCBS 59 [500]
4-4.5 TOTAL PCBS 450 [500]

J12_5W
0-0.5 TOTAL PCBS 36 [2]
0.5-1 TOTAL PCBS 121.X [2]
1-1.5 TOTAL PCBS 223 [2]
1.5-2 TOTAL PCBS 600 [2]

J14
2-2.5 BENZO(A)PYRENE U [0.66]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE 21 D [210]
2-2.5 NAPHTHALENE 0.28 J [4200]
0-0.5 TOTAL PCBS 59 [500]
2-2.5 TOTAL PCBS 3.9 [500]

K15
0-6 ARSENIC 0.85 J [--]
0-6 BENZO(A)PYRENE U [0.66]
0-4 BENZO(A)PYRENE U [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 14 B [210]
0-6 BIS(2-ETHYLHEXYL) PHTHALATE 15 B [210]
0-4 NAPHTHALENE 0.025 JB [4200]
0-6 NAPHTHALENE 0.054 JB [4200]
0-6 TOTAL PCBS 0.34 [2]

I16
1.5-2 BENZO(A)PYRENE U [0.66]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 0.85 [210]
1.5-2 NAPHTHALENE U [4200]
0-0.5 TOTAL PCBS 39 [500]

C15
1.5-2 BENZO(A)PYRENE U [0.66]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 99 D [210]
1.5-2 NAPHTHALENE 0.67 [4200]
0-0.5 TOTAL PCBS 0.84 [2]
1.5-2 TOTAL PCBS 9.5 [2]

SB219
2-2.5 ARSENIC 4.1 [20]
2-2.5 BIS(2-ETHYLHEXYL) PHTHALATE 470 JD [210]
6.5-7 BIS(2-ETHYLHEXYL) PHTHALATE 240 JD [210]
2-2.5 TOTAL PCBS 17 [2]
6.5-7 TOTAL PCBS 29 [2]

C16
1.5-2 BENZO(A)PYRENE 0.33 J [0.66]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 104 BD [210]
1.5-2 NAPHTHALENE 2.1 J [4200]
1.5-2 TOTAL PCBS 31.9 [2]
1.5-2 TOTAL PCBS 81 [2]
1.5-2 TOTAL PCBS 83 [2]

112(K/C 16.5)
0-0.5 ARSENIC 1.85 [20]
0-0.5 BENZO(A)PYRENE U [0.66]
3.5-4 BENZO(A)PYRENE U [0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE 190 B [210]
3.5-4 BIS(2-ETHYLHEXYL) PHTHALATE 24 B [210]
0-0.5 NAPHTHALENE U [4200]
3.5-4 NAPHTHALENE U [4200]

TP24(II/I 16.5)
0-4 BENZO(A)PYRENE U [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 200 D [210]
0-4 NAPHTHALENE 0.81 [4200]
0-4 TOTAL PCBS 15 [500]

I17
0-4 ARSENIC 0.37 J [20]
0-4 BENZO(A)PYRENE U [0.66]
1.5-2 BENZO(A)PYRENE U [0.66]
0-4 BIS(2-ETHYLHEXYL) PHTHALATE 0.14 JBA [210]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 0.9 JBA [210]
0-4 NAPHTHALENE 0.027 J [4200]
1.5-2 NAPHTHALENE 0.29 J [4200]
0-0.5 TOTAL PCBS 3.8 [500]

BLN_B-12
0-0.5 TOTAL PCBS 5.6 [500]
1-1.5 TOTAL PCBS 4 [500]

113(II/I 17.75)
0-0.5 BENZO(A)PYRENE U [0.66]
2.5-3 BENZO(A)PYRENE U [0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE 280 [210]
2.5-3 BIS(2-ETHYLHEXYL) PHTHALATE 11 B [210]
0-0.5 NAPHTHALENE U [4200]
2.5-3 NAPHTHALENE U [4200]

F16.5
1.5-2 ARSENIC 155 [--]
1.5-2 BENZO(A)PYRENE 0.080 J [0.66]
1.5-2 BIS(2-ETHYLHEXYL) PHTHALATE 0.11 JB [210]
1.5-2 NAPHTHALENE 0.061 J [4200]
1.5-2 TOTAL PCBS 0.19 [2]

CAP_B-76
0-0.5 TOTAL PCBS 14 [2]
1-1.5 TOTAL PCBS 3.4 [2]

CAP_B-75
0-0.5 TOTAL PCBS 0.3 [2]
1-1.5 TOTAL PCBS U [2]

H16.5
0-2 BENZO(A)PYRENE U [0.66]
0-0.5 BENZO(A)PYRENE U [0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE 5000 BD [210]
0-2 BIS(2-ETHYLHEXYL) PHTHALATE 61 D [210]
0-0.5 NAPHTHALENE U [4200]
0-2 NAPHTHALENE U [4200]
0-0.5 TOTAL PCBS 150 [2]
0-2 TOTAL PCBS 5.6 [2]

CAP_B-77
0-0.5 TOTAL PCBS 7.8 [2]
1-1.5 TOTAL PCBS U [2]

CAP_B-79
0-0.5 TOTAL PCBS 3.6 [2]
1-1.5 TOTAL PCBS U [2]

147(H/B 17.75)
0-0.5 BENZO(A)PYRENE U [0.66]
2.5-3 BENZO(A)PYRENE U [0.66]
0-0.5 BIS(2-ETHYLHEXYL) PHTHALATE 0.089 [210]
2.5-3 BIS(2-ETHYLHEXYL) PHTHALATE 15 [210]
0-0.5 NAPHTHALENE U [4200]
2.5-3 NAPHTHALENE 0.071 [4200]
2.5-3 TOTAL PCBS 195 [2]

CAP_B-81
0-0.5 TOTAL PCBS 2.2 [2]
1-1.5 TOTAL PCBS U [2]

CAP_B-80
0-0.5 TOTAL PCBS 0.59 [2]
1-1.5 TOTAL PCBS 0.83 [2]

CAP_B-83
0-0.5 TOTAL PCBS 1.54 [2]
1-1.5 TOTAL PCBS 0.6 [2]

CAP_B-85
0-0.5 TOTAL PCBS 6.5 [2]
1-1.5 TOTAL PCBS 2.80 [2]

CAP_B-74
0-0.5 TOTAL PCBS 0.37 [2]

CAP_B-82
0-0.5 TOTAL PCBS 0.96 [2]
1-1.5 TOTAL PCBS 0.32 [2]

B19
0-0.5 TOTAL PCBS 0.25 [2]

CAP_B-73
0-0.5 TOTAL PCBS U [2]
1-1.5 TOTAL PCBS 1.4 [2]

CAP_B-88
0-0.5 TOTAL PCBS 1.73 [2]
1-1.5 TOTAL PCBS 6.8 [2]

Channel B
Channel A
Channel C
Former Lagoons

Legend

- Sample Locations
- Proposed Extent of Engineered Cap
- LNAPL Plume Extent to be Excavated for Off-Site Disposal
- Soils Outside Main Excavation Area to Be Excavated for Off-site Disposal (PCBs > 500 mg/kg)
- Soils Outside Main Excavation Area to Be Excavated for Off-site Disposal (non-PCBs)
- Soils Outside Main Excavation Area to Be Excavated and Re-Used in Designated Areas (PCBs < 500 mg/kg)
- Wetland

DRAWING TITLE: Data Defining the Extent of the Engineered Cap – Southwest	CLIENT NAME: Weston Solutions, Inc.	REPORT DATE: July 2009	PROJECT MANAGER: D. Kopcow
	PROJECT NAME: Hatco Remediation	DRAWING: PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3/06793_Cap_SW_Border.mxd	CHECKED BY: A. Garrison
		REVISION No. 0	CONTRACT No. / DELIVERY ORDER NO.
FIGURE: 14	SCALE: 1 inch = 25 feet	WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes
	DATE: 07/10/2009		DATE CREATED: 07/07/2009

N W E S

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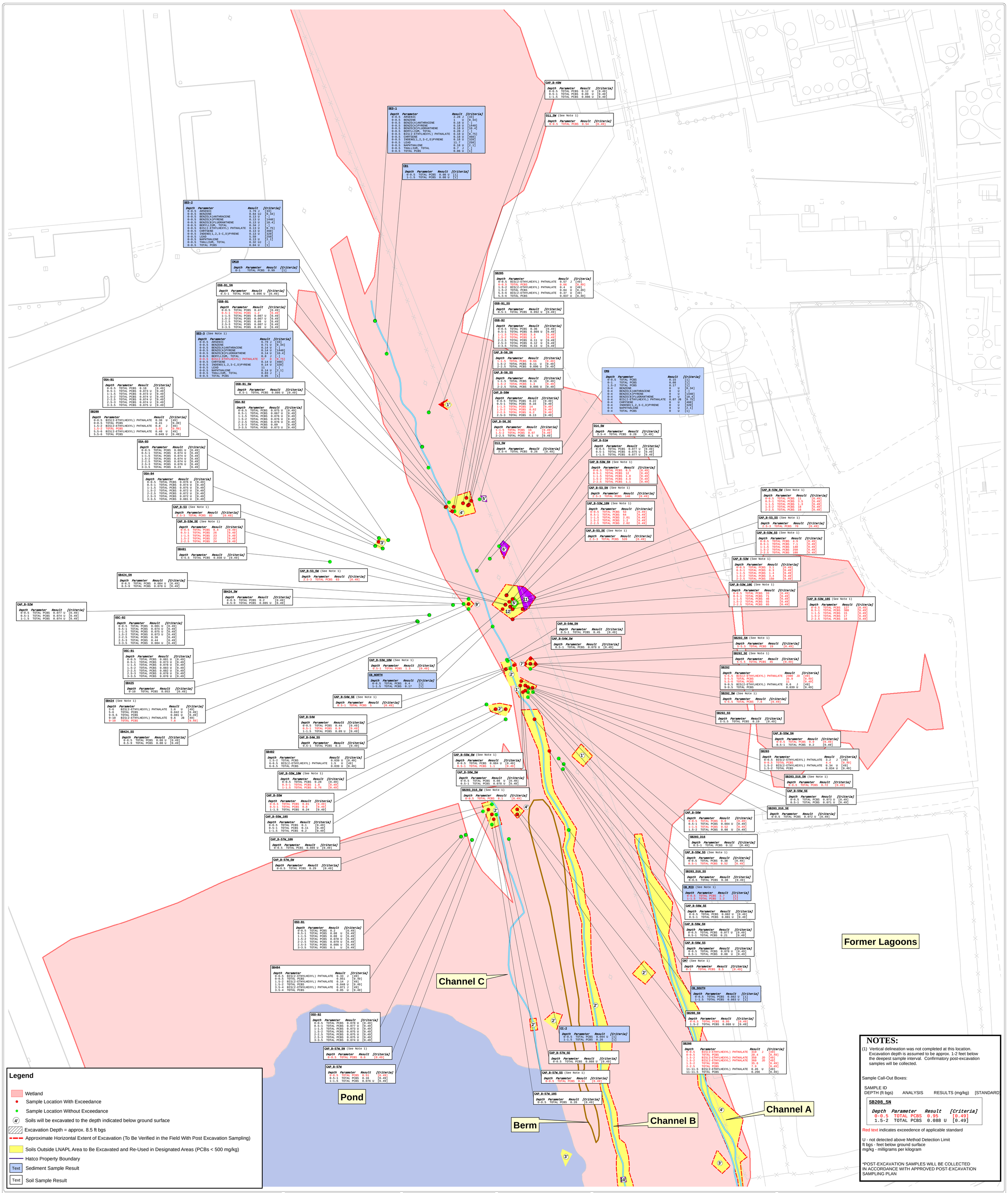

SED-1

Depth	Parameter	Result	[Criteria]
0-0.5	ARSENIC	2.28 J	[33]
0-0.5	BENZENE	1 U	[0.34]
0-0.5	BENZO(A)ANTHRACENE	0.18 U	[-]
0-0.5	BENZO(A)PYRENE	0.18 U	[1440]
0-0.5	BENZO(B)FLUORANTHENE	0.18 U	[10.4]
0-0.5	BERYLLIUM, TOTAL	0.28 J	[-]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.18 U	[0.75]
0-0.5	CHRYSENE	0.18 U	[460]
0-0.5	INDENO(1,2,3-C,D)PYRENE	0.18 U	[320]
0-0.5	LEAD	11.7	[250]
0-0.5	NAPHTHALENE	0.18 U	[2.1]
0-0.5	THALLIUM, TOTAL	0.7 J	[-]
0-0.5	TOTAL PCBS	0.06 U	[1]

CB1

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.08 U	[1]
1-1.5	TOTAL PCBS	0.08 U	[1]

CAP_B-49W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.12 U	[0.49]
0.5-1	TOTAL PCBS	0.09 U	[0.49]
1-1.5	TOTAL PCBS	0.086 U	[0.49]

D11_5W (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.54	[0.49]

SED-2

Depth	Parameter	Result	[Criteria]
0-0.5	ARSENIC	3.79 J	[33]
0-0.5	BENZENE	0.64 UJ	[0.34]
0-0.5	BENZO(A)ANTHRACENE	0.13 U	[-]
0-0.5	BENZO(A)PYRENE	0.13 U	[1440]
0-0.5	BENZO(B)FLUORANTHENE	0.13 U	[10.4]
0-0.5	BERYLLIUM, TOTAL	0.34 J	[-]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.13 U	[0.75]
0-0.5	CHRYSENE	0.13 U	[460]
0-0.5	INDENO(1,2,3-C,D)PYRENE	0.13 U	[320]
0-0.5	LEAD	5.59	[250]
0-0.5	NAPHTHALENE	0.13 U	[2.1]
0-0.5	THALLIUM, TOTAL	0.32 UJ	[-]
0-0.5	TOTAL PCBS	0.04 U	[1]

CM10

Depth	Parameter	Result	[Criteria]
0-1	TOTAL PCBS	0.99	[1]

OSB-B1_5N

Depth	Parameter	Result	[Criteria]
0.5-1	TOTAL PCBS	0.096 U	[0.49]

OSB-B1

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.47	[0.49]
0.5-1	TOTAL PCBS	1.2	[0.49]
1-1.5	TOTAL PCBS	0.087 U	[0.49]
1.5-2	TOTAL PCBS	0.087 U	[0.49]
2-2.5	TOTAL PCBS	0.09 U	[0.49]
2.5-3	TOTAL PCBS	0.087 U	[0.49]
3-3.5	TOTAL PCBS	0.09 U	[0.49]

SED-3 (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	ARSENIC	6.79 J	[33]
0-0.5	BENZENE	0.71 U	[0.34]
0-0.5	BENZO(A)ANTHRACENE	0.14 U	[-]
0-0.5	BENZO(A)PYRENE	0.14 U	[1440]
0-0.5	BENZO(B)FLUORANTHENE	0.14 U	[10.4]
0-0.5	BERYLLIUM, TOTAL	0.8 J	[-]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	57 D	[0.75]
0-0.5	CHRYSENE	0.14 U	[460]
0-0.5	INDENO(1,2,3-C,D)PYRENE	0.14 U	[320]
0-0.5	LEAD	11	[-]
0-0.5	NAPHTHALENE	0.14 U	[2.1]
0-0.5	THALLIUM, TOTAL	0.83 J	[-]
0-0.5	TOTAL PCBS	0.05	[1]

OSA-B1

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.18	[0.49]
0.5-1	TOTAL PCBS	0.073 U	[0.49]
1-1.5	TOTAL PCBS	0.073 U	[0.49]
1.5-2	TOTAL PCBS	0.074 U	[0.49]
2-2.5	TOTAL PCBS	0.074 U	[0.49]
2.5-3	TOTAL PCBS	0.074 U	[0.49]
3-3.5	TOTAL PCBS	0.075 U	[0.49]

OSB-B1_5W

Depth	Parameter	Result	[Criteria]
0.5-1	TOTAL PCBS	0.086 U	[0.49]

OSA-B2

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.075 U	[0.49]
0.5-1	TOTAL PCBS	0.067 U	[0.49]
1-1.5	TOTAL PCBS	0.076 U	[0.49]
1.5-2	TOTAL PCBS	0.076 U	[0.49]
2-2.5	TOTAL PCBS	0.076 U	[0.49]
2.5-3	TOTAL PCBS	0.08	[0.49]
3-3.5	TOTAL PCBS	0.073 U	[0.49]

SB209

Depth	Parameter	Result	[Criteria]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.38 U	[49]
0-0.5	TOTAL PCBS	0.41	[0.49]
1.5-2	BIS(2-ETHYLHEXYL) PHTHALATE	0.8 J	[49]
1.5-2	TOTAL PCBS	1.52	[0.49]
5.5-6	BIS(2-ETHYLHEXYL) PHTHALATE	0.48 U	[49]
5.5-6	TOTAL PCBS	0.049 U	[0.49]

OSA-B3

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.081 U	[0.49]
0.5-1	TOTAL PCBS	0.074 U	[0.49]
1-1.5	TOTAL PCBS	0.074 U	[0.49]
1.5-2	TOTAL PCBS	0.074 U	[0.49]
2-2.5	TOTAL PCBS	0.074 U	[0.49]
2.5-3	TOTAL PCBS	0.076 U	[0.49]
3-3.5	TOTAL PCBS	0.23	[0.49]

OSA-B4

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.076 U	[0.49]
0.5-1	TOTAL PCBS	0.074 U	[0.49]
1-1.5	TOTAL PCBS	0.075 U	[0.49]
1.5-2	TOTAL PCBS	0.072 U	[0.49]
2-2.5	TOTAL PCBS	0.072 U	[0.49]
2.5-3	TOTAL PCBS	0.072 U	[0.49]
3-3.5	TOTAL PCBS	0.081 U	[0.49]

CAP_B-53 (See Note 1)

Depth	Parameter	Result	[Criteria]
2.5-3	TOTAL PCBS	82	[0.49]

CAP_B-53W_5E (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	8.4	[0.49]
0.5-1	TOTAL PCBS	26	[0.49]
1-1.5	TOTAL PCBS	23	[0.49]
1.5-2	TOTAL PCBS	22	[0.49]
2-2.5	TOTAL PCBS	24	[0.49]

SB401

Depth	Parameter	Result	[Criteria]
5-5.5	TOTAL PCBS	0.038 U	[0.49]

CAP_B-53_5W (See Note 1)

Depth	Parameter	Result	[Criteria]
2.5-3	TOTAL PCBS	63	[0.49]

SB424_5N

Depth	Parameter	Result	[Criteria]
8-8.5	TOTAL PCBS	0.084 U	[0.49]
8.5-9	TOTAL PCBS	0.078 U	[0.49]

SB424_5W

Depth	Parameter	Result	[Criteria]
8-8.5	TOTAL PCBS	0.2	[0.49]
8.5-9	TOTAL PCBS	0.085 U	[0.49]

CAP_B-52W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.077 U	[0.49]
0.5-1	TOTAL PCBS	0.074 U	[0.49]
1-1.5	TOTAL PCBS	0.074 U	[0.49]

OSC-B2

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.081 U	[0.49]
0.5-1	TOTAL PCBS	0.074 U	[0.49]
1-1.5	TOTAL PCBS	0.075 U	[0.49]
1.5-2	TOTAL PCBS	0.073 U	[0.49]
2-2.5	TOTAL PCBS	0.36	[0.49]
2.5-3	TOTAL PCBS	0.44	[0.49]
3-3.5	TOTAL PCBS	0.084 U	[0.49]

OSC-B1

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.081 U	[0.49]
0.5-1	TOTAL PCBS	0.073 U	[0.49]
1-1.5	TOTAL PCBS	0.078 U	[0.49]
1.5-2	TOTAL PCBS	0.083 U	[0.49]
2-2.5	TOTAL PCBS	0.082 U	[0.49]
2.5-3	TOTAL PCBS	0.078 U	[0.49]
3-3.5	TOTAL PCBS	0.078 U	[0.49]

SB425

Depth	Parameter	Result	[Criteria]
9-10	TOTAL PCBS	0.053	[0.49]

SB424 (See Note 1)

Depth	Parameter	Result	[Criteria]
5-6	BIS(2-ETHYLHEXYL) PHTHALATE	1.6 U	[49]
5-6	TOTAL PCBS	0.042 U	[0.49]
9-9.5	TOTAL PCBS	0.081 U	[0.49]
9-10	BIS(2-ETHYLHEXYL) PHTHALATE	9.6 JB	[49]
9-10	TOTAL PCBS	7.8	[0.49]

SB424_5S

Depth	Parameter	Result	[Criteria]
8-8.5	TOTAL PCBS	0.08 U	[0.49]
8.5-9	TOTAL PCBS	0.08 U	[0.49]

CAP_B-53W_10W (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	53	[0.49]
0.5-1	TOTAL PCBS	64	[0.49]
1-1.5	TOTAL PCBS	2.01	[0.49]
1.5-2	TOTAL PCBS	1.2	[0.49]
2-2.5	TOTAL PCBS	2.02	[0.49]

CAP_B-53_5E (See Note 1)

Depth	Parameter	Result	[Criteria]
2.5-3	TOTAL PCBS	520	[0.49]

CAP_B-53W_10E (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	33	[0.49]
0.5-1	TOTAL PCBS	71	[0.49]
1-1.5	TOTAL PCBS	46	[0.49]
1.5-2	TOTAL PCBS	55	[0.49]
2-2.5	TOTAL PCBS	65	[0.49]

CAP_B-53W_10S (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	127	[0.49]
0.5-1	TOTAL PCBS	380	[0.49]
1-1.5	TOTAL PCBS	15	[0.49]
1.5-2	TOTAL PCBS	17	[0.49]
2-2.5	TOTAL PCBS	16	[0.49]

CAP_B-54W_5N

Depth	Parameter	Result	[Criteria]
0.5-1	TOTAL PCBS	0.45	[0.49]

CAP_B-54W_5W

Depth	Parameter	Result	[Criteria]
0.5-1	TOTAL PCBS	0.079 U	[0.49]

SB292_5N (See Note 1)

Depth	Parameter	Result	[Criteria]
5-5.5	TOTAL PCBS	19	[0.49]

SB292_5E (See Note 1)

Depth	Parameter	Result	[Criteria]
5-5.5	TOTAL PCBS	45	[0.49]

CAP_B-53W_10W (See Note 1)

Depth	Parameter	Result	[Criteria]
0.5-1	TOTAL PCBS	1.3	[0.49]

CB_NORTH

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.4	[1]
1-1.5	TOTAL PCBS	0.17	[1]

CAP_B-54W_5E (See Note 1)

Depth	Parameter	Result	[Criteria]
0.5-1	TOTAL PCBS	5	[0.49]

CAP_B-54W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.44	[0.49]
0.5-1	TOTAL PCBS	0.9	[0.49]
1-1.5	TOTAL PCBS	0.09 U	[0.49]

CAP_B-54W_5S

Depth	Parameter	Result	[Criteria]
0.5-1	TOTAL PCBS	0.3	[0.49]

SB402

Depth	Parameter	Result	[Criteria]
1.5-2	TOTAL PCBS	0.039 U	[0.49]
6-6.5	BIS(2-ETHYLHEXYL) PHTHALATE	1.5 U	[49]
6-6.5	TOTAL PCBS	0.039 U	[0.49]

CAP_B-55W_10W (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.28	[0.49]
0.5-1	TOTAL PCBS	1.8	[0.49]
1-1.5	TOTAL PCBS	0.76	[0.49]

CAP_B-55W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.91	[0.49]
0.5-1	TOTAL PCBS	0.8	[0.49]
1-1.5	TOTAL PCBS	0.24	[0.49]

CAP_B-55W_10S

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.1	[0.49]
0.5-1	TOTAL PCBS	0.11	[0.49]
1-1.5	TOTAL PCBS	0.2	[0.49]

CAP_B-57W_10N

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.089 U	[0.49]

CAP_B-57W_5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.29	[0.49]

SB205

Depth	Parameter	Result	[Criteria]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.57 J	[49]
0-0.5	TOTAL PCBS	0.66	[0.49]
1.5-2	BIS(2-ETHYLHEXYL) PHTHALATE	0.4 U	[49]
1.5-2	TOTAL PCBS	0.04 U	[0.49]
5.5-6	BIS(2-ETHYLHEXYL) PHTHALATE	0.37 U	[49]
5.5-6	TOTAL PCBS	0.037 U	[0.49]

OSB-B1_5S

Depth	Parameter	Result	[Criteria]
0.5-1	TOTAL PCBS	0.092 U	[0.49]

OSB-B2

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.36	[0.49]
0.5-1	TOTAL PCBS	0.099 U	[0.49]
1-1.5	TOTAL PCBS	3.6	[0.49]
1.5-2	TOTAL PCBS	1.6	[0.49]
2-2.5	TOTAL PCBS	0.11 U	[0.49]
2.5-3	TOTAL PCBS	0.12 U	[0.49]
3-3.5	TOTAL PCBS	0.13 U	[0.49]

CAP_B-50_5N

Depth	Parameter	Result	[Criteria]
1-1.5	TOTAL PCBS	0.66	[0.49]
1.5-2	TOTAL PCBS	0.11 U	[0.49]
2-2.5	TOTAL PCBS	0.096 U	[0.49]

CAP_B-50_5S

Depth	Parameter	Result	[Criteria]
1-1.5	TOTAL PCBS	0.16	[0.49]
2-2.5	TOTAL PCBS	0.095 U	[0.49]

CAP_B-50W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.22	[0.49]
0.5-1	TOTAL PCBS	0.16	[0.49]
1-1.5	TOTAL PCBS	14	[0.49]
1.5-2	TOTAL PCBS	0.62	[0.49]
2-2.5	TOTAL PCBS	6.2	[0.49]
2.5-3	TOTAL PCBS	0.13	[0.49]

CAP_B-50_5E

Depth	Parameter	Result	[Criteria]
1-1.5	TOTAL PCBS	15	[0.49]
1.5-2	TOTAL PCBS	0.07	[0.49]
2-2.5	TOTAL PCBS	0.1 U	[0.49]

D13_5W

Depth	Parameter	Result	[Criteria]
3.5-4	TOTAL PCBS	0.26	[0.49]

CM9

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.15	[-]
0-1	TOTAL PCBS	0.66	[-]
1.5-2	TOTAL PCBS	0.17	[-]
0-4	BENZENE	0 U	[0.34]
0-4	BENZO(A)ANTHRACENE	0 U	[-]
0-4	BENZO(A)PYRENE	0 U	[1440]
0-4	BENZO(B)FLUORANTHENE	0 U	[10.4]
0-4	BIS(2-ETHYLHEXYL) PHTHALATE	0.07 JB	[0.75]
0-4	CHRYSENE	0 U	[460]
0-4	INDENO(1,2,3-C,D)PYRENE	0 U	[320]
0-4	NAPHTHALENE	0 U	[2.1]
0-4	TOTAL PCBS	0 U	[1]

D14_5W

Depth	Parameter	Result	[Criteria]
3.5-4	TOTAL PCBS	0.28	[0.49]

CAP_B-51W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.077 U	[0.49]
0.5-1	TOTAL PCBS	0.075 U	[0.49]
1-1.5	TOTAL PCBS	0.077 U	[0.49]

CAP_B-53W_5N (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	8.5	[0.49]
0.5-1	TOTAL PCBS	12	[0.49]
1-1.5	TOTAL PCBS	1.8	[0.49]
1.5-2	TOTAL PCBS	4.9	[0.49]
2-2.5	TOTAL PCBS	1.1	[0.49]

CAP_B-53_5N (See Note 1)

Depth	Parameter	Result	[Criteria]
2.5-3	TOTAL PCBS	140	[0.49]

CAP_B-53W_5W (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	11	[0.49]
0.5-1	TOTAL PCBS	3.5	[0.49]
1-1.5	TOTAL PCBS	1.3	[0.49]
1.5-2	TOTAL PCBS	18	[0.49]
2-2.5	TOTAL PCBS	16	[0.49]

CAP_B-53_5S (See Note 1)

Depth	Parameter	Result	[Criteria]
2.5-3	TOTAL PCBS	70	[0.49]

CAP_B-53W_5S (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	4.9	[0.49]
0.5-1	TOTAL PCBS	7.1	[0.49]
1-1.5	TOTAL PCBS	140	[0.49]
1.5-2	TOTAL PCBS	250	[0.49]
2-2.5	TOTAL PCBS	180	[0.49]

CAP_B-53W (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3.1	[0.49]
0.5-1	TOTAL PCBS	6.3	[0.49]
1-1.5	TOTAL PCBS	1.4	[0.49]
1.5-2	TOTAL PCBS	3.4	[0.49]
2-2.5	TOTAL PCBS	150	[0.49]

SB292 (See Note 1)

Depth	Parameter	Result	[Criteria]
5-5.5	BIS(2-ETHYLHEXYL) PHTHALATE	2900 JD	[49]
5-5.5	TOTAL PCBS	35.9	[0.49]
5.5-6	TOTAL PCBS	11	[0.49]
9-9.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.6 J	[49]
9-9.5	TOTAL PCBS	0.039 U	[0.49]

SB292_5W (See Note 1)

Depth	Parameter	Result	[Criteria]
5-5.5	TOTAL PCBS	7.8	[0.49]

SB292_5S

Depth	Parameter	Result	[Criteria]
5-5.5	TOTAL PCBS	0.19	[0.49]

CAP_B-55W_5N

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.9	[0.49]
0.5-1	TOTAL PCBS	0.2	[0.49]

SB203

Depth	Parameter	Result	[Criteria]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	3.2 J	[49]
0-0.5	TOTAL PCBS	4.4	[0.49]
1.5-2	BIS(2-ETHYLHEXYL) PHTHALATE	0.34 U	[49]
1.5-2	TOTAL PCBS	0.034 U	[0.49]

SB203_D16_5N (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.72	[0.49]

CAP_B-55W_5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.073 U	[0.49]
0.5-1	TOTAL PCBS	0.071 U	[0.49]

SB203_D16_5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.072 U	[0.49]

CAP_B-56W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.8	[0.49]
0.5-1	TOTAL PCBS	0.084 U	[0.49]
1-1.5	TOTAL PCBS	0.52	[0.49]
1.5-2	TOTAL PCBS	0.08 U	[0.49]

SB203_D16

Depth	Parameter	Result	[Criteria]
0.5-1	TOTAL PCBS	0.12	[0.49]

CAP_B-55W_5S (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.38	[0.49]
0.5-1	TOTAL PCBS	0.52	[0.49]

SB203_D16_5S

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.38	[0.49]

CB_MID (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3.7	[1]
1-1.5	TOTAL PCBS	1.2	[1]

CAP_B-56W_5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.082 U	[0.49]
0.5-1	TOTAL PCBS	0.081 U	[0.49]

CAP_B-56W_5N

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.077 U	[0.49]
0.5-1	TOTAL PCBS	0.21	[0.49]

CAP_B-56W_5S

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.078 U	[0.49]
0.5-1	TOTAL PCBS	0.08 U	[0.49]

CM7 (See Note 1)

Depth	Parameter	Result	[Criteria]
0-1	TOTAL PCBS	8.5	[0.49]

CB_SOUTH

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.082 U	[1]
1-1.5	TOTAL PCBS	0.083 U	[1]

SB208_5N

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.95	[0.49]
1.5-2	TOTAL PCBS	0.088 U	[0.49]

SB208

Depth	Parameter	Result	[Criteria]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	310 J	[49]
0-0.5	TOTAL PCBS	20.4	[0.49]
1.5-2	BIS(2-ETHYLHEXYL) PHTHALATE	350 JD	[49]
1.5-2	BIS(2-ETHYLHEXYL) PHTHALATE	360 JD	[49]
1.5-2	TOTAL PCBS	35.6	[0.49]
2-2.5	TOTAL PCBS	7.9	[0.49]
11-11.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.45 U	[49]
11-11.5	TOTAL PCBS	0.266	[0.49]

CC-2

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.094 U	[1]
1-1.5	TOTAL PCBS	0.26	[1]

CAP_B-57W_5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.088 U	[0.49]

CAP_B-57W_5S (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.91	[0.49]

CAP_B-57W_10S

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.28	[0.49]

OSD-B1

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.2	[0.49]
0.5-1	TOTAL PCBS	0.08 U	[0.49]
1-1.5	TOTAL PCBS	0.08 U	[0.49]
1.5-2	TOTAL PCBS	0.079 U	[0.49]
2-2.5	TOTAL PCBS	0.079 U	[0.49]
2.5-3	TOTAL PCBS	0.086 U	[0.49]
3-3.5	TOTAL PCBS	0.1 U	[0.49]

SB404

Depth	Parameter	Result	[Criteria]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.33 J	[49]
0-0.5	TOTAL PCBS	0.051	[0.49]
1.5-2	BIS(2-ETHYLHEXYL) PHTHALATE	0.14 J	[49]
1.5-2	TOTAL PCBS	0.048 U	[0.49]
3.5-4	BIS(2-ETHYLHEXYL) PHTHALATE	0.071 J	[49]
3.5-4	TOTAL PCBS	0.05 U	[0.49]

OSD-B2

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.078 U	[0.49]
0.5-1	TOTAL PCBS	0.077 U	[0.49]
1-1.5	TOTAL PCBS	0.073 U	[0.49]
1.5-2	TOTAL PCBS	0.075 U	[0.49]
2-2.5	TOTAL PCBS	0.075 U	[0.49]
2.5-3	TOTAL PCBS	0.075 U	[0.49]
3-3.5	TOTAL PCBS	0.074 U	[0.49]

CAP_B-57W_5N (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.6	[0.49]

CAP_B-57W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.51	[0.49]
0.5-1	TOTAL PCBS	0.16	[0.49]
1-1.5	TOTAL PCBS	0.076 U	[0.49]

NOTES:

(1) Vertical delineation was not completed at this location. Excavation depth is assumed to be approx. 1-2 feet below the deepest sample interval. Confirmatory post-excavation samples will be collected.

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

SB208_5N

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.95	[0.49]
1.5-2	TOTAL PCBS	0.088 U	[0.49]

Red text indicates exceedence of applicable standard

U - not detected above Method Detection Limit
ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

*POST-EXCAVATION SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH APPROVED POST-EXCAVATION SAMPLING PLAN

WESTON SOLUTIONS

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205 Campus Drive Edison, New Jersey 08837-3939
TEL: (732) 417-5800 Fax: (732) 417-5801
http://www.westonsolutions.com

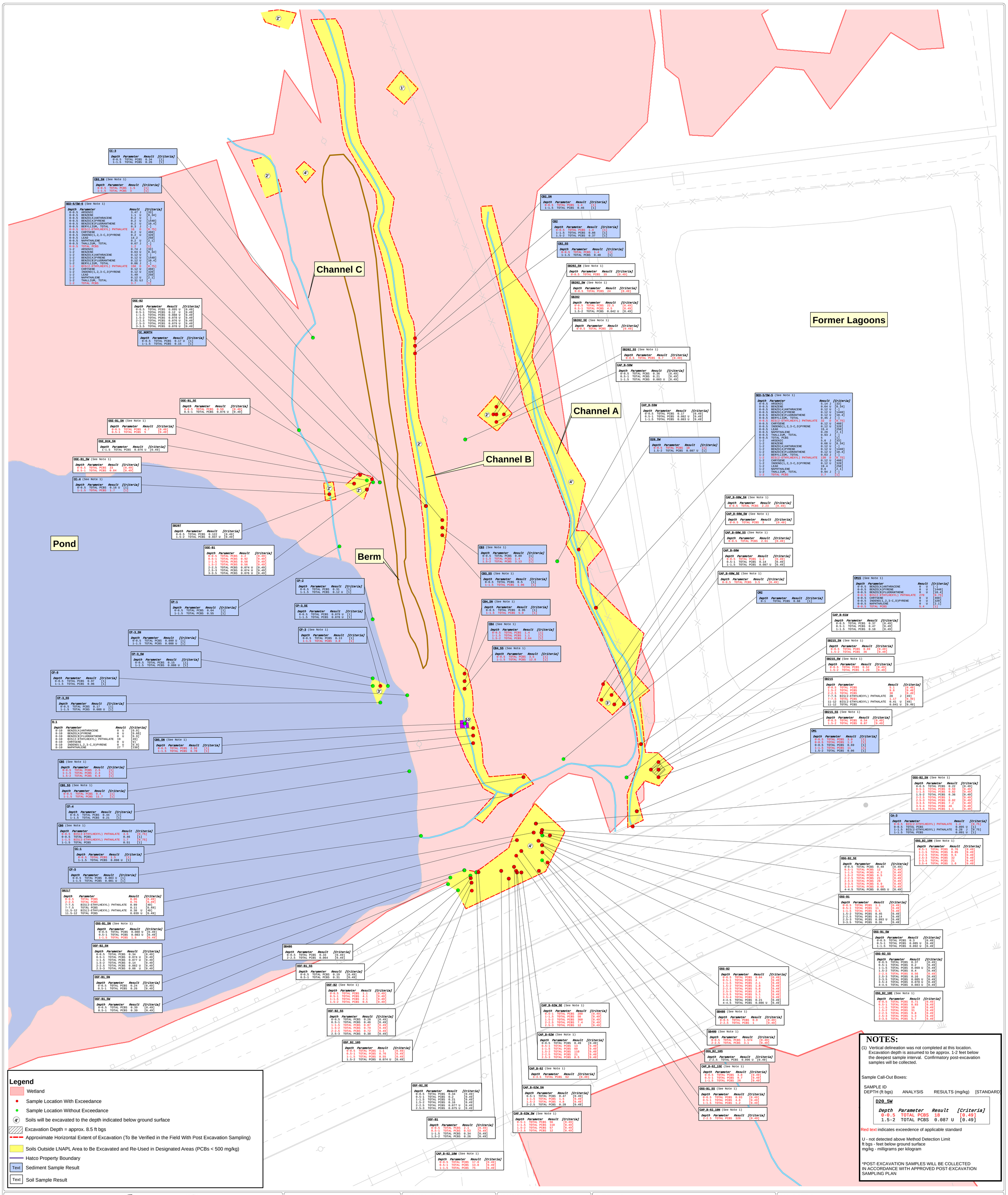
N W E S

REPORT DATE:	August 2009
PROJECT MANAGER:	D. Kopcow
CLIENT NAME:	Weston Solutions, Inc.
DRAWING: 06878_Offsite_1of2.mxd PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3	
CHECKED BY:	A. Garrison
REVISION No.	0
CONTRACT No. DELIVERY ORDER NO.	
PROJECT NAME:	Hatco Remediation
WORK ORDER No.	13067.001.002.8013
DRAWN/MODIFIED BY: DATE CREATED:	J. Lynes 08/04/2009

DRAWING TITLE:

Analytical Results and Extent of Excavation Areas for Off-Site Properties Channels A, B, C and Off-Site Pond - North

FIGURE:	SCALE:	DATE:
15	1 inch = 30 feet	08/04/2009



WESTON SOLUTIONS

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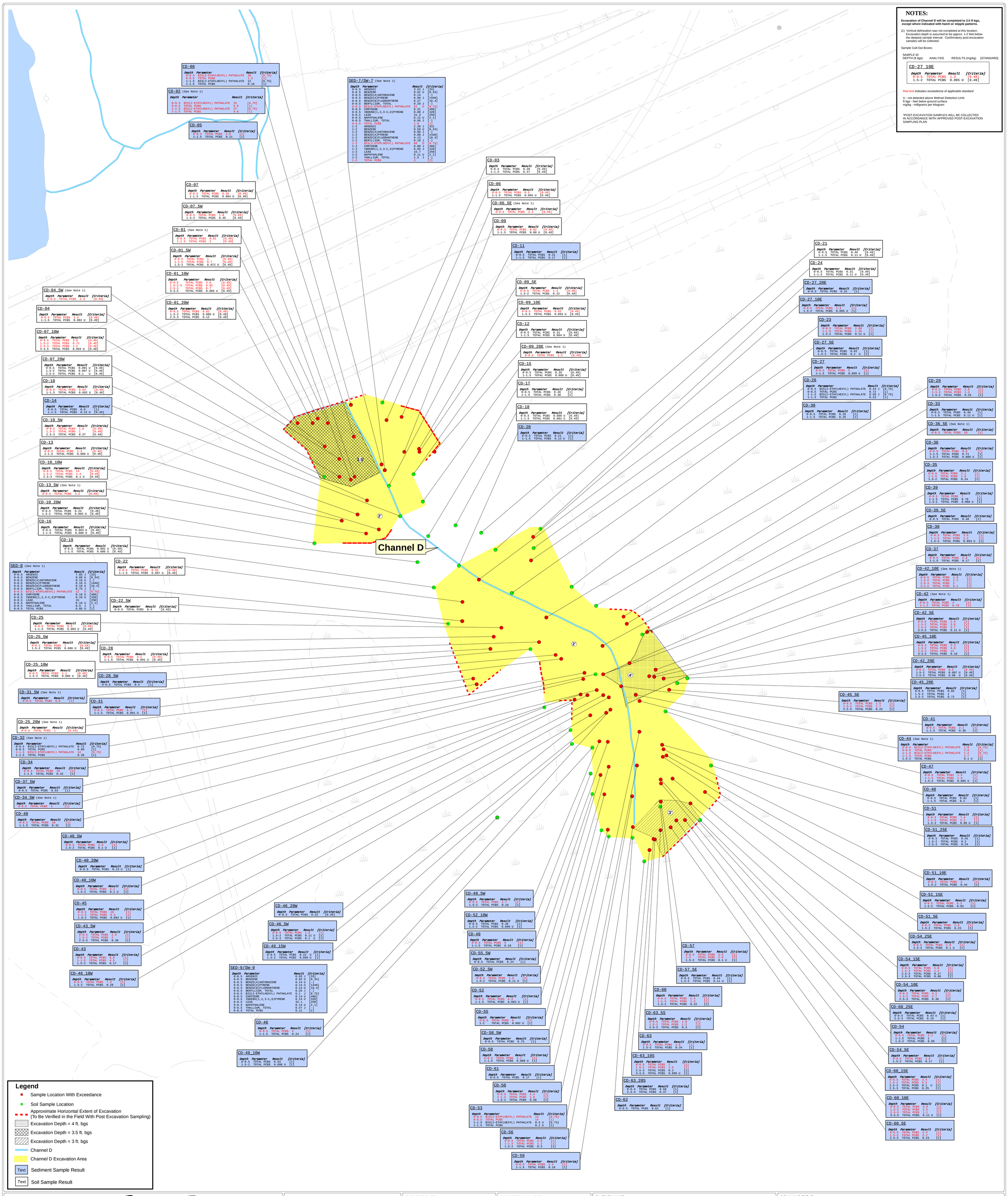
http://www.westonsolutions.com

REPORT DATE:	August 2009
PROJECT MANAGER:	D. Kopcow
CLIENT NAME:	Weston Solutions, Inc.
DRAWING: 06879_Offsite_2of2.mxd PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3	
CHECKED BY:	A. Garrison
REVISION No.	0
CONTRACT No. DELIVERY ORDER NO.	
PROJECT NAME:	Hatco Remediation
WORK ORDER No.	13067.001.002.8013
DRAWN/MODIFIED BY:	J. Lynes
DATE CREATED:	08/04/2009

DRAWING TITLE:

Analytical Results and Extent of Excavation Areas for Off-Site Properties Channels A, B, C and Off-Site Pond - South

FIGURE:	SCALE:	DATE:
16	1 inch = 20 feet	08/04/2009



NOTES:

Excavation of Channel D will be completed to 2.5 ft bgs, except where indicated with hatch or stipple patterns.

(1) Vertical delineation was not completed at this location. Excavation depth is assumed to be approx. 1-2 feet below the deepest sample interval. Confirmatory post-excavation samples will be collected.

Sample Call-Out Boxes:

SAMPLE ID
DEPTH (ft bgs) ANALYSIS RESULTS (mg/kg) [STANDARD]

CD-27 10E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.3	[0.49]
1.5-2	TOTAL PCBS	0.095 U	[0.49]

Red text indicates exceedence of applicable standard

U - not detected above Method Detection Limit
ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

*POST-EXCAVATION SAMPLES WILL BE COLLECTED IN ACCORDANCE WITH APPROVED POST-EXCAVATION SAMPLING PLAN

CD-08

Depth	Parameter	Result	[Criteria]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	36	[0.75]
0-0.5	TOTAL PCBS	1.5	[1]
1-1.5	BIS(2-ETHYLHEXYL) PHTHALATE	12	[0.75]
1-1.5	TOTAL PCBS	0.16	[1]

CD-02 (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	32	[0.75]
0-0.5	TOTAL PCBS	5.0	[1]
1-1.5	BIS(2-ETHYLHEXYL) PHTHALATE	27	[0.75]
1-1.5	TOTAL PCBS	4.8	[1]

CD-05

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.6	[1]
1-1.5	TOTAL PCBS	0.21	[1]

CD-07

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.59	[0.49]
1-1.5	TOTAL PCBS	0.084 U	[0.49]

CD-07 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.8	[0.49]
1.5-2	TOTAL PCBS	0.45	[0.49]

CD-01 (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.81	[0.49]
1-1.5	TOTAL PCBS	2	[0.49]

CD-01 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1	[0.49]
1-1.5	TOTAL PCBS	0.7	[0.49]
1.5-2	TOTAL PCBS	0.072 U	[0.49]

CD-01 10W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	4.8	[0.49]
1.5-2.5	TOTAL PCBS	0.92	[0.49]
2.5-3	TOTAL PCBS	0.7	[0.49]
3-3.5	TOTAL PCBS	0.099 U	[0.49]

CD-01 20W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.81	[0.49]
1.5-2	TOTAL PCBS	0.088 U	[0.49]
2.5-3	TOTAL PCBS	0.12	[0.49]

CD-04 5W (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.3	[0.49]

CD-04

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.4	[0.49]
1-1.5	TOTAL PCBS	0.082 U	[0.49]

CD-07 10W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3.6	[0.49]
1.5-2	TOTAL PCBS	0.71	[0.49]
2.5-3	TOTAL PCBS	1.2	[0.49]
3-3.5	TOTAL PCBS	0.094 U	[0.49]

CD-07 20W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.091 U	[0.49]
1.5-2	TOTAL PCBS	0.097 U	[0.49]
2.5-3	TOTAL PCBS	0.1 U	[0.49]

CD-10

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.63	[0.49]
1-1.5	TOTAL PCBS	0.092 U	[0.49]

CD-14

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.9	[1]
1-1.5	TOTAL PCBS	0.12 U	[0.49]

CD-10 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.6	[0.49]
1.5-2	TOTAL PCBS	1	[0.49]
2.5-3	TOTAL PCBS	0.37	[0.49]

CD-13

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.4	[0.49]
1-1.5	TOTAL PCBS	0.089 U	[0.49]

CD-10 10W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	14	[0.49]
1.5-2	TOTAL PCBS	1.4	[0.49]
2.5-3	TOTAL PCBS	0.1 U	[0.49]

CD-13 5W (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3.2	[0.49]

CD-10 20W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.24	[0.49]
1.5-2	TOTAL PCBS	0.095 U	[0.49]

CD-16

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.084 U	[0.49]
1-1.5	TOTAL PCBS	0.088 U	[0.49]

CD-19

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.081 U	[0.49]
1-1.5	TOTAL PCBS	0.086 U	[0.49]

CD-22

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.53	[0.49]
1-1.5	TOTAL PCBS	0.097 U	[0.49]

SED-8 (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	ARSENIC	7.85 J	[33]
0-0.5	BENZENE	0.89 U	[0.34]
0-0.5	BENZO(A)ANTHRACENE	0.16 U	[-]
0-0.5	BENZO(A)PYRENE	0.16 U	[1440]
0-0.5	BENZO(B)FLUORANTHENE	0.16 U	[10.4]
0-0.5	BERYLLIUM, TOTAL	0.75 J	[-]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	12 D	[0.75]
0-0.5	CHRYSENE	0.16 U	[460]
0-0.5	INDENO(1,2,3-C,D)PYRENE	0.16 U	[320]
0-0.5	LEAD	15	[250]
0-0.5	NAPHTHALENE	0.16 U	[2.1]
0-0.5	THALLIUM, TOTAL	0.9 J	[-]
0-0.5	TOTAL PCBS	0.05 U	[1]

CD-22 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.4	[0.49]

CD-25

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.5	[0.49]
1-1.5	TOTAL PCBS	0.083 U	[0.49]

CD-25 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1	[0.49]
1.5-2	TOTAL PCBS	0.086 U	[0.49]

CD-28

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	4.1	[0.49]
1-1.5	TOTAL PCBS	0.091 U	[0.49]

CD-25 10W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.1	[0.49]
1.5-2	TOTAL PCBS	0.085 U	[0.49]

CD-28 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.4	[1]

CD-31 5W (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	6.6	[1]

CD-31

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	6.3	[1]
1-1.5	TOTAL PCBS	0.091 U	[1]

CD-25 20W (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1	[0.49]

CD-32 (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.72	[0.75]
0-0.5	TOTAL PCBS	0.89	[1]
1-1.5	BIS(2-ETHYLHEXYL) PHTHALATE	14	[0.75]
1-1.5	TOTAL PCBS	0.39	[1]

CD-34

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	10	[1]
1-1.5	TOTAL PCBS	0.42	[1]

CD-37 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.53	[1]

CD-34 5W (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3	[1]

CD-40

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	10	[1]
1-1.5	TOTAL PCBS	0.31	[1]

CD-40 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.9	[1]
1.5-2	TOTAL PCBS	0.1 U	[1]

CD-40 20W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.13 U	[1]

CD-40 10W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.1	[1]
1.5-2	TOTAL PCBS	0.1 U	[1]

CD-45

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	19	[1]
1-1.5	TOTAL PCBS	6.3	[1]
1.5-2	TOTAL PCBS	0.092 U	[1]

CD-43 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.5	[1]
1.5-2	TOTAL PCBS	2	[1]
2.5-3	TOTAL PCBS	0.36	[1]

CD-43

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	6.8	[1]
1-1.5	TOTAL PCBS	4.5	[1]
1.5-2	TOTAL PCBS	0.17	[1]

CD-46 10W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	7.3	[1]
1.5-2	TOTAL PCBS	0.28	[1]

CD-46 20W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.22	[0.49]

CD-46 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.8	[1]
1.5-2	TOTAL PCBS	0.11 U	[1]
2.5-3	TOTAL PCBS	0.1 U	[1]

CD-49 15W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.22 U	[1]
1.5-2	TOTAL PCBS	0.095 U	[1]

SED-9/SW-9

Depth	Parameter	Result	[Criteria]
0-0.5	ARSENIC	5.83 J	[33]
0-0.5	BENZENE	0.82 U	[0.34]
0-0.5	BENZO(A)ANTHRACENE	0.14 U	[-]
0-0.5	BENZO(A)PYRENE	0.14 U	[1440]
0-0.5	BENZO(B)FLUORANTHENE	0.14 U	[10.4]
0-0.5	BERYLLIUM, TOTAL	0.25 J	[-]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.1 J	[0.75]
0-0.5	CHRYSENE	0.14 U	[460]
0-0.5	INDENO(1,2,3-C,D)PYRENE	0.14 U	[320]
0-0.5	LEAD	32.1	[250]
0-0.5	NAPHTHALENE	0.14 U	[2.1]
0-0.5	THALLIUM, TOTAL	0.47 J	[-]
0-0.5	TOTAL PCBS	0.11	[1]

CD-46

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	4	[1]
1-1.5	TOTAL PCBS	0.24	[1]

CD-49 10W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.53	[1]
1.5-2	TOTAL PCBS	0.098 U	[1]

SED-7/SW-7 (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	ARSENIC	3.52 J	[33]
0-0.5	BENZENE	0.62 U	[0.34]
0-0.5	BENZO(A)ANTHRACENE	0.14	[-]
0-0.5	BENZO(A)PYRENE	0.09 J	[1440]
0-0.5	BENZO(B)FLUORANTHENE	0.27	[10.4]
0-0.5	BERYLLIUM, TOTAL	0.29 J	[-]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	51 D	[0.75]
0-0.5	CHRYSENE	0.31	[460]
0-0.5	INDENO(1,2,3-C,D)PYRENE	0.08 J	[320]
0-0.5	LEAD	31.3	[250]
0-0.5	NAPHTHALENE	0.12 U	[2.1]
0-0.5	THALLIUM, TOTAL	0.66 J	[-]
0-0.5	TOTAL PCBS	1.9	[1]
1-2	ARSENIC	2.39 J	[33]
1-2	BENZENE	0.59 U	[0.34]
1-2	BENZO(A)ANTHRACENE	0.09 J	[-]
1-2	BENZO(A)PYRENE	0.08 J	[1440]
1-2	BENZO(B)FLUORANTHENE	0.13	[10.4]
1-2	BERYLLIUM, TOTAL	0.18 J	[-]
1-2	BIS(2-ETHYLHEXYL) PHTHALATE	80 D	[0.75]
1-2	CHRYSENE	0.08 J	[460]
1-2	INDENO(1,2,3-C,D)PYRENE	0.05 J	[320]
1-2	LEAD	15.7	[250]
1-2	NAPHTHALENE	0.11 U	[2.1]
1-2	THALLIUM, TOTAL	1.5 J	[-]
1-2	TOTAL PCBS	3	[1]

CD-03

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.28	[0.49]
1-1.5	TOTAL PCBS	0.47	[0.49]

CD-06

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.9	[0.49]
1-1.5	TOTAL PCBS	0.083 U	[0.49]

CD-06 5E (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3.8	[0.49]

CD-09

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.82	[0.49]
1-1.5	TOTAL PCBS	0.08 U	[0.49]

CD-11

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.31	[1]
1-1.5	TOTAL PCBS	0.17	[1]

CD-09 5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.4	[0.49]
1.5-2	TOTAL PCBS	0.22	[0.49]

CD-09 10E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.52	[0.49]
1.5-2	TOTAL PCBS	0.093 U	[0.49]

CD-12

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.31	[0.49]
1-1.5	TOTAL PCBS	0.084 U	[0.49]

CD-09 20E (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.2	[0.49]

CD-15

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.35	[0.49]
1-1.5	TOTAL PCBS	0.088 U	[0.49]

CD-17

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.46	[1]
1-1.5	TOTAL PCBS	0.38	[1]

CD-18

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.086 U	[0.49]
1-1.5	TOTAL PCBS	0.091 U	[0.49]

CD-20

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.21	[1]
1-1.5	TOTAL PCBS	0.12 U	[1]

CD-49 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.7	[1]
1.5-2	TOTAL PCBS	0.16	[1]

CD-52 10W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.46	[1]
1.5-2	TOTAL PCBS	0.096 U	[1]

CD-49

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	5	[1]
1-1.5	TOTAL PCBS	0.18	[1]

CD-55 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.24	[1]

CD-52 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.6	[1]
1.5-2	TOTAL PCBS	0.11 U	[1]

CD-52

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	4.3	[1]
1-1.5	TOTAL PCBS	0.083 U	[1]

CD-55

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	6	[1]
1-2	TOTAL PCBS	0.092 U	[1]

CD-58 5W

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.75	[1]

CD-58

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.7	[1]
1-1.5	TOTAL PCBS	0.088 U	[1]

CD-61

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.17	[1]

CD-50

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	4.4	[1]
1-1.5	TOTAL PCBS	1.9	[1]
1.5-2	TOTAL PCBS	0.58	[1]

CD-53

Depth	Parameter	Result	[Criteria]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	19	[0.75]
0-0.5	TOTAL PCBS	14	[1]
1-1.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.5 U	[0.75]
1-1.5	TOTAL PCBS	0.1 U	[1]

CD-56

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.8	[1]
1-1.5	TOTAL PCBS	1.2	[1]
1.5-2	TOTAL PCBS	0.3	[1]

CD-59

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.4	[1]
1-1.5	TOTAL PCBS	0.16	[1]

CD-21

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.46	[0.49]
1-1.5	TOTAL PCBS	0.11 U	[0.49]

CD-24

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.31	[0.49]
1-1.5	TOTAL PCBS	0.11 U	[0.49]

CD-27 20E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.31	[1]

CD-27 10E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.3	[1]
1.5-2	TOTAL PCBS	0.095 U	[1]

CD-23

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.08	[1]
1-1.5	TOTAL PCBS	1.26	[1]
1.5-2	TOTAL PCBS	0.11 U	[1]

CD-27 5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.82	[1]
1.5-2	TOTAL PCBS	0.1 U	[1]

CD-27

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	5	[1]
1-1.5	TOTAL PCBS	0.099 U	[1]

CD-26

Depth	Parameter	Result	[Criteria]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.44 J	[0.75]
0-0.5	TOTAL PCBS	0.72	[1]
1-1.5	BIS(2-ETHYLHEXYL) PHTHALATE	0.59 J	[0.75]
1-1.5	TOTAL PCBS	0.23	[1]

CD-30

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.25	[1]
1-1.5	TOTAL PCBS	0.25	[1]

CD-29

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.8	[1]
1-1.5	TOTAL PCBS	1.3	[1]
1.5-2	TOTAL PCBS	0.25	[1]

CD-33

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.46	[1]
1-1.5	TOTAL PCBS	0.11 U	[1]

CD-36 5E (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	28	[1]

CD-36

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	9.8	[1]
1-1.5	TOTAL PCBS	0.71	[1]
1.5-2	TOTAL PCBS	0.088 U	[1]

CD-35

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.1	[1]
1-1.5	TOTAL PCBS	1.5	[1]
1.5-2	TOTAL PCBS	0.24	[1]

CD-39

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3	[1]
1-1.5	TOTAL PCBS	0.78	[1]
1.5-2	TOTAL PCBS	0.086 U	[1]

CD-39 5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.48	[1]

CD-38

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3.6	[1]
1-1.5	TOTAL PCBS	2.2	[1]
1.5-2	TOTAL PCBS	0.093 U	[1]

CD-37

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.8	[1]
1-1.5	TOTAL PCBS	0.17	[1]

CD-42 10E (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.9	[1]
1.5-2	TOTAL PCBS	2.2	[1]
2.5-3	TOTAL PCBS	2	[1]
3-3.5	TOTAL PCBS	0.1	[1]

CD-42 (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	4	[1]
1-1.5	TOTAL PCBS	0.79	[1]

CD-42 5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.4	[1]
1.5-2	TOTAL PCBS	3.8	[1]
2.5-3	TOTAL PCBS	3.7	[1]
3-3.5	TOTAL PCBS	0.11 U	[1]

CD-45 10E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3.3	[1]
1.5-2	TOTAL PCBS	4.6	[1]
2.5-3	TOTAL PCBS	33	[1]
3-3.5	TOTAL PCBS	0.18	[1]

CD-42 20E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.5	[0.49]
1.5-2	TOTAL PCBS	0.087 U	[0.49]
2.5-3	TOTAL PCBS	0.09 U	[0.49]

CD-45 20E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.85	[1]
1.5-2	TOTAL PCBS	1	[1]
2.5-3	TOTAL PCBS	0.72	[1]

CD-45 5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.1	[1]
1.5-2	TOTAL PCBS	1.1	[1]
2.5-3	TOTAL PCBS	0.22	[1]

CD-41

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.1	[1]
1-1.5	TOTAL PCBS	0.36	[1]

CD-44 (See Note 1)

Depth	Parameter	Result	[Criteria]
0-0.5	BIS(2-ETHYLHEXYL) PHTHALATE	1.8	[0.75]
0-0.5	TOTAL PCBS	2.8	[1]
1-1.5	BIS(2-ETHYLHEXYL) PHTHALATE	1.2	[0.75]
1-1.5	TOTAL PCBS	2.7	[1]
1.5-2	TOTAL PCBS	0.1 U	[1]

CD-47

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.4	[1]
1-1.5	TOTAL PCBS	1.9	[1]
1.5-2	TOTAL PCBS	0.085 U	[1]

CD-48

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.82	[1]
1-1.5	TOTAL PCBS	0.2	[1]

CD-51

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	7.4	[1]
1-1.5	TOTAL PCBS	2.1	[1]
1.5-2	TOTAL PCBS	0.09 U	[1]

CD-51 25E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.55	[1]
1.5-2	TOTAL PCBS	0.2	[1]
2.5-3	TOTAL PCBS	0.24	[1]

CD-51 10E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3	[1]
1.5-2	TOTAL PCBS	0.44	[1]

CD-51 15E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	8.2	[1]
1.5-2	TOTAL PCBS	0.83	[1]

CD-51 5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.6	[1]
1.5-2	TOTAL PCBS	0.23	[1]

CD-54 25E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.8	[1]
2.5-3	TOTAL PCBS	0.1 U	[1]

CD-54 15E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	5.6	[1]
1.5-2	TOTAL PCBS	1.4	[1]
2.5-3	TOTAL PCBS	0.17	[1]
2.5-3	TOTAL PCBS	0.68	[1]

CD-54 10E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	4.2	[1]
1.5-2	TOTAL PCBS	2.2	[1]
2.5-3	TOTAL PCBS	0.38	[1]

CD-60 25E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.43 U	[1]
2.5-3	TOTAL PCBS	0.19	[1]

CD-54

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.1	[1]
1-1.5	TOTAL PCBS	1	[1]
1.5-2	TOTAL PCBS	0.65	[1]

CD-54 5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	1.6	[1]
1.5-2	TOTAL PCBS	0.17	[1]

CD-60 15E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	9.4	[1]
1.5-2	TOTAL PCBS	5.4	[1]
2.5-3	TOTAL PCBS	0.1 U	[1]
2.5-3	TOTAL PCBS	0.25	[1]

CD-60 10E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3.9	[1]
1.5-2	TOTAL PCBS	2.5	[1]
2.5-3	TOTAL PCBS	1.1	[1]
3-3.5	TOTAL PCBS	0.11 U	[1]

CD-60 5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.4	[1]
1.5-2	TOTAL PCBS	2.2	[1]
2.5-3	TOTAL PCBS	0.23	[1]

CD-57

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	3.5	[1]
1-2	TOTAL PCBS	2.8	[1]
1.5-2	TOTAL PCBS	0.1 U	[1]

CD-57 5E

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	0.44	[1]
1.5-2	TOTAL PCBS	0.11 U	[1]

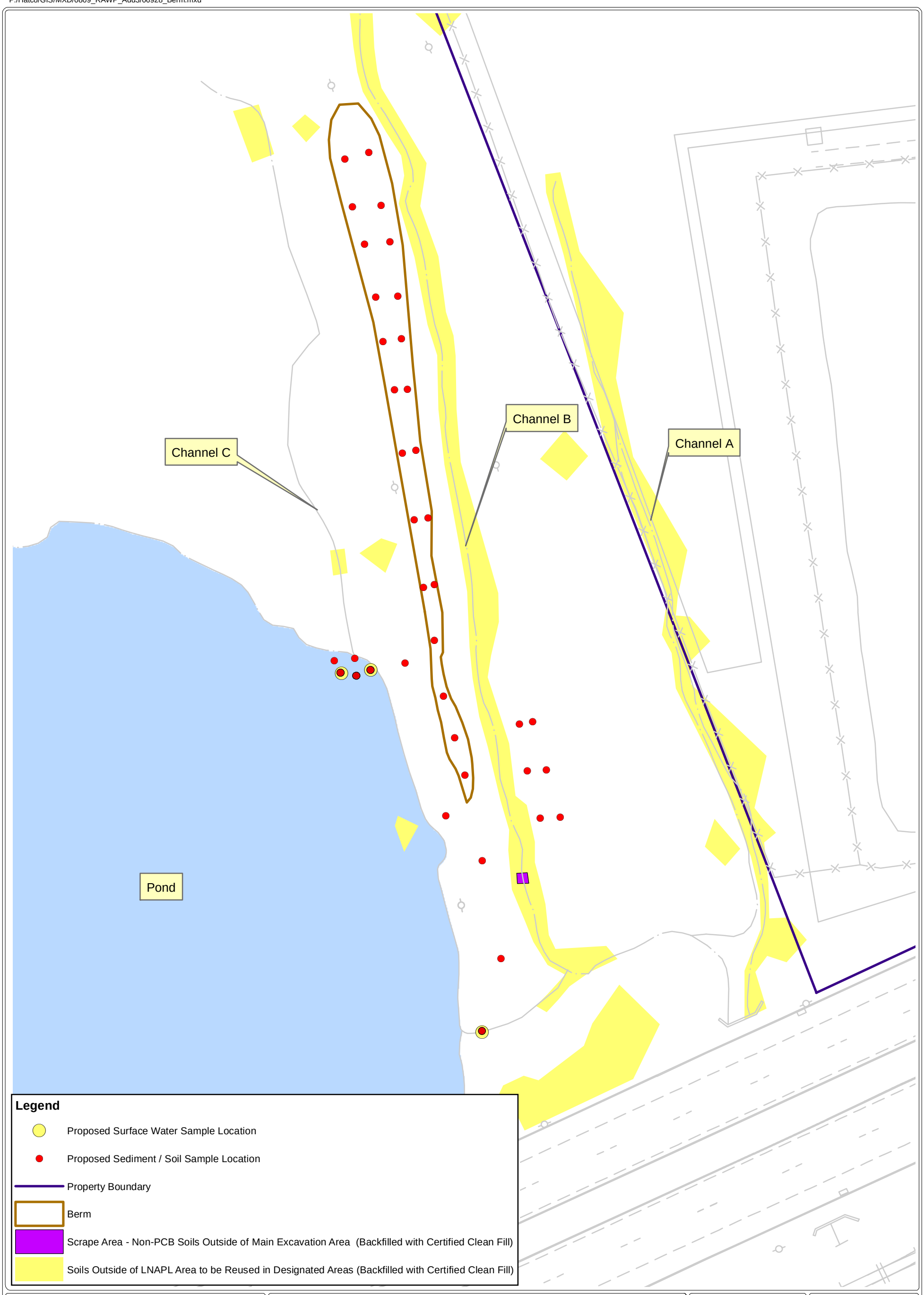
CD-60

Depth	Parameter	Result	[Criteria]
0-0.5	TOTAL PCBS	2.4	[1]
1-1.5	TOTAL PCBS	1.7	[1]
1.5-2	TOTAL PCBS	0.22	[1]

CD-63 5S

Depth	Parameter	Result	[Criteria]

P:/Hatco/GIS/MXD/0809_RAWP_Add3/06928_Berm.mxd



SCALE:
50 25 0 50
Graphic Scale In Feet

PROJECT: Hatco Remediation

CLIENT NAME: Weston Solutions Inc.

TITLE: Proposed Sample Locations for Channels A, B, C and Off-Site Pond

DRAWING NUMBER: 06928

FIGURE #: 18

DRAWN BY: J. Lynes

REVIEWED BY: A. Garrison

PROJECT MANAGER: D. Kopcow

SCALE:

DATE: August 2009

N W E S

ATTACHMENT 1

Attachment 1
Remedial Action Work Plan Addendum 3
Post-Excavation Sampling Plan
Hatco Site – Fords, New Jersey

TABLE OF CONTENTS

Section **Title** **Page**

1.0 BACKGROUND AND RATIONALE 1-1

2.0 SAMPLING AND ANALYSIS PLAN DESIGN 2-1

2.1 LNAPL AREAS 2-3
2.2 ON-SITE NON-LNAPL CONTAMINATION AREAS 2-5
2.2.1 Areas with PCBs Greater than 500 mg/kg 2-6
2.2.2 Areas with PCBs Less than 500 mg/kg 2-7
2.2.3 Areas with Non-PCB Contamination 2-8
2.3 OFF-SITE CONTAMINATION AREAS 2-9
2.3.1 Channels A, B, C, and Pond 2-10
2.3.2 Channel D 2-11
2.4 SAMPLE IDENTIFICATION 2-13
2.4.1 LNAPL Area 2-14
2.4.2 On-Site Non-LNAPL Contamination 2-15
2.4.3 Off-Site Contamination 2-15

3.0 SAMPLING PROCEDURES 3-1

3.1 SHALLOW POST-EXCAVATION SAMPLE COLLECTION 3-2
3.2 AT-DEPTH POST-EXCAVATION SAMPLE COLLECTION 3-2
3.3 SOIL DELINEATION BORINGS AT X136 3-3

4.0 QUALITY ASSURANCE AND QUALITY CONTROL 4-1

5.0 FIELD DECONTAMINATION 5-1

6.0 INVESTIGATION-DERIVED WASTE MANAGEMENT 6-1

LIST OF TABLES

Table	Title
SP-1	Post-Excavation Sampling Summary Table
SP-2	Additional Investigation Sampling Summary Table
SP-3	Analytical Methods, and Container and Preservation Requirements
SP-4	Summary of Field QC Sampling Program

LIST OF FIGURES

Figure	Title
SP-1	RAWP Addendum 3 Sampling Plan Post-Excavation Sampling Locations - Non-LNAPL Excavation Areas
SP-2	RAWP Addendum 3 Sampling Plan Post-Excavation Sampling Locations - Channels A, B, C and Pond
SP-3	RAWP Addendum 3 Sampling Plan Post-Excavation Sampling Locations - Channel D
SP-4	RAWP Addendum 3 Sampling Plan Post-Excavation Sampling Locations - LNAPL Excavation Areas

1.0 BACKGROUND AND RATIONALE

On August 18, 2005, Weston Solutions, Inc. (Weston®) submitted a Consolidated Remedial Action Work Plan and Implementation Schedule (Consolidated RAWP) to the U.S. Environmental Protection Agency (USEPA) and the New Jersey Department of Environmental Protection (NJDEP) for the Hatco Corporation site located on King George Post Road in Fords, New Jersey (the Site). The Consolidated RAWP was based on a Draft RAWP prepared by URS Corporation on behalf of Hatco and responded to comments provided by USEPA and NJDEP in conditional approval letters for the Draft RAWP dated March 30, 2005 and February 17, 2005, respectively.

Weston is providing this Addendum No. 3 to the August 2005 Consolidated RAWP. Addendum No. 3 has been organized to respond to the unresolved items from the above-referenced documents. Addendum No. 3 also includes changes/suggestions associated with November 2007 and January 2009 meetings held among NJDEP, the USEPA, Hatco, and Weston. A summary of Weston's site investigation and remedial activities conducted since submittal of the Consolidated RAWP is provided in the body of the RAWP Addendum No. 3, to which this sampling plan is appended. These investigative activities provide the basis for the remedial approach outlined in the RAWP Addendum No. 3.

This Post-Excavation Sampling and Analysis Plan (PESAP) for the RAWP Addendum 3 provides the rationale and procedures proposed for collection of the post-excavation confirmation samples that will document completion of the remedial action at the Hatco site. This PESAP and technical approach have been developed in accordance with the *New Jersey Technical Requirements for Site Remediation* (TRSR) and the NJDEP *Field Sampling Procedures Manual* (August 2005).

This PESAP focuses on remedial actions (i.e., excavation) conducted in areas described as the light non-aqueous phase liquid (LNAPL) excavation areas, on-site non-LNAPL excavation areas, and off-site excavation areas. These remedial areas are further detailed based on either the contaminants of concern, the concentrations of the contaminants of concern, or their specific location within the area of interest. This PESAP describes the on-site sampling program for

collection of confirmatory data necessary to determine the effectiveness of excavation-related remedial activities at the Hatco site.

The PESAP also includes a description of an additional investigation requested by the NJDEP based on their 24 July 2009 site visit. The additional investigation focuses on specific soils, sediments, and surface water in the vicinity of Channel B and Channel C on the off-site property located to the west of the southern portion of the Hatco facility.

2.0 SAMPLING AND ANALYSIS PLAN DESIGN

Historical sample locations, concentrations and depths were used to develop this PESAP, in addition to extensive field data and analytical results obtained during Weston's 2007 pre-design investigation. Extensive delineation sampling was conducted prior to actual excavation/sediment removal in these areas so that the volume of soil and sediment requiring removal could be better quantified, disruptions to Hatco's operations could be minimized, and the overall remediation implementation schedule could be shortened.

The results of the pre-design investigation sampling program also enabled Weston to better define the lateral extent of the site-wide engineered cap to be placed in those locations of the Site with PCB soil concentrations greater than 2 milligrams per kilogram (mg/kg).

The remedial standards that the post-excavation soil samples will have to meet are as follows:

- For excavation areas located within the footprint of the proposed cap, soils will be removed in sufficient volume that the post-remedial soil samples will contain less than 500 mg/kg. Soils within the footprint of the cap will be subsequently prevented from personnel coming into contact with them by the presence of the on-site cap. Therefore, non-PCB contaminants will remain in place, and post-excavation remedial standards do not apply for non-PCB contaminants within the footprint of the proposed cap.

- For on-site excavation areas located beyond the limits of the proposed cap, the remedial standard for PCBs is 2 mg/kg in soils and 1 mg/kg in sediments. For non-PCB contaminants of concern, the on-site applicable remedial criteria are the 1999 non-residential soil cleanup criteria, with the exception of naphthalene. Since the 2006 soil remediation standard for naphthalene is more than an order of magnitude below the soil cleanup criteria, the soil remediation standard takes precedence. The non-residential remedial criteria for non-PCB contaminants requiring remediation at the Hatco site include:

  - arsenic (20 mg/kg);
  - benzene (13 mg/kg);
  - benzo(a)anthracene (4 mg/kg);
  - benzo(a)pyrene (0.66 mg/kg);
  - benzo(b) fluoranthene (4 mg/kg);
  - benzo(k)fluoranthene (4 mg/kg);
  - beryllium (2 mg/kg);
  - bis(2-ethylhexyl)phthalate (210 mg/kg);
  - butylbenzyl phthalate (10,000 mg/kg);
  - chrysene (40 mg/kg);
  - indeno(123-cd)pyrene (4 mg/kg);
  - lead (600 mg/kg);

- naphthalene (17 mg/kg); and
- thallium (2 mg/kg).

- For off-site excavation areas, the remedial standard for PCBs is 0.49 mg/kg in soils and 1 mg/kg in sediments. For non-PCB contaminants of concern, the off-site applicable remedial criteria are the 1999 residential (unrestricted use) criteria for bis(2-ethylhexyl) phthalate (49 mg/kg) and the 2008 residential (unrestricted use) standard for naphthalene (6 mg/kg). In addition, bis(2-ethylhexyl) phthalate results for samples collected from wetland areas will be compared to NJDEP's ecological screening criterion of 0.925 mg/kg, to NJDEP's lowest effects level/screening criterion of 0.182 mg/kg, and NJDEP's Severe Effect Level of 0.75 mg/kg.

Sediment is defined by the State of New Jersey (N.J.A.C. 7:8-1.2) as solid material, mineral or organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water or gravity as a product of erosion. Soil is defined in the same regulations as "all unconsolidated mineral and organic material of any origin." Because the distinction between the two may be difficult to apply in the field in some situations, Weston is basing the delineation between soil and sediment on past experience, actual field conditions encountered during delineation sampling, and past discussions with NJDEP. For the purposes of this remedial action, sediment will be classified as any material falling within the bed (but not bank) of stream channels, saturated ditches or ponds at the Hatco facility or off-site, including Channels A, B, C and D, and the off-site pond. Any samples collected from areas falling outside of delineated wetland boundaries will be considered soil.

Within areas delineated as wetlands, but located outside of the actual stream channels, the classification of soil versus sediment will depend upon the degree of saturation of the soil matrix. NJDEP distinguishes between emergent wetlands (freshwater marsh), and forested wetlands. Emergent wetlands are characterized by rooted hydrophytes present for most of the growing season. NJDEP classifies material present within emergent wetlands as sediment. At the Hatco site these areas consist of wetlands dominated by common reed and other emergent species that have not been historically filled and still maintain saturated conditions during the growing season. Forested wetlands adjacent to the Hatco property are characterized by hydric soils; these are undrained soils that are saturated, flooded, or ponded that develop anaerobic conditions that favor the growth of hydrophytic vegetation. The material collected within these areas will be classified as soil.

Figure SP-1 provides an overview map of the areas requiring remediation under RAWP Addendum 3, as described in this PESAP. Figures SP-2 and SP-3 provide a closer view of the off-site excavation areas, with Figure SP-2 depicting the excavation areas associated with Channels A, B, C, and the Pond, and Figure SP-3 depicting the two excavation areas associated with Channel D. Figure SP-4 shows the areas proposed for removal by excavation of soils associated with the LNAPL plume present at the Hatco site. A summary of the post-excavation sampling program is provided as Table SP-1. A summary of the Additional Sampling Program is provided as Table SP-2. Table SP-3 identifies the analytical methods, and the sample container and preservation requirements for the post-excavation sampling program described in this PESAP, and Table SP-4 provides a summary of the field quality assurance sampling program that will be conducted during implementation of this PESAP.

Sample collection methodology is discussed in Section 3 of this PESAP.

2.1 LNAPL Areas

As discussed in the RAWP Addendum 3, the extent of the LNAPL plume was assessed by performing a visual inspection for the presence of LNAPL in soil samples collected during the 2007 verification sampling program described above. Soil borings were advanced by either hand augering or direct-push (Geoprobe) methods to determine the extent of visible LNAPL across the Site. These data were used to define the horizontal and vertical extent of visible LNAPL as well as to define the overburden soils which did not contain LNAPL. The horizontal extent of the LNAPL plume is depicted on Figure 1 of the RAWP Addendum 3.

The northern portion of the LNAPL plume will be addressed by the interim remedial measure (IRM) proposed under the IRM RAWP submitted to NJDEP and USEPA for concurrence under separate cover in August 2009. The remaining portions of the LNAPL plume that are accessible for remedial excavation are the southern “legs” of the plume. The eastern leg of the LNAPL plume encompasses an area of approximately 45,900 square feet with a perimeter of approximately 1,100 linear feet, while the western leg of the LNAPL plume encompasses an area of approximately 37,400 square feet with a perimeter of approximately 750 linear feet. Per the Technical Requirements for Site Remediation (TRSR), for excavations with perimeters between 20 and 300 linear feet, post-excavation soil sampling should be conducted at a frequency of one “sidewall” sample per 30 linear feet of excavation perimeter, plus one “bottom” sample per 900

square feet of excavation footprint. However, as per the TRSR at New Jersey Administrative Code, Title 7, Chapter 26E (N.J.A.C. 7:26E-6.4(a)2.iii), a reduction in sampling frequency can be proposed for excavations with perimeter measurements greater than 300 linear feet provided that Weston can demonstrate that the reduction in sampling frequency is adequate.

Weston is proposing that following removal by excavation of the LNAPL-contaminated soils, post-excavation samples be collected on a frequency of one sidewall sample for every 50 linear feet of excavation perimeter, and one bottom sample per every 2,500 square feet of excavation bottom (i.e., sampling along a 50-foot grid). Weston considers this sampling frequency adequate for the following reasons:

- Weston conducted extensive sampling in the past, and has a comprehensive understanding of the extent of the LNAPL plume, both in a horizontal direction and vertically above and below the LNAPL plume. A large number of historic and 2007 soil samples were used to define the limits of the LNAPL plume, and subsequently, the planned remedial excavation area. Those limits have been refined and are provided on Figure SP-4 of this PESAP. The extensive historic sampling provides a high degree of confidence on the location of the plume, and reduces the potential for the remedial excavation to not capture all the LNAPL-contaminated soils within the LNAPL plume "legs."

- The LNAPL is visually distinguishable from the soils and groundwater in the excavation area. Therefore, it will provide strong visual cues as to the adequacy of the remedial action and will allow Weston to bias the post-excavation sampling to those areas most likely to contain the highest concentration of remaining contaminants during the post-excavation confirmation sampling program.

As shown on Figure SP-4 and presented in Table SP-1 of this PESAP, the adequacy of remediation of the western "leg" of the LNAPL plume will be confirmed through collection of 14 sidewall and 17 bottom samples. It is noted that sidewall samples will not be collected from the perimeter between the western "leg" of the LNAPL plume and the main body of the plume; this perimeter will be established by the installation of a cut-off wall during implementation of the IRM RAWP. The western "leg" excavation will extend to the cut-off wall; therefore, there will not be any soil present along the excavation perimeter from which to collect sidewall samples. Post-excavation soil samples collected from the western plume "leg" will be analyzed for polychlorinated biphenyls (PCBs) and selected semi-volatile organic compounds (SVOCs) as noted in Table SP-1 of this PESAP. As this area is on-site but not beneath the proposed on-site

cap, the applicable remedial standards are 2 mg/kg for PCBs and the non-residential remedial standards outlined above (Section 2.0) for the SVOCs.

As shown on Figure SP-4 and presented in Table SP-1 of this PESAP, the adequacy of remediation of the eastern "leg" of the LNAPL plume will be confirmed through collection of 21 sidewall and 19 bottom samples. As with the western "leg" of the LNAPL plume, sidewall samples will not be collected from the perimeter between the eastern "leg" of the LNAPL plume and the main body of the plume due to the presence of the cut-off wall along that excavation perimeter. Based on historic sample data, selected SVOC compounds [bis(2-ethylhexyl) phthalate and benzo(a)pyrene] have been detected within samples collected from the eastern "leg" of the LNAPL plume. However, as these compounds have only been detected in those areas of the eastern "leg" of this excavation area that will be subsequently covered by the proposed site cap, the post-excavation soil samples collected to document the adequacy of the remedial action for the eastern "leg" of the LNAPL plume will be limited to PCBs. The remedial standard for PCBs in this excavation area will be 500 mg/kg for PCBs in those areas of the excavation that will subsequently be covered by the proposed on-site cap, and 2 mg/kg for those areas that fall beyond the limits of the cap.

2.2 On-Site Non-LNAPL Contamination Areas

As graphically depicted on Figure SP-1, there are 112 excavation areas wholly located within the boundaries of the Hatco facility that contain site-related contaminants requiring remediation beyond the horizontal and vertical limits of the LNAPL plume area. Table SP-1 identifies the historic contaminants associated with each "hot spot" identified on-site. For ease of discussion, the "hot spots" have been subdivided into three categories: those containing PCBs in concentrations greater than 500 mg/kg, those beyond the limits of the proposed cap that contain PCBs in concentrations less than 500 mg/kg but at concentrations greater than the applicable remedial standard, and those containing site-related contaminants other than PCBs.

Each of these "hot spots" will be remediated by excavation, and the effectiveness of the remedy will be confirmed by collection of post-excavation soil samples to document that remaining soils do not contain contaminants at concentrations greater than the applicable remedial criteria.

As per the requirements of the TRSR at N.J.A.C. 7:26E-6.4(a)2ii, post excavation samples will be collected from each excavation at a frequency of one perimeter sample for every 30 linear feet of sidewall, and one bottom sample from each 900 square feet of excavation footprint.

In the event that the applicable remedial criteria are exceeded in one or more post-excavation soil samples, the excavation will be expanded in a horizontal and/or vertical direction, as appropriate, and the expanded excavation area will be treated as a separate excavation area for the purposes of calculating the appropriate number of post-excavation soil samples.

Table SP-1 summarizes the anticipated number and depth of post-excavation soil samples, and the analysis proposed for each, by excavation area. The numbers and locations of post-excavation soil samples may change depending on field conditions and the potential need to expand remedial excavations, but for all soil "hot-spots," the TRSR-mandated sampling frequency of one sidewall sample for every 30 linear feet of excavation perimeter and one bottom sample for every 900 square feet of excavation bottom will be followed.

2.2.1 Areas with PCBs Greater than 500 mg/kg

There are a limited number of on-site areas that contain PCBs in concentrations greater than 500 mg/kg that are not associated with the LNAPL plume. Those areas that contain PCBs in concentrations greater than 500 mg/kg are depicted on Figure SP-1 as green polygons, and include the following "hot spot" excavation areas: X002, X042, X047, X049, X066, X075, X080, X083, X084, X086, X088, X090, X091, X093, X094, X095, X096, X098, and X099. With the exception of X083, which also contains bis(2-ethylhexyl)phthalate at concentrations greater than remedial standard, these excavation areas are identified on Figure SP-1 as green polygons (X083 is presented on Figure SP-1 as a purple polygon). These excavation areas also have "PCB > 500 mg/kg" identified as the contaminant exceeding remedial standard on Table SP-1.

As described in the RAWP Addendum 3, these "hot spot" areas will be remediated by excavation and off-site disposal. Post-excavation soil samples will be limited to PCB analysis with the exception of X083, which will also be analyzed for bis(2-ethylhexyl) phthalate.

Per the requirements of the TRSR at N.J.A.C. 7:26E-6.4(a)2ii, post excavation samples will be collected from each excavation at a frequency of one perimeter sample for every 30 linear feet of sidewall, and one bottom sample from each 900 square feet of excavation footprint.

In the event that the applicable remedial criteria are exceeded in one or more post-excavation soil samples, the excavation will be expanded in a horizontal and/or vertical direction, as appropriate, and the expanded excavation area will be treated as a separate excavation area for the purposes of calculating the appropriate number of post-excavation soil samples.

The proposed post-excavation soil sample locations are identified Figure SP-1; however, sample locations may be re-located by the on-site Weston representative based upon field conditions, and will be biased toward areas of greatest contamination based on field observations. Additionally, as agreed to in previous correspondence with the EPA, base post-excavation samples will be off set approximately 3 feet north and east of previously-collected delineation sample locations to the extent practical and in accordance with the above-proposed frequency.

2.2.2 Areas with PCBs Less than 500 mg/kg

Numerous on-site areas have been identified beyond the limits of the proposed cap that contain PCBs in concentrations greater than the applicable on-site remedial criteria of 2 mg/kg. These areas are identified on Figure SP-1 as yellow polygons. Each area depicted as a yellow polygon does not contain non-PCB contaminants at concentrations above their applicable remedial standards.

As described in the RAWP Addendum 3, these “hot spot” areas will be remediated by excavation and re-use on-site in accordance with the soil reuse plan presented as Attachment 6 to the RAWP Addendum 3, to which this PESAP is Attachment 1.

Post-excavation soil samples will be limited to PCB analysis for these excavation areas, since no contaminants other than PCB were detected in historic samples at concentrations greater than applicable remedial criteria. Per the requirements of the TRSR at N.J.A.C. 7:26E-6.4(a)2ii, post excavation samples will be collected from each excavation at a frequency of one perimeter sample for every 30 linear feet of sidewall, and one bottom sample from each 900 square feet of excavation footprint.

In the event that the applicable remedial criteria are exceeded in one or more post-excavation soil samples, the excavation will be expanded in a horizontal and/or vertical direction, as appropriate, and the expanded excavation area will be treated as a separate excavation area for the purposes of calculating the appropriate number of post-excavation soil samples.

The proposed post-excavation soil sample locations are identified Figure SP-1; however, sample locations may be re-located by the on-site Weston representative based upon field conditions, and will be biased toward areas of greatest contamination based on field observations. Additionally, as agreed to in previous correspondence with the EPA, base post-excavation samples will be off set approximately 3 feet north and east of previously-collected delineation sample locations to the extent practical and in accordance with the above-proposed frequency. Table SP-1 summarizes the anticipated number of samples and sample depth for each excavation area that is contaminated with PCBs at concentrations less than 500 mg/kg.

2.2.3 Areas with Non-PCB Contamination

Contaminants other than PCBs have also been detected on-site in historic samples. These contaminants include polynuclear aromatic hydrocarbons (benzo(a)anthracene, benzo(a)pyrene, benzo(b) fluoranthene, benzo(k)fluoranthene, chrysene, and indeno(123-cd)pyrene), phthalates (bis(2-ethylhexyl)phthalate and butylbenzyl phthalate), naphthalene, benzene, and metals (arsenic, beryllium, and thallium). As discussed in the RAWP Addendum 3 text, the non-PCB contaminants of concern that have been detected most often on-site include phthalates, arsenic, benzo(a) pyrene, and naphthalene.

Each on-site area requiring remedial excavation for non-PCB contaminates is shown on Figure SP-1 as a purple polygon. It is noted that these areas may also contain PCBs in concentrations greater than applicable remedial standards. The specific contaminant of concern in historic samples that exceeded applicable remedial criteria are identified on Table SP-1. Soils removed from non-PCB excavation areas will be disposed of off-site in accordance with waste classification sampling.

Post-excavation soil samples will be conducted for the criteria specified for each excavation area on Table SP-1 using the methods identified. Per the requirements of the TRSR at N.J.A.C. 7:26E-6.4(a)2ii, post excavation samples will be collected from each excavation at a frequency

of one perimeter sample for every 30 linear feet of sidewall, and one bottom sample from each 900 square feet of excavation footprint.

The analytical results will be compared to the applicable remedial criteria, which are the 1999 non-residential direct contact soil cleanup criteria for all contaminants other than naphthalene. For naphthalene, the applicable remedial criterion is the 2008 non-residential soil remediation standard. In the event that the applicable remedial criteria are exceeded in one or more post-excavation soil samples, the excavation will be expanded in a horizontal and/or vertical direction, as appropriate, and the expanded excavation area will be treated as a separate excavation area for the purposes of calculating the appropriate number of post-excavation soil samples.

The proposed post-excavation soil sample locations are identified Figure SP-1; however, sample locations may be re-located by the on-site Weston representative based upon field conditions, and will be biased toward areas of greatest contamination based on field observations.

2.3 Off-Site Contamination Areas

As described in the RAWP Addendum 3, the limits of off-site soil and sediment contamination have been defined by Weston's verification sampling program (with some noted exceptions) as indicted in Figure 1 of the RAWP Addendum 3.

Based upon the results of the 2007 sample collection, Weston has identified a total of 22 off-site soil and sediment areas in Channels A, B, C, D and the Pond area that contain site-related contaminants at concentrations greater than the applicable unrestricted use remedial standards. The remedial strategy for these off-site areas is excavation with post-excavation sampling to document that remedial limits are met in remaining soils.

As per the requirements of the TRSR at N.J.A.C. 7:26E-6.4(a)2ii, post excavation samples will be collected from each excavation at a frequency of one perimeter sample for every 30 linear feet of sidewall, and one bottom sample from each 900 square feet of excavation footprint.

In the event that the applicable remedial criteria are exceeded in one or more post-excavation soil samples, the excavation will be expanded in a horizontal and/or vertical direction, as appropriate,

and the expanded excavation area will be treated as a separate excavation area for the purposes of calculating the appropriate number of post-excavation soil samples.

Table SP-1 summarizes the anticipated number and depth of post-excavation soil samples and the analysis proposed for each, by "hot spot" excavation area. The numbers and locations of post-excavation soil samples may change depending on field conditions and the potential need to expand remedial excavations, but for all soil "hot-spots," the TRSR-mandated sampling frequency of one sidewall sample for every 30 linear feet of excavation perimeter and one bottom sample for every 900 square feet of excavation bottom will be followed.

The following subsections describe the post-excavation sampling program proposed for Channels A, B, C, and the Pond, and for Channel D.

2.3.1 Channels A, B, C, and Pond

Figure SP-2 presents the locations of all excavation areas that are located either wholly or partially within off-site areas. Those off-site excavation areas that require excavation solely for the presence of PCBs include the following: X071, X072, X073, X074, X080, X081, X102, X103, X104, X105, X106, X108, X109, X110, X111, X112, X113, X114, and X115. For these excavation areas, the post-excavation sampling program will be limited to analysis for PCBs, and the post-excavation sample results will be compared to the applicable remedial standard (0.49 mg/kg for soils and 1 mg/kg for sediments).

The following off-site excavation areas require excavation for both PCBs and bis(2-ethylhexyl) phthalate: X078, X082, X083, and X107. For these excavation areas, the post-excavation sampling program will be limited to analysis for PCBs and bis(2-ethylhexyl) phthalate. The post-excavation PCB sample results will be compared to the applicable remedial standard (0.49 mg/kg for soils and 1 mg/kg for sediments). The post-excavation bis(2-ethylhexyl) phthalate sample results will be compared to the applicable unrestricted use remedial standard of 49 mg/kg, except that bis(2-ethylhexyl) phthalate from sediment sampless will be compared to NJDEP sediment screening levels discussed in Section 2.0 of this PESAP.

Excavation areas X071, X102, X103, and X114 require remediation for PCB; however, they also have historical detections of bis(2-ethylhexyl) phthalate at concentrations below the residential

soil cleanup criteria but above NJDEP sediment screening levels. Therefore, post-remedial soil samples in the vicinity of the historic detections of bis(2-ethylhexyl) phthalate will also be analyzed for bis(2-ethylhexyl) phthalate, with the results compared to the sediment screening levels discussed in Section 2.0 of this PESAP.

The excavation identified as X136 is based on a historic detection of naphthalene at a concentration of 27 mg/kg in sample B-1 collected from a depth of 8-10 feet below grade. The current unrestricted use remedial standard for naphthalene is 17 mg/kg, which is more than an order of magnitude lower than the previously-approved cleanup criteria of 230 mg/kg; therefore the new remedial standard takes precedence. However, per the TRSR (at N.J.A.C. 7:26E-3.6(a)5, soil samples must be collected in discrete 6-inch increments. Therefore, it is proposed that the historic exceedance be confirmed prior to excavation. Four confirmation soil samples are proposed for historic location of B-1 at depths of 8-8.5 feet below grade, 8.5-9 feet below grade, 9-9.5 feet below grade, and 9.5-10 feet below grade. If the confirmation soil samples do not exceed the applicable remedial standard of 17 mg/kg, the historic exceedance will be considered an anomaly and remedial action will not be required for "excavation" X136. If, however, one or more of the confirmation samples contain naphthalene at a concentration(s) of greater than 17 mg/kg, the naphthalene "hot spot" will be remediated by excavation and post-excavation soil samples will be collected from the excavation sidewalls and excavation bottom.

As per the requirements of the TRSR at N.J.A.C. 7:26E-6.4(a)2ii, post excavation samples will be collected from each excavation installed along Channels A, B, C, and the Pond at a frequency of one perimeter sample for every 30 linear feet of sidewall, and one bottom sample from each 900 square feet of excavation footprint. A summary of the proposed post-excavation samples are presented, by excavation area, in Table SP-1.

2.3.2 Channel D

There are two excavation areas proposed in Channel D, as shown on Figure SP-3. These excavations have been designated as X100 and X101. Each of these two excavation areas requires remedial excavation for PCBs, which exceed the applicable unrestricted use standard, which for PCB is 0.49 mg/kg in soil and 1.0 mg/kg in sediment. Therefore, post-excavation remedial samples will be collected for PCB analysis as described in Table SP-1. As per the requirements of the TRSR at N.J.A.C. 7:26E-6.4(a)2ii, post excavation samples will be collected

from each excavation at a frequency of one perimeter sample for every 30 linear feet of sidewall, and one bottom sample from each 900 square feet of excavation footprint.

While excavation areas X100 and X101 require remediation for PCB, certain historic samples also had detections of bis(2-ethylhexyl) phthalate at concentrations below the residential soil cleanup criteria but above NJDEP sediment screening levels. Therefore, post-remedial soil samples in the vicinity of the historic detections of bis(2-ethylhexyl) phthalate will also be analyzed for bis(2-ethylhexyl) phthalate, with the results compared to the sediment screening levels discussed in Section 2.0 of this PESAP.

2.4 Additional Investigation Samples

NJDEP conducted a site visit on 24 July 2009. Following that site visit, they corresponded with Weston via email and raised some concerns regarding additional areas where they require additional investigation. Those areas are limited to a berm between Channel B and the off-stie pond where dredge spoils may have been placed and in near-by areas that may have been subject to overland surface water flow. NJDEP also specifically requested sediment and surface water samples from the off-site pond, both in the vicinity of the pond inlet from Channel C, as well as the pond outlet. The locations of the requested additional samples are provided on Figure 18 of the RAWP Addendum 3, to which this PESAP is attached.

As the berm area has not previously been investigated, soil samples will be analyzed for the entire list of contaminants that have been detected in on-site soils at concentrations greater than applicable remedial standards (i.e., the full list of contaminants identified in Section 2.0 of this PESAP). Likewise, since the NJDEP is concerned that the soils in the vicinity may have been impacted by overland flow, the soils samples proposed from the area near the berm will also be analyzed for the full list of site-related contaminants. Soil samples collected within the berm will be collected from a depth of 2.0 to 2.5 feet below the surface of the berm, whereas the soil samples collected in the vicinity of, but not from, the berm will be collected from the soil surface (the benzene aliquot will be collected from the 0.5 to 1.0 feet below grade interval to reduce the potential for volatiles loss). The soil samples collected from both within the footprint of, and near the footprint of, the berm will be designated as “BERM” samples.

Sediment and surface water samples collected from the off-site pond inlet and outlet will be analyzed for PCB and bis(2-ethylhexyl)phthalate. A single sample is proposed for the pond outlet for both sediment and surface water matrices. For the pond itself, five sediment samples are proposed for the area immediately south of the Chanel C inlet; of these five samples, it is proposed that two of the locations will also have surface water samples co-located.

A summary of the proposed additional sampling program is presented as Table SP-2.

2.5 Sample Identification

Each sample will be assigned a unique field sample identification code and labeled accordingly. This field sample identification code provides the tracing of the sample from the location in the field, through laboratory analysis, and finally to data evaluation and presentation, and contains information traceable to the type, location where the sample was collected, and other information appropriate to that sample. This code will be used for references to this particular sample in field and project documentation and reports. It is essential that the integrity of the field sample identification (ID) code not be compromised.

The location within the vertical sample column will be identified through the use of a systematic sample naming convention. Following the sample location designator, as described in more detail in the following subsections, the depth will be identified through use of the code "_##-##" where the "##" is substituted by an alphabetic depth designator, as follows:

AA	0 Feet
AB	0.5 Feet
AC	1 Feet
AD	1.5 Feet
AE	2 Feet
AF	2.5 Feet
AG	3 Feet
AH	3.5 Feet
AI	4 Feet
AJ	4.5 Feet
AK	5 Feet
AL	5.5 Feet
AM	6 Feet
AN	6.5 Feet
AO	7 Feet
AP	7.5 Feet
AQ	8 Feet

AR	8.5 Feet
AS	9 Feet
AT	9.5 Feet
AU	10 Feet
AV	10.5 Feet
AW	11 Feet
AX	11.5 Feet
AY	12 Feet
AZ	12.5 Feet
BA	13 Feet
BB	13.5 Feet
BC	14 Feet
BD	14.5 Feet
BE	15 Feet
BF	15.5 Feet
BG	16 Feet
BH	16.5 Feet

BI	17 Feet
BJ	17.5 Feet
BK	18 Feet
BL	18.5 Feet
BM	19 Feet
BN	19.5 Feet
BO	20 Feet
BP	20.5 Feet
BQ	21 Feet
BR	21.5 Feet
BS	22 Feet
BT	22.5 Feet
BU	23 Feet
BV	23.5 Feet
BW	24 Feet
BX	24.5 Feet
BY	25 Feet

BZ	25.5 Feet
CA	26 Feet
CB	26.5 Feet
CC	27 Feet
CD	27.5 Feet
CE	28 Feet
CF	28.5 Feet
CG	29 Feet
CH	29.5 Feet
CI	30 Feet
CJ	30.5 Feet
CK	31 Feet
CL	31.5 Feet
CM	32 Feet
CN	32.5 Feet
CO	33 Feet
CP	33.5 Feet

CQ	34 Feet
CR	34.5 Feet
CS	35 Feet

CT	35.5 Feet
CU	36 Feet
CV	36.5 Feet

CW	37 Feet
CX	37.5 Feet
CY	38 Feet

CZ	38.5 Feet

Therefore, for a post-excavation sample collected from a depth of 10-10.5 feet below grade from the intersection of grid lines "XAC" and "X103" would be designated as "XAC_X103_AU-AV".

Duplicate sample pairs will have the designators "_1" for the environmental sample and "_2" for the duplicate sample added to the end of the sample ID, and field blanks will be designated with "_3" appended to the sample ID.

2.5.1 LNAPL Area

As per Figure SP-4, the north-south grid lines are designated as "XAA" through "XAK" and the east-west grid lines are designated as "X101" through "X111." These grid lines were each designated with an additional alphanumeric "digit" to prevent confusion with the grid line designations that have been proposed under the post-IRM sampling program, which was submitted under separate cover in July 2009.

Soil sampling locations will be identified by the north-south grid line designation and the east-west grid line designation. For example, samples collected from the node at the intersection of north-south grid line "XAC" and east-west grid line "X103" will have field ID number beginning with "XAC_X103."

Depth and sample type designators will be appended to the sample location code as described in section 2.4, above.

As agreed to in previous correspondence with the EPA, base post-excavation samples will be off set approximately 3 feet north and east of delineation sample locations to the extent practical and in accordance with the above-proposed frequency. Sample locations and depths will be determined in the field by the on-site Weston representative, based upon visual observations.

2.5.2 On-Site Non-LNAPL Contamination

Each excavation area other than the LNAPL areas has been designated by a 4-digit alphanumeric code beginning with "X" followed by three numbers. As shown on Figure SP-1 and in Table SP-1, the non-LNAPL excavation areas are numbered from X001 through X136. Each of these excavation areas, with the exceptions noted below, are on-site excavation areas associated with non-LNAPL contaminant exceedances. Post-excavation samples collected from each of these excavation areas will be designated by the excavation area "X" code, followed by an underscore and numbered in an ordinal fashion from 01 to the final sample collected from that excavation area. Depth, sample type, and locational (e.g., bottom) sample designators will be appended to the sample location code as described in section 2.4, above. Therefore, the four sidewall and one bottom sample collected from excavation area X001 would be designated as follows:

- X001_01_AC-AD through X001_12_AC-AD (twelve sidewall samples collected at 1-1.5 feet below grade)
- X001_13_AG-AH through X001_16_AG-AH (four bottom samples collected at 3-3.5 feet below grade.
- Additionally, if for example the sixteenth sample collected from the excavation were collected as a duplicate sample pair, those two samples would be designated as X001_16_AG-AH_1 and X001_16_AG-AH_2.

2.5.3 Off-Site Contamination

The method for assigning sample identifiers for post-excavation samples collected from the off-site excavation areas are identical to those used for determining those collected from the on-site, non-LNAPL contamination areas. Therefore, post-excavation samples collected from excavation area X073 would be as follows:

- X073_01_AA-AB through X073_04_AA-AB (four sidewall samples collected at 0-0.5 feet below grade)
- X073_13_AG-AH through X073_16_AG-AH (one bottom samples collected at 3-3.5 feet below grade.

The excavation area "X" code designators are shown on Figure SP-2 for Channels A, B, C, and the Pond, and on Figure SP-3 for Channel D.

2.5.4 Additional Investigation Samples

The soil samples to be collected from within the footprint of the berm will be designated BERM-1-AE-AF through BERM-22-AE-AF, as the samples are proposed for collection from a depth of 2.0 to 2.5 feet below the surface of the berm. The "berm" soil samples collected from beyond the footprint of the berm between Channel B and Channel C will be designated as BERM-23-##-## through BERM-26-##-##, whereas the "berm" soil samples collected from beyond the footprint of the berm between Channel A and Channel B will be designated as BERM-27-##-## through BERM-32-##-## (where the ##-## designates the depth interval collected). BERM-23-##-## through BERM-32-##-## will be collected from the 0-0.5-foot interval except for the VOC fraction, which will be collected from the 0.5-1.0-foot interval.

Sediment samples requested by NJDEP under the additional investigation program will be designated as CP-7 through CP-12. Three of these locations (two in the pond and one in the pond outlet channel) will have co-located surface water samples collected; those co-located surface water samples will have the same field sample identification code as their co-located sediment samples. The sediment and surface water sample collected from the pond outlet will be designated as CP-7 (with sediment being CP-7-AA-AB). The sediment samples collected from the pond just south of the Channel C inlet will be designated CP-8-AA-AB through CP-12-AA-AB, and the co-located surface water samples will be designated CP-8 and CP-9.

3.0 SAMPLING PROCEDURES

Sampling procedures will follow technical requirements as set forth in the NJDEP *Field Sampling Procedures Manual* (August 2005) as described below. Weston will follow the Health and Safety Plan provided in the Consolidated RAWP approved by the NJDEP on September 26, 2006. Two different sample collection methodologies will be employed for post-excavation sample collection. Grab or hand collection methods, including use of a dedicated disposable scoop, will be utilized for shallow excavation areas (3 feet or less in depth where the base of the excavation is determined to be competent). At-depth post-excavation samples or samples from shallow excavations with incompetent base surfaces will be collected through use of the excavator bucket. The perimeter length and base area of each excavation will be verified in the field after excavation is complete to ensure that the correct post-excavation sampling frequency is obtained, in accordance with NJDEP requirements.

In the event that visible separate-phase product is observed during the post-remedial sampling program, the actions that will be taken will depend on the area being sampled:

- For the on-site LNAPL area being remediated by excavation of contaminated soils and LNAPL, if separate-phase LNAPL is observed in the confirmation samples collected from the excavation sidewall or base, then the visible LNAPL has not been sufficiently removed; the sample will be abandoned, and the excavation will be expanded until no visible LNAPL is present. Once samples with no visible LNAPL are collected, those samples will be submitted to the laboratory for confirmatory analysis.

- For the on-site LNAPL area included in the IRM, if separate-phase LNAPL is observed in the confirmation samples, the finding will be noted in the field documentation (e.g., soil boring log), and the phases will be allowed to separate prior to analysis of the soil fraction. As per Toxic Substance Control Act (TSCA) regulations (at 40 CFR 761.1(b)(4)(iii)), biphasic material must be separated prior to analysis. Based on Weston's experience at the Hatco site, Weston is proposing to not sample the LNAPL phase; rather, management of this material will be as TSCA material, and analyses will be limited to the soil phase of the sample.

- Based on numerous samples collected at the site during the various phases of historic and ongoing investigations, Weston does not anticipate that separate-phase LNAPL will be present in samples collected in areas beyond the known limits of the LNAPL plume.

To maintain a record of sample collection, transfer between personnel, shipment, and receipt by the laboratory, standard chain-of-custody forms will be completed for all samples. Each form will be completed in the field and signed and dated by a member of the field team who will

verify the exact sample shipment. This form will accompany the samples to the laboratory. Signed and dated custody seals will then be applied to the shipping container. Sample collection methodologies are described in more detail in the following sections.

3.1 Shallow Post-Excavation Sample Collection

Post-excavation samples from within shallow excavation areas may be collected through use of a trowel or hand auger, depending upon site-specific conditions and the competency of the excavation base. The analytical samples will be collected utilizing NJDEP protocols. Dedicated disposable scoops and bowls will be utilized for collection of samples for PCBs and/or metals analysis only. For those samples that will be analyzed for SVOC analysis, decontaminated stainless steel scoops/spoons will be used to minimize the potential for contamination of the sample with plasticizers, some of which are site-specific contaminants of concern. Soil samples being analyzed for volatile organic compounds (e.g., benzene) will be collected using EnCore sampling devices.

Post-excavation samples will be collected from a discreet 6 inch interval at each location. Samples are to be collected directly with dedicated, disposable scoops, homogenized as necessary in dedicated, disposable beakers, and placed directly into sample containers. Any sampling equipment (e.g., hand auger, etc.) coming in contact with the soil will be decontaminated before and after each post-excavation sample location. Samples will be placed in a cooler and chilled with ice, and will be picked up by the laboratory.

Any non-dedicated sampling equipment coming in contact with the soil will be decontaminated before and after each sample location. Equipment will be washed in the following sequence: 1) a steam/high-pressure water wash; 2) a potable water and soap wash; and, 3) a distilled and deionized (ASTM Type II) water rinse.

3.2 At-Depth Post-Excavation Sample Collection

Post–excavation samples from deeper excavations or from shallow excavations with incompetent base surfaces will be collected remotely through use the excavator bucket. Care will be taken to ensure that the post-excavation sample is collected from soils that have not been in contact with the excavator bucket surface to minimize the potential for cross-contamination.

Samples collected for PCBs and/or metals only will be collected through use of dedicated, disposable scoops, then homogenized as necessary in dedicated, disposable beakers, and placed directly into sample containers. For those samples where SVOC analysis is required, soil samples will be collected from the excavator bucket using decontaminated stainless steel sampling scoops or spoons. For soil samples being collected for volatile organic compound analysis (e.g., benzene), samples will be collected from the excavator bucket using an EnCore sampling device.

Samples will be placed in a cooler and chilled with ice, and will be picked up by the laboratory.

Any non-dedicated sampling equipment coming in contact with the soil will be decontaminated before and after each sample location. Equipment will be washed in the following sequence: 1) a steam/high-pressure water wash; 2) a potable water and soap wash; and, 3) a distilled and deionized (ASTM Type II) water rinse.

3.3 Soil Delineation Borings At X136

As described in Section 2.3.1 above, four at-depth soil samples will be collected to confirm the exceedance of naphthalene in historic sample B-1 in excavation area X136 to determine the need to perform remedial excavation associated with the data point. The confirmation soil samples will be collected via Geoprobe boring device.

The Geoprobe® system consists of a hydraulically powered percussion hammer which is truck- (or smaller vehicle-) mounted. The vehicles use hydraulic pumps belt-driven by the vehicle engine to provide power to the probing unit.

One function of the carrier vehicle is to provide static weight for advancement of the probing tools. In practice, probing tools are advanced as far as possible using only the static weight of the carrier vehicle. Applied static force varies with the weight and cargo of the carrier, as well as, the distance that the probe unit is positioned from the carrier. This static force is often sufficient to advance a one-inch diameter tool string to depths of 20 feet in soils consisting of silts or low friction clayey silts.

Soil samples will be collected using 2-inch diameter 4-foot or 5-foot long MacroCore® samplers. The macro samplers will have acetate liners. After driving and retrieving the macro

sampler using the Geoprobe system, the acetate liner will be cut open, the soil screened for VOCs using either a FID or PID, and then soil samples will be collected from each of the 6-inch intervals collected between 8 and 10 feet below grade. These samples will be analyzed for naphthalene only. Soil samples collected using decontaminated stainless steel sampling scoops or spoons, and homogenized as necessary within the acetate sleeve, and placed directly into sample containers. Samples will be placed in a cooler and chilled with ice, and will be picked up by the laboratory.

3.4 Additional Investigation Sampling Methods

During the additional investigation being conducted to answer NJDEP's specific concerns raised during their 24 July 2009 site visit, soil samples will be collected from a berm, from the surface soils in vicinity of the berm, from the off-site pond, and from the pond's outlet. It is anticipated that the soil samples collected from within the footprint of the berm will be collected using the hand auger sampling method, and that the "berm" soil samples collected from beyond the footprint of the berm will be collected using manual collection techniques. Additionally, it is anticipated that the sediment samples collected from within the off-site pond will be collected using a petite Ponar dredge, while the sediment samples collected from the pond outlet will be collected using techniques for either a trowel/scoop or auger beneath a shallow aqueous layer. Surface water samples collected from the pond and the pond outlet will be collected using either the manual method or the dip method. Specific procedures describing each of these sampling methodologies is provided in the QAPP, which is provided as Attachment 3 to the RAWP Addendum 3 to which this PESAP is also attached.

4.0 QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance/quality control (QA/QC) samples will be collected in accordance with Weston's Quality Assurance Project Plan (QAPP), included as Attachment 3 to the RAWP Addendum No. 3 to which this sampling plan is appended.. Table SP-4 summarizes the QA/QC sampling program that will be used during implementation of this Sampling Plan.

During the post-excavation sampling program, blind field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a rate of 1 per 20 soil samples per analytical method. Field blanks will be collected once per day per matrix and analyzed for the same parameters as the field samples; however, since all sampling equipment other than the excavation buckets will be dedicated, disposable equipment, the field blank samples will be limited to evaluating the efficiency of decontamination of the excavation equipment tools. Field blanks will be collected by pouring laboratory-supplied analyte-free water over the decontaminated sampling tools into laboratory-supplied bottleware.

A record of all field procedures, tests, and observations will be recorded in a field logbook or on appropriate logging forms. Entries in the log book and field forms will include the individuals participating in the field effort, date and time, and the initials of the individual responsible for recording the observations. Photodocumentation will be conducted with digital photography to provide an extra layer of documentation of the field observations.

5.0 FIELD DECONTAMINATION

Non-dedicated field equipment that comes in direct contact with soil samples will be decontaminated by high pressure hot steam cleaning and air dried. Unless it will be used immediately, equipment will then be wrapped in foil until ready to use. Decontaminated equipment will be stored on site in a secure equipment storage location until use. Prior to sampling, the decontaminated equipment must be rinsed with demonstrated analyte-free distilled and deionized water. All drilling/heavy equipment will be steam-cleaned at the completion of the project to ensure that no contamination is transported from the sampling site.

6.0 INVESTIGATION-DERIVED WASTE MANAGEMENT

All waste generated during the post-excavation sampling program will be handled in accordance with applicable Federal and State requirements. Waste will be segregated according to waste stream (e.g., sampling equipment, personal protective equipment, product recovered during dewatering activities, decontamination fluids) then containerized in 55-gallon drums or other DOT-approved containers.

Bulk samples will be collected from each waste stream for waste classification analysis and the waste will be transported to a licensed waste disposal facility.

Toxic Substances Control Act (TSCA) wastes, i.e., those containing PCBs at concentrations of 50 mg/kg or more, will be encountered since the remedial action will include removal of soils and LNAPL with PCBs at concentrations of 500 mg/kg or more dry weight,. All TSCA wastes will be handled, stored, transported and managed in accordance with Federal guidelines.

Aqueous wastes such as dewatering liquids will be handled either through the Middlesex County Utilities Authority- (MCUA-) permitted groundwater treatment system (implemented under the IRM RAWP) or will be containerized and hauled off-site by a licensed hauler at a permitted disposal facility.

TABLES

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X001	PESE_B-13	0-0.5; 0.5-1; 1-1.5	PCB	Figure 7	12 sidewall 4 bottom	Side @ 1-1.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X002	CAP_B-31_5N	1.5-2; 2-2..5; 2.5-3	PCB > 500 mg/kg	Figure 6	5 sidewall 1 bottom	Side @ 2.5-3 Bottom @ 6-6.5	PCB (8082)	SP-1
X003	CC3.5	0-0.5; 0.5-1	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-1
X004	CAP_B-20	0-0.5	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-1
X005	CAP_B-28_5E	0-0.5	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-1
X006	CAP_B-27	0-0.5; 1.5-2	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X007	PESE_B-29	0-0.5	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X008	Z4	0-0.5	Benzo(a)pyrene	Figure 10	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	Benzo(a)pyrene (8270C)	SP-1
X009	CAP_B-17_5W	0-0.5; 1.5-2	PCB	Figure 7	5 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X010	SB241	2-3	Naphthalene	Figure 10	4 sidewall 1 bottom	Side @ 2.5-3.5 Bottom @ 4-4.5	Naphthalene (8270C)	SP-1
X011	SB242	2.5-3	Naphthalene	Figure 10	4 sidewall 1 bottom	Side @ 2.5-3.5 Bottom @ 4-4.5	Naphthalene (8270C)	SP-1
X012	SB243	2-4; 5.5-6	Naphthalene	Figure 10	8 sidewall (4 at each depth) 1 bottom	Side @ 3-3.5 Side @ 5.5-6 Bottom @ 7-7.5	Naphthalene (8270C)	SP-1
X013	PESE_B-33	1.5-2 (exceedance @ Y4.5)	PCB	Figure 7	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 3-3.5	PCB (8082)	SP-1
X014	N23	0-0.5	Naphthalene	Figure 10	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	Naphthalene (8270C)	SP-1
X015	P28.5	0-0.5	Benzo(a)pyrene	Figure 10	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	Benzo(a)pyrene (8270C)	SP-1

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X016	PESE_B-37	0-0.5	PCB	Figure 7	5 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	PCB (8082)	SP-1
X017	O15	BaP: 0-0.5; 0.5-1; 2-2.5 BaA: 2-2.5 Napthalene: 2.5-3	Benzo(a)pyrene (BaP); Benzo(a) anthracene (BaA); Naphthalene	Figure 10	8 sidewall (4 at each depth; shallow for BaP only) 1 bottom	Side @ 0-0.5 (BaP) Side @ 2.5-3 (all) Bottom @ 3-3.5 (all)	Benzo(a)pyrene; Benzo(a) anthracene; Naphthalene (8270C)	SP-1
X018	S/T29	0-0.5	PCB Lead	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	PCB (8082) Lead (6010B)	SP-1
X019	123(O/P_29.25)	BaP: 0-0.5; 0.5-1; 2-2.5 BkF and Indeno (123-cd)pyrene: 0-0.5	Benzo(a)pyrene (BaP); Benzo(k) fluoranthene (BkF); Indeno (123-cd)pyrene	Figure 10	8 sidewall (4 at each depth; deep for BaP only) 1 bottom	Side @ 0-0.5 (all) Side @ 2-2.5 (BaP) Bottom @ 3-3.5 (all)	Benzo(a)pyrene; Benzo(k) fluoranthene; Indeno (123-cd) pyrene (8270C)	SP-1
X020	CAP B-36	1.5-2	PCB	Figure 7	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 3-3.5	PCB (8082)	SP-1
X021	122(P/R 30.25)	0-0.5	Benzo(a)pyrene	Figure 10	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	Benzo(a)pyrene (8270C)	SP-1
X022	S/T31	0-0.5	Arsenic	Figure 10	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	Arsenic (6010B)	SP-1
X023	SB226	1.5-2	PCB	Figure 9	7 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 3-3.5	PCB (8082)	SP-1
X024	117(R/S 31.75)	2.5-3	Bis(2-ethylhexyl) phthalate	Figure 10	4 sidewall 1 bottom	Side @ 2.5-3 Bottom @ 4-4.5	Bis(2-ethylhexyl) phthalate (8270C)	SP-1
X025	S/T31.75	Naphthalene: 0-0.5; 1.5-2; 2-2.5 Bis(2-ethylhexyl) phthalate: 1.5-2	Naphthalene Bis(2-ethylhexyl) phthalate	Figure 10	10 sidewall (5 at each depth, shallow for naphthalene only) 1 bottom	Side @ 0-0.5 (naphthalene) Side @ 1.75-2.25 (all) Bottom @ 3-3.5 (all)	Naphthalene; Bis(2-ethylhexyl) phthalate (8270C)	SP-1

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X026	S/T32	1.5-2	Naphthalene Bis(2-ethylhexyl) phthalate	Figure 10	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 3-3.5	Naphthalene; Bis(2-ethylhexyl) phthalate (8270C)	SP-1
X027	57(2)	2.5-3.5	Naphthalene	Figure 3	4 sidewall 1 bottom	Side @ 3-3.5 Bottom @ 4-4.5	Naphthalene (8270C)	SP-1
X028	116(FF 18.5)	0-0.5	Benzo(a)pyrene	Figure 10	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	Benzo(a)pyrene (8270C)	SP-1
X029	A/F 19	Bis(2-ethylhexyl) phthalate : 0-0.5;0-6 PCB: 0-0.5	Bis(2-ethylhexyl) phthalate PCB	Figure 10 Figure 9 for PCB	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	Bis(2-ethylhexyl) phthalate (8270C) PCB (8082)	SP-1
X030	SB214	Bis(2-ethylhexyl) phthalate: 0-0.5 PCB: 0-0.5	Bis(2-ethylhexyl) phthalate PCB	Figure 10	4 sidewall 1 bottom	Side @ 0-0.5 (all) Bottom @ 3-3.5 (all)	Bis(2-ethylhexyl) phthalate (8270C) PCB (8082)	SP-1
X031	CAP_B-76	0-0.5; 1-1.5	PCB	Figure 14	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X032	RR5	1-1.5	Beryllium	Figure 10	4 sidewall 1 bottom	Side @ 1-1.5 Bottom @ 2-2.5	Beryllium (6010B)	SP-1
X033	CAP_B-77	0-0.5; 1-1.5; 2.5-3	PCB	Figure 13 Figure 14	30 sidewall 11 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X034	G18	1.5-2	PCB	Figure 13	9 sidewall 2 bottom	Side @ 1.5-2 Bottom @ 4-4.5	PCB (8082)	SP-1
X035	RR7	Bis(2-ethylhexyl) phthalate: 0-0.5; 1-1.5 Naphthalene: 1-1.5 PCB: 0-0.5; 1-1.5	Bis(2-ethylhexyl) phthalate Naphthalene PCB	Figure 10 Figure 9 for PCB	8 sidewall (4 at each depth) 1 bottom	Side @ 0-0.5 (bis(2-ethylhexyl) phthalate, PCB) Side @ 1-1.5 (all) Bottom @ 2-2.5 (all)	Bis(2-ethylhexyl) phthalate, Naphthalene (8270C) PCB (8082)	SP-1

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X036	RR8	Benzo(a) anthracene: 0-0.5 Benzo(a)pyrene: 0-0.5 Benzo(b) flouranthene: 0-0.5 Benzo(k) fluoranthene: 0-0.5 Bis (2-ethylhexyl) phthalate: 0-0.5; 1-1.5 Chrysene: 0-0.5 Naphthalene: 0-0.5; 1-1.5 PCB: 0-0.52; 1.5-2	Benzo(a) anthracene Benzo(a)pyrene Benzo(b) flouranthene Benzo(k) fluoranthene Bis (2-ethylhexyl) phthalate Chrysene Naphthalene PCB	Figure 10 Figure 8 for PCBs	8 sidewall (4 at each depth) 1 bottom	Side @ 0-0.5 (all) Side @ 1-1.5 (Bis(2-ethlyhexyl) phthalate, PCB, Naphthalene) Bottom @ 2-2.5 (all)	Benzo(a) anthracene, Benzo(a)pyrene, Benzo(b) flouranthene, Benzo(k) fluoranthene, Bis (2-ethylhexyl) phthalate, Chrysene, Naphthalene (8270) PCB (8082)	SP-1
X037	RR9	2-2.5	Naphthalene	Figure 10	4 sidewall 1 bottom	Side @ 2-2.5 Bottom @ 3.5-3.5	Naphthalene (8270)	SP-1
X038	RR10	2-2.5	Beryllium	Figure 10	4 sidewall 1 bottom	Side @ 2-2.5 Bottom @ 3-3.5	Beryllium (6010B)	SP-1
X039	CAP_B-87	0-0.5; 1-1.5	PCB	Figure 9	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X040	CAP_B-86	1-1.5	PCB	Figure 9	4 sidewall 1 bottom	Side @ 1-1.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X041	CAP_B-92	1-1.5	PCB	Figure 9	4 sidewall 1 bottom	Side @ 1-1.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X042	PESE_B-60	2-2.5; 2.5-3	PCB > 500 mg/kg	Figure 6	6 sidewall 1 bottom	Side @ 2-2.5 Bottom @ 5-5.5	PCB (8082)	SP-1
X043	PESE_B-139	0-0.5; 0.5-1; 1-1.5; 1.5-2; 2-2.5; 2.5-3	PCB	Figure 9	19 sidewall 16 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X044	CAP_B-89	1-1.5	PCB	Figure 8	4 sidewall 1 bottom	Side @ 1-1.5 Bottom @ 3-3.5	PCB (8082)	SP-1

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X045	SE2(B 20.75)	0-0.5; 1-1.5; 1.5-2	PCB	Figure 9	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X046	CAP_B-98	0-0.5; 1-1.5	PCB	Figure 9	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	PCB (8082)	SP-1
X047	SB422	1.5-2	PCB > 500 mg/kg	Figure 6	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 5-5.5	PCB (8082)	SP-1
X048	CAP_B95	0-0.5; 1-1.5	PCB	Figure 9	8 sidewall 2 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X049	T20.5	1-1.5	PCB > 500 mg/kg	Figure 6	4 sidewall 1 bottom	Side @ 1-1.5 Bottom @ 2-2.5	PCB (8082)	SP-1
X050	C21.75	0-0.5	Benzo(a)pyrene	Figure 10	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	Benzo(a)pyrene (8270C)	SP-1
X051	SB216 TP1A	1.5-2; 7-7.5	PCB	None shown	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 8-8.5	PCB (8082)	SP-1
X052	113(II/I 17.75)	Bis(2-ethylhexyl) phthalate: 0-0.5 Benzene: 2.5-3	Bis(2-ethylhexyl) phthalate, Benzene	Figure 10	8 sidewall (4 at each depth, for different parameters) 1 bottom	Side @ 0-0.5 (bis (2-ethylhexyl phthalate only) Side @ 2.5-3 (benzene only) Bottom @ 3-3.5 (all)	Bis (2-ethylhexyl) phthalate (8270C) Benzene (8260B)	SP-1
X053	I18	0-0.5; 1.5-2	PCB	Figure 9	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X054	SB219	2-2.5; 6.5-7	Bis(2-ethylhexyl) phthalate PCB	Figure 10 Figure 8	8 sidewall (4 at each depth) 1 bottom	Side @ 2-2.5 Side @ 6.5-7 Bottom @ 7-7.5	Bis(2-ethylhexyl) phthalate (8270C) PCB (8082	SP-1
X055	112(K/C 16.5)	1-1.5	Benzene	Figure 10	4 sidewall 1 bottom	Side @ 1-1.5 Bottom @ 3-3.5	Benzene (8260B)	SP-1
X056	C17	0-0.5	PCB	Figure 8	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	PCB (8082)	SP-1

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X057	114(C/J 17.5)	5-5.5	Bis(2-ethylhexyl) phthalate	Figure 10	4 sidewall 1 bottom	Side @ 5-5.5 Bottom @ 7-7.5	Bis(2-ethylhexyl) phthalate (8270C)	SP-1
X058	C16	1.5-2	PCB	Figure 8	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 4-4.5	PCB (8082)	SP-1
X059	SB294	9-9.5	PCB	Figure 8	4 sidewall 1 bottom	Side @ 9-9.5 Bottom @ 11-11.5	PCB (8082)	SP-1
X060	CAP_B-101	0-0.5	PCB	Figure 8	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	PCB (8082)	SP-1
X061	J16-5	Naphthalene: 0-4 PCB: 0-4; 0-6	Naphthalene PCB	Figure 10 Figure 8	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 7-7.5	Naphthalene (8270C) PCB (8082)	SP-1
X062	SB295	4-5	PCB	Figure 8	4 sidewall 1 bottom	Side @ 4-4.5 Bottom @ 6-6.5	PCB (8082)	SP-1
X063	L17	0-0.5	PCB	Figure 8	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X064	CAP_B-100	0-0.5; 1-1.5	PCB	Figure 8	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X065	CAP_B-99	0-0.5; 1-1.5	PCB	Figure 8	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 4-4.5	PCB (8082)	SP-1
X066	TP33(L/M 16.5)	0.5-1.5	PCB > 500 mg/kg	Figure 6	5 sidewall 1 bottom	Side @ 0.5-1 Bottom @ 2-2.5	PCB (8082)	SP-1
X067	TP34(M 16.5) TP33(L/M 16.5)	Naphthalene, Bis (2-ethylhexyl) phthalate: 0.5-1.5 Benzo(a) pyrene: 2-3	Benzo(a)pyrene Bis(2-ethylhexyl) phthalate Naphthalene	Figure 10	4 sidewall 1 bottom	Side @ 2-2.5 Bottom @ 4-4.5	Benzo(a)pyrene, Bis(2-ethylhexyl) phthalate, naphthalene (8270C)	SP-1
X068	TP2A	2-2.5	Bis(2-ethylhexyl) phthalate PCB	Figure 10 Figure 8	4 sidewall 1 bottom	Side @ 2-2.5 Bottom @ 3-3.5	Bis(2-ethylhexyl) phthalate (8270C) PCB (8082)	SP-1

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X069	CAP_B-69 CAP_B-66	0-0.5; 1-1.5;	PCB	Figure 8 Figure 9	33 sidewall 8 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X070	SB216	1.5-2	PCB	Figure 9	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 3-3.5	PCB (8082)	SP-1
X071	CA_1 SB215 CM15	0-0.5; 1-1.5; 1.5-2; 2-2.5 7-7.5 (SB215 only)	PCB	Figure 8 Figure 9	38 sidewall 6 bottom samples SB215 sub-excavation: 4 sidewall, 1 bottom	Side @ 0-0.5 Bottom @ 4-4.5 SB215 sub-excavation: Side @ 7-7.5 Bottom @ 9-9.5	Bis(2-ethylhexyl) phthalate [4] (8270C) PCB (8082)	SP-1
X072	CAP_B-60W	0-0.5	PCB	Figure 9 Figure 17	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-3
X073	SB202	0-0.5; 0.5-1	PCB	Figure 8 Figure 16	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP- 3
X074	SB204_5N	0-0.5	PCB	Figure 8 Figure 16	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-3
X075	B13(M/D 16.25)	1.5-2; 4-4.5	PCB >500 mg/kg	Figure 6	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 6-6.5	PCB (8082)	SP-1
X076	B13(M/D 16.25)	Bis(2-ethylhexyl) phthalate: 0-4; 1.5-2; 0-8; 0-10 Thallium: 1.5-2	Bis(2-ethylhexyl) phthalate Thallium	Figure 10	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 5-5.5	Bis(2-ethylhexyl) phthalate (8270C) Thallium (6010B)	SP-1
X077	TP39(D 16.25)	Bis(2-ethylhexyl) phthalate : 2.5-3 PCB: 2.5-3; 3-3.5	Bis(2-ethylhexyl) phthalate PCB	Figure 10 Figure 8	4 sidewall 1 bottom	Side @ 2.5-3 Bottom @ 4-4.5	Bis(2-ethylhexyl) phthalate (8270C) PCB (8082)	SP-1
X078	SB292	Bis(2-ethylhexyl) phthalate: 5-5.5 PCB: 5-5.5; 5.5-6	Bis(2-ethylhexyl) phthalate PCB	Figure 10 Figure 16 Figure 8 Figure 19	4 sidewall 1 bottom	Side @ 5-5.5 Bottom @ 7-75	Bis(2-ethylhexyl) phthalate (8270C) PCB (8082)	SP-3

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

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X079	TP25(D 14.75)	Bis(2-ethylhexyl) phthalate: 9-10 PCB: 9-10; 10-10.5	Bis(2-ethylhexyl) phthalate PCB	Figure 10 Figure 8 Figure 19	3 sidewall 1 bottom	Side @ 9-10 Bottom @ 11-11.5	Bis(2-ethylhexyl) phthalate (8270C) PCB (8082)	SP-3
X080	CAP_B-53W_10N	0-0.5; 0.5-1; 1-1.5; 1.5-2; 2-2.5; 2.5-3	PCB >500	Figure 15	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 4-4.5	PCB (8082)	SP-3
X081	CAP_B-53W	0-0.5; 0.5-1; 1-1.5; 1.5-2; 2-2.5; 2.5-3	PCB	Figure 8 Figure 15	5 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 4-4.5	PCB (8082)	SP- 3
X082	D14	Bis(2-ethylhexyl) phthalate: 0-6 PCB: 0-6; 1.5-2; 3.5-4	Bis(2-ethylhexyl) phthalate PCB	Figure 10 Figure 8 Figure 15 Figure 19	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	Bis(2-ethylhexyl) phthalate (8270C) PCB (8082)	SP-3
X083	D13	PCB: 0-4; 0-0.5; 1.5-2 Bis(2-ethylhexyl) phthalate: 0-4; 1.5-2	PCB >500 Bis(2-ethylhexyl) phthalate	Figure 6, Figure 15 Figure 10	8 sidewall (4 at each depth) 1 bottom	Side @ 0-0.5 Side @ 1.5-2 Bottom @ 4-4.5	PCB (8082) Bis(2-ethylhexyl) phthalate (8270C)	SP- 3
X084	M13	4-4.5	PCB >500	Figure 6	4 sidewall 1 bottom	Side @ 4-4.5 Bottom @ 6-6.5	PCB (8082)	SP-1
X085	M12	0-0.5; 0.5-1	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 4-4.5	PCB (8082)	SP-1
X086	L12	0.5-1	PCB >500	Figure 6	4 sidewall 1 bottom	Side @ 0.5-1 Bottom @ 2-2.5	PCB (8082)	SP-1
X087	SB287_5W	5-5.5; 9.5-10	PCB	Figure 7	3 sidewall 1 bottom	Side @ 5-5.5 Bottom @ 11-11.5	PCB (8082)	SP-1
X088	SB287-5N	1.5-2; 5-5.5	PCB >500	Figure 6 Figure 7	8 sidewall (4 at each depth) 1 bottom	Side @ 1.5-2 Side @ 5-5.5 Bottom @ 6-6.5	PCB (8082)	SP-1
X089	J12_5E	0-0.5; 0.5-1; 1-1.5; 1.5-2	PCB	Figure 7	3 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082)	SP-1

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X090	TP18(K/C 14.25)	3-4	PCB >500	Figure 6	4 sidewall 1 bottom	Side @ 3.5-4 Bottom @ 5-5.5	PCB (8082)	SP-1
X091	SB286	5-6	PCB >500	Figure 6	4 sidewall 1 bottom	Side @ 5-5.5 Bottom @ 8-8.5	PCB (8082)	SP-1
X092	B21	0-0.5	Lead	Figure 10	4 sidewalls 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	Lead (6010B)	SP-1
X093	P13	5.5-6; 6.5-7	PCB >500	Figure 6	4 sidewall 1 bottom	Side @ 6-6.5 Bottom @ 10-10.5	PCB (8082)	SP-1
X094	L11	0-0.5	PCB >500	Figure 6	3 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	PCB (8082)	SP-1
X095	J10	4-4.5	PCB >500	Figure 6	4 sidewall 1 bottom	Side @ 4-4.5 Bottom @ 8-8.5	PCB (8082)	SP-1
X096	C9	2-2.5	PCB >500	Figure 6	4 sidewall 1 bottom	Side @ 2-2.5 Bottom @ 3-3.5	PCB (8082)	SP-1
X097	K8	0-0.5; 0.5-1	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-1
X098	SB262	5.25-5.75	PCB >500	Figure 6	4 sidewall 1 bottom	Side @ 5.25-5.75 Bottom @ 10-10.5	PCB (8082)	SP-1
X099	SB263	4-4.5	PCB >500	Figure 6	4 sidewall 1 bottom	Side @ 4-4.5 Bottom @ 5-5.5	PCB (8082)	SP-1

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X100	CD-45_10E	0-0.5; 1-1.5; 1.5-2; 2.5-3	PCB	Figure 17	For 4-foot deep sub-excavation: 8 sidewall 2 bottom For 3 ft deep sub-excavation: 7 sidewall 1 bottom For main excavation: 26 sidewall 15 bottom	For 4-foot deep sub-excavation: Side @ 0-0.5 Bottom @ 4-4.5 For 3 ft deep sub-excavation: Side @ 0-0.5 Bottom @ 3-3.5 For main excavation: Side @ 0-0.5 Bottom @ 2.5-3	Bis(2-ethylhexyl) phthalate [5] (8270C) PCB (8082)	SP-4
X101	CD-01_10W	0-0.5; 1-1.5; 1.5-2.5; 2.5-3	PCB	Figure 17	For 3.5 foot deep sub-excavation: 8 sidewall) 3 bottom For shallow main excavation: 11 sidewall 5 bottom	For 3.5-foot deep sub-excavation: Side @ 0-0.5 Bottom @ 3.5-4 For main excavation: Side @ 0-0.5 Bottom @ 2.5-3	Bis(2-ethylhexyl) phthalate [5] (8270C) PCB (8082)	SP-4
X102	OSG-B2	0-0.5; 0.5-1; 1-1.5; 1.5-2; 2-2.5; 2.5-3; 3-3.5;3.5-4; 4-4.5	PCB	Figure 16	For 5-foot area: 6 sidewall 2 bottom For 3-foot area: 7 sidewall 2 bottom	For 5-foot area: Side @ 0-0.5 Bottom @ 5-5.5 For 3-foot area: Side @ 0-0.5 Bottom @ 3-3.5	Bis(2-ethylhexyl) phthalate [4] (8270C) PCB (8082)	SP-3

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X103	CB-MID CB4	0-0.5; 1-1.5; 1.5-2	PCB	Figure 15 Figure 16	38 sidewall 6 bottom	Side @ 0-0.5 Bottom @ 2-2.5 for 3 northern bottom samples and 3-3.5 for 3 southern bottom samples	Bis(2-ethylhexyl) phthalate [4] (8270C) PCB (8082)	SP-3
X104	CP-3	1-1.5	PCB	Figure 16	4 sidewall 1 bottom	Side @ 1-1.5 Bottom @ 2.5-3	PCB (8082)	SP-3
X105	OSE-B1_5N	0-0.5; 0.5-1	PCB	Figure 16	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-3
X106	CC-4	1-1.5	PCB	Figure 15	4 sidewall 1 bottom	Side @ 1-1.5 Bottom @ 3-3.5	PCB (8082)	SP-3
X107	SB208	PCB: 0-0.5; 1.5-2; 2-2.5 Bis(2-ethylhexyl) phthalate: 0-0.5; 1.5-2	PCB Bis(2-ethylhexyl) phthalate	Figure 16 Figure 19	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 3-3.5	PCB (8082) Bis(2-ethlyhexyl) phthalate (8270C)	SP-3
X108	CAP-B-57W	0-0.5	PCB	Figure 16	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	PCB (8082)	SP-3
X109	CAP_B-55W_10S	0-0.5; 0.5-1; 1-1.5	PCB	Figure 16	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-3
X110	SB203	0-0.5; 0.5-1	PCB	Figure 16	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-3
X111	CAP_B-54W	0.5-1	PCB	Figure 16	4 sidewall 1 bottom	Side @ 0.5-1 Bottom @ 2-2.5	PCB (8082)	SP-3
X112	SB424	9-10	PCB	Figure 15	4 sidewall 1 bottom	Side @ 9-9.5 Bottom @ 11-11.5	PCB (8082)	SP-3
X113	SB209	1.5-2	PCB	Figure 15	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 3-3.5	PCB (8082)	SP-3

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X114	OSB-B1	0.5-1; 1-1.5; 1.5-2	PCB	Figure 15	5 sidewall 1 bottom	Side @ 1-1.5 Bottom @ 3-3.5	Bis(2-ethylhexyl) phthalate [3] (8270C) PCB (8082)	SP-3
X115	D11	0-0.5; 0.5-1	PCB	Figure 15	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	PCB (8082)	SP-3
X116	M11	0-0.5	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-1
X117	M10	0-0.5; 0.5-1	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-1
X118	M9	0-0.5	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	PCB (8082)	SP-1
X119	L8	PCB: 0-0.5; 0-8; 5-5.5 Bis(2-ethylhexyl) phthalate: 0-8	Bis(2-ethylhexyl) phthalate	Figure 10	8 sidewall (4 at each depth) 1 bottom	Side @ 0-0.5 (all) Side @ 5-5.5 (PCB only) Bottom @ 10-10.5 (all)	Bis(2-ethylhexyl) phthalate (8270C) PCB (8082)	SP-1
X120	J8	0-0.5; 0.5-1	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-1
X121	C8	PCB: 0-0.5; 2-2.5; 4-4.5; 5.5-6 Bis(2-ethylhexyl) phthalate: 2-2.5	PCB Bis(2-ethylhexyl) phthalate	Figure 7 Figure 10	8 sidewall (4 at each depth) 1 bottom	Side @ 0-0.5 (PCB only) Side @ 2-2.5 (all) Bottom @ 7-7.5 (all)	PCB (8082) Bis(2-ethylhexyl) phthalate (8270C)	SP-1
X122	K7 SB265	PCB: 0-0.5 Bis(2-ethylhexyl) phthalate : 5.5-6	PCB Bis(2-ethylhexyl) phthalate	Figure 7 Figure 10	8 sidewall (4 at each depth) 1 bottom	Side @ 0-0.5 (PCB only) Side @ 5.5-6 (bis(2-ethylhexyl) phthalate only) Bottom @ 7-7.5 (all)	PCB (8082) Bis(2-ethylhexyl) phthalate (8270C)	SP-1

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X123	K6	0-0.5; 2-2.5; 9.5-10	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 10-10.5	PCB (8082)	SP-1
X124	T6	0-0.5	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	PCB (8082)	SP-1
X125	C5	PCB: 0-0.5 Bis(2-ethylhexyl) phthalate: 1.5-2	PCB Bis(2-ethylhexyl) phthalate	Figure 7 Figure 10	8 sidewall (4 at each depth) 1 bottom	Side @ 0-0.5 (PCB only) Side @ 1.5-2 (Bis (2-ethylhexyl) phthalate only) Bottom @ 3-3.5 (all)	PCB (8082) Bis(2-ethylhexyl) phthalate (8270C)	SP-1
X126	K5	0-0.5; 4-4.5; 5-5.5	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 7-7.5	PCB (8082)	SP-1
X127	K4.5	1.5-2	PCB	Figure 7	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 3-3.5	PCB (8082)	SP-1
X128	K3.75	0-0.5	Bis(2-ethylhexyl) phthalate	Figure 10	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2-2.5	Bis(2-ethylhexyl) phthalate (8270C)	SP-1
X129	I4.0_5N	3.5-4	PCB	Figure 7	4 sidewall 1 bottom	Side @ 3.5-4 Bottom @ 6-6.5	PCB (8082)	SP-1
X130	I3.0	1.5-2; 2-2.5	PCB	Figure 7	4 sidewall 1 bottom	Sode @ 1.5-2 Bottom @ 3-3.5	PCB (8082)	SP-1
X131	B3	2-2.5	Benzo(a)pyrene	Figure 10	4 sidewall 1 bottom	Side @ 2-2.5 Bottom @ 3-3.5	Benzo(a)pyrene (8270C)	SP-1
X132	CAP_B-32	0-0.5; 1-1.5	PCB	Figure 7	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	PCB (8082)	SP-1
X133	CAP_B-23_5N	0.5-1; 1.5-2	PCB	Figure 7	4 sidewall 1 bottom	Side @ 1.5-2 Bottom @ 2-2.5	PCB (8082)	SP-1
X134	FF34	1.5-2	Benzo(a)pyrene	Figure 10	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 2.5-3	Benzo(a)pyrene (8270C)	SP-1

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance[1] Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance[2]	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
X135	SB240	0-0.5	Naphthalene	Figure 10	4 sidewall 1 bottom	Side @ 0-0.5 Bottom @ 1-1.5	Naphthalene (8270C)	SP-1
X136	B-1	8-10	Naphthalene	Figure 3, 10	Confirmation samples If confirmation samples exceed remedial standard: 4 sidewall 1 bottom	Conf @ 8-8.5 Conf @ 8.5-9 Conf @ 9-9.5 Conf @ 9.5-10 If needed: Side @ exceeded confirmation sample depth Bottom @ 10.5-11	Naphthalene (8270C)	SP-3
LNAPL excavation “west leg”	SB270	Depth based on visual observation of LNAPL	PCB >500 Benzo(a)pyrene Bis(2-ethylhexyl) phthalate Butylbenzyl phthalate Naphthalene Benzene	Figure 4	14 sidewall 17 bottom	Side @ 0.5-foot interval immediately above water table Bottom @ 0.5-foot interval below lowest LNAPL	PCB (8082); Benzo(a)pyrene Bis(2-ethylhexyl) phthalate Butylbenzyl phthalate Naphthalene (8270C); Benzene (8260B)	SP-2

Table SP-1
Post-Excavation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Excavation Polygon Number	Historic or 2007 Exceedance(1) Associated with Excavation Polygon	Depth of Historic or 2007 Exceedance(2)	Contaminant Exceeding Remedial Standard	Addendum 3 Figure Showing Pertinent Historic Data	Proposed Post-Excavation Sample	Depth of Post-Excavation Sample	Analyte for Post-Excavation Sample (Method)	Figure Showing Post-Excavation Samples
LNAPL excavation "east leg"	LN_B-16	Depth based on visual observation of LNAPL	PCB >500 Benzo(a)pyrene Bis(2-ethylhexyl) phthalate	Figure 4	21 sidewall 19 bottom	Side @ 0.5-foot interval immediately above water table Bottom @ 0.5-foot interval below lowest LNAPL	PCB (8082) (exceedances of non-PCB analytes only detected in samples beneath proposed cap; therefore, post-excavation soil samples are proposed for PCB only.)	SP-2

Notes:

(1) Not all samples that exceeded remedial criteria are listed on this table. The "historic or 2007 exceedance" identified on this table is solely to be used as an aid in identifying the remedial excavations on the RAWP Addendum 3 figures. Where 2007 or historic exceedances are not shown on the referenced RAWP Addendum 3 figures, a sampling location without exceedances was provided to allow the reader to find the applicable excavation polygon.

(2) Depth of historic or 2007 exceedance may be based on samples collected from within the polygon that are not identified under the column "Historic or 2007 Exceedance Associated with Excavation Polygon"

(3) Bis(2-ethylhexyl)phthalate analysis limited to those post-excavation samples in the vicinity of historic bis(2-ethylhexyl)phthalate detections, as shown on RAWP Addendum 3 Figure 15.

(4) Bis(2-ethylhexyl)phthalate analysis limited to those post-excavation samples in the vicinity of historic bis(2-ethylhexyl)phthalate detections, as shown on RAWP Addendum 3 Figure 16.

(5) Bis(2-ethylhexyl)phthalate analysis limited to those post-excavation samples in the vicinity of historic bis(2-ethylhexyl)phthalate detections, as shown on RAWP Addendum 3 Figure 17.

Table SP-2
Additional Investigation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Sample ID	Sample Location Description	Matrix	Figure Showing Investigation Area	Sample Depth (1)	Analyte for Sample (Method)	Figure Showing Sample Location
BERM-01 through BERM-22	Within footprint of berm (shown as brown line on Figure 18)	Soil	Addendum 3 Figure 18	2.0-2.5	PCB (8082); Benzo(a)anthracene, Benzo(a) pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Bis(2-ethylhexyl)phthalate, Butylbenzyl phthalate, Chrysene, Indeno(123-cd)pyrene, Napththalene, (8270C) Benzene (8260B) Arsenic, Beryllium, Lead, Thallium (6010B)	Addendum 3 Figure 18
BERM-23 through BERM-26	Between Channel B and Channel C, beyond berm footprint	Soil	Addendum 3 Figure 18	0.0-0.5 (all except benzene) 0.5-1.0 (benzene only)	PCB (8082); Benzo(a)anthracene, Benzo(a) pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Bis(2-ethylhexyl)phthalate, Butylbenzyl phthalate, Chrysene, Indeno(123-cd)pyrene, Napththalene, (8270C) Benzene (8260B) Arsenic, Beryllium, Lead, Thallium (6010B)	Addendum 3 Figure 18
BERM-27 through BERM-32	Between Channel A and Channel B, beyond berm footprint	Soil	Addendum 3 Figure 18	0.0-0.5 (all except benzene) 0.5-1.0 (benzene only)	PCB (8082); Benzo(a)anthracene, Benzo(a) pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Bis(2-ethylhexyl)phthalate, Butylbenzyl phthalate, Chrysene, Indeno(123-cd)pyrene, Napththalene, (8270C) Benzene (8260B) Arsenic, Beryllium, Lead, Thallium (6010B)	Addendum 3 Figure 18

Table SP-2 (Continued)
Additional Investigation Sampling Summary Table
Hatco Remedial Action Work Plan Addendum 3

Sample ID	Sample Location Description	Matrix	Figure Showing Investigation Area	Sample Depth [1]	Analyte for Sample (Method)	Figure Showing Sample Location
CP-7	Pond outlet channel	Sediment	Addendum 3 Figure 18	0.0-0.5	PCB (8082); Bis(2-ethylhexyl)phthalate (8270C)	Addendum 3 Figure 18
CP-7	Pond outlet channel	Aqueous (Surface Water)	Addendum 3 Figure 18	Immediately below surface	PCB (8082); Bis(2-ethylhexyl)phthalate (8270C)	Addendum 3 Figure 18
CP-8 through CP-12	Pond inlet south of Channel C	Sediment	Addendum 3 Figure 18	0.0-0.5	PCB (8082); Bis(2-ethylhexyl)phthalate (8270C)	Addendum 3 Figure 18
CP-8 and CP-9	Pond inlet south of Channel C	Aqueous (Surface Water)	Addendum 3 Figure 18	Immediately below surface	PCB (8082); Bis(2-ethylhexyl)phthalate (8270C)	Addendum 3 Figure 18

Notes:

[1] Depth is feet below ground surface (soil) or feet below sediment-surface water interface (sediments). Surface water samples to be collected just beneath surface of water.

TABLE SP-3
Analytical Methods, and Container and Preservation Requirements
Post-Excavation Sampling Program
Hatco Site

Analytical Parameters	Matrix	Preparation Method	Analysis Method	Container	Preservation	Holding Time[1]
Post-Excavation Sampling Program						
Soil Samples						
PCBs	Soil	SW-846 3541C/3550C	SW-846 8082	8 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
SVOCs [Benzo(a) anthracene; Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(k) fluoranthene; Bis(2-ethylhexyl) phthalate; Butylbenzyl phthalate; Chrysene; Indeno(123-cd)pyrene; Naphthalene]	Soil	SW-846 3541C/3550	SW-846 8270C	8 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Volatile Organic Compounds [Benzene]	Soil	SW-846 5030/5035	SW-846 8260B	Three 5-gram EnCore Sampler	Cool to 4°C	14 days if frozen within 48 hours of collection
Metals/Inorganics [Arsenic; Beryllium; Lead; Thallium]	Soil	SW-846 3050B	SW-846 6010B	8 oz glass	Cool to 4°C	6 months
Aqueous (Field Blank) Samples						
PCBs	Aqueous	SW-846 3540C/3550C	SW-846 8082	Two 1,000-mL amber glass	Cool to 4°C	7 days to extraction; 40 days from extraction to analysis
SVOCs [Benzo(a) anthracene; Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(k) fluoranthene; Bis(2-ethylhexyl) phthalate; Butylbenzyl phthalate; Chrysene; Indeno(123-cd)pyrene; Naphthalene]	Aqueous	SW-846 3520/3510	SW-846 8270C	Two 1,000-mL amber glass	Cool to 4°C	7 days to extraction; 40 days from extraction to analysis
VOCs [Benzene]	Aqueous	SW-846 5030	SW-846 8260B	Three 40-mL vials with septum cap, no headspace	HCl to pH<2, Cool to 4°C	14 days (7 days if unpreserved)
Metals/Inorganics [Arsenic; Beryllium; Lead; Thallium]	Aqueous	SW-846 3010/3020	SW-846 6010B	One 1,000-mL polyethylene	HNO_3 to pH<2, Cool to 4°C	6 months

Notes can be found at end of Table.

TABLE SP-3 (Continued)
Analytical Methods, and Container and Preservation Requirements
Post-Excavation Sampling Program
Hatco Site

Analytical Parameters	Matrix	Preparation Method	Analysis Method	Container	Preservation	Holding Time[1]
Additional Investigation Sampling Program						
Soil (Berm) Samples						
PCBs	Soil	SW-846 3541C/3550C	SW-846 8082	8 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
SVOCs [Benzo(a) anthracene; Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(k) fluoranthene; Bis(2-ethylhexyl) phthalate; Butylbenzyl phthalate; Chrysene; Indeno(123-cd)pyrene; Naphthalene]	Soil	SW-846 3541C/3550	SW-846 8270C	8 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Volatile Organic Compounds [Benzene]	Soil	SW-846 5030/5035	SW-846 8260B	Three 5-gram EnCore Sampler	Cool to 4°C	14 days if frozen within 48 hours of collection
Metals/Inorganics [Arsenic; Beryllium; Lead; Thallium]	Soil	SW-846 3050B	SW-846 6010B	8 oz glass	Cool to 4°C	6 months
Sediment Samples						
PCBs	Sed-iment	SW-846 3540C/3550C	SW-846 8082	8 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Bis(2-ethylhexyl) phthalate	Sed-iment	SW-846 3550	SW-846 8270C	8 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Surface Water Samples						
PCBs	Aqueous	SW-846 3540C/3550C	SW-846 8082	Two 1,000-mL amber glass	Cool to 4°C	7 days to extraction; 40 days from extraction to analysis
Bis(2-ethylhexyl) phthalate	Aqueous	SW-846 3520/3510	SW-846 8270C	Two 1,000-mL amber glass	Cool to 4°C	7 days to extraction; 40 days from extraction to analysis

Notes can be found at end of Table.

TABLE SP-3 (Continued)
Analytical Methods, Container, and Preservation Requirements
Post-IRM Confirmation Sampling Program
Hatco Site

Analytical Parameters	Matrix	Preparation Method	Analysis Method	Container	Preservation	Holding Time[1]
Waste Classification [2]						
Toxicity Characteristic Leaching Procedure (TCLP) VOCs	Solid	SW-846 1311	SW-846 8260B	4-oz wide-mouth with septa cap, packed full	Cool 4°C	14 days to leaching; 14 days from leaching to analysis
TCLP SVOCs	Solid	SW-846 1311	SW-846 8270C	250 mL amber glass	Cool 4°C	14 days to leaching; 7 days from leaching to extraction; 40 days from extraction to analysis
TCLP Pesticides	Solid	SW-846 1311	SW-846 8081	8 oz amber glass	Cool 4°C	14 days to leaching; 7 days from leaching to extraction; 40 days from extraction to analysis
TCLP Herbicides	Solid	SW-846 1311	SW-846 8151	8 oz amber glass	Cool 4°C	14 days to leaching; 7 days from leaching to extraction; 40 days from extraction to analysis
TCLP Metals	Solid	SW-846 1311	SW-846 6010B (7471 for mercury)	250 mL amber glass	Cool 4°C	Mercury: 28 days to TCLP extraction; 28 days from TCLP extraction to determinative analysis. Others: 180 days to TCLP extraction; 180 days from TCLP extraction to determinative analysis
Paint Filter test	Solid	None	SW-846 9095A	8 oz glass	Cool to 4°C	None
Reactive-Cyanide	Solid	None	SW-846 Chapter 7 Section 7.3.3	8 oz glass	Cool to 4°C	None
Reactive-Sulfide	Solid	None	SW-846 Chapter 7 Section 7.3.4	8 oz glass	Cool to 4°C	None
Ignitability	Solid	None	SW-846 1010A	8 oz-glass	Cool to 4°C	None
Corrosivity	Solid	None	SW-846 9045D	8 oz-glass	Cool to 4°C	None
Petroleum Hydrocarbons	Solid	None	Diesel Range Organics by 8015	Two 8-oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
PCBs	Solid	SW-846 3540C/3550C	SW-846 8082	4 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis

Notes:
(1) Holding time begins with the date of collection.
(2) Preliminary list of parameters; information will be finalized based on requirements of selected disposal facility.
HCl: Hydrochloric acid
HNO_3: Nitric acid
mL: Milliliters
oz: ounces
PCBs: Polychlorinated biphenyls
SVOCs: Semivolatile organic compounds
SW: Solid waste
VOCs: Volatile organic compounds
°C: Degrees Celsius

TABLE SP-4
Summary of Field QC Samples
Post-Excavation Sampling Program
Hatco Site

Analytical Parameter	Investigation Samples	No. of Field Duplicate[1]	No. of MS/MSD[1]	No. of Field Blank[2]	Estimated No. of Total Investigation Samples
Post-Excavation Sampling Program					
PCBs	931	47	47	TBD	1,025
Bis(2-ethylhexyl)phthalate	236	12	12	TBD	260
Naphthalene	124	7	7	TBD	138
Benzo(a)pyrene	94	5	5	TBD	104
Benzene	41	3	3	TBD	47
Butylbenzyl phthalate	31	2	2	TBD	35
Benzo(a)anthracene	10	1	1	TBD	12
Benzo(k)fluoranthene	10	1	1	TBD	12
Beryllium	10	1	1	TBD	12
Lead	10	1	1	TBD	12
Arsenic	5	1	1	TBD	7
Benzo(b)fluoranthene	5	1	1	TBD	7
Chrysene	5	1	1	TBD	7
Indeno(123-cd)pyrene	5	1	1	TBD	7
Thallium	5	1	1	TBD	7
Additional Investigation Sampling Program					
"Berm" Soil Samples					
PCBs	32	2	2	TBD	36
Benzo(a)anthracene	32	2	2	TBD	36
Benzo(b)fluoranthene	32	2	2	TBD	36
Benzo(k)fluoranthene	32	2	2	TBD	36
Benzo(a)pyrene	32	2	2	TBD	36
Bis(2-ethylhexyl)phthalate	32	2	2	TBD	36
Butylbenzyl phthalate	32	2	2	TBD	36
Chrysene	32	2	2	TBD	36
Indeno(123-cd)pyrene	32	2	2	TBD	36
Naphthalene	32	2	2	TBD	36
Benzene	32	2	2	TBD	36
Arsenic	32	2	2	TBD	36
Beryllium	32	2	2	TBD	36
Lead	32	2	2	TBD	36
Thallium	32	2	2	TBD	36
Pond and Outlet Channel Sediment Samples					
PCBs	6	1	1	TBD	8
Bis(2-ethylhexyl)phthalate	6	1	1	TBD	8
Pond and Outlet Channel Surface Water Samples					
PCBs	3	1	1	TBD	5
Bis(2-ethylhexyl)phthalate	3	1	1	TBD	5

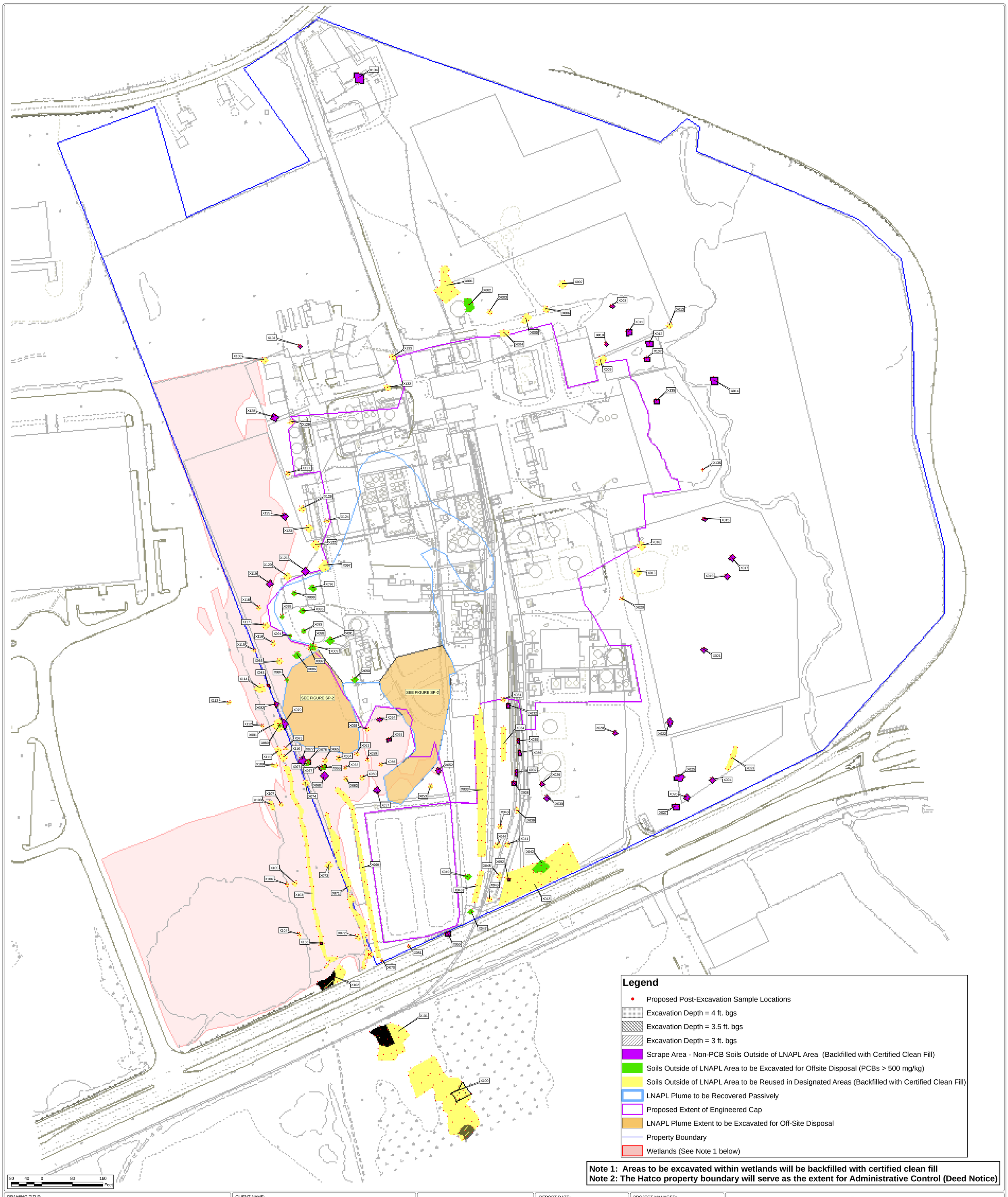
TABLE SP-4 (Continued)
Summary of Field QC Samples
Post-Excavation Sampling Program
Hatco Site

Analytical Parameter	Investigation Samples	No. of Field Duplicate[1]	No. of MS/MSD[1]	No. of Field Blank[2]	Estimated No. of Total Investigation Samples
Waste Classification [(3)]					
TCLP VOCs	15+	N/A	N/A	N/A	5+
TCLP BNAs	15+	N/A	N/A	N/A	5+
TCLP Pesticides	15+	N/A	N/A	N/A	5+
TCLP Herbicides	15+	N/A	N/A	N/A	5+
TCLP Metals	15+	N/A	N/A	N/A	5+
Paint Filter	15+	N/A	N/A	N/A	5+
RCRA Characteristics[(4)]	15+	N/A	N/A	N/A	5+
Petroleum Hydrocarbons	15+	N/A	N/A	N/A	5+
PCBs (excavated soils)	15+	N/A	N/A	N/A	5+

NOTES
1. Estimated field duplicate samples and estimated MS/MSD samples will be collected at a rate of 1 per 20.
2. Estimated Field blank will be collected at a rate of 1 per day for daily per decontamination event.
3. Preliminary list of parameters. Parameters will be finalized based requirements of requirements disposal facility. Number of samples will be finalized based on frequency requirements of disposal facility combined with total amount of waste generated and number of waste streams generated.
4. RCRA Characteristics include: ignitability, corrosivity, reactivity, and toxicity.

BNAs: Base-Neutral and Acid Extractable Compounds
MS/MSD: Matrix Spike/Matrix Spike Duplicate
PCBs: Polychlorinated Biphenlys
RCRA: Resource Conservation and Recovery Act
TBD: To be determined
TCLP: Toxicity Characteristic Leaching Procedure
VOC: Volatile Organic Compounds

FIGURES



Note 1: Areas to be excavated within wetlands will be backfilled with certified clean fill
Note 2: The Hatco property boundary will serve as the extent for Administrative Control (Deed Notice)

DRAWING TITLE:

RAWP Addendum 3 Sampling Plan
Post-Excavation Sampling Locations
For Non LNAPL Excavation Areas

FIGURE: SP-1

SCALE: 1 inch = 80 feet

DATE: 07/10/2009

CLIENT NAME: Weston Solutions, Inc.

PROJECT NAME: Hatco Remediation

N W E S

REPORT DATE: July 2009

DRAWING PATH: P:/Hatco/GIS/MXD/0809_RAWP_Add3/06768_Key_Map.mxd

REVISION No. 0

WORK ORDER No. 13067.001.002.8013

PROJECT MANAGER: D. Kopcow

CHECKED BY: L. Amend-Babcock

CONTRACT No.

DELIVERY ORDER NO.

DRAWN/MODIFIED BY: J. Lynes

DATE CREATED: 07/16/2009

Weston Solutions, Inc.
205 Campus Drive Edison, New Jersey 08837-3939
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http://www.westonsolutions.com

Grid X100
Grid X101
Grid X102
Grid X103
Grid X104
Grid X105
Grid X106
Grid X107
Grid X108
Grid X109
Grid X110
Grid X111
Grid XAA
Grid XAB
Grid XAC
Grid XAD
Grid XAE
Grid XAF
Grid XAG
Grid XAH
Grid XAI
Grid XAJ
Grid XAK

Approximate Location Of LNAPL Separation And Groundwater Treatment Plant

Legend

- Proposed Post-Excavation Sample Locations
- Building / Structures / Utilities Where Post – Remedy Sampling Is Deferred Until Demo Of Building / Structures / Utilities
- LNAPL Plume Extent
- LNAPL Separation And Groundwater Treatment Plant
- Active LNAPL Recovery Trench
- Sheet Pile Barrier
- Hatco Property Boundary

40 20 0 40 80
Graphic Scale In Feet

WESTON SOLUTIONS SM

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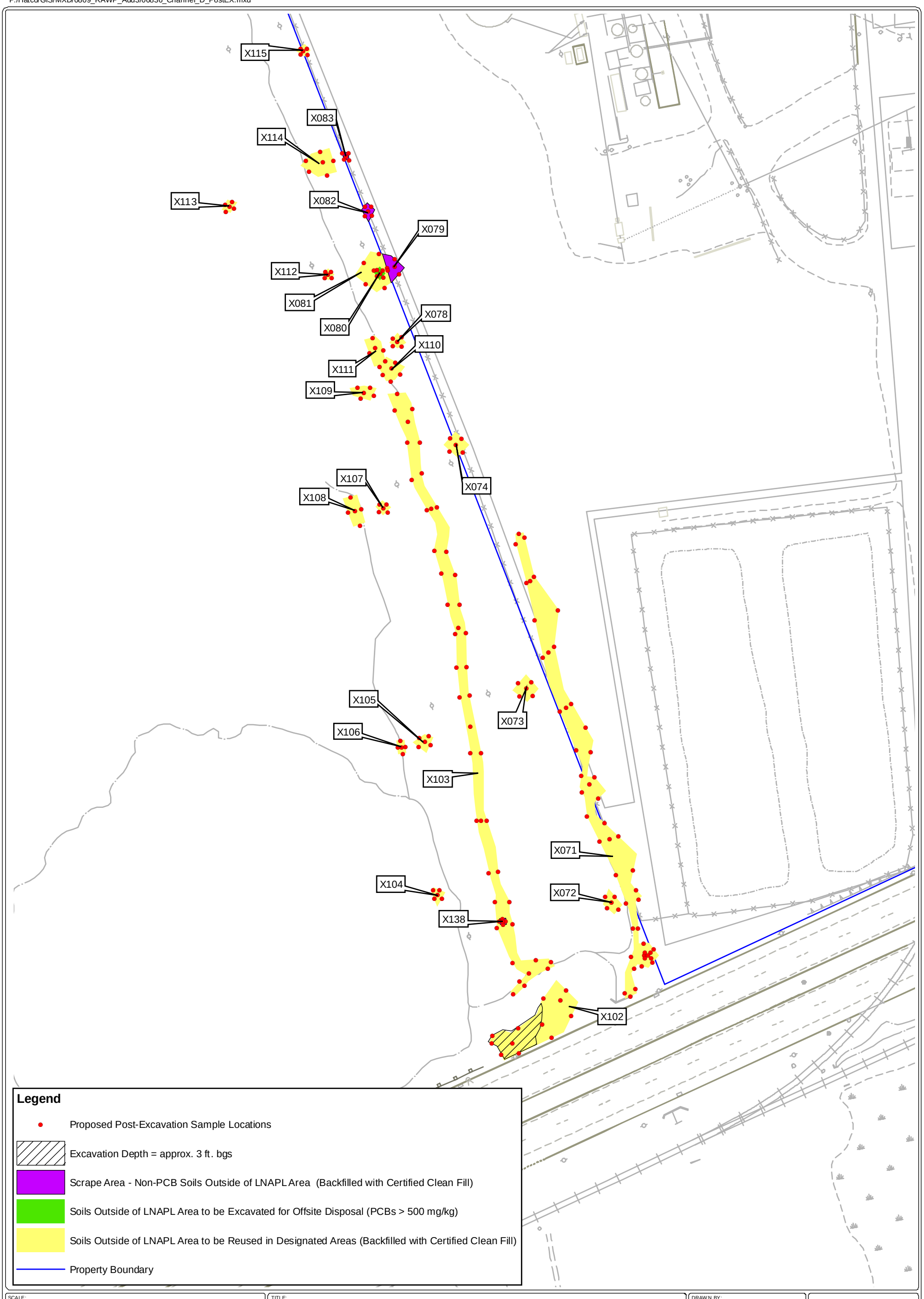
N W E S

REPORT DATE: July 2009	PROJECT MANAGER: D. Kopcow	CLIENT NAME: Weston Solutions Inc.	DRAWING TITLE: RAWP Addendum 3 Sampling Plan Post-Excavation Sampling Locations LNAPL Excavation Areas
DRAWING PATH: 06831_LNAPL_EX_PostEX.mxd P:/Hatco/GIS/MXD /0809_RAWP_Add3	CHECKED BY: L. Amend-Babcock		
REVISION No. 0	CONTRACT No. / DELIVERY ORDER NO.	PROJECT NAME: Hatco Remediation	
WORK ORDER No. 13067.001.002.8013	DRAWN/MODIFIED BY: J. Lynes / DATE CREATED: 07/16/2009		FIGURE: SP-2 / SCALE: 1" = 40' / DATE: 07/16/2009

P:/Hatco/GIS/MXD/0809_RAWP_Add3/06836_Channel_D_PostEX.mxd



SCALE:
80 40 0 80
Graphic Scale In Feet

PROJECT:
Hatco Remediation

CLIENT NAME:
Weston Solutions, Inc.

TITLE:
RAWP Addendum 3 Sampling Plan
Post-Excavation Sampling Locations
Channels A, B, C and Pond

WESTON SOLUTIONS SM

DRAWING NUMBER:
06839

FIGURE #:
SP-3

DRAWN BY:
J. Lynes

REVIEWED BY:
L. Amend-Babcock

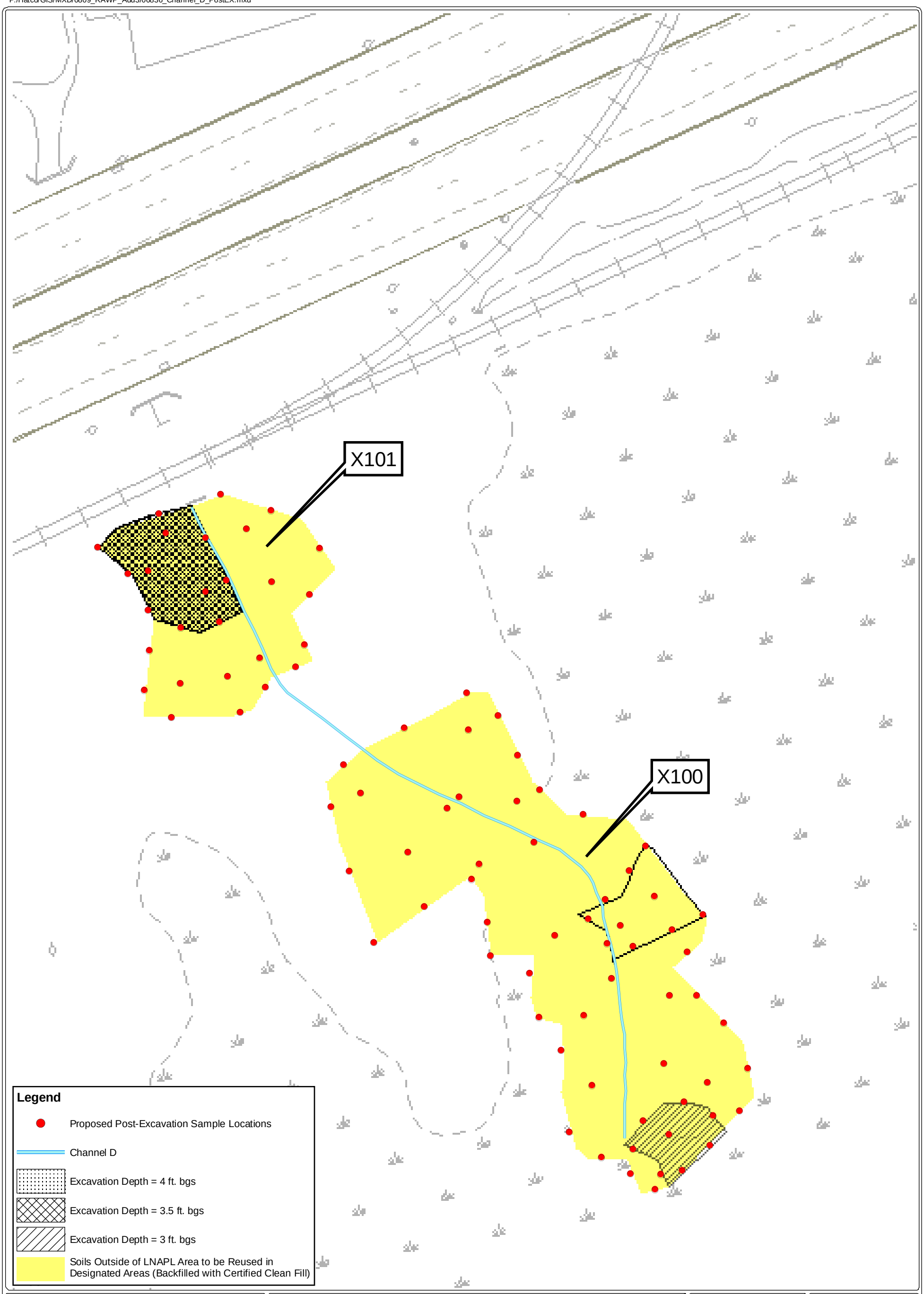
PROJECT MANAGER:
D. Kopcow

SCALE:
1" = 80'

DATE:
July 2009

N
W E
S

P:/Hatco/GIS/MXD/0809_RAWP_Add3/06836_Channel_D_PostEX.mxd



SCALE:
40 20 0 40
Graphic Scale In Feet

PROJECT:
Hatco Remediation

CLIENT NAME:
Weston Solutions, Inc.

TITLE:
RAWP Addendum 3 Sampling Plan
Post-Excavation Sampling Locations
Channel D

DRAWING NUMBER: 06836

FIGURE #: SP-4

DRAWN BY: J. Lynes

REVIEWED BY: L. Amend-Babcock

PROJECT MANAGER: D. Kopcow

SCALE: 1" = 40'

DATE: July 2009

N W E S

ATTACHMENT 2

Hatco Remediation
Means & Methods for
Excavation, Dewatering, Material Handling, and Restoration

1. EXCAVATION

1.1. Limits And Positioning

The areas to be excavated both on and off-site shall be laid out in the field utilizing Global Positioning System (GPS) technology. Work zones shall be established prior to breaking ground. Only trained qualified personnel will be allowed in exclusion zones.

1.2. Health and Safety

A site-specific HASP to address all remediation activities at the Site has been prepared to implement the RA. The HASP was prepared in accordance with all applicable federal, state and local requirements including, but not limited to, Occupational Safety and Health Administration Regulations 29 CFR Part 1910 (Occupational Safety and Health Standards) and 29 CFR Part 1926 (Safety and Health Regulations for Construction) and N.J.A.C. 7:26E-1.9. The HASP outlines the health and safety procedures and equipment required for activities to minimize the potential for exposure to site workers, including construction workers. The HASP will be submitted to the NJDEP after retention of the Remediation Contractor and prior to implementation of the RA at the Site.

1.3. Utilities & Structures

Each excavation area will be evaluated for potential conflicts with underground utilities and adjacent buildings or structures prior to excavation. In cases where excavations are expected to encounter utilities, the utility structures shall be exposed by non-aggressive means. Once the utility structure(s) are exposed, they will be protected and/or supported in accordance with accepted industry standards. Acceptable methods of supporting shall include, but not be limited to, sand bags and wooden cribbing.

1.4. Site Preparation

Prior to the initiation of remedial activities, contractors will mobilize to the site to prepare the site for remediation. Preparations will include:

- Establishing the work zones, including an exclusion zone, a contaminant reduction zone, and a support zone;
- Vegetation clearing where appropriate;
- Creation of haul roads where appropriate;
- Installing soil erosion control measures consistent with the approved soil erosion and sediment control plan; and

- Creating temporary stockpile locations and an equipment decontamination pad using a system of barriers with impermeable liners (if needed).

All site preparation will be performed in accordance with applicable permits in order to limit impact to on-site and adjacent wetlands.

1.5. Soil Removal

Excavation of all on-site areas will be performed as outlined in Addendum 3 and completed until all soils above the applicable standards have been successfully remediated, as confirmed by post-excavation sample analysis. Air monitoring for dust and volatile organic compounds will be conducted during all material handling procedures, as outlined in Attachment 5 of Addendum 3. The use of potable water as a dust suppression technique is the most likely technique that will be implemented. In the event that this dust suppression technique is not adequate, activity will be suspended until an adequate measure can be implemented. Odor control measures are not anticipated to be necessary in the majority of excavation areas outside the plant's main production area, although it will most likely be utilized during LNAPL area excavation. In the event that odor becomes an issue, activity will be suspended until appropriate control measures can be implemented. Weston will implement odor control foam as necessary, as outlined in Attachment 5.

Measures to control soil erosion and dust are prescribed in the Soil Erosion and Sediment Control Plan (SESCP), approved by Freehold Soil Conservation District. The SESCP was prepared in accordance with the requirements set forth at N.J.A.C. 2:90 and the *Standards for Soil Erosion and Sediment Control in New Jersey* (NJ State Soil Conservation Committee, November 2000).

Where groundwater is not encountered and the bearing capacity of the underlying formation allows, heavy equipment will work directly above/on the material to be removed. In cases where the underlying formation is not suitable to support heavy equipment, long-reach machinery will be utilized. Care will be taken to eliminate tracking of impacted material. Once machinery conveyance (wheels, tracks, etc) comes into contact with impacted material, the equipment will remain within the exclusion zone until decontaminated. Fuel and other equipment service needs will be brought to the equipment. Appropriate controls such as clean polyethylene work surfaces shall be utilized to allow for routine maintenance and repairs of equipment while working in exclusion zones. Only trained qualified personnel will be allowed to enter controlled work zones to service equipment.

As the depth of soil removal increases, it is anticipated that dewatering of the excavation may be required. Traditional in-hole dewatering methods will be employed to remove standing water from open excavations. These methods will include the use of gas-powered lift pumps set within low spots of the excavation. Large diameter slotted pipe, or other similar means, may be used to limit the intake of fine soils into the pumps. Should site conditions preclude dewatering via traditional in-hole pumping methods,

alternative means of in-place moisture removal will be evaluated. Other material handling practices may include gravity drainage of soils within the excavation. The use of soil amendments for moisture stabilization within the excavation may also be implemented. Once impacted soil has been stabilized for on-site transportation, it will be moved to the on-site stockpile area for blending and continued moisture stabilization.

1.5.1. Overburden and Impacted Soils in LNAPL Area

Excavation of overburden soil and LNAPL shall proceed in a phased manner. Prior to initiation of excavation activities, LNAPL control measures such as recovery wells, recovery trenches and barrier walls, will be installed as outlined in the IRM RAWP. This will limit the influx of water and product into LNAPL excavation areas from the north and allow for successful excavation of LNAPL-impacted soils in the southern portion of the plume. Additionally, in limited areas, sheet piling or wooded cribbing may be utilized for excavation sidewall support. Weston will develop a complete design of any necessary retaining structures after NJDEP approval of this RAWP Addendum and the IRM RAWP is received.

Soil defined as overburden, i.e., no visible LNAPL and PCB concentrations less than 500 mg/kg dry weight, shall be excavated and segregated from the material to be excavated for off-site disposal. In accordance with the Revised Soil Reuse Proposal, provided in Attachment 6, the overburden shall be placed back into the excavation following confirmation with post-excavation samples.

1.6. Sediment Excavation and Restoration

Sediments will be temporarily staged on a lined and bermed staging pad which will be covered during non-working hours. The staging pad will be constructed with a low point or sump for water collection. Water will be pumped from the excavation to a holding tank to allow solids settling. Excavated sediment will be evaluated for transportation suitability. Based on characteristics of the sediment and field observations, moisture stabilization options will be evaluated. Amendments may be added and/or blended into the sediment pile. The stockpile will be managed to prevent releases from the staging areas. The stockpile will also be managed to minimize waste generation due to rain water accumulation. The stockpile will be lined, covered and bermed, allowing for the management of liquid run-off and precipitation run-on. Fluids collected from the stockpile shall be handled in the same manner as excavation dewatering fluids (refer to Section 2.0).

Sediments to be reused will be stabilized or dewatered, as necessary, to improve their structural characteristics prior to placement. The need for stabilizing sediments will be determined in the field. If the sediments are too wet and soft to allow for grading and cap placement, addition of granular material (e.g., sand or gravel) or absorbents (e.g., fly ash) will be considered to improve the structural properties of the sediments.

Stream channels and wetlands will be restored and revegetated in accordance with the wetlands and stream encroachment permits. Areas of the site from which soil and sediment will be removed for reuse will be restored. Soil and sediment excavation areas will be restored to original grade by placing certified-clean fill and topsoil. The fill will be seeded and mulched to prevent erosion. Streambeds where sediments are removed for reuse will be backfilled with gravel to restore the drainage channel, and will be allowed to naturally re-vegetate.

2. STOCKPILE MANAGEMENT

Management of overburden and impacted materials within the soil stockpile areas will be accomplished by utilizing engineering controls and best work practices. Stockpile areas will be constructed of rugged durable High Density Polyethylene (HDPE) liners, or equivalent. These materials are capable of withstanding heavy equipment traffic and resisting tears and perforations, while providing containment of liquids and environmental wastes. The sub-grade under the liners will be prepared by removing sharp, objectionable materials that could cause damage prior to liner placement. Containment berms will be constructed around a minimum of three sides of the LNAPL area overburden stockpile and four sides for any impacted soil stockpile. Ramps will allow dumping and work access over berms. Berms may be constructed out of hay bales, earth materials or other suitable materials to provide adequate free board to contain liquids. Processed gravel and/or other suitable materials will be utilized to construct work ramps to allow access without getting waste onto truck tires. Additional engineering controls, such as drive through decontamination structures, may be utilized to prevent tracking to and from the stockpile areas.

Soil piles will be covered with durable reinforced water resistant tarps when not actively being worked. The stockpile areas will be shaped in such a manner that allows for the shedding of rainwater to centralized collection point(s) from which the water can be removed. Accumulated water from the stockpile areas will be handled in the same manner as construction dewatering fluids.

Within each stockpile area, soils will be blended or mixed with heavy equipment such as a loader or excavator to achieve a uniform consistency and attain moisture stability. Overburden soils should not require any treatment other than mechanical blending prior to sampling for reuse. Impacted soils may require the addition of amendments (drying agents) during blending to attain moisture stabilization suitable for off-site transportation. Once soil has been worked in the stockpile areas, batches of the treated material will be segregated from the working portion of the pile(s). Overburden soil batches that meet reuse criteria shall be systematically removed from containment and be reinstalled into completed portions of the excavation in accordance with the requirements of the approved plan. Impacted soil batches that meet off-site disposal criteria and are ready for shipment shall be systematically removed from containment and manifested off-site. The sequential rotation of material into and out of the stockpile areas will help to minimize the overall amount of space needed to process soil. Any details on the number of samples to be taken (discrete/composite), any field processing of soils, etc.?

3. DEWATERING

Dewatering of excavations may be necessary to achieve the depth of waste removal required. Dewatering methods to be evaluated include traditional pump in-hole, temporary well point and gravity draining methods.

A critical part of the overall dewatering evaluation is determining the quality of the dewatering fluid. Weston will develop a complete design of dewatering methods and an on-site treatment system after NJDEP approval of this RAWP Addendum and the IRM RAWP is received. It is anticipated that treatment of the dewatering fluid will be necessary, and will be implemented via use of the LNAPL treatment system proposed in the IRM RAWP. Treatment of the dewatering effluent may include:

- Phase separation.
- LNAPL storage via Frac tank and/or drums if LNAPL is removed from the phase separator.
- Groundwater influent equalization tank
- Filtration
- Liquid phase carbon adsorption
- Polishing filtration
- Effluent holding tank and composite sampler

Once dewatering fluids are treated, they will be discharged to the Middlesex County Utility Authority (MCUA) in accordance with a discharge permit. Influent and effluent samples will be collected and analyzed for permit-specified parameters at a frequency established by the MCUA.

4. BACKFILLING

Excavations shall be backfilled with certified-clean fill for all excavation areas within delineated wetlands or beyond the limits of the engineered cap. Appropriate documentation of the suitability of the source material will be provided in the Remedial Action Report. In accordance with NJAC 7:26E-6.4, fill will have equal or lesser permeability than native soils. The gradational characteristics for the fill placed within the areas to be backfilled with clean fill shall meet the following:

U.S. Standard Sieve Size	*Percent Finer By Weight*
2 ½"	*100*
2"	*80-100*
1"	*70-100*
3/8"	*50-100*
No. 10	*30-85*
No. 30	*15-65*
No.60	*10-45*
No. 200	*5-15*

Backfilling of the LNAPL excavation will be performed in accordance with the Soil Reuse Proposal included as Attachment 6 of this Addendum.

Backfill material will be compacted to a minimum of 95% of the maximum dry density as determined in accordance with ASTM D-1557, the Modified Proctor. Density testing will be performed as determined by the remediation engineer. Backfill will be placed, spread and compacted in such a manner to minimize the development of wrinkle and/or displacement of the soil reinforcement.

Backfill material will be placed in maximum 12-inch thick uncompacted lifts where heavy compaction equipment is to be used, and a maximum of 6-inch thick uncompacted lifts where hand-operated equipment is used.

Where standing water is present in an excavation at the time of backfilling, structural fill such as stone or dense graded aggregate (DGA), and a geotextile sheet shall be placed forming a bridge lift prior to the placement of backfill soil.

5. POST-REMEDIATION

At the termination of field activities, containment and stockpile area materials, as well as excavation protection devices and other field tools, will be evaluated for disposal. Materials which have potentially come into contact with TSCA waste will be presumed to contain PCBs and will be stored/disposed of properly as TSCA waste.

Piles and cribbing in contact with LNAPL or areas with PCBs in soil greater than 50 mg/kg will be presumed to contain PCBs and will be stored and disposed of appropriately as TSCA waste at the termination of the field activities. For areas with PCB concentrations below 50 mg/kg, Weston will sample and determine appropriate waste classification and disposal method for piles/cribbing at the termination of field activities.

ATTACHMENT 3

QUALITY ASSURANCE PROJECT PLAN
REMEDIAL ACTION WORK PLAN ADDENDUM 3
AND INTERIM REMEDIAL ACTION WORK PLAN
HATCO SITE
FORDS, NEW JERSEY

August 2009

Prepared by:

WESTON SOLUTIONS, INC.
205 Campus Drive
Edison, New Jersey 08837

W.O. No.: 13067.001.002.8013

TABLE OF CONTENTS

SECTION **TITLE** **PAGE**

SECTION 1 INTRODUCTION 1-1

1.1 PROJECT SCOPE 1-1
1.2 PROJECT DATA QUALITY OBJECTIVES 1-2
1.2.1 Accuracy 1-2
1.2.2 Precision 1-4
1.2.3 Completeness 1-5
1.2.4 Representativeness 1-5
1.2.5 Comparability 1-6
1.2.6 Regulatory Criteria 1-6

SECTION 2 PROJECT ORGANIZATION AND RESPONSIBILITIES 2-1

2.1 WESTON PERSONNEL RESPONSIBILITIES 2-1
2.1.2 Project Manager 2-1
2.1.3 Quality Assurance Officer 2-1
2.1.4 Field Team Leader 2-1
2.1.5 Project Chemist 2-1
2.2 LABORATORY RESPONSIBILITIES 2-2
2.2.1 Laboratory Director 2-2
2.2.2 Laboratory Project Manager 2-2
2.2.3 Laboratory Quality Assurance Officer 2-2
2.2.4 Area Supervisors 2-3

SECTION 3 FIELD ACTIVITIES 3-1

3.1 NON-INVASIVE DATA COLLECTION METHODS 3-1
3.1.1 Surveying 3-1
3.2 INVASIVE DATA COLLECTION METHODS 3-1
3.2.1 Soil Sampling 3-2
3.2.2 Sample Collection Methods 3-4
3.2.3 Sediment Sampling 3-8
3.2.4 Duplicate/Split Sampling 3-11
3.3 GROUNDWATER SAMPLING/MEASUREMENT 3-11
3.3.1 Monitoring Well/Piezometer Construction 3-11
3.3.2 Monitoring Well Development 3-13
3.3.3 Monitoring Well Abandonment 3-15
3.3.4 Water Level Measurements 3-15
3.3.5 Groundwater Sampling Procedures 3-16
3.3.6 Duplicate/Split Sampling 3-17
3.4 DECONTAMINATION PROCEDURES 3-19

TABLE OF CONTENTS
(CONTINUED)

SECTION **TITLE** **PAGE**

3.5 FIELD DOCUMENTATION 3-20
3.5.1 Data Management 3-20
3.5.2 Field Sample Identification 3-21
3.5.3 Field Log Books 3-25
3.5.4 Chain-of-Custody Documentation 3-26
3.6 SAMPLE HANDLING 3-26
3.6.1 Sample Volumes and Containers 3-26
3.6.2 Sample Preservation 3-26
3.6.3 Sample Labeling and Shipping 3-26
3.6.4 Sample Receipt and Storage 3-27
3.7 QUALITY ASSURANCE 3-27
3.7.1 Field Rinsate Blank (Field Blank) 3-27
3.7.2 Field Duplicate 3-28
3.7.3 Matrix Spike/Matrix Spike Duplicate (MS/MSD) 3-28
3.8 FIELD MEASUREMENT 3-28
3.8.1 OVM/PID 3-28
3.8.2 Data RAM (PDR-1000) 3-28
3.8.3 Contaminant-Specific Colorimetric Indicator Tubes 3-29

SECTION 4 PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES 4-1

SECTION 5 INVESTIGATION-DERIVED WASTE MANAGEMENT 5-1

5.1 SOIL BORING CUTTINGS 5-1
5.2 EXCAVATED SOILS 5-2
5.3 DECONTAMINATION FLUIDS 5-2
5.4 PERSONAL PROTECTIVE EQUIPMENT (PPE) 5-2
5.5 ON-SITE STORAGE OF WASTES 5-2

SECTION 6 LABORATORY ANALYSIS 6-1

6.1 LABORATORY REQUIREMENTS 6-1
6.1.1 Sample Receipt 6-1
6.1.2 Sample Storage 6-2
6.1.3 Sample Tracking 6-2
6.1.4 Recordkeeping 6-2
6.2 METHOD DETECTION LIMITS/METHOD QUANTITATION LIMITS/REPORTING LIMITS 6-2
6.3 ANALYTICAL METHODS AND HOLDING TIMES 6-3
6.4 QUALITY CONTROL 6-3
6.5 DATA DELIVERABLE FORMATS 6-4

TABLE OF CONTENTS
(CONTINUED)

SECTION	TITLE	PAGE
6.6	LABORATORY REVIEW AND CROSS-CHECK	6-4
6.7	DATA VALIDATION	6-5
SECTION 7 CORRECTIVE ACTIONS		**7-1**
7.1	FIELD ACTIVITIES	7-1
7.2	LABORATORY ACTIVITIES	7-1

LIST OF TABLES

Table	Title
2-1	Project Organization
3-1	Analytical Methods and Container and Preservation Requirements
3-2	Summary of Field QC Samples

LIST OF APPENDICES

Appendix	Title
A	Quality Assurance Manual – TestAmerica Edison

SECTION 1
INTRODUCTION

1.1 PROJECT SCOPE

The Hatco facility is located in Woodbridge Township, Middlesex County, in the town of Fords. From 1959 to 1978, W.R. Grace & Company (Grace) owned and operated an organic chemical manufacturing facility at the site. In the 1960s, some of these manufacturing operations involved the use of heat transfer fluids containing polychlorinated biphenyls (PCBs). The use of PCBs was discontinued between 1966 and 1970. In 1978, Grace sold the facility to the Hatco Corporation (Hatco). In 1979, 1980, and 1981, the New Jersey Department of Environmental Protection (NJDEP) began performing inspections and collecting samples at the site, as a result of which Hatco was required to cease all discharges to the groundwater, and to create a plan for removing the contaminated soil from the site. In 2005, a liability transfer was completed with NJDEP, and Weston Solutions, Inc. (Weston®) gained responsibility for the monitoring and clean-up of known PCB contamination at the Hatco facility.

A summary of the previous investigations to date is provided in Weston's August 2005 Consolidated Remedial Action Work Plan (RAWP), Weston's August 2006 Addendum to the August 2005 Consolidated RAWP, Weston's September 2006 Revised Addendum to the August 2005 Hatco Site Consolidated RAWP, and updated in the 2007 Data Progress Report. Environmental media of concern present at the site include:

- Groundwater contaminated with PCBs and light non-aqueous phase liquid (LNAPL);
- Soil and sediments contaminated with PCBs; and
- Soil contaminated with selected semi volatile organic compounds (SVOCs) and arsenic.

It is noted that there are additional, sporadic detections of other contaminants not identified above, at concentrations greater than their respective remedial criteria, but that those contaminants specified above are the primary regulatory "drivers" of the remedial action. It is further noted that, for specific "hot spots" which contain exceedances of contaminants other than those identified above, post-remediation sampling to document the efficacy of the remedial action will include those contaminants which exceeded the applicable remedial criteria.

The RAWP and subsequent approved amendments (including Weston's September 25, 2006 Revised Addendum to the August 18, 2005 Hatco Site Consolidated RAWP, and August 8, 2007 Response to the June 7, 2007 NJDEP Notice of Deficiency Letter) have been prepared to address soil contamination present at the site. The areas of proposed interim removal action will consist of selected areas, associated with structures, utilities, and active Hatco site operations, where LNAPL will be removed from the surface of the groundwater and associated soils through water table depression and product removal. Other areas where LNAPL is not co-located with site structures and active site operations will be addressed through excavation and off-site disposal of contaminated and/or LNAPL-impacted soils. Additionally, soil "hot spots" that are not associated

with LNAPL will be excavated and managed in accordance with the contaminant profile in the excavated soils. Specifically, soils with PCB levels above 500 milligrams/kilogram (mg/kg), off-site disposal, and backfill. Additional excavation of other on-site contaminated soils (PCBs less than 500 mg/kg and non-PCB-contaminated soils) will be performed; this excavated material will be re-used on site in the LNAPL area as backfill. Once all excavation is complete, an engineered cap will be placed atop all soils with PCB concentrations greater than 2.0 mg/kg. Off-site contaminated soils will be excavated and shipped for off-site disposal at a licensed facility permitted to manage the materials.

This Quality Assurance Project Plan (QAPP) summarizes the quality assurance/quality control (QA/QC) procedures that will be incorporated into the Remedial Action (RA) activities planned for the Hatco facility. Procedures in the QAPP identify proper sample collection, handling, and documentation, sampling-derived waste management plan; and laboratory protocols to be used throughout all RA activities. Other planning documents include:

- RAWP and approved amendments - These documents outline the remedial approach for the Hatco site.

- Health and Safety Plan (HASP) - This document contains site-specific information concerning the chemical and physical hazards expected at the sites during implementation of the 2007 investigation and subsequent RA. The plan presents levels of protection, emergency precautions, contingency plans, and surveillance equipment to be utilized during field activities.

1.2 PROJECT DATA QUALITY OBJECTIVES

The overall data quality objective for field activities, data analyses, and laboratory analyses is to produce data of sufficient and known quality to support remedial design and to confirm the effectiveness of planned remedial activities. Specifically, all data will be gathered or developed using procedures appropriate for the intended use. Quality assurance (QA) measures will be implemented throughout the project to ensure that data have known and suitable quality characteristics such as accuracy, precision, representativeness, completeness and compatibility. Descriptions of these criteria are presented in the following subsections.

1.2.1 Accuracy

Accuracy is a measure of the bias in a system and is the degree of agreement of a measurement (or an average of measurement), X, with an accepted reference or true value, T. It is usually expressed as the difference between the two values, X-T, or the difference as a percentage of the reference or true value, 100 [(X-T)/T], and sometimes expressed as a ratio, X/T.

Accuracy is measured through the analyses of fortified reagent-free matrices and fortified field samples. Results from these measurements are calculated as percent recovery (%R). Laboratory quality control (QC) samples, such as matrix spike and matrix spike duplicate (MS/MSD), are used

to demonstrate method performance and are used to trigger corrective action when control limits are not met. In the organic analysis, surrogate compounds are often used to evaluate method accuracy.

Accuracy measurements from field samples (e.g., MS/MSD) give an indication of physical or chemical interferences present that can either enhance or mask the actual presence of target analytes. Determination of %R requires analysis of a fortified sample and non-fortified sample so that any background analyte already present in the sample can be accounted for in the recovery determination. Thus, sample homogeneity also becomes a factor in recovery determinations, as variable backgrounds can affect the apparent analyte recovery. Problems with sample recovery are more likely to occur with soil and sediment samples, water samples containing a noticeable amount of solids, and nonstandard matrices.

The accuracy goal for environmental samples collected during this project reflects the performance-based control limits set by the laboratory for the site-specific contaminants in soils; specifically, the laboratory MS/MSD recovery limits must be as follows:

Parameter	Method	Required (1) Reporting Limit	Quantitation Limit	MS/MSD Recovery Limits
Soils (reporting limit in mg/kg dry weight)				
PCBs	8082	0.49	0.067	70-130
Benzo(a)anthracene	8270C	4	0.033	54-107
Benzo(a)pyrene	8270C	0.66	0.033	36-134
Benzo(b)fluoranthene	8270C	4	0.033	42-129
Benzo(k)fluoranthene	8270C	4	0.033	24-178
Bis(2-ethylhexyl)phthalate	8270C	49	0.33	50-109
Butylbenzyl phthalate	8270C	10,000	0.33	58-104
Chrysene	8270C	40	0.33	55-103
Indeno(123-cd)pyrene	8270C	4	0.033	0.1-157
Naphthalene	8270C	6	0.33	36-107
Benzene	8260B	13	0.05	62-138
Arsenic	6010B	20	0.25	75-125
Beryllium	6010B	2	0.1	75-125
Lead	6010B	600	0.25	75-125
Thallium	6010B	2	0.25	75-125
Sediment (mg/kg dry weight)				
PCBs	8082	1	0.067	70-130
Bis(2-ethylhexyl)phthalate	8270C	0.182 (2)	0.33	58-104
Aqueous (surface water samples, reporting limit in ug/L)				
PCBs	8082	0.014 (3) 0.000064 (4)	0.5	Aroclor 1016: 67-120 Aroclor 1260: 47-146
Bis(2-ethylhexyl)phthalate	8270C	1.2 (4)	10	66-112
Aqueous (field blanks, reporting limit in ug/L)				
PCBs	8082	N/A	0.5	Aroclor 1016: 67-120 Aroclor 1260: 47-146
Benzo(a)anthracene	8270C	N/A	1	64-110
Benzo(a)pyrene	8270C	N/A	1	50-172
Benzo(b)fluoranthene	8270C	N/A	1	60-164
Benzo(k)fluoranthene	8270C	N/A	1	48-199

Parameter	Method	Required [1] Reporting Limit	Quantitation Limit	MS/MSD Recovery Limits
Bis(2-ethylhexyl)phthalate	8270C	N/A	10	66-112
Butylbenzyl phthalate	8270C	N/A	10	66-110
Chrysene	8270C	N/A	10	67-115
Indeno(123-cd)pyrene	8270C	N/A	1	44-191
Naphthalene	8270C	N/A	10	61-108
Benzene	8260B	N/A	1	73-131
Arsenic	6010B	N/A	5	75-125
Beryllium	6010B	N/A	2	75-125
Lead	6010B	N/A	5	75-125
Thallium	6010B	N/A	10	75-125
Other analytes as determined by discharge permit	To be determined	To be determined	To be determined	To be determined

(1) Based on remedial goal.
(2) Reporting limit is lowest effects level
(3) FW2 Aquatic Chronic Criterion (N.J.A.C. 7:9B-1.14(f)7)
(4) FW2 Human Health Criterion (N.J.A.C. 7:9B-1.14(f)7)

The same accuracy goals exist for waste classification samples. Once the groundwater discharge permit is obtained for disposal of groundwater removed during active LNAPL recovery, and the groundwater sampling and remediation program is designed, control limits for groundwater parameters with be included in an update or updates to this QAPP.

1.2.2 Precision

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is usually expressed as the relative percent difference (RPD) or the standard deviation.

During collection of data using field methods and/or instruments, precision is checked by reporting multiple measurements at one location and comparing results. For example, water level measurements would be taken three times at a well and the values compared. Only if the values are within a specified percentage (10%) of each other are the measurements considered sufficiently precise.

Analytical precision is calculated by expressing as a percentage of the difference between results of analyses of duplicate samples for a given analyte.

For environmental samples, laboratory precision is commonly determined from laboratory duplicate samples (MS/MSD or MD). Precision is usually expressed as the relative percent difference (RPD) or relative standard deviation (RSD). The laboratory QC samples are used to demonstrate acceptable method performance and are used to trigger corrective action when control limits are exceeded.

$$RPD = \left\{ \frac{|R1 - R2|}{(R1 + R2)/2} \right\} x100\%$$ where R1 and R2 are the results for the laboratory duplicates

The precision goal for this project reflects the performance-based control limits set by the laboratory for site-specific contaminants in soils; specifically the laboratory sets its precision goal for all parameters at 10% RPD for laboratory duplicates.

Field duplicates are generally considered to have adequate precision when aqueous sample results are within 20% of each other; for soil field duplicate samples, acceptable precision is achieved when the analytical results are within 35% of each other. The data are considered estimated if aqueous sample results fall beyond these criteria but are below 100% RPD for aqueous samples and below 120% for soil samples.

1.2.3 Completeness

Data completeness for this project is defined as the percent of acceptable data obtained compared to those planned for the project. Unless recommended for rejection as a result of data validation, qualified data are considered valid, useable data and therefore acceptable. The level of completeness can be affected by field conditions as well as laboratory factors.

Field data completeness can be affected by inaccessibility to various areas and/or media, along with unanticipated difficulties with sample collection. For example, a seasonally low water table at a monitoring well may prevent collection of the required sample volume needed for sample analysis. Laboratory data completeness can be affected by difficulties encountered during sample handling, as well as unforeseen complications with respect to sample preparation or analysis.

The overall completeness goal for sampling activities associated with remedial action at the Hatco facility is 95%, including difficulties from both field and laboratory sources. It should be noted, however, that the completeness goal for data upon which remedial decisions are to be made (e.g., post-excavation data for an excavation-specific contaminant of concern) is 100%.

1.2.4 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter, and variation at a sampling point or an environmental condition. Representativeness is a qualitative parameter that is most concerned with the proper design of the sampling program. To ensure that the samples obtained in the field represent the particular environment from which they are collected, field sampling and laboratory analysis will be performed in accordance with NJDEP's *Field Sampling Procedures Manual* (2005) (FSPM) and the *Technical Requirements for Site Remediation* (N.J.A.C. 7:26E-1 et seq.) (TRSR) as described in the approved remedial documents, including this QAPP and the remedial action planning documents for which this QAPP has been developed.

1.2.5 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Sampling procedures for environmental matrices ensure that samples are collected using acceptable field techniques in a consistent manner, and include appropriate QA/QC procedures to ensure the validity of the data.

All analytical data will be reviewed by the laboratory relative to representativeness, completeness, precision, accuracy and specific project requirements to assess the quality of the analytical data. When all criteria are met, data are deemed acceptable without qualification. When precision and accuracy goals are not met for laboratory analysis, the sample set will be reanalyzed or reported with qualification in the case narrative. Some of the factors affecting this final sample disposition include:

- Project-specific QA/QC requirements;
- Availability of sufficient sample for reanalysis;
- Holding time considerations; and
- Regulatory action limits.

The results of the aqueous samples will be reported in the unit of micrograms per liter (ug/L); the results of the soil/sediment samples will be reported on a dry weight basis in the unit of micrograms per kilogram (ug/kg) for organics and milligrams per kilogram (mg/kg) for inorganics. Soil and sediment sample results will be converted mg/kg (by multiplying the result in ug/kg by 1,000) for comparison of the results to the regulatory criteria, which are provided by NJDEP and the United States Environmental Protection Agency (USEPA) in units of mg/kg.

1.2.6 Regulatory Criteria

The data collected to document the remedial action will be evaluated consistent with the NJDEP TRSR regulations and with site-specific cleanup levels established by USEPA and NJDEP.

- In on-site soils beneath the limits of the proposed cap, PCBs will be compared to the USEPA site-specific cleanup value of 500 mg/kg; non-PCB contaminants will be allowed to remain at concentrations up to and above non-residential cleanup criteria and remedial standards.

- In on-site soils beyond the limits of the proposed cap, PCBs will be compared to the NJDEP 1999 non-residential soil cleanup criterion of 2 mg/kg. Naphthalene will be compared to the NDJEP 2008 non-residential soil remediation standard as this standard was more than an order of magnitude below its 1999 non-residential soil cleanup criterion. All other non-PCB site-specific contaminants of concern will be compared to their respective NJDEP 1999 soil cleanup criteria.

- In on-site and off-site sediments, the post-remedial data will be compared to the PCB sediment criterion of 1 mg/kg. Bis(2-ethylhexyl) phthalate results in sediment samples will be compared against the NJDEP ecological screening criterion of 0.925 mg/kg, the Lowest Effects Level (LEL) of 0.182 mg/kg, and the Severe Effects Level of 0.75 mg/kg.

- In off-site soils, PCB results will be compared to the NJDEP 1999 residential cleanup criterion of .049 mg/kg.

- In surface waters, PCB samples will be compared to the NJDEP Surface Water Quality Criteria (SWQC) of 0.014 micrograms per liter (ug/L) for aquatic chronic protection and 0.000064 ug/L for human health protection. Bis(2-ethylhexyl) phthalate results in surface water samples will be compared against the NJDEP SWQC of 1.2 ug/L for human health protection. It is noted that the most sensitive analytical methodologies available through the selected laboratory can not meet the SWQC: for PCB the reporting limit is 0.5 ug/L and the method detection limit is 0.12 ug/L. Concentrations detected above the detection limit but below the reporting limit are reported, but as an estimated concentration and flagged with a "J" qualifier in the laboratory reports. Likewise, detections of bis(2-ethylhexyl) phthalate between it's reporting limit of 10 ug/L and its method detection limit of 2.4 are reported by the laboratory as an estimated concentration and flagged with a "J" qualifier.

A more detailed discussion of the remedial criteria for the Hatco remedial program is provided in the Remedial Action Work Plan Addendum 3 document to which this QAPP is appended.

SECTION 2
PROJECT ORGANIZATION AND RESPONSIBILITIES

This section describes the organizational structure, lines of authority, and responsibilities of key individuals for the project. Emphasis is placed on the organization and entities responsible for implementation and administration of this QAPP. The project organization structure showing relationships of persons with key responsibilities for this project is shown in Table 2-1.

2.1 WESTON PERSONNEL RESPONSIBILITIES

The environmental data generated in the field or by the laboratory will be reviewed, verified, and reconciled with data quality objectives by Weston personnel in various disciplines. The responsibilities for the key engineering/science personnel are described in the following sections.

2.1.2 Project Manager

The Weston Project Manager is responsible for planning, coordinating, integrating, monitoring, and managing project activities. The Project Manager is also responsible for meeting project scope objectives, budget, and for the overall quality of submittals.

2.1.3 Quality Assurance Officer

The Project QA Officer is responsible for ensuring conformance with Weston policies, procedures, and sound practices during project planning (i.e., preparation of the Field Sampling Plan [FSP], QAPP, HASP), and execution of the RA. The Project QA Officer relies on the Field Team Leader, Laboratory Project Manager, and Laboratory QA Officer to ensure that relevant QA/QC procedures are followed in the field and the laboratory, and may conduct independent audits throughout the project life.

2.1.4 Field Team Leader

The Field Team Leader is responsible for ensuring field personnel follow procedures established by this QAPP and the task-specific work plan/sampling plan for sampling, chain-of-custody, and documentation. The Field Team Leader is assigned on a per-task basis and shall verify entries of field measurements, and entries to logbook, chain-of-custody forms, and other necessary datasheets.

2.1.5 Project Chemist

The Project Chemist shall be consulted in project scoping and planning stages to assist in developing data quality objectives to be included in the task-specific sampling plan and the QAPP. The Project Chemist is responsible for examining all laboratory data deliverables to assess data quality. The laboratory is ultimately responsible for providing data satisfying the

data quality objectives documented in this QAPP. Based on project requirements, the Project Chemist may review, verify, and/or validate the laboratory-generated data to determine data usability against the QAPP-specified data quality objectives.

2.2 LABORATORY RESPONSIBILITIES

Any contract laboratory performing analyses in compliance with this QAPP must be validated, accredited, or certified by NJDEP.

Responsibilities for the key laboratory personnel are described in the following sections.

2.2.1 Laboratory Director

The Laboratory Director is in charge of all laboratory activities and must sign off the analytical deliverables. This person is ultimately responsible for making sure all analytical tasks are conducted in compliance with this QAPP and with the applicable laboratory standard operating practices approved through NJDEP certification program for the laboratory.

2.2.2 Laboratory Project Manager

The Project Manager is responsible for scheduling project requirements, monitoring analytical status/deadlines, approving laboratory reports, and coordinating data revisions/corrections and resubmitting packages to project staff. The Project Manager will ensure that laboratory personnel understand and conform to this QAPP. This person, or his designees, will also inform Weston regarding field practice (e.g., sample preservation) not conforming to this QAPP.

The Project Manager shall be the point of contact with Weston technical and subcontract lab personnel on technical issues pertaining to laboratory analytical work, and has overall responsibility of implementing the QAPP at the laboratory.

2.2.3 Laboratory Quality Assurance Officer

The Laboratory Quality Assurance Officer (QAO) is assigned by the contracted laboratory. They will ensure conformance with authorized policies, procedures, and sound practices, and will recommend improvements as necessary. The QAO will inform the Project Manager of nonconformance to the QA program and introduce control samples into the sampling train. In addition, the QAO will approve laboratory data before reporting or transmittal to permanent storage and be responsible for retention of supporting information such as control charts and other performance indicators to demonstrate that the systems that produced the data were in control. The QAO will also review results of internal QA audits and recommended corrective actions and schedules for their implementation. This person must be independent of the laboratory's daily operation.

2.2.4 Area Supervisors

The laboratory technical staff in sample management, sample preparation, organic analysis, metal analysis, and other non-metal chemical analyses must be supervised by persons familiar with the prescribed procedures, the calibration, or test methods, and the assessment of the results.

These area supervisors are to ensure data reporting is in compliance with prescribed analytical method and to communicate project-related difficulties and/or non-conformance that may impact data quality or project progress to the Project Manager (and the QAO if applicable), who in turn shall inform Weston Project Manager or his designee about these difficulties and/or non-conformance.

TABLE 2-1
PROJECT ORGANIZATION

Task	2.2.4.1.1.1.1.1 Name - Affiliation	Telephone Number
Overall Project Coordination	Daniel Kopcow, Project Manager – Weston Solutions, Inc. Richard Craig, Client Service Manager – Weston Solutions, Inc. Alanna Garrison, Senior Scientist – Weston Solutions, Inc.	(732) 417-5800 (732) 417-5800 (732) 417-5800
Sampling Activities, including environmental health & safety (EHS), Quality Assurance and Quality Control	Quality Assurance Officer Laura Amend-Babcock, P.E. – Weston Solutions, Inc. Field Team Leader Steve O'Brien – Weston Solutions, Inc. EHS Compliance Alanna Garrison, CSP – Weston Solutions, Inc. Project Chemist Yunru Yang – Weston Solutions, Inc.	(732) 417-5800 (732) 417-5800 (732) 417-5800 (732) 417-5800
Laboratory Activities, including Quality Assurance and Quality Control	David Lissy – Project Manager, Test America, Edison, NJ	(732) 549-3900

SECTION 3
FIELD ACTIVITIES

The following subsections detail specific procedures and protocols used as guidance for activities and equipment utilized for obtaining environmental samples. Upon arrival at the site, observations are made of the physical area, as well as overhead, to ensure that no obvious, potential hazards exist.

3.1 NON-INVASIVE DATA COLLECTION METHODS

3.1.1 Surveying

Global Positioning System (GPS) surveys of all soil sample locations and the extent of excavations will be performed. Weston Solutions, Inc. (Weston®) personnel will follow NJDEP protocols, "NJDEP standards for using Trimble navigation global positioning systems (GPS) receivers for the collection of accurate location data for use with Arc/Info and Arcview Geographic Information Systems (GIS)" (Jacoby, 1998).

Soil borings, surface soil, and sediment sample locations will be horizontally surveyed. Locations of soil and sediment samples may be recorded using a GPS unit with submeter accuracy, properly calibrated and operated by a qualified user.

Groundwater investigations require surveying to ensure accurate data collection. Well survey information will be collected by a New Jersey-licensed surveyor. All data will be collected and reported in NAD (North American Datum) 1983.

<u>GIS Reporting Requirements</u>

All map figures included in sampling and remedial action reports will be scaled and will contain an orientation designation (e.g., North arrow). Sample locations, sample depths, field identification numbers, and contaminant concentrations will be plotted on the appropriate figures. Where an entire contaminant class is not detected or is less than the applicable remediation standard, contaminants may not be listed individually. All individual maps will have a common coordinate system and contain details and features contained on the site base map.

3.2 INVASIVE DATA COLLECTION METHODS

The following subsections detail specific procedures and protocols used as guidance for activities and equipment utilized for obtaining environmental samples. Prior to conducting any invasive subsurface investigations, the position of any underground utilities within easements and public roadways will be located by a representative from the respective utility company. The process of initiating the utility mark-out involves a single phone call to a service that notifies the utility

companies that may potentially have utilities in the intended area of work; this phone call must be made by the entity performing the invasive activity (e.g., drilling subcontractor). This is important since utility markouts usually end at the roadway, and utilities may extend from the roadway to the site buildings. If activities are proposed on private property, direct contact is made with property owners to ensure that utility lines are not present within the proposed work area. Utility blue-prints are typically used by contractors, utility representatives, and property owners to locate the buried utilities. These require ground-truthing at the site. If utilities are suspected in the area, hand augering should be used prior to intrusive activities to confirm that the proposed sample point or excavation is not intersected by a utility. Upon arrival at the site, observations are made around the area, as well as overhead, to ensure that no obvious potential hazards exist. Geophysical surveys may also be performed to check for possible underground utilities/conduits prior to initiating invasive subsurface work

3.2.1 Soil Sampling

The soil sampling procedures will follow the guidelines documented in the *NJDEP Field Sampling Procedures Manual* (August 2005) as described below. Lithologic description, field measurements (such as presence of LNAPL) and comments will be recorded using electronic Borehole Logging Forms such as Weston's GeoFAST program. The soil sampling methods will be used for collection of samples as identified in the sampling plans attached to the RAWP Addendum 3 as well as the Interim Remedial Measure (IRM) RAWP.

3.2.1.1 Delineation Samples

Delineation soil samples, where proposed prior to remedial action, will be collected to determine the horizontal and vertical extent of historic contamination, both on-site and off-site. Historic contamination will be delineated using a 5-foot step-out sampling pattern at each location. Delineation samples will be collected from discrete 6-inch intervals from designated depths that correspond with historic sample exceedances at each location in accordance with Weston's 2007 *On-Site Sampling Plan*.

The soil samples will be field-screened with a properly calibrated photoionization detector (PID), organic vapor meter (OVM) or other suitable instrument. Delineation sample locations will be biased based on professional judgment to ensure that all necessary data is collected to ensure that historical contamination is adequately delineated, both horizontally and vertically. Delineation soil samples will be analyzed for the specific parameters as identified in the applicable sampling plan.

Dedicated and disposable sampling equipment will be utilized for each sample location. Any non-dedicated sampling equipment will be decontaminated between samples following procedures outlined in Section 3.4 of this document.

3.2.1.2 Waste Classification Samples

Composite soil samples will be collected for waste characterization in accordance with the frequency instituted by the disposal facility and will be compared to EPA regulatory limits established under the Resource Conservation and Recovery Act (RCRA). For soils which contain PCBs, the results will also be compared to levels established by the USEPA *Toxic Substances Control Act* (TSCA). At a minimum, waste classification samples will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) volatile organic compounds (VOCs), TCLP SVOCs, TCLP pesticides/herbicides, TCLP metals, PCBs, and RCRA characteristics. For TCLP VOA analysis, discrete samples will be collected using an EnCore sampling device.

3.2.1.3 Post-Excavation Samples

Collection of post-excavation samples will be performed as outlined in the *Post-Excavation Sampling and Analysis Plan* (Weston, August 2009), which is also appended to the RAWP Addendum 3 to which this QAPP is appended. Sampling procedures will follow technical requirements as set forth in the NJDEP *Field Sampling Procedures Manual* (August 2005) as described herein. Post-excavation samples will be collected at a frequency of one sidewall sample per 30 linear feet and one base sample for every 900 square feet in all excavation areas with the exception of the excavation areas associated with the LNAPL removal areas (the "legs" of the "dancing man"). A sampling frequency for those two excavations has been proposed at one sidewall sample per 50 linear feet of sidewall and one base sample for every 2,500 square feet (i.e., sampling on a 50-foot grid).

Post-excavation soil samples will be analyzed for those parameters which have shown historical exceedances of the applicable remedial criteria discussed in Section 1.2.6 of this QAPP. Specific analytes required for each excavation area are identified in Table SP-1 of the Post-Excavation Sampling Plan attached to the *Remedial Action Work Plan Addendum 3* (Weston, August 2009) and in Table 1 of the Confirmation Sampling Plan attached to the *Interim Remedial Measure Remedial Action Work Plan* (Weston, August 2009).

Weston will follow the Health and Safety Plan (HASP) provided in the Consolidated RAWP approved by the NJDEP on September 26, 2006, as updated by the HASP appended to the RAWP Addendum 3 to which this QAPP is appended. It is anticipated that two different sample collection methodologies will be used to collect post-excavation samples. Manual collection methods, including use of a dedicated disposable scoop, will be utilized for shallow excavation areas (3 feet or less in depth where the base of the excavation is determined to be competent). At-depth post-excavation samples and samples from shallow excavations with incompetent base will be collected from the excavator bucket. Sampling methodologies are presented in Section 3.2 of this QAPP.

3.2.1.4 Post-IRM Confirmation Samples

Collection of post-IRM samples to document the efficacy of the LNAPL removal program in those areas where Hatco structures and operations preclude excavation will be performed as outlined in the *Confirmation Sampling Plan attached to the Interim Remedial Measure Work Plan (Weston, August 2009).* Sampling procedures will follow technical requirements as set forth in the NJDEP *Field Sampling Procedures Manual* (August 2005), as described in this QAPP. Post-IRM samples will be collected using a Geoprobe coring device, and samples will be collected on a 30-foot by 30-foot grid, with one sample collected from each 2-foot depth interval within the historic limits of LNAPL at each sampling node. Since the entire area from which the IRM is proposed falls within the limits of the proposed cap, analysis will be limited to PCBs to document that all contaminated media within the footprint of the IRM has been remediated to less than 500 mg/kg PCBs. More detail regarding the post-IRM sampling program can be found in the *Confirmation Sampling Plan*, which is attached to the *Interim Remedial Measure* RAWP (Weston, August 2009). Details on the Geoprobe sampling method can be found in Section 3.2.2.3 of this QAPP.

3.2.1.5 Additional Investigation (Berm) Samples

Collection of additional investigation samples will be performed as outlined in the *Post-Excavation Sampling and Analysis Plan* (Weston, August 2009), which is also appended to the RAWP Addendum 3 to which this QAPP is appended. The locations of the additional samples are shown on Figure 18 of the RAWP Addendum 3.

Collection of "BERM" soil samples from within the footprint of the berm, as shown by the brown line on RAWP Addendum 3 Figure 18, will be collected using hand augers since the samples will be collected from the 2-2.5-foot interval below the ground surface. Auger collection methods will be performed as discussed in Section 3.2.2.4 of this QAPP. Collection of "BERM" soil samples located beyond the footprint of the berm will be accomplished using manual collection techniquies, as described in section 3.2.2.1 of this QAPP, since these samples will be collected from the 0.5-1.0-foot interval for VOC analysis and from the 0.0-0.5-foot interval for all parameters other than VOC. More detail regarding the additional investigation sampling program can be found in the *Post-Excavation Sampling and Analysis Plan* (Weston, August 2009).

3.2.2 Soil Sample Collection Methods

To allow the maximum flexibility of sampling technologies used in remedial action activities, the following methods can be used in collected all sample types described in Section 3.2.1.

3.2.2.1 Surface Soil Manual Collection

A dedicated, disposable or decontaminated collection device, such as a scoop or trowel, will be used to collect soil samples directly from the sidewalls of the excavated areas or the excavator bucket, based on the depth of the excavation.

Samples near the soil surface will be collected with tools such as dedicated disposable trowels, coring devices and scoops. Surface material will be removed to the required depth with this equipment. Non-volatile organic fractions will be collected from zero to 6 inches below ground surface (bgs).

The following procedures will be used to collect surface soil samples:

- Carefully remove all inconsequential surface debris (e.g., vegetation, rocks, etc.) prior to sample collection.

- If VOC fraction is required for the sample, collect the VOC fraction by plunging the EnCore sampler into the soil at the appropriate sample depth. Collect sufficient number of EnCore samplers, as specified on the Analytical Methods and Container and Preservative Requirements Table, by co-locating the EnCore sampling devices.

- Once the VOC fraction is collected (or if VOC fraction is not required), place sufficient soil/sediment volume of sample in a decontaminated stainless steel or other appropriate homogenization container.

- Homogenize the sample in accordance with the "coning and quartering" method. Mix the sample. The sample is then quartered, with each quarter mixed again. Once each quarter is mixed, each quarter is rolled to the center of the container and the entire sample is mixed again.

Sample fractions will be placed into appropriate, labeled containers, and caps will be tightly secured. The samples will then be placed in coolers and chilled to 4°C.

3.2.2.2 Subsurface Soil Sample Collection using Backhoe Bucket

In some instances, it will be unsafe for a sampling technician to enter an excavation to collect post-excavation samples. Field conditions of concern include excavations deeper than 4 feet below grade, excavations in unstable soils, excavations with near-by vibratory sources, and excavations with groundwater or rain water in them. Under these types of field conditions, Weston reserves the right to collect the post-excavation soil samples through use of a backhoe bucket.

The following procedures will be used to collect soil samples from depth utilizing a backhoe bucket:

- Identify the location and depth of the post-excavation sample required to the backhoe operator. Confirm that the operator is collecting the sample from the appropriate location and depth.

- Using decontaminated sampling equipment, cut a clean “face” from the excavated soils. If VOC fraction is required for the sample, collect the VOC fraction by plunging the EnCore sampler into clean face of the excavated material in the backhoe bucket, making sure to not collect soils that have been in contact with the backhoe bucket itself, to reduce the potential for cross-contamination. Collect sufficient number of EnCore samplers to obtain the sample volume required by the laboratory.

- Once the VOC fraction is collected (or if VOC fraction is not required), place sufficient soil/sediment volume of sample in a decontaminated stainless steel or other appropriate homogenization container, again, taking care to remove soils from within the center of the bucket and not from the edge of the bucket (i.e, collect soils that have not come into contact with the bucket sides).

- Homogenize the sample in accordance with the "coning and quartering" method as described in Section 3.2.2.1 of this QAPP.

3.2.2.3 Geoprobe®

The Geoprobe® method involves the use of a truck-mounted (or otherwise motorized vehicle) direct-push boring mechanism operated by a qualified driller licensed by the state of New Jersey. A hollow tube MacroCore® with a dedicated disposable acetate sleeve is advanced through direct-push mechanism. The sleeve is held in place by a steel bit, which is decontaminated between each boring location. The MacroCore is typically advanced in 4-foot sections, but 5-foot coring devices are also commercially available. Once the MacroCore is advanced, it is retracted and opened to remove the acetate sleeve. A new acetate sleeve is installed within the Macrocore and the boring is advanced an additional 4 feet or 5-feet. This process is repeated until the desired depth is achieved.

For installation of the borings, a 2-inch-diameter MacroCore will be used. This will produce a borehole that is 2.25 inches in diameter. The bit will be decontaminated on site between boring locations.

For sample logging and collection, the acetate sleeve is cut open with a cutting blade, then the sample is examined and field screened. Sample collection is determined and implemented. Of VOC fraction is required, the sample is collected by plunging an appropriate number of EnCore sampling devices directly into the soil core within the opened acetate sleeve. The remainder of the sample aliquots are collected and homogenized as described in Sections 3.2.2.1 and 3.2.2.2 of this QAPP.

3.2.2.4 Subsurface Soil Sample Manual Collection through Augers

Although it is not anticipated that augers will be used to collect subsurface soil samples, sample collection through augers is being included herein in the event that field conditions warrant use of this method for delineation or post-remedial sample collection.

The manual auger sampling system consists of an auger, or a thin-wall tube sampler, a series of extensions, and a "T" handle. The sampler is constructed of Teflon or stainless steel and will be decontaminated before use. The auger is used to bore a hole to a desired sampling depth, and the sample may be collected directly from the auger. If a core sample is to be collected, the auger tip is then replaced with a thin-wall tube sampler. The system is then lowered down the borehole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected from the thin-wall tube sampler.

The following procedure will be used for collecting soil samples with an auger:

1. Attach the auger bit to an auger extension rod, and attach the "T" handle to the rod.

2. Clear the area to be sampled of any inconsequential surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first several inches of surface soil for an area approximately 6 inches in radius around the augering location to ensure no encumbrances (such as large rocks) are present.

3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding extension rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.

4. After reaching the desired depth, carefully remove the auger from the boring. When sampling directly from the auger, collect the sample after the auger is removed from the boring and proceed to Step 10.

5. Remove auger tip from the rods and replace with a pre-cleaned thin-wall tube sampler. Install the proper cutting tip.

6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into soil. Care should be taken to avoid scraping the borehole sides. Avoid hammering the rods to facilitate coring as the vibrations may cause the boring walls to collapse.

7. Remove the tube sampler, and unscrew the rods.

8. Remove the cutting tip and the core from the device.

9. Discard the top of the core (approximately one inch), as this possibly represents material collected before penetration of the layer of concern (e.g., material sloughed from the borehole sides).

10. Collect samples for designated chemical analysis.

11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the extension rod assembly, and follow steps 3 through 11, making sure to decontaminate the auger and tube sampler between samples.

12. Abandon the hole according to applicable NJDEP regulations.

3.2.3 Sediment Sample Collection Methods

Sediment samples may be collected using a variety of methods and equipment, depending on the depth of the aqueous layer, the portion of the sediment profile required (surface versus subsurface), the type of sample required (disturbed versus undisturbed), contaminants present, and sediment type. If both sediment and surface water are to be sampled from a particular sampling location, the sediment samples will always be collected following collection of the surface water sample at the sampling location.

Sediment is collected from beneath an aqueous layer either directly, using a hand-held device such as a shovel, trowel, or auger; or indirectly, using a remotely activated device such as an Ekman or Ponar dredge. Following collection, sediment is transferred from the sampling device to a sample container of appropriate size for the analyses requested. Hand-held devices such as a hand auger or trowel will be the preferred method of collection when conditions allow.

Selection of a sampling device is most often contingent upon: (1) the depth of water at the sampling location, and (2) the physical characteristics of the sediment to be sampled. The following procedures may be utilized:

3.2.3.1 Sampling Sediment with a Trowel or Scoop from Beneath a Shallow Aqueous Layer

Collection of sediment from beneath a shallow aqueous layer can be accomplished with tools such as spades, shovels, trowels, and scoops. Although this method can be used to collect both unconsolidated/consolidated sediment, it is limited somewhat by the depth and movement of the aqueous layer. Deep and rapidly flowing water render this method less accurate than others discussed below. However, representative samples can be collected with this procedure in shallow sluggish water provided care is demonstrated by the sample team member. A decontaminated stainless steel trowel or scoop will suffice in most applications.

The following procedure will be used to collect sediment with a scoop, shovel, or trowel:

1. Using a decontaminated sampling instrument, remove the desired thickness and volume of sediment from the sampling area.

2. Transfer the sample into an appropriate decontaminated stainless steel container for homogenization. The "coning and quartering" method will be used. If a sample aliquot for VOC analysis is required from the sampling location, the VOC sample will be collected using an EnCore sampling device prior to homogenization.

3. Surface water will be decanted from the sample or homogenization container prior to sealing or transfer; care will be taken to retain the fine sediment fraction during this procedure.

3.2.3.2 Sampling Sediment with a Bucket Auger or Tube Auger from Beneath a Shallow Aqueous Layer

Collection of sediment from beneath a shallow aqueous layer can be accomplished with a system consisting of bucket auger or tube auger, a series of extensions, and a "T" handle. The use of additional extensions in conjunction with a bucket auger can increase the depth of water from which sediment can be collected from 24 inches to 10 feet or more. However, sample handling and manipulation increases in difficulty with increasing depth of water. The bucket auger or tube auger is driven into the sediment and used to extract a core. The various depths represented by the core are homogenized or a subsample of the core is taken from the appropriate depth.

The following procedure will be used to collect sediment samples with a stainless steel bucket auger or tube auger:

1. Attach the auger head to the required length of extensions, then attach the "T" handle to the upper extension.

2. Insert the bucket auger or tube auger into the sediment at a 0° to 20° angle from vertical. This orientation minimizes spillage of the sample from the sampler upon extraction from the sediment and water.

3. Rotate the auger to cut a core of sediment.

4. Slowly withdraw the auger; if using a tube auger.

5. Transfer the sample into an appropriate decontaminated stainless steel container for homogenization. The "coning and quartering" method will be used. If a sample aliquot for VOC analysis is required from the sampling location, the VOC sample will be collected using an EnCore sampling device prior to homogenization.

6. Surface water will be decanted from the sample or homogenization container prior to sealing or transfer; care will be taken to retain the fine sediment fraction during this procedure.

7. Transfer the sample or a specified aliquot of sample into an appropriate sample container.

3.2.3.3 Sampling Sediment Using a Ponar Dredge

A Petite Ponar dredge may be used to collect sediment samples beneath standing water. In shallow (less than 3 ft) waters, the dredge may be operated while wading. At deeper water locations, the Ponar dredge should be operated from a workboat. The following procedure will be used to collect sediment samples with a petite Ponar dredge:

1. Attach a sturdy nylon or steel cable to the hook provided on the top of the dredge.

2. Arrange the Ponar dredge sampler in the open position, setting the trip bar so the sampler remains open when lifted from the top.

3. Slowly lower the sampler to a point just above the sediment.

4. Drop the sampler sharply into the sediment, then pull up sharply on the line, thus releasing the trip bar and closing the dredge.

5. Raise the sampler to the surface and slowly decant any free liquid through the screens on top of the dredge. Be careful to retain fine sediments.

6. Open the dredge and transfer the sediment to a stainless steel homogenization bowl. Continue to collect additional sample until sufficient mateirla has been obtained. Thoroughly mix sediment to obtain a homogenous sample, and then transfer to the appropriate sample container.

7. If samples are to be collected for VOC, they must be collected directly from the homogenization bowl prior to mixing the sample to minimize volatilization of contaminants.

3.2.3.4 Sampling Sediment from Areas without an Aqueous Layer

For those areas where sediments are not overlain by an aqueous layer, the methods described for shallow soil samples in the subsections of 3.2.2 shall be used.

3.2.4 Duplicate/Split Sampling

For soil and sediment investigations, field duplicate samples will be collected and will represent approximately five percent per matrix per analyte of the investigative samples. Field duplicates will be submitted to the laboratory as "blind" samples.

Obtaining duplicate samples in a soil or sediment matrix requires homogenization of the sample aliquot prior to filling sample containers, except for samples collected for VOC analysis. Duplicate samples for VOC analysis must be taken from discrete locations or intervals without compositing or mixing. This practice is necessary to prevent the loss of volatile constituents and to preserve, to the extent practicable, the physical integrity of the volatile fraction. Homogenization of the sample for remaining parameters is necessary to generate two equally representative samples. Note that enough sample must be collected at one time in order to fill the necessary sample containers. It may be necessary to co-locate or depth integrate collection so enough sample volume is available for both aliquots of the duplicate sample pair.

3.3 WATER SAMPLING/MEASUREMENT

3.3.1 Monitoring Well/Piezometer Construction

Overburden monitoring wells may be installed by Weston during the course of remedial activities, specifically in relation to the installation and operation of a IRM LNAPL recovery system. Piezometers (or observation wells) may also be installed in the overburden in certain areas throughout the site for the primary purpose of collecting static water level data. The construction and development of these piezometers/observation wells will be identical to a 2-inch overburden monitoring well so that groundwater samples may be obtained from them as needed.

Well locations will be pre-determined by the recovery system engineers to ensure best placement to compliment remedial system design and function, however, unforeseen field conditions may warrant slight modifications to planned well/piezometer locations. Should an existing on-site or off-site well need to be abandoned during remedial activities, it may need to be replaced in kind to augment passive remediation systems.

Well construction information will be included on the Well Construction Form for each well installed. At a minimum, the well construction information will show depth from surface grade, the bottom of the boring, the screened interval, casing material, casing diameter, gravel pack location, grout seal and height of riser pipe above the ground. Well locations, including top of riser and surface elevations, will be established by a New Jersey-licensed surveyor, as required by N.J.A.C. 7:9D-1.11(f)(3)(iv)(3).

Overburden Well Construction

Any of the drilling methods discussed in this section of the QAPP can be used to drill and/or set a well in the overburden. The hollow-stem auger method is the preferred choice for shallow (<30 ft) overburden wells.

The annular space between the well screen and the boring is filled with a uniform gravel/sand pack to serve as a filter media. For wells deeper than approximately 50 feet, or when recommended by the site geologist, the sand pack is emplaced using a tremie pipe. A sand slurry composed of sand and potable water is pumped through the tremie pipe into the annulus throughout the entire screened interval, and over the top of the screen. The driller shall determine if it is necessary to pump additional sand/gravel slurry to cover the screen after the sand/gravel pack has densified and settled.

The depth of the top of the sand shall be determined, thus verifying the thickness of the sand pack. Additional sand shall be added to bring the top of the sand pack to approximately 2 to 3 ft above the top of the well screen. Under no circumstances should the sand pack extend into any aquifer other than the one to be monitored. In most cases, the well design can be modified to allow for a sufficient sand pack without threat of crossflow between producing zones through the sand pack.

In materials that will not maintain an open hole using hollow-stem augers, the temporary or outer casing is withdrawn gradually during placement of sand pack/grout. For example, after filling 2 feet with sand pack, the outer casing should be withdrawn 2 ft. This step of placing more sand and withdrawing the outer casing should be repeated until the level of the sand pack is approximately 3 feet above the top of the well screen. This ensures that there is no locking of the permanent (inner) casing in the outer casing.

A bentonite slurry seal of a minimum 2-foot vertical thickness will be placed in the annular space above the sand pack to separate the sand pack from the cement surface seal and to prevent infiltration of cement into the filter pack and the well screen. The slurry will be prepared by mixing powdered or granular bentonite with potable water. The slurry must be of sufficiently high specific gravity and viscosity to prevent its displacement by the grout to be emplaced above it. The bentonite slurry will be pumped through a tremie pipe and emplaced directly above the sand pack. This seal will be allowed to “set up” (or begin to solidify) for approximately 30 to 60 minutes prior to grouting up the remaining annular space.

A cement/bentonite grout will be placed from the top of the bentonite seal to the ground surface. Grout is pumped through a tremie pipe until undiluted grout flows from the annulus at the ground surface. In materials that will not maintain an open hole, the temporary steel casing should be withdrawn in a manner that prevents the level of grout from dropping below the bottom of the casing. Additional grout may be added to compensate for the removal of the temporary casing and the tremie pipe to ensure that the top of the grout is at or above ground

surface. After the grout has set (about 24 hours), any depression due to settlement is filled with a grout mixture similar to that described above.

A protective steel casing will be placed around the exposed PVC well casing and will extend a minimum of 3 ft below ground surface. The protective casing will be grouted in and a cement pad will be constructed around each protective casing ensuring cement slopes away from the casing. Vent holes will be drilled in the riser pipe and protective casing to vent moisture. In addition, a small hole will be drilled into the base of the protective casing to drain rain water between the casing and well. The protective casing will include a hinged cap, which will be padlocked for protection. The padlocks will either have identical keys, or be keyed for opening with one master key. Flush mounted well completions may be used for wells installed within high traffic areas. All wells will be constructed in a manner which prevents damage from thaw/freeze conditions (i.e., frost sleeve installation).

3.3.2 Monitoring Well Development

Well development is the process by which fine soil materials are removed from in and around the screen allowing water to flow freely into the well. This process is accomplished by moving water or air through the well screen into and out of the surrounding material. The well development process:

- Removes materials that have built-up in the openings of the screen during the well drilling and installation processes.

- Removes fines from the sides of the borehole that resulted from the drilling procedures, (e.g., drilling mud).

- Increases the hydraulic conductivity of adjacent geologic materials and the filter pack by removing fine materials.

- Stabilizes the fine materials that remain in the vicinity of the well and retards their movement into the well.

The benefits of well development are increased yields, reduced pumping of fines that can damage pumps, decreased corrosion and encrustation, and production of low-turbidity groundwater samples. The development process results in a layer of coarse particles adjacent to the screen. The percentage of finer particles increases with distance away from the well. Well development is necessary in any well because clogging can occur regardless of the drilling method used or the formation being penetrated.

Weston will initiate well development as soon as practical after installation, but no sooner than 48 hours after grouting is completed.

There are a variety of methods that can be used in well development. Several are discussed below; however, pumping combined with surge blocking will be the preferred method. If well development goals are not met using this combined method, others will be utilized (as determined by the driller).

- Bailing - This method involves removing turbid water from a well using a bailer (usually the large type used on drill rigs rather than the type used for sample collection). The process of lowering and raising the bailer helps to move water into and out of the filter pack which flushes finer material into the well for removal. Bailing is a relatively ineffective method of well development; however, Weston may use bailing as a starting method in wells with very turbid water.

- Mechanical Surging - In this method, also called block surging, a surge block or surge plunger is pushed in and pulled out of the well in a plunger-like fashion. The plunger can be solid or valved. Valved plungers allow action on the downstroke and strong action on the upstroke, but care will be taken on the upstroke because screens can be collapsed. As fines are flushed into the well, they will be bailed or pumped.

- Overpumping - This method involves pumping at high rates, then allowing the well to recover before pumping again. This method assumes that the hydrogeologic system will then be stable at normal pumping rates. When the pumps are stopped, backwash helps overcome bridging. While this method is simple and quick, it is also minimally effective. Overpumping may be used as a finishing method.

Criteria used to determine when development is complete are provided below. These criteria will be considered as goals.

- Water appearance (e.g., continue until opaque or translucent water becomes transparent or clear).

- Turbidity (e.g., goal of less than 50 Nephelometric Turbidity Units (NTUs) as determined by a nephelometer).

- Flow rate (e.g., continue until maximum flow rate stabilizes).

- Water volume (e.g., remove at least 3 to 5 times the well volume in high yielding wells).

- Field parameters (e.g., continue until temperature, specific conductance, and pH stabilize). Stabilization is defined as less than 10 percent variation.

Specific procedures to be followed during well development are summarized below:

- Open the monitoring well, take initial measurements (i.e., head space air monitor readings, water level, well depth, pH, temperature, and specific conductivity) and record results in the site logbook.

- Develop the well by the appropriate method (e.g.., surging and pumping) to accommodate site conditions and project requirements. Dispersing agents, acids, or disinfectants will not be used to enhance development of the well.

- Continue until the development goals above are achieved.

- Containerize discharge water if required.

- All data will be recorded on a Well Development Form.

- Decontaminate equipment as appropriate prior to use in the next well.

3.3.3 Monitoring Well Abandonment

Periodically during the investigation, there may be a need to abandon selected monitoring wells. Upon approval of the NJDEP, monitoring wells will be abandoned in accordance with the requirements of N.J.A.C. 7:9-9.1 through 9.4 (Sealing of Abandoned Wells). Abandonment activities will be conducted by a N.J.-licensed and certified Well Driller and Well Sealer. A Well Abandonment Report will be submitted to the NJDEP Division of Water Resources.

3.3.4 Water Level Measurements

A survey mark will be clearly placed on the casing for use as a reference point for measurement. Generally, the reference point is made at the top of the well casing or "stickup" (not the protective casing). All field personnel will be notified of such reference point in order to ensure comparable data and measurements.

Prior to measurement, water levels in monitoring wells will be allowed to stabilize for a minimum of 24 hours after well construction and development. In low yield situations, recovery may take longer. All measurements will be made to an accuracy of 0.01 foot.

In general, measurements should proceed from least to most contaminated wells. Where many wells are to be sampled (i.e., greater than 10), measurements may be taken in a systematic manner to insure efficiency and accuracy. The depth sounder (water level meter) will be thoroughly decontaminated between well locations to prevent potential cross-contamination. The well will be opened and the headspace monitored with the appropriate monitoring instrument to determine the presence of volatile organic compounds. The total depth of the well will be measured using the survey mark and a depth sounder.

Next, the water level measuring device will be lowered into the well until the water surface is encountered. The distance from the water surface to the reference point on well casing will be measured and recorded in the site logbook and/or a groundwater level data form. All downhole equipment will be removed, decontaminated as necessary, and the casing cap replaced. If floating hydrocarbon product is present, a special dual-phase level indicator will be used. Any physical changes to the protective concrete pad or variation in total depth of the well should also be noted in the logbook and/or form.

3.3.5 Groundwater Sampling Procedures

The following procedure shall be utilized should groundwater sampling from monitoring wells be required during the course of remediation.

Prior to sampling a monitor well, the well will be purged to remove water that may have stagnated in the well, and to introduce fresh groundwater into the well for sampling. This can be achieved with one of a number of instruments. The most common of these are the bailer and/or pump. Weston plans to utilize low-flow rate submersible pumps to purge and sample the monitoring wells. Research by the EPA has concluded that this method of purging and sampling results in the collection of samples with low turbidity levels. Studies have confirmed that this method produces greater sample quality, accuracy and reproducibility over samples collected through more conventional methods such as bailing (R. Puls and R. Powell, 1992, Groundwater Monitoring Review). According to these studies, samples collected with this method typically contain turbidity levels less than 5 NTUs, even if fine materials are present in the formation.

Low-flow rate pumps may include Well Wizards, submersible Johnson Keck, or Grundfos pumps, or other similar equipment. Weston intends to use a 2-inch Grundfos Redi-Flo submersible pump. These pumps will be used for both purging and sampling, unless a well exhibits such low yield/recharge that pumping becomes impractical. In cases where well yield/recharge is very low, a bailer or WaTerra pump (inertial pump) may be used for development, purging, and sampling in accordance with procedures outlined in the NJDEP's *Field Sampling Procedures Manual* (August 2005). The pump intake will be set at the midpoint of the saturated section of screen. Water level measurements will be taken as appropriate, by personnel associated with a laboratory certified by NJDEP to collect "analyze immediately" parameters, to ensure that the water column does not extend below the top of the well screen, thereby eliminating exposure of the well screen to air.

The wells will be purged until a minimum of three to five well volumes have been removed or field parameters (e.g., temperature, specific conductance, pH, turbidity, dissolved oxygen [D.O.], and redox potential [Eh]) stabilize. Stabilization is defined as less than 10 percent variation. These parameters will be measured using a ground water quality meter (such as a YSI or Horiba) equipped with a flow-through chamber. Less than three volumes may be removed from low yielding wells. Groundwater samples will be collected immediately following purging using the same adjustable low-flow rate pumping equipment (i.e., within 2 hours if sufficient recharge is available). Analytical samples will be collected in-line prior to the flow-through chamber to

prevent potential cross-contamination. Flow rates will be approximately 100 milliliters per minute (ml/m) or less during sampling. The pump will be lowered into the middle of the screened interval during sampling in order to obtain a representative sample. Since flow rates during sampling will be minimal, the potential of exposing the well screen will essentially be eliminated. If water level information obtained during purging indicates otherwise, the pump will be set immediately above the well screen during sampling.

Equipment will be decontaminated prior to use and between monitoring wells. Once purging is completed and the correct laboratory-cleaned sample containers have been prepared, sampling will immediately proceed. The following order of sample fraction collection will generally be followed; however, field conditions and well yield may require field decisions to modify the order on a case by case basis:

1. pH, conductivity and temperature (i.e., field parameters).
2. Volatile organics.
3. SVOCs.
4. Petroleum Hydrocarbons.
5. PCBs.
6. Metals.

The type of analysis for which a sample is being collected determines the type of bottle, preservative, holding time, and filtering requirements. Samples should be collected directly from the sampling device into appropriate laboratory cleaned containers.

Samples shall be appropriately preserved, labeled, logged, and placed in a cooler to be maintained at 4°C. Samples will be shipped well before the holding time is up and in most cases will be shipped within 24 hours of sample collection. The bottles will be shipped with adequate insulation and cooling materials to ensure that they arrive intact.

3.3.6 Surface Water Sampling Procedures

This standard operating procedure is applicable to the collection of representative liquid samples from streams, rivers, lakes, ponds, lagoons, and surface impoundments. It includes samples collected from depth, as well as samples collected from the surface.

The sampling of liquids by use of either the Direct Method or a Dip Sampler is presented below. Weston anticipates the use of the Direct Method for surface water sampling in all cases where access is not restricted. When surface water and sediment are to be collected from the same location, surface water samples will be collected prior to sediment sampling at each location.

3.3.6.1 Direct Method

For streams, rivers, lakes, and other surface waters, the direct method may be utilized to collect water samples from the surface directly into the sample bottle. The direct method will be the preferred method of collection, especially when collecting samples for volatile organic analysis.

Using adequate protective clothing, access the sampling location by appropriate means. For shallow stream stations, collect the sample under the water surface while pointing the sample container upstream; the container must be upstream of the collector. Avoid disturbing the substrate. Sample collection will begin in the most downstream portion of the stream. For lakes and other impoundments, collect the sample under the water surface avoiding surface debris and turbulence.

When using the direct method, sample bottles without preservation will be used. All samples will then be preserved and checked for proper preservation.

3.3.6.2 Dip Sampler

A dip sampler is useful in situations where a sample is to be recovered from an outfall pipe or along a lagoon bank where direct access is limited. The long handle on such a device allows access from a discrete location. Sampling procedures are as follows:

1. Assemble the device in accordance with the manufacturer's instructions.

2. Extend the device to the sample location and collect the sample by dipping the sampler into the substance.

3. Retrieve the sampler and transfer the sample to the appropriate sample container.

The dip sampler will be constructed of non-reactive materials such as borosilicate glass, stainless steel or teflon. The sampler will be decontaminated prior to use.

3.3.7 Duplicate/Split Sampling

For groundwater sampling, duplicate samples will be collected and will represent approximately five percent of the investigative samples per analyte. One surface water duplicate sample will be collected. Duplicates of water samples will be collected by alternately filling sample containers from the same sampling device from each container. Samples for volatile organic analysis will be the first set of containers filled. The vials for volatile organic analysis will be alternately filled (i.e., one vial for the sample, one for the duplicate, and repeat until all vials are filled). If heterogeneity is suspected, separate samples of each phase should be collected as the nature of phased liquids precludes homogenization. It is generally not necessary to homogenize groundwater samples.

3.4 DECONTAMINATION PROCEDURES

The purpose of these standard procedures is to provide a description of the methods used for preventing, minimizing, or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination and to provide general guidelines for developing decontamination procedures for sampling equipment to be used during hazardous waste operations. This procedure does not address personnel decontamination.

Soil / Sediment Sampling Equipment

The decontamination procedures described below are modified from NJDEP methods. Non-dedicated field equipment that comes in direct contact with soil samples (e.g., MacroCore tips) will be decontaminated by high pressure hot steam cleaning and air dried. Equipment will then be wrapped in foil until ready to use. Decontaminated equipment will be stored on site in a secure equipment storage location until use. Prior to sampling, the decontaminated equipment must be rinsed with demonstrated analyte-free distilled and deionized water. Through distillation, all ionized solids and a broad range of organic constituents are removed, thus making distilled, deionoized water an ideal solvent for use when sampling for organic parameters. Deionized water is water that has been effectively freed from any existing ionic impurities. The use of distilled and deionized water, commonly available as a single product from commercial vendors, is acceptable provided that the lot number and the associated analysis is available.

Decontamination of Heavy Equipment

Other equipment and material associated with sampling episodes are required to be cleaned prior to usage. Items such as drilling equipment, excavators and other equipment all present potential sources of interference to environmental samples. These items may come in contact with the materials adjacent to the matrix being sampled or may be attached to actual sampling equipment which has been cleaned.

Two options are available to accomplish cleaning of heavy equipment: steam cleaning and manual scrubbing. The use of a high-pressure steam generator can remove visible debris and has several advantages. Steam generators using potable water provide a high-pressure medium which is very effective for residuals removal. They are also efficient in terms of ease of handling and generate low volumes of wash solutions.

A second option involves manual scrubbing of equipment using a non-phosphate detergent solution followed by a thorough water rinse. This procedure can be as effective as steam cleaning and is preferred in situations where steam cleaning fails to remove visible materials. Disadvantages to manual scrubbing are that it is labor intensive and it generates large volumes of water and rinse solutions.

Heavy equipment such as drill rods, bits, and casing will be steam-cleaned prior to usage onsite and between borehole locations. All drilling/heavy equipment will be steam-cleaned at the completion of the project to ensure that no contamination is transported from the sampling site.

Decontamination of Pumps

When submersible pumps are used for purging and sampling, they will be cleaned and flushed prior to and between use. This cleaning process consists of an external laboratory grade glassware detergent wash and tap water rinse, or steam cleaning of pump casing, hose and cables, followed by a 20-gallon flush of potable water through the pump. This flushing will be accomplished by the use of a clean plastic overpack drum or a plastic garbage can filled with potable water or some other form of "standpipe". The pump will then be rinsed externally with demonstrated analyte-free distilled and deionized water. For submersible pumps smaller than four inches in diameter, the recommended volume required for flushing may be proportionately reduced.

If the evacuation hose is not changed between locations, it must also be decontaminated in the same manner as the pump.

The field team will exercise caution to avoid contact with the pump casing and water in the drum while the pump is running (metal drums/garbage cans will not be used) to avoid electric shock. Surface pumps used for well evacuation need not be cleaned between well locations if only a check valve is used. The submersible pump and tubing will always be placed on a clean polyethylene sheeting to avoid contact with ground surface. All tubing will be rinsed with demonstrated analyte-free distilled and deionized water to remove any residual material and wiped clean with a paper towel before entering the well.

In order to document that this modification from the decontamination protocols specified in the *Field Sampling Procedures Manual* (NJDEP, 2005) is adequate, field blank samples will be collected from decontaminated pumps) on a frequency of one field blank sample per decontamination event (maximum of one per day) for each analyte which is being analyzed for in the groundwater samples.

3.5 FIELD DOCUMENTATION

3.5.1 Data Management

The data management technique employed at the Hatco site utilizes Tablet Personal Computers (Tablets) to capture chain-of-custody (COC) and geotechnical data, allows for data transfer from the field to the data management team, and stores data in a centralized repository (utilizing EnviroData).

Field notes, COC data, and geologic information are collected in the field using Microsoft Windows Journal, FieldFast^{SM}, and GeoFast^{SM} extension for FieldFast (GeoFast). Windows Journal provides an electronic means of capturing hand written field notes and replaces bound notebooks. When

implemented on a Tablet hand written notes can be captured as an image or converted to text using handwriting recognition software. FieldFast utilizes a Tablet to capture sample attributes such as field sample ID, analyses to be performed, date and time of collection, and sampler's name (amongst others). Following sample collection the Tablet can produce bottle labels immediately in the field and later synchronized with a field office server to create COC forms. This system eliminates typographical errors and ensures that the laboratory can clearly read the paperwork accompanying the sample shipment. GeoFast captures drilling and geologic information traditionally recorded in bound fieldbooks or soil boring logs. This innovative tool prompts the field geologist to provide soil descriptions using standard methodology. This approach eliminates the collection of incomplete data in the field and ensures that all field geologists capture the same information, minimizing problems with geologic interpretations. GeoFast provides data in an export format that is easily imported to WinLoG (a geologic reporting tool) to generate report-quality soil boring logs, well construction diagrams, and cross-sections.

Survey data will be acquired in the field to document soil and sediment sample locations and limits of excavation using a Global Positioning System (GPS). The GPS equipment planned for use on this project provides sub-meter accuracy. Data can be easily transferred from the GPS to EnviroData and GIS. Survey data for establishing horizontal and vertical datum for

3.5.2 Field Sample Identification

During sample collection, a variety of data will be collected and managed electronically to eliminate the potential for transcription errors. Field data is defined as all information generated during the field effort, such as field notes, COC information, geotechnical information (i.e., soil descriptions, well construction information, etc.), and survey data.

Each sample will be assigned a unique field sample identification code and labeled accordingly. This field sample identification code provides the tracing of the sample from the location in the field, through laboratory analysis, and finally to data evaluation and presentation, and contains information traceable to the type, location where the sample was collected, and other information appropriate to that sample. This code will be used for references to this particular sample in field and project documentation and reports. It is essential that the integrity of the field sample identification (ID) code not be compromised.

Delineation and post-excavation soil samples will be identified slightly differently, depending on the type of sample and the location from which the samples will be collected.

<u>General Sampling Scheme</u>:

The sample identification code consists of three fields, separated by underscores, in the following format:

AC_YY_Z_R

AC = Sample area of concern, post-excavation grid designation, on-site or off-site non-LNAPL excavation area, or IRM confirmation sample grid designation
YY = Sample Boring Location / Sequence (1, 2, 3….)
Z = Depth Interval (see discussion below)

R = Sample type identifier
(1=sample, 2= duplicate, 3 = field blank)

Delineation Samples:

For delineation samples, the code "AC" above will be replaced by a sample area of concern (e.g., A, B, C) and the symbol "_B_" to designate that the sample is a boring location.

LNAPL Excavation Area Post-Excavation Samples:

As described in the Post Excavation Sampling Plan attached to the RAWP Addendum 3 to which this QAPP is appended, the area proposed for excavation associated with the LNAPL plume will have a 50-foot-by-50-foot grid established as an aid in determining the location of post-excavation soil samples. The north-south grid lines are designated as "XAA" through "XAK" and the east-west grid lines are designated as "X101" through "X111." These grid lines were each designated with an additional alphanumeric "digit" to prevent confusion with the grid line designations that have been proposed under the post-IRM sampling program, discussed later in this section of the QAPP.

Soil sampling locations will be identified by the north-south grid line designation and the east-west grid line designation. Therefore, for post-excavation samples collected in the LNAPL excavation area, the sample code designator "AC" above would be replaced with the north-south grid line and the east-west grid line. For example, samples collected from the node at the intersection of north-south grid line "XAC" and east-west grid line "X103" will have field ID number beginning with "XAC_X103."

On-Site Non-LNAPL Area Post-Excavation Samples:

Each excavation area other than the LNAPL areas has been designated by a 4-digit alphanumeric code beginning with "X" followed by three numbers. As described in the Post-Excavation Sampling Plan, the non-LNAPL excavation areas are numbered from X001 through X138. Each of these excavation areas, with the exceptions noted below, are on-site excavation areas associated with non-LNAPL contaminant exceedances. Post-excavation samples collected from each of these excavation areas will be designated by the excavation area "X" code as a replacement for the code "AC" described in the general sampling scheme, above. These designators will be followed by an underscore and numbered in an ordinal fashion from 01 to the final sample collected from that excavation area.

Off-Site Non-LNAPL Area Post-Excavation Samples:

The method for assigning sample identifiers for post-excavation samples collected from the off-site excavation areas are identical to those used for determining those collected from the on-site, non-LNAPL contamination areas.

Post-IRM Confirmation Samples:

As described in the Confirmation Sampling Plan attached to the *Interim Remedial Measure Remedial Action Work Plan* (Weston, August 2009) a 30-foot-by-30-foot grid will be established across the footprint of the IRM for collection of confirmation soil samples to document the efficacy of the IRM. The north-south grid lines will be designated as "XA" through "XZ" and the east-west grid lines will be designated as "X01" through "X36." Soil sampling locations will be identified by the north-south grid line designation and the east-west grid line designation, similar to the sample designations specified for the LNAPL area post-excavation samples.

Additional Investigation Samples

Additional samples are proposed for collection based on comments from NJDEP following their 24 July 2009 site visit. Soil samples will be collected from within a soil berm located between Channels B and C, and soil samples (also designated "BERM" samples) will be collected from the soils in the vicinity of the berm between Channel B and C and between Channel A and B. The samples collected from within the berm itself will be designated BERM-1-AE-AF through BERM-22-AE-AF (depth designation "AE-AF is per sample depth description, below). The "berm" soil samples collected from beyond the footprint of the berm will be designated as BERM-23-##-## through BERM-32-##-##, where the ##-## designates the depth interval collected. BERM-23-##-## through BERM-32-##-## will be collected from the 0-0.5-foot interval except for the VOC fraction, which will be collected from the 0.5-1.0-foot interval.

Sediment samples requested by NJDEP under the additional investigation program will be designated as CP-7 through CP-12. Three of these locations (two in the pond and one in the pond outlet channel) will have co-located surface water samples collected; those co-located surface water samples will have the same field sample identification code as their co-located sediment samples.

Sample Depth:

The location within the vertical sample column will be identified through the use of a systematic sample naming convention. Following the sample location designator, as described in more detail in the following subsections, the depth will be identified through use of the code "_##-##" where the "##" is substituted by an alphabetic depth designator, as follows:

Sample Depth Interval Identification

AA	0 Feet	AB	0.5 Feet	AC	1 Feet	AD	1.5 Feet

AE	2 Feet
AF	2.5 Feet
AG	3 Feet
AH	3.5 Feet
AI	4 Feet
AJ	4.5 Feet
AK	5 Feet
AL	5.5 Feet
AM	6 Feet
AN	6.5 Feet
AO	7 Feet
AP	7.5 Feet
AQ	8 Feet
AR	8.5 Feet
AS	9 Feet
AT	9.5 Feet
AU	10 Feet
AV	10.5 Feet
AW	11 Feet

AX	11.5 Feet
AY	12 Feet
AZ	12.5 Feet
BA	13 Feet
BB	13.5 Feet
BC	14 Feet
BD	14.5 Feet
BE	15 Feet
BF	15.5 Feet
BG	16 Feet
BH	16.5 Feet
BI	17 Feet
BJ	17.5 Feet
BK	18 Feet
BL	18.5 Feet
BM	19 Feet
BN	19.5 Feet
BO	20 Feet
BP	20.5 Feet

BQ	21 Feet
BR	21.5 Feet
BS	22 Feet
BT	22.5 Feet
BU	23 Feet
BV	23.5 Feet
BW	24 Feet
BX	24.5 Feet
BY	25 Feet
BZ	25.5 Feet
CA	26 Feet
CB	26.5 Feet
CC	27 Feet
CD	27.5 Feet
CE	28 Feet
CF	28.5 Feet
CG	29 Feet
CH	29.5 Feet
CI	30 Feet

CJ	30.5 Feet
CK	31 Feet
CL	31.5 Feet
CM	32 Feet
CN	32.5 Feet
CO	33 Feet
CP	33.5 Feet
CQ	34 Feet
CR	34.5 Feet
CS	35 Feet
CT	35.5 Feet
CU	36 Feet
CV	36.5 Feet
CW	37 Feet
CX	37.5 Feet
CY	38 Feet
CZ	38.5 Feet

As an example, a post-IRM confirmation sample collected from a depth of 10-10.5 feet below grade from the intersection of grid lines "XAC" and "X103" would be designated as "XAC_X103_AU-AV".

For all sample types, duplicate sample pairs will have the designators "_1" for the environmental sample and "_2" for the duplicate sample added to the end of the sample ID, and field blanks will be designated with "_3" appended to the sample ID.

The field duplicate sample will be disguised to the laboratory for analysis but its location from which it was taken will be documented in the electronic field log for future reference.

3.5.3 Field Log Books

All field notes will be captured electronically on a tablet PC. Each field team leader will be responsible for the collection of all location and sampling data as well as daily field logs. All data will be collected electronically in the Tablet assigned to each field lead.

Data collection begins with documentation and collection of environmental samples by the field teams. Each team will collect data independently during sample collection activities. Field note documentation will be maintained using an electronic logbook. Sample locations will be identified using a Trimble GPS unit while sample collection data will be captured using FieldFast and GeoFast. FieldFast will be used to generate sample labels and COC forms both electronically and in hardcopy. All data will be stored and synchronized with a dedicated office server at the end of each day.

At the beginning of each workday, the team lead will begin a new electronic daily log for general log notes. A new data acquisition file will be created for sample location data. Each lead will be responsible for making certain that the latest FieldFast database has been downloaded to their Tablet prior to leaving the field office. At the end of each workday, each lead will be responsible for the download of all data generated during the day to the office server. This download will include three files:

1. Electronic Daily Log Notes
2. FieldFast Database
3. GPS uncorrected data file (.ssf)

Included within the electronic daily log notes, the following information pertinent to health and safety shall be maintained. Examples of this information include:

- Real-time personnel air monitoring results, when applicable.
- Heat/cold stress monitoring data, if applicable.
- Upgrades or downgrades of personnel protective equipment.
- Reason(s) for upgrades or downgrades (documenting appropriate approvals).

3.5.4 Chain-of-Custody Documentation

The purpose of the COC procedures is to document the history of sample containers and samples from the time of sample collection through shipment and analysis, and to maintain sampling integrity. COC is initiated in the field and will travel with the samples. Custody seals will be affixed to the shipping container and sealed with clear tape. Upon sample receipt, the contract laboratory will resume sample custody.

3.6 SAMPLE HANDLING

3.6.1 Sample Volumes and Containers

A sufficient volume of samples, representative of each matrix, will be collected. Sample volumes for the parameters of concern are shown in Table 3-1. All containers will be cleaned by the laboratory performing the analyses and comply with the QA/QC requirements of NJDEP's *Field Sampling Procedure Manual* (August 2005). Certified, clean sample containers will be provided by the contract laboratory.

The field sampling team is required to provide additional sample volume for aqueous samples, excluding field blanks and waste classification samples, designated for matrix spike/matrix spike duplicate (MS/MSD) analysis to be performed by the laboratory. This additional volume will be provided once every 20 samples.

The soil and sediment samples must be filled to the rim of the sample containers. For soil/sediment samples collected for TCLP VOC analysis, sample jars must be filled to ensure zero headspace or an EnCore sampler must be used. Field quality assurance sample frequency is discussed in Table 3-2.

3.6.2 Sample Preservation

Field sampling teams will be prepared to add additional preservatives for any aqueous samples collected, if necessary.

All samples (preserved or unpreserved) will be placed in a cooler surrounded by ice as soon as possible to retard potential biological impact. Sample holding times are calculated from the time of collection. Sample holding times are also included in Table 3-1.

3.6.3 Sample Labeling and Shipping

All samples collected on-site will be given a unique sample identification code. All sample bottles will be identified by use of a sample label.

Precautions will be taken to ensure that all samples removed from the site are fully contained within the sample bottleware and that no residue remains on the outside of the container.

Samples will be packed and shipped following NJDEP-recommended procedures and in accordance with applicable Department of Transportation (DOT) and IATA regulations. Alternately, the laboratory may provide a courier/driver to pick up samples from the site.

It is assumed that both environmental and hazardous materials samples will be collected and will require shipment from the site. Shipment of samples beyond 24 hours but within 48 hours after collection is allowable if continuous maintenance of samples at 4°C is guaranteed and if the laboratory will receive the samples in time to ensure conformance with holding times.

3.6.4 Sample Receipt and Storage

The analytical laboratory shall follow internal COC procedures associated with sample receipt, storage, preparation, analysis and general security procedures. Upon sample receipt, the laboratory sample custodian will inspect the integrity of the sample containers. The presence of broken or leaking samples will be noted on the COC record. The sample custodian will sign (with date and time of receipt) the COC record, thus assuming custody of the samples. The sample custodian will also check the information on the COC record against the sample labels. Any inconsistencies will be resolved with the sampling representative before sample analysis proceeds. After sample receipt, all analytical samples will be stored in a locked sample refrigerator pending sample preparation and analysis. The storage refrigerators are maintained at 4ºC ($\pm$ 2°C). The refrigerator temperature must be monitored routinely in accordance with the laboratory's standard operating procedure.

3.7 QUALITY ASSURANCE

During field sampling activities, field QC samples consisting of trip blanks (if required), field blanks, and field duplicates will be collected. The samples to be used for matrix spike/matrix spike duplicate will also be designated. These samples will be submitted to the analytical laboratory for analysis concurrently with actual field samples. A summary of the field QC sampling program can be found in Table 3-2.

3.7.1 Field Rinsate Blank (Field Blank)

Field blanks will be collected at the rate of one per day, as required by NJDEP's *Field Sampling Procedures Manual*. Field blanks will be obtained by pouring demonstrated analyte-free deionized water, supplied by the laboratory, through a field decontaminated sampling device. Field blank samples will be collected in appropriate sample bottles and placed in the ice-filled coolers along with the environmental samples for transport to the laboratory. Field blanks will be preserved as specified for the analytical methodology and analyzed for all requested chemical analyses.

Where field equipment has been decontaminated and is dedicated to a sampling location (e.g., pumps permanently installed in wells), field blanks will not be required. Field blanks are not required when a sample is collected directly from a source into a sampling container, nor are

field blanks required for dedicated, disposable equipment.. One field blank will be collected for each day of sample collection activity.

3.7.2 Field Duplicate

Field duplicate samples will be collected at a frequency of one per 20 and will be submitted to the laboratory as "blind" samples.

With the exception for samples collected for VOC analysis, obtaining duplicate samples in a soil or sediment matrix requires homogenization of the sample aliquot to generate two equally representative samples prior to filling sample containers. Note that enough sample volume must be collected at one time in order to fill all the necessary sample containers. It may be necessary to co-locate or depth-integrate collection so enough sample volume is available. Note that VOC duplicate samples from the soil and sediment matrix must be co-located rather than homogenized to prevent the loss of the volatile components in the sample during the homogenization process.

3.7.3 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

For every 20 field samples collected, one will be designated for MS/MSD analyses. For waste classification samples and field blanks, MS/MSD analysis will not be performed. For metal analysis, MSD will not be performed; a laboratory duplicate will be performed instead.

3.8 FIELD MEASUREMENT

3.8.1 OVM/PID

The OVM or PID (Mini-RAE or equivalent) will be calibrated according to manufacturer's instruction and used continuously during the field activities and intrusive remedial activities to monitor health and safety conditions that may arise from volatile organics. Responses on the instruments in the breathing zone may trigger an upgrade in personal protection. This information is detailed in the Site HASP.

All soil samples collected for analysis will be screened in open air with either OVM or PID. In addition, all Geoprobe® acetate sleeve samples that are collected via direct push will be removed from the MacroCore, laid on plastic sheeting, cut in half lengthwise with a decontaminated knife or spade, and screened immediately with a PID. All instrument readings will be recorded in the electronic field notes, or in the case of describing soil samples from a borehole, in the GeoFast Logging Form using standard logging notation.

3.8.2 Data RAM (PDR-1000)

The Data RAM will be used continuously during intrusive field activities (during dry and/or dusty conditions) to monitor health and safety conditions that may arise form airborne dust or

particulate concentrations. Responses on the instrument in the breathing zone may trigger an upgrade in personal protection. This information is detailed in the Site HASP.

The instruments will be calibrated on a daily basis as per the manufacturer's instructions. Calibration information for all field instruments will be recorded in the Field Calibration section of the site supervisor's notes.

3.8.3 Contaminant-Specific Colorimetric Indicator Tubes

In accordance with the Health and Safety Plan (HASP) developed for the Hatco project, and the Hatco Air Sampling Program, colorimetric tubes will be used on-site to supplement real-time air monitoring with the OVM and PDR. The air sampling program has been designed to determine potential hazardous atmospheric working conditions for Weston, its subcontractors and vendors at the Hatco site during remedial and post-remedial activities. Hatco's plant operations include the regular use of two volatile products, valeric acid and isopentanoic acid, both of which impart a strong odor to the air sitewide during their use. Weston has observed that the odors permeate clothing, equipment and vehicles used at the site. No exposure limits have been established by any United States regulatory agency to limit workplace exposure to these substances.

Weston understands that Hatco has no engineering controls in place to limit the odor of effluent fumes resulting from these products. However, the Material Safety Data Sheet (MSDS) for isopentanoic acid indicates the substance should only be used within closed systems and exhaust gases should be treated before discharge to the atmosphere. Due to the lack of engineering controls and the pervasive odor associated with these chemicals, Weston will implement the regular use of colorimetric detector tubes to determine the presence of these and other potentially hazardous airborne substances within the Weston work area that are resultant from facility operations. The colorimetric tube results are supplemented by 24-hour ambient air samples collected at the Hatco site, collected at the start of work activities and whenever site conditions change sufficiently to warrant re-sampling.

The odor threshold for both valeric acid and isopentanoic acid is low, in the part per billion range. Therefore, odor cannot be used as a reliable indicator of exposure. Colorimetric detector tubes will be utilized to measure for the presence of both valeric acid and isopentanoic acid at the site. Background concentrations will be analyzed at the same time that ambient air samples are collected, and any time when a strong odor (associated with either product) is detected by field personnel. A minimum of one colorimetric sample per 8-hour shift shall be collected to ensure adequate worker protection is provided. Should weather conditions change, the work area shifts closer to facility operations, or the temperature drastically increases, an additional colorimetric sample shall be obtained.

Human health risk information regarding valeric acid and isopentanoic acid indicates that exposure affects the respiratory system and causes severe bronchial irritation. Since no human exposure limits have been published by recognized United States sources such as The National Institute for Occupational Safety and Health (NIOSH) or the Occupational Safety and Health

Administration (OSHA), a conservative risk-based action level has been established for Weston personnel and subcontractors. Any detectable measurement of valeric acid or isopentanoic acid (above approximately 0.4 parts per million [ppm]) would trigger an upgrade to Level C respiratory protection. Should the measurable concentration of valeric acid or isopentanoic acid exceed 1.0 ppm, onsite operations shall cease and the Weston Division Safety Manager shall be consulted. Any exceedance of a site-specific action level shall be reported immediately to the Site Manager and the Project Manager.

Any change in site air monitoring procedure (based upon the results of initial air sample data) shall be documented in an amendment to the site HASP.

Colormetric indicator tubes will be used as per the manufacturer's instructions, ensuring that the appropriate volume of air is being drawn across the color-changing indicator materials to provide an reading accurate within the manufacturer's range of accuracy for each type of tube.

SECTION 4
PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES

The ability to generate valid analytical data requires that all analytical instrumentation be properly and regularly maintained. The laboratory maintains full service contracts on all major instruments. These service contracts not only provide routine preventive maintenance, but also emergency repair service. Only the elements of the maintenance program related to field sampling activity are discussed in this section.

Before any instrument is used as a measurement device, the instrumental response to known reference materials must be determined. The manner in which various instruments are calibrated is dependent on the particular type of instrument and its intended use.

Field personnel are responsible for the calibration of their respective equipment. Specific instrument calibration procedures for various instruments are located in the transport/storage containers for all field equipment. All field instruments will be calibrated on a daily basis (before use each day) in accordance with the manufacturer's instructions. Field staff shall ensure an adequate supply of calibration materials for all instruments that must be calibrated using a standardized solution or gas.

An inventory control system governing field equipment and instrumentation is maintained by the Weston's local equipment storeroom supervisor as the basis for maintenance and calibration control. The inventory control documentation includes the following:

- Description of instrument;
- Manufacturer, model number, and serial number;
- Identification number;
- Name, address, and telephone number of company that services the instrument or equipment;
- Type of service policy; and
- Timing and frequency of routine maintenance, servicing, and calibration.

Standard procedures for field instrumentation and equipment maintenance, repair, and calibration are according to the manufacturer's specifications. The team leaders will be responsible for implementing the calibration procedures used while on site.

SECTION 5
INVESTIGATION-DERIVED WASTE MANAGEMENT

This section provides guidance for the appropriate management of contaminated and non-contaminated waste generated during the remedial activities planned for the Hatco Site. Wastes covered within this discussion include soil boring cuttings; water generated during well development and purging; fluid resulting from decontamination procedures; accumulated rainwater in temporary waste storage areas; and personal protective equipment (PPE). This plan was written to be consistent with the NJDEP's *Field Sampling Procedures Manual* (August 2005) and USEPA's "Management of Investigation-Derived Wastes during Site Inspections" (May 1991), and does not specifically address the remediation wastes generated during remedial activities (e.g., excavation of contaminated media).

Only those personnel who have been trained as specified under the RCRA and DOT regulations will be permitted to manage RCRA hazardous wastes or TSCA wastes. Additionally RCRA and DOT-trained personnel will be responsible for packaging and offering for transport investigation-derived wastes (transport will be accomplished with DOT-trained personnel who hold a commercial driver's license with a HazMat endorsement.) Personnel may be provided with function-specific training to allow them to perform specific tasks associated with waste management when accomplishing field activities covered under this QAPP.

It is anticipated that the waste generated during the remedial activities will not be RCRA regulated, with a small amount of waste which may be covered under TSCA regulations; therefore, this plan addresses non-RCRA regulated wastes only. If determined that RCRA and/or TSCA waste has been generated during the activities, storage and disposal requirements under RCRA and/or TSCA will take precedence.

5.1 SOIL BORING CUTTINGS

Soil boring cuttings will be continuously screened during soil sampling activities for evidence of contamination. Screening methods will include visual inspection of soils for staining; sheens or other evidence of contamination; screening of soils using PIDs or OVMs; and monitoring for odors that may indicate contamination.

If the screening tools and/or previous sampling results indicate that contamination is not present, the soils will be returned to the borehole. The soils will be graded to resemble natural conditions.

If evidence of contamination is observed, the fate of the soils is dependent on surface soil conditions at that location. In accordance with NJDEP protocols, the cuttings may be placed back into the borehole if the detected contamination is addressed as part of the site's remedial action [N.J.A.C. 7:26E-3.6(a)].

Alternately, soil cuttings may be consolidated with soils excavated during implementation of the remedial action, and disposed of off-site in accordance with waste classification analytical data.

5.2 EXCAVATED SOILS

Remedial activities at the site include the excavation of PCB-contaminated soils. All excavated materials with 500 milligrams per kilogram (mg/kg) dry weight will be stockpiled in a bermed staging area lined with heavy-duty (60 millimeter) plastic sheeting adjacent to the excavation or placed directly into lined roll-off containers for subsequent off-site disposal. Should soils be stockpiled, the stockpiles will be securely covered at the end of each work day and secured to prevent wind dispersal or rain water infiltration. The stockpiled soils will later be live-loaded into containers for transport to a licensed off-site disposal facility in accordance with Weston's *Waste Management Plan for the Hatco Facility* (2007).

On-site soils excavated from beyond the limits of the proposed cap which are contaminated only with PCBs at concentrations of less than 500 mg/kg dry weight will be either reused on-site beneath the cap in accordance with the soil reuse plan. On-site soils contaminated with constituents other than PCBs will be disposed of off-site in accordance with the *Remedial Action Work Plan Addendum 3* (Weston, August 2009) as appropriate based on waste classification data for samples collected from those waste streams. Off-site contaminated soils will be shipped off-site for disposal. Off-site disposal will be at licensed, disposal facility permitted to handle the particular waste type.

5.3 DECONTAMINATION FLUIDS

Decontamination fluids may be generated during steam cleaning operations and sampling equipment decontamination. Since the decontamination of equipment utilized for soil involves only tap water, DI water, and non-phosphate detergent, this portion of the decontamination fluids will be treated as non-hazardous liquid waste and will be put into the on-site frac tank and managed in accordance with applicable laws and regulations.

5.4 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Used PPE will be placed directly into the lined roll-off container within the decontamination zone that is designated specifically for TSCA materials disposal. The spent PPE will be containerized until the termination of the project, at which time waste classification samples will be collected and the waste disposed of by a permitted disposal facility appropriate to the waste classification obtained through the waste classification sample results.

5.5 ON-SITE STORAGE OF WASTES

A central storage area will be constructed within the property limits of the Hatco site. Following activities in each specific area of the Hatco site, waste will be transported by either pick-up truck, fork truck, or other heavy equipment to the storage area. The waste will be containerized in a

lined roll-off container with a lid, and will remain in this area until disposal. The container will be accurately marked as to the area in which the waste was generated, the dates generated, and the type of waste contained. All sampling for disposal purposes will be performed within this short-term storage area.

SECTION 6
LABORATORY ANALYSIS

In order to generate analytical data of known and defensible quality, adherence to established quality assurance protocols will be used. To ensure that the samples obtained in the field represent the particular environment from which they are collected and are of satisfactory quality, laboratory analysis will be performed in accordance with USEPA-approved laboratory methods and QA plan/SOPs established by the laboratory, in accordance with and the general procedures outlined in the Technical Requirements for Site Remediation (N.J.A.C. 7:26E-1 *et seq*.) as discussed herein.

6.1 LABORATORY REQUIREMENTS

At the time of submission of the RAW QAPP, Weston plans to use TestAmerica laboratory, located in Edison, New Jersey (formerly known as STL Edison). The laboratory's address, telephone number, and certification number is provided below:

TestAmerica Edison
777 New Durham Road
Edison, NJ 08817
Phone: 732-549-3900
Fax: 732-549-3679
New Jersey Department of Environmental Protection (NJDEP) Certification Number: 12028

6.1.1 Sample Receipt

A designated sample custodian is responsible for samples received at the laboratory. This individual is aware of custody requirements and the potential hazards of dealing with environmental samples. In addition to receiving samples, the sample custodian will also be responsible for documenting sample receipt, storage before and after sample analysis, and the proper disposal of samples. Upon sample receipt, the sample custodian will:

- Inspect the sample container for integrity and ensure custody seals are in place. The presence of leaking or broken containers will be noted on the chain-of-custody/sample analysis request forms. The sample custodian will sign (with date and time of receipt) the chain-of-custody/sample analysis request forms, thus assuming custody of the samples, and will assign the laboratory sample identification numbers.

- Measure and record the temperature of the cooler. If reading is greater than 10ºC, the laboratory will notify Weston's Project Manager who will determine if resampling is necessary.

- Compare the information of the chain-of-custody/sample analysis request forms with the sample tags and labels to verify sample identity. Any inconsistencies will be resolved with a field sampling representative before sample analysis proceeds.

- Alert the Project Manager, Laboratory Managers, and Section Managers for analyses requiring immediate attention because of short holding times, high moisture content, or other special condition.

6.1.2 Sample Storage

Samples will be maintained in a locked refrigerator maintained at 4ºC (± 2ºC). The temperature is monitored by the laboratory security system and is recorded daily in a bound logbook by the sample custodian. Provisions will be in place to handle emergency conditions. The laboratory will maintain controlled building access. In the event that the refrigerator temperature is not maintained, the laboratory will notify Weston's Project Manager, who will notify the Field Team Leader to implement corrective action in the field for subsequent sample shipments.

6.1.3 Sample Tracking

Each sample will receive a unique sample number at the laboratory when it is logged into the laboratory computer. Each person handling a sample batch will note the location change, time, date, and reason for movement.

For samples that require extraction or digestion prior to analysis, a sample extraction or digestion record will be prepared at the time of extraction or digestion. Laboratory data will be entered on the sample extraction form via computer and permanently recorded in a bound laboratory logbook.

6.1.4 Recordkeeping

Data related to sample preparation and analysis, as well as observations by laboratory analysts, will be permanently recorded in bound laboratory logbooks. Laboratory logbook pages will be signed and dated daily by laboratory analysts. Corrections to logbook entries will be made by drawing a single line through the erroneous entry and writing the correct entry next to the one crossed out. Corrections will be initialed and dated by the analyst.

6.2 METHOD DETECTION LIMITS/METHOD QUANTITATION LIMITS/REPORTING LIMITS

To generate data that will meet the project-specific data quality objectives, the laboratory will demonstrate the sensitivities of the methodologies used for sample analyses will be at or below the project-specified action levels. Sensitivity refers to the amount of material necessary to produce a detector response that can be reliably detected or quantified. Many unique definitions

exist for these limits. Specific detection limits are highly matrix-dependent. To be consistent and report data that are comparable, the definitions described below will be used.

- Method Detection Limit - The method detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. Method detection limit shall be estimated in an interference-free matrix, typically reagent water for water methods and a purified solid matrix (e.g., sand) for soil/sediment methods and shall be estimated for each compound/analyte of interest using the procedures presented in 40 CFR, Part 136, Appendix B. The MDLs shall be extraction/digestion method-specific and shall include any cleanup methods used. The laboratory shall perform MDL studies whenever the basic chemistry of the procedures are changed. If any of the target analytes are not recovered, then the MDL study shall be repeated for the failed target analytes. The MDL study must be done, at a minimum, on an annual basis.

- Method Quantitation Limit - The method quantitation limit (MQL), also called practical quantitation limit (PQL), is the lowest calibration standard and shall be no lower than 10 times the standard deviation as determined from the MDL study.

- Method Reporting Limit - The method reporting limit (MRL) is a threshold value below which the laboratory reports a result as "<" or "ND". For this project, the MRL shall be the PQL and must be less than the pertinent NJDEP Soil Cleanup Criteria or Guidance value. Method reporting limits shall be adjusted based on the sample matrix and any necessary sample dilution. For soil and sediment, all MRLs must be reported on a dry-weight basis. The laboratory must attempt to meet MRL goals of less than NJDEP cleanup criteria for all compounds/analytes of interest.

6.3 ANALYTICAL METHODS AND HOLDING TIMES

Table 3-1 summarizes the analytical methods to be used and the maximum holding times for soil samples. Sample holding times are calculated from the time of collection. All samples collected under this QAPP will be analyzed as indicated in Table 3-1.

6.4 QUALITY CONTROL

All sample analyses must include a method blank, a method blank spike, a matrix spike (where applicable), a laboratory duplicate for inorganic analyses (or matrix spike duplicate for organic analyses), and a laboratory control standard in each batch of 20 or fewer samples as required by applicable methods. In addition, appropriate surrogate compounds (organic analysis only) will be spiked into each sample. Recoveries from matrix spikes and surrogate compounds will be calculated and recorded on control charts to maintain a history of system performance. The laboratory performance-based acceptable limits for each compound/analyte will be established and provided by the laboratory.

Any blanks and/or other QC parameters not meeting the established acceptance criteria will prompt sample re-extraction/re-digestion and/or re-analysis.

Before any instrument is used as a measurement device on any samples, the instrument responses to known reference materials must be determined. The manner in which various instruments are calibrated is dependent upon the particular type of instrument and its intended use. All sample measurements are made within the calibrated range of the instrument. Preparation of all reference materials used for calibration shall be documented in the standards preparation notebook.

Instrument calibration typically consists of two types: initial calibration and continuing calibration. Initial calibration procedures establish the calibration range of the instrument and determine instrument response over that range. Typically, three to five analyte concentrations are used to establish instrument response over a concentration range. The instrument response over the range is generally absorbance, peak height, etc., which can be expressed as a linear model with a correlation coefficient (e.g., for atomic absorption, inductively coupled plasma, UV-visible-infrared spectrophotometry, ion chromatography) or as a response factor or amount versus response plot (e.g., for GC, GC/MS).

Continuing calibration usually includes measurement of the instrument response to fewer calibration standards and requires instrument response to compare with certain limits (e.g., ±10%) of the initial measured instrument response. Continuing calibration may be used within an analytical sequence to verify stable calibration throughout the sequence and/or to demonstrate that instrument response did not drift during a period of nonuse of the instrument.

Instrument initial calibration must be performed to the pertinent method specifications or the manufacturing manual. Continuing calibration or calibration verification shall be performed at frequencies outlined in the pertinent analytical methods. The acceptance criteria must be met before any samples can be analyzed.

6.5 DATA DELIVERABLE FORMATS

All laboratory data will be provided by the laboratory in NJDEP reduced deliverable format. Electronic data will be sufficient to meet the requirements of the HazSite electronic data deliverables (EDDs) format. HazSite EDDs will be provided to NJDEP as part of the Remedial Action Report.

6.6 LABORATORY REVIEW AND CROSS-CHECK

Details regarding TestAmerica's laboratory review and cross-check procedures for elimination of errors during routine data transfer, in calculations, preparation of data deliverable packages, and off-line storage are provided in TestAmerica's Quality Assurance Manual, which is provided on compact disk as Appendix A to this QAPP..

6.7 DATA VALIDATION

A limited data validation will be conducted by Weston on the sample analysis performed by the laboratory and will consist of the following activities:

- Review of chain-of-custody documents to verify sample identities;
- Review of sample log-in documents to identify any potential problems with custody seals, container integrity, sample preservation, labeling, etc.;
- Review of sample analysis holding times;
- Review of field blank and trip blank (where applicable) data to identify any potential problems with sampling devices contamination, sample container contamination, preservative contamination, laboratory reagent water contamination, or cross-contamination between samples during transport; and
- Review of method blank data to determine the presence or absence of any sources of contamination in the analytical process.

SECTION 7
CORRECTIVE ACTIONS

When a nonconformance or deficiency is identified during a formal audit of field activities, corrective action will be initiated by the Project Manager. The Project Manager will also be responsible for ensuring that the corrective action has actually been taken, and that it adequately addresses the nonconformance. When corrective actions are required in the laboratory, the Laboratory Manager will determine and institute the appropriate corrections.

7.1 FIELD ACTIVITIES

Project personnel will be responsible for reporting suspected QA nonconformances by initiating a nonconformance report.

The field team leader will be responsible for ensuring that corrective actions for nonconformances are implemented by the following actions:

- Evaluating reported nonconformances;
- Eliminating additional work on nonconforming items;
- Determining disposition or action to be taken;
- Maintaining a log of nonconformances;
- Reviewing nonconformance reports;
- Evaluating disposition or action taken; and
- Ensuring that nonconformance reports are included in the final documentation.

The field team leader will ensure that additional work that is dependent on the nonconforming activity is not performed until the nonconformance is corrected, and will be responsible for evaluating each nonconformance and for implementing corrective actions.

7.2 LABORATORY ACTIVITIES

The initial responsibility to monitor the quality of an analytical system lies with the analyst. The analyst will verify that all quality control procedures are followed and results of analysis of quality control samples are within acceptance criteria. This requires that the analyst assess the correctness of all of the following items as appropriate:

- Sample preparation procedure;
- Instrument performance;
- Initial calibration;
- Calibration verification;
- Method blank result;
- Duplicate analysis;
- Laboratory control standard; and

- Fortified sample result.

If the assessment reveals that any of the QC acceptance criteria are not met, the analyst must immediately assess the analytical system to correct the problem. The analyst notifies the appropriate supervisor and the Laboratory QA Officer of the problem and, if possible, identifies potential causes and corrective action.

The nature of the corrective action obviously depends on the nature of the problem. For example, if continuing calibration verification is determined to be out of control, the corrective action may require recalibration of the analytical system and reanalysis of all samples since the last acceptable continuing calibration standard.

When the appropriate corrective action measures have been defined and the analytical system is determined to be "in control," the analyst documents the problem and the corrective action. Copies of the form summarizing these actions are provided to the Section Manager and Laboratory QA Officer.

Data generated concurrently with an out-of-control system will be evaluated for usability in light of the nature of the deficiency. If the deficiency does not impair the usability of the results, data will be reported and the deficiency noted in the case narrative. Where sample results are impaired, the Laboratory Project Manager is notified, and appropriate corrective action (e.g., reanalysis) is taken.

TABLE 3-1
Analytical Methods, and Container and Preservation Requirements
RAWP Addendum 3 and IRM Confirmation Sampling Programs
Hatco Site

Analytical Parameters	Matrix	Preparation Method	Analysis Method	Container	Preservation	Holding Time[(1)]
Post-Excavation Sampling Program						
Soil Samples						
PCBs	Soil	SW-846 3541C/3550C	SW-846 8082	8 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
SVOCs [Benzo(a) anthracene; Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(k) fluoranthene; Bis(2-ethylhexyl) phthalate; Butylbenzyl phthalate; Chrysene; Indeno(123-cd)pyrene; Naphthalene]	Soil	SW-846 3541C/3550	SW-846 8270C	8 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Volatile Organic Compounds [Benzene]	Soil	SW-846 5030/5035	SW-846 8260B	Three 5-gram EnCore Sampler	Cool to 4°C	14 days if frozen within 48 hours of collection
Metals/Inorganics [Arsenic; Beryllium; Lead; Thallium]	Soil	SW-846 3050	SW-846 6010B	8 oz glass	Cool to 4°C	6 months
Aqueous (Field Blank) Samples						
PCBs	Aqueous	SW-846 3540C/3550C	SW-846 8082	Two 1,000-mL amber glass	Cool to 4°C	7 days to extraction; 40 days from extraction to analysis
SVOCs [Benzo(a) anthracene; Benzo(a) pyrene; Benzo(b)fluoranthene; Benzo(k) fluoranthene; Bis(2-ethylhexyl) phthalate; Butylbenzyl phthalate; Chrysene; Indeno(123-cd)pyrene; Naphthalene]	Aqueous	SW-846 3520/3510	SW-846 8270C	Two 1,000-mL amber glass	Cool to 4°C	7 days to extraction; 40 days from extraction to analysis
VOCs [Benzene]	Aqueous	SW-846 5030	SW-846 8260B	Three 40-mL vials with septum cap, no headspace	HCl to pH<2, Cool to 4°C	14 days (7 days if unpreserved)
Metals/Inorganics [Arsenic; Beryllium; Lead; Thallium]	Aqueous	SW-846 3010/3020	SW-846 6010B	One 1,000-mL polyethylene	HNO_3 to pH<2, Cool to 4°C	6 months

Notes can be found at end of Table.

TABLE 3-1 (Continued)
Analytical Methods, and Container and Preservation Requirements
RAWP Addendum 3 and IRM Confirmation Sampling Programs
Hatco Site

Analytical Parameters	Matrix	Preparation Method	Analysis Method	Container	Preservation	Holding Time[1]
Additional Investigation Sampling Program						
Sediment Samples						
PCBs	Sediment	SW-846 3540C/3550C	SW-846 8082	8 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Bis(2-ethylhexyl) phthalate	Sediment	SW-846 3550	SW-846 8270C	8 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Surface Water Samples						
PCBs	Aqueous	SW-846 3540C/3550C	SW-846 8082	Two 1,000-mL amber glass	Cool to 4°C	7 days to extraction; 40 days from extraction to analysis
Bis(2-ethylhexyl) phthalate	Aqueous	SW-846 3520/3510	SW-846 8270C	Two 1,000-mL amber glass	Cool to 4°C	7 days to extraction; 40 days from extraction to analysis
Aqueous (Field Blank) Samples						
Post-IRM Soil Sampling Program						
Polychlorinated Biphenyls (PCBs)	Soil	SW-846 3540C/3550C	SW-846 8082	4 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
PCBs	Aqueous (Field Blank)	SW-846 3540C/3550C	SW-846 8082	1L Amber 1L DI Water	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis

Notes can be found at end of Table.

TABLE 3-1 (Continued)
Analytical Methods, Container, and Preservation Requirements
Post-IRM Confirmation Sampling Program
Hatco Site

Analytical Parameters	Matrix	Preparation Method	Analysis Method	Container	Preservation	Holding Time[1]
LNAPL/Groundwater Effluent Sampling Program [2]						
Volatile Organic Compounds (VOCs)	Aqueous	None	40 CFR 136 Method 624	Three 40-mL VO vial with septa cap, no headspace	HCl to pH<2 Cool to 4°C	14 days
Base-Neutral Extractable Compounds (BNAs)	Aqueous	None	40 CFR 136 Method 625	Two 1-L amber glass	Cool to 4°C	7 days to extraction; 40 days from extraction to analysis
PCBs	Aqueous	None	40 CFR 136 Method 625	Two 1-L amber glass	Cool to 4°C	7 days to extraction; 40 days from extraction to analysis
Arsenic, Iron, Manganese, Cadmium	Aqueous	None	Method for Chemical Analysis of Water and Waste (MCAWW) 200.7	1-L polyethylene	HNO_3 to pH<2 Cool to 4°C	6 months
pH	Aqueous	None	Standard Methods SM 4500-H+	250-mL polyethylene	Cool to 4°C	Immediately
Chemical Oxygen Demand (COD)	Aqueous	None	Standard Methods 5220D	100 mL polyethylene or glass	H_2SO_4 to pH<2 Cool to 4°C	28 days
Biological Oxygen Demand (BOD)	Aqueous	None	Standard Methods 5210B	500 mL polyethylene or glass	Cool to 4°C	48 hours
TSS	Aqueous	None	Standard Methods 2540D	500 mL polyethylene or glass	Cool to 4°C	7 days

Notes can be found at end of Table

TABLE 3-1 (Continued)
Analytical Methods, Container, and Preservation Requirements
Post-IRM Confirmation Sampling Program
Hatco Site

Analytical Parameters	Matrix	Preparation Method	Analysis Method	Container	Preservation	Holding Time[1]
Waste Classification [2]						
Toxicity Characteristic Leaching Procedure (TCLP) VOCs	Solid	SW-846 1311	SW-846 8260B	4-oz wide-mouth with septa cap, packed full	Cool 4°C	14 days to leaching; 14 days from leaching to analysis
TCLP SVOCs	Solid	SW-846 1311	SW-846 8270C	250 mL amber glass	Cool 4°C	14 days to leaching; 7 days from leaching to extraction; 40 days from extraction to analysis
TCLP Pesticides	Solid	SW-846 1311	SW-846 8081	8 oz amber glass	Cool 4°C	14 days to leaching; 7 days from leaching to extraction; 40 days from extraction to analysis
TCLP Herbicides	Solid	SW-846 1311	SW-846 8151	8 oz amber glass	Cool 4°C	14 days to leaching; 7 days from leaching to extraction; 40 days from extraction to analysis
TCLP Metals	Solid	SW-846 1311	SW-846 6010B (7471 for mercury)	250 mL amber glass	Cool 4°C	Mercury: 28 days to TCLP extraction; 28 days from TCLP extraction to determinative analysis. Others: 180 days to TCLP extraction; 180 days from TCLP extraction to determinative analysis
Paint Filter test	Solid	None	SW-846 9095A	8 oz glass	Cool to 4°C	None
Reactive-Cyanide	Solid	None	SW-846 Chapter 7 Section 7.3.3	8 oz glass	Cool to 4°C	None
Reactive-Sulfide	Solid	None	SW-846 Chapter 7 Section 7.3.4	8 oz glass	Cool to 4°C	None
Ignitability	Solid	None	SW-846 1010A	8 oz-glass	Cool to 4°C	None
Corrosivity	Solid	None	SW-846 9045D	8 oz-glass	Cool to 4°C	None
Petroleum Hydrocarbons	Solid	None	Diesel Range Organics by 8015	Two 8-oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
PCBs	Solid	SW-846 3540C/3550C	SW-846 8082	4 oz glass	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis

Notes:
(1) Holding time begins with the date of collection.
(2) Preliminary list of parameters; information will be finalized based on requirements of selected disposal facility.

IRM: Interim Remedial Measure
HCl: Hydrochloric acid
HNO_3: Nitric acid
mL: Milliliters
oz: ounces
RAWP: Remedial Action Work Plan
PCBs: Polychlorinated biphenyls
SVOCs: Semivolatile organic compounds
SW: Solid waste
VOCs: Volatile organic compounds
°C: Degrees Celsius

TABLE 3-2
Summary of Field QC Samples
RAWP Addendum 3 and IRM Confirmation Sampling Programs
Hatco Site

Analytical Parameter	Investigation Samples	No. of Field Duplicate[1]	No. of MS/MSD[1]	No. of Field Blank[2]	Estimated No. of Total Investigation Samples
Post-Excavation Sampling Program					
PCBs	931	47	47	TBD	1,025
Bis(2-ethylhexyl)phthalate	236	12	12	TBD	260
Naphthalene	124	7	7	TBD	138
Benzo(a)pyrene	94	5	5	TBD	104
Benzene	41	3	3	TBD	47
Butylbenzyl phthalate	31	2	2	TBD	35
Benzo(a)anthracene	10	1	1	TBD	12
Benzo(k)fluoranthene	10	1	1	TBD	12
Beryllium	10	1	1	TBD	12
Lead	10	1	1	TBD	12
Arsenic	5	1	1	TBD	7
Benzo(b)fluoranthene	5	1	1	TBD	7
Chrysene	5	1	1	TBD	7
Indeno(123-cd)pyrene	5	1	1	TBD	7
Thallium	5	1	1	TBD	7
Additional Investigation Sampling Program					
"Berm" Soil Samples					
PCBs	32	2	2	TBD	36
Benzo(a)anthracene	32	2	2	TBD	36
Benzo(b)fluoranthene	32	2	2	TBD	36
Benzo(k)fluoranthene	32	2	2	TBD	36
Benzo(a)pyrene	32	2	2	TBD	36
Bis(2-ethylhexyl)phthalate	32	2	2	TBD	36
Butylbenzyl phthalate	32	2	2	TBD	36
Chrysene	32	2	2	TBD	36
Indeno(123-cd)pyrene	32	2	2	TBD	36
Naphthalene	32	2	2	TBD	36
Benzene	32	2	2	TBD	36
Arsenic	32	2	2	TBD	36
Beryllium	32	2	2	TBD	36
Lead	32	2	2	TBD	36
Thallium	32	2	2	TBD	36
Pond and Outlet Channel Sediment Samples					
PCBs	6	1	1	TBD	8
Bis(2-ethylhexyl)phthalate	6	1	1	TBD	8
Pond and Outlet Channel Surface Water Samples					
PCBs	3	1	1	TBD	5
Bis(2-ethylhexyl)phthalate	3	1	1	TBD	5

TABLE 3-2 (Continued)
Summary of Field QC Samples
RAWP Addendum 3 and IRM Confirmation Sampling Programs
Hatco Site

Analytical Parameter	Investigation Samples	No. of Field Duplicate[1]	No. of MS/MSD[1]	No. of Field Blank[2]	Estimated No. of Total Investigation Samples
Post-IRM Soil Sampling Program					
PCBs	524	27	27	TBD	578
LNAPL/Groundwater Effluent Sampling Program [(3)]					
VOCs	See Note 3	See Note 1	See Note 1	N/A	See Note 3
BNAs	See Note 3	See Note 1	See Note 1	N/A	See Note 3
PCBs	See Note 3	See Note 1	See Note 1	N/A	See Note 3
Arsenic, Iron, Manganese, Cadmium	See Note 3	See Note 1	See Note 1	N/A	See Note 3
pH	See Note 3	See Note 1	See Note 1	N/A	See Note 3
COD	See Note 3	See Note 1	See Note 1	N/A	See Note 3
BOD	See Note 3	See Note 1	See Note 1	N/A	See Note 3
TSS	See Note 3	See Note 1	See Note 1	N/A	See Note 3
Waste Classification [(3)]					
TCLP VOCs	20+	N/A	N/A	N/A	5+
TCLP BNAs	20+	N/A	N/A	N/A	5+
TCLP Pesticides	20+	N/A	N/A	N/A	5+
TCLP Herbicides	20+	N/A	N/A	N/A	5+
TCLP Metals	20+	N/A	N/A	N/A	5+
Paint Filter	20+	N/A	N/A	N/A	5+
RCRA Characteristics[(4)]	20+	N/A	N/A	N/A	5+
Petroleum Hydrocarbons	20+	N/A	N/A	N/A	5+
PCBs (excavated soils)	20+	N/A	N/A	N/A	5+

NOTES
1. Estimated field duplicate samples and estimated MS/MSD samples will be collected at a rate of 1 per 20.
2. Estimated Field blank will be collected at a rate of 1 per day for daily per decontamination event.
3. Preliminary list of parameters. Parameters will be finalized based requirements of requirements disposal facility. Number of samples will be finalized based on frequency requirements of disposal facility combined with total amount of waste generated and number of waste streams generated.
4. RCRA Characteristics include: ignitability, corrosivity, reactivity, and toxicity.

BNAs: Base-Neutral and Acid Extractable Compounds
BOD: Biological Oxygen Demand
COD: Chemical Oxygen Demand
IRM: Interim Remedial Action
LNAPL: Light Non-Aqueous Phase Liquid
MCUA: Middlesex County Utilities Authority
MS/MSD: Matrix Spike/Matrix Spike Duplicate
PCBs: Polychlorinated Biphenlys
RAWP: Remedial Action Work Plan
RCRA: Resource Conservation and Recovery Act
TBD: To be determined
TCLP: Toxicity Characteristic Leaching Procedure
TSS: Total Suspended Solids
VOC: Volatile Organic Compounds

Cover Page:

Quality Assurance Manual

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This document was previously identified as No. EDS-QA-LQM

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Quality Assurance Manual
Approval Signatures

	12/20/07
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	12/20/07
Quality Manager - Carl Armbruster	**Date**
	12/20/07
Laboratory Operations Manager – Mark Acierno	**Date**

SECTION 2

TABLE OF CONTENTS

Section No.	Title	Page No.	Effective Date
-	COVER PAGE	COVER	01/01/2008
1.0	TITLE PAGE	1-1	01/01/2008
2.0	TABLE OF CONTENTS	2-1	01/01/2008
3.0	INTRODUCTION	3-1	01/01/2008
3.1	Introduction And Compliance References	3-1	01/01/2008
3.2	Terms And Definitions	3-1	01/01/2008
3.3	Scope / Fields Of Testing	3-2	01/01/2008
3.4	Management Of The Manual	3-2	01/01/2008
4.0	ORGANIZATION AND MANAGEMENT *(NELAC 5.4.1)*	4-1	01/01/2008
4.1	Overview	4-1	01/01/2008
4.2	Roles And Responsibilities	4-2	01/01/2008
4.3	Deputies	4-13	01/01/2008
5.0	QUALITY SYSTEM *(NELAC 5.4.2)*	5-1	01/01/2008
5.1	Quality Policy Statement	5-1	01/01/2008
5.2	Ethics And Data Integrity	5-1	01/01/2008
5.3	Quality System Supporting Documentation	5-2	01/01/2008
5.4	Qa/Qc Objectives For The Measurement Of Data	5-3	01/01/2008
5.5	Criteria For Quality Indicators	5-5	01/01/2008
5.6	Statistical Quality Control	5-5	01/01/2008
5.7	Quality System Metrics	5-6	01/01/2008
6.0	DOCUMENT CONTROL *(NELAC 5.4.3)*	6-1	01/01/2008
6.1	Overview	6-1	01/01/2008
6.2	Document Approval And Issue	6-1	01/01/2008
6.3	Procedures For Document Control Policy	6-2	01/01/2008
6.4	Obsolete Documents	6-2	01/01/2008
7.0	REVIEW OF WORK REQUEST	7-1	01/01/2008
7.1	Overview	7-1	01/01/2008
7.2	Review Sequence And Key Personnel	7-2	01/01/2008
7.3	Documentation	7-3	01/01/2008
8.0	SECTION 8 *(NELAC 5.4.5)*	8-1	01/01/2008
8.1	Overview	8-1	01/01/2008
8.2	Qualifying And Monitoring Subcontractors	8-1	01/01/2008
8.3	Oversight And Reporting	8-4	01/01/2008
8.4	Contingency Planning	8-5	01/01/2008
9.0	PURCHASING SERVICES AND SUPPLIES *(NELAC 5.4.6)*	9-1	01/01/2008
9.1	Overview	9-1	01/01/2008
9.2	Glassware	9-1	01/01/2008
9.3	Reagents, Standards & Supplies	9-1	01/01/2008

Section No.	Title	Page No.	Effective Date
9.4	Purchase Of Equipment/Instruments/Software	9-3	01/01/2008
9.5	Services	9-4	01/01/2008
9.6	Suppliers	9-4	01/01/2008
10.0	SERVICE TO THE CLIENT *(NELAC 5.4.7)*	10-1	01/01/2008
10.1	Overview	10-1	01/01/2008
10.2	Special Services	10-1	01/01/2008
10.3	Client Communication	10-1	01/01/2008
10.4	Reporting	10-1	01/01/2008
10.5	Client Surveys	10-2	01/01/2008
11.0	COMPLAINTS *(NELAC 5.4.8)*	11-1	01/01/2008
11.1	Overview	11-1	01/01/2008
11.2	External Complaints	11-1	01/01/2008
11.3	Internal Complaints	11-2	01/01/2008
11.4	Management Review	11-2	01/01/2008
12.0	CONTROL OF NON-CONFORMING WORK *(NELAC 5.4.9)*	12-1	01/01/2008
12.1	Overview	12-1	01/01/2008
12.2	Responsibilities And Authorities	12-1	01/01/2008
12.3	Evaluation Of Significance And Actions Taken	12-2	01/01/2008
12.4	Prevention Of Nonconforming Work	12-2	01/01/2008
12.5	Method Suspension/Restriction (Stop Work Procedures)	12-3	01/01/2008
13.0	CORRECTIVE ACTION *(NELAC 5.4.10)*	13-1	01/01/2008
13.1	Overview	13-1	01/01/2008
13.2	Definitions	13-1	01/01/2008
13.3	General	13-1	01/01/2008
13.4	Closed Loop Corrective Action Process	13-2	01/01/2008
13.5	Technical Corrective Actions	13-3	01/01/2008
13.6	Basic Corrections	13-4	01/01/2008
14.0	PREVENTIVE ACTION *(NELAC 5.4.11)*	14-1	01/01/2008
14.1	Overview	14-1	01/01/2008
14.2	Management Of Change	14-2	01/01/2008
15.0	CONTROL OF RECORDS *(NELAC 5.4.12)*	15-1	01/01/2008
15.1	Overview	15-1	01/01/2008
15.2	Technical And Analytical Records	15-3	01/01/2008
15.3	Laboratory Support Activities	15-5	01/01/2008
15.4	Administrative Records	15-5	01/01/2008
15.5	Records Management, Storage And Disposal	15-5	01/01/2008
16.0	AUDITS *(NELAC 5.4.13)*	16-1	01/01/2008
16.1	Overview	16-1	01/01/2008
16.2	Technical And Analytical Records	16-1	01/01/2008
16.3	External Audits	16-3	01/01/2008
16.4	Audit Findings	16-5	01/01/2008
17.0	MANAGEMENT REVIEWS *(NELAC 5.4.14)*	17-1	01/01/2008
17.1	Quality Assurance Report	17-1	01/01/2008
17.2	Annual Management Review	17-2	01/01/2008

Section No.	Title	Page No.	Effective Date
17.3	Potential Integrity Related Managerial Reviews	17-3	01/01/2008
18.0	PERSONNEL *(NELAC 5.5.2)*	18-1	01/01/2008
18.1	Overview	18-1	01/01/2008
18.2	Education And Experience Requirements For Technical Personnel	18-1	01/01/2008
18.3	Training	18-2	01/01/2008
18.4	Data Integrity And Ethics Training Program	18-3	01/01/2008
19.0	ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS *(NELAC 5.5.3)*	19-1	01/01/2008
19.1	Overview	19-1	01/01/2008
19.2	Environment	19-1	01/01/2008
19.3	Work Areas	19-2	01/01/2008
19.4	Floor Plan	19-2	01/01/2008
19.5	Building Security	19-3	01/01/2008
20.0	TEST METHODS AND METHOD VALIDATION *(NELAC 5.5.4)*	20-1	01/01/2008
20.1	Overview	20-1	01/01/2008
20.2	STANDARD OPERATING PROCEDURES (Sops)	20-1	01/01/2008
20.3	Laboratory Methods Manual	20-1	01/01/2008
20.4	Selection Of Methods	20-2	01/01/2008
20.5	Laboratory Developed Methods And Non-Standard Methods	20-5	01/01/2008
20.6	Validation Of Methods	20-5	01/01/2008
20.7	Method Detection Limits (Mdl)/ Limits Of Detection (Lod)	20-7	01/01/2008
20.8	Instrument Detection Limits (Idl)	20-8	01/01/2008
20.9	Verification Of Detection And Reporting Limits	20-9	01/01/2008
20.10	Retention Time Windows	20-9	01/01/2008
20.11	Evaluation Of Selectivity	20-10	01/01/2008
20.12	Estimation Of Uncertainty Of Measurement	20-10	01/01/2008
20.13	Control Of Data	20-11	01/01/2008
21.0	EQUIPMENT (AND CALIBRATIONS) *(NELAC 5.5.5)*	21-1	01/01/2008
21.1	Overview	21-1	01/01/2008
21.2	Preventive Maintenance	21-1	01/01/2008
21.3	Support Equipment	21-3	01/01/2008
21.4	Instrument Calibrations	21-5	01/01/2008
21.5	Policy On Tentatively Identified Compounds (Tics) – Gc/Ms Analysis	21-13	01/01/2008
21.6	Policy On Gc/Ms Tuning	21-13	01/01/2008
22.0	MEASUREMENT TRACEABILITY *(NELAC 5.5.6)*	22-1	01/01/2008
22.1	Overview	22-1	01/01/2008
22.2	Nist-Traceable Weights And Thermometers	22-2	01/01/2008
22.3	Reference Standards / Materials	22-2	01/01/2008
22.4	Documentation And Labeling Of Standards, Reagents, And Reference Materials	22-2	01/01/2008

Section No.	Title	Page No.	Effective Date
23.0	SAMPLING *(NELAC 5.5.7)*	23-1	01/01/2008
23.1	Overview	23-1	01/01/2008
23.2	Sampling Containers	23-1	01/01/2008
23.3	Field Quality Control (Qc)	23-2	01/01/2008
23.4	Definition Of Holding Time	23-3	01/01/2008
23.5	Sampling Containers, Preservation Requirements, Holding Times	23-3	01/01/2008
23.6	Sample Aliquots / Subsampling	23-3	01/01/2008
24.0	HANDLING OF SAMPLES *(NELAC 5.5.8)*	24-1	01/01/2008
24.1	Chain Of Custody (Coc)	24-1	01/01/2008
24.2	Sample Receipt	24-2	01/01/2008
24.3	Sample Acceptance Policy	24-4	01/01/2008
24.4	Sample Storage	24-4	01/01/2008
24.5	Hazardous Samples And Foreign Soils	24-5	01/01/2008
24.6	Sample Shipping	24-5	01/01/2008
24.7	Sample Disposal	24-5	01/01/2008
25.0	ASSURING THE QUALITY OF TEST RESULTS *(NELAC 5.5.9)*	25-1	01/01/2008
25.1	Overview	25-1	01/01/2008
25.2	Controls	25-1	01/01/2008
25.3	Negative Controls	25-1	01/01/2008
25.4	Positive Controls	25-2	01/01/2008
25.5	Sample Matrix Controls	25-4	01/01/2008
25.6	Acceptance Criteria (Control Limits)	25-6	01/01/2008
25.7	METHOD DETECTION LIMITS (Mdls)	25-8	01/01/2008
25.8	Additional Procedures To Assure Quality Control	25-8	01/01/2008
26.0	REPORTING RESULTS *(NELAC 5.5.10)*	26-1	01/01/2008
26.1	Overview	26-1	01/01/2008
26.2	Test Reports	26-1	01/01/2008
26.3	Reporting Level Or Report Type	26-3	01/01/2008
26.4	Supplemental Information For Test	26-4	01/01/2008
26.5	Environmental Testing Obtained From Subcontractors	26-5	01/01/2008
26.6	Client Confidentiality	26-5	01/01/2008
26.7	Format Of Reports	26-6	01/01/2008
26.8	Amendments To Test Reports	26-6	01/01/2008
26.9	Policies On Client Requests For Amendments	26-6	01/01/2008

LIST OF TABLES

Table No.	Title	Page	Effective Date
9-1	Storage of Reagents and Chemicals	9-6	01/01/2008
13-1	Example - General Corrective Action Procedures	13-6	01/01/2008
15-1	Record Index	15-1	01/01/2008
15-2	Special Record Retention Requirements	15-2	01/01/2008
16-1	Audit Types and Frequency	16-1	01/01/2008
21-1	Example - Laboratory Equipment & Instrumentation	21-15	01/01/2008
21-2	Example – Schedule of Routine Maintenance	21-34	01/01/2008
21-3	Example – Periodic Calibration	21-37	01/01/2008
22-1	Example – Standard Source & Preparation	22-5	01/01/2008
23-1	Holding Times, Preservation and Container Requirements - Drinking Water (SDWA)	23-5	01/01/2008
23-2	Holding Times, Preservation and Container Requirements: NPDES, RCRA – Organic	23-14	01/01/2008
23-3	Holding Times, Preservation and Container Requirements: Drinking Water (SDWA)	23-22	01/01/2008
23-4	Holding Times, Preservation and Container Requirements: U.S. EPA Contract Laboratory Program Statement of Work	23-25	01/01/2008
23-5	Holding Times, Preservation and Container Requirements: TCLP and SPLP	23-27	01/01/2008
23-6	Holding Times, Preservation and Container Requirements: NPDES – Bacteria, Protozoa, Toxicity Tests	23-28	01/01/2008
23-7	Holding Times, Preservation and Container Requirements: NPDES - Radiological	23-29	01/01/2008
23-8	Holding Times, Preservation and Container Requirements: Air Samples	23-30	01/01/2008

LIST OF FIGURES

Figure No.	Title	Page	Effective Date
3-1	Example - Format for a QA/QC Policy Memorandum	3-4	01/01/2008
4-1	Corporate Organizational Chart	4-14	01/01/2008
8-1	Example - Subcontracting Laboratory Approval Form (Initial / Renewal)	8-6	01/01/2008
8-2	Example - Subcontracted Sample Form	8-7	01/01/2008
9-1	Example - JD Edwards Vendor Add Request Form	9-7	01/01/2008
13-1	Example - Corrective Action Report	13-5	01/01/2008
16-1	Example - Internal Audit Workbook	16-7	01/01/2008
16-2	Example – Internal Audit System Checklist	16-8	01/01/2008
17-1	Example - QA Monthly Report to Management	17-4	01/01/2008
17-2	Example – Laboratory Metrics Categories	17-6	01/01/2008
20-1	Example – Demonstration of Capability Documentation	20-19	01/01/2008
20-2	Example – New Method / Additional Analyte Checklist	20-20	01/01/2008
20-3	Work Flow	20-21	01/01/2008
24-1	Example – Chain of Custody	24-7	01/01/2008
24-2	Example - Custody Seal	24-8	01/01/2008
24-3	Example – Internal Chain of Custody Form	24-9	01/01/2008
24-4	Example – Sample Disposal Record	24-10	01/01/2008
24-5	Example – Sample Acceptance Policy	24-11	01/01/2008
24-6	Example – Cooler Receipt Form	24-12	01/01/2008
26-1	Read and Understand Memo for: Electronic Reporting and Electronic Signatures Policy	26-8	01/01/2008
26-2	Agreement for Electronic Reports	26-9	01/01/2008

LIST OF APPENDICES

Appendix No.	Title	Page	Effective Date
1	TestAmerica Ethics Policy No. CA-L-P-001	Appendix 1-1	01/01/2008
2	Example - Laboratory Organization Chart	Appendix 2-1	01/01/2008
3	Laboratory Floor Plan	Appendix 3-1	01/01/2008
4	Summary of Calibration, QC Procedures and Corrective Action	Appendix 4-1	01/01/2008
5	Glossary / Acronyms	Appendix 5-1	01/01/2008
6	Laboratory Certifications, Accreditations, Validations	Appendix 6-1	01/01/2008
7	Data Qualifiers	Appendix 7-1	01/01/2008

SOPs AND POLICIES REFERRED TO IN THE QA MANUAL

SOP/Policy Reference	Title
CA-Q-S-001	Solvent and Acid Lot Testing and Approval
CA-Q-S-002	Acceptable Manual Integration Practices
CA-Q-S-003	Management of Change Procedure
CA-Q-S-004	Method Compliance & Data Authenticity Audits
CA-Q-S-005	Calibration Curves (General)
CW-Q-S-001	Corporate Document Control and Archiving
CW-Q-S-002	Writing a Standard Operating Procedure (SOPs)
CA-L-S-001	Internal Investigation of Potential Data Discrepancies and Determination for Data Recall
CA-L-S-002	Subcontracting Procedures
CA-L-P-001	Ethics Policy
CA-L-P-002	Contract Compliance Policy
CW-L-P-001	Record Retention
CW-F-P-002	Authorization Matrix
CA-C-S-001	Work Sharing Process
CA-T-P-001	Qualified Products List
CW-F-S-004	Controlled Purchases Policy

SECTION 3

INTRODUCTION
(NELAC 5.1 - 5.3)

3.1 INTRODUCTION AND COMPLIANCE REFERENCES

TestAmerica Edison's Quality Assurance Manual (QAM) is a document prepared to define the overall policies, organization objectives and functional responsibilities for achieving TestAmerica's data quality goals. Each TestAmerica laboratory maintains a local perspective in its scope of services and client relations and maintains a national perspective in terms of quality.

The QAM has been prepared to assure compliance with the 2003 National Environmental Laboratory Accreditation Conference (NELAC) standards and ISO/IEC Guide 17025 (1999). In addition, the policies and procedures outlined in this manual are compliant with the various accreditation and certification programs listed in Appendix 6. The relevant NELAC section is included in the heading of each QAM section.

The QAM has been prepared to be consistent with the requirements of the following documents:

- EPA 600/4-88/039, *Methods for the Determination of Organic Compounds in Drinking Water,* EPA, Revised July 1991.
- EPA 600/R-95/131, *Methods for the Determination of Organic Compounds in Drinking Water,* Supplement III, EPA, August 1995.
- EPA 600/4-79-019, *Handbook for Analytical Quality Control in Water and Wastewater Laboratories,* EPA, March 1979.
- EPA SW-846, *Test Methods for the Evaluation of Solid Waste, 3rd Edition,* September 1986; Update I, July 1992; Update II, September 1994; and Update III, December 1996.
- Federal Register, 40 CFR Parts 136, 141, 172, 173, 178, 179 and 261.
- USEPA Contract Laboratory Program. *Statement of Work for Inorganics Analysis. Multi-Media, Multi-Concentration*. Document ILM04.0.
- USEPA Contract Laboratory Program. *Statement of Work for Inorganics Analysis. Multi-Media, Multi-Concentration*. Document ILM05.3, February 2004.
- USEPA Contract Laboratory Program. *Statement of Work for Organics Analysis. Multi-Media, Multi-Concentration.* Document Number OLMO3.1, August 1994.
- USEPA Contract Laboratory Program. *Statement of Work for Organics Analysis. Multi-Media, Multi-Concentration.* Document Number OLMO4.2, May 1999.
- APHA, *Standard Methods for the Examination of Water and Wastewater,* 18th Edition, 19th, 20th and 21st Edition.
- Toxic Substances Control Act (TSCA).

3.2 TERMS AND DEFINITIONS

A Quality Assurance Program is a company-wide system designed to ensure that data produced by TestAmerica Edison conforms to the standards set by state and/or federal regulations. The program functions at the management level through company goals and management policies, and at the analytical level through Standard Operating Procedures

(SOPs) and quality control. The TestAmerica program is designed to minimize systematic error, encourage constructive, documented problem solving, and provide a framework for continuous improvement within the organization.

Refer to Appendix 5 for the Glossary/Acronyms.

3.3 SCOPE / FIELDS OF TESTING

TestAmerica Edison analyzes thousands of environmental and industrial samples every month. Sample matrices vary among drinking water, wastewater, groundwater, hazardous waste, sludge and soils. The Quality Assurance Program contains specific procedures and methods to test samples of differing matrices for chemical, physical and biological parameters. The Program also contains guidelines on maintaining documentation of analytical process, reviewing results, servicing clients and tracking samples through the laboratory. The technical and service requirements of all requests to provide analyses are thoroughly evaluated before commitments are made to accept the work. Measurements are made using published reference methods or methods developed and validated by the laboratory.

The methods covered by this manual include the most frequently requested water, industrial waste, and soil methodologies needed to provide analytical services in the United States and its territories. The specific list of test methods used by the laboratory can be found in TestAmerica Edison Work Instruction No. EDS-WI-009 (Analytical Methods Capabilities). The approach of this manual is to define the minimum level of quality assurance and quality control necessary to meet requirements. All methods performed by TestAmerica Edison shall meet these criteria as appropriate. In some instances, quality assurance project plans (QAPPs), project specific data quality objectives (DQOs) or local regulations may require criteria other than those contained in this manual. In these cases, the laboratory will abide by the requested criteria following review and acceptance of the requirements by the Laboratory Director and the Quality Assurance (QA) Manager. In some cases, QAPPs and DQOs may specify less stringent requirements. The Laboratory Director and the QA Manager must determine if it is in the lab's best interest to follow the less stringent requirements.

3.4 MANAGEMENT OF THE MANUAL

3.4.1 Review Process

The manual is reviewed annually by the QA Manager and laboratory personnel to assure that it reflects current practices and meets the requirements of TestAmerica Edison's clients and regulators. Occasionally, the manual may need changes in order to meet new or changing regulations and operations. The QA Manager will review the changes in the normal course of business and incorporate changes into revised sections of the document. The updates will be reviewed by the QA Manager, Laboratory Director/Manager, Technical Director(s), relevant operational staff and Corporate Quality Assurance (if a change is made to the Corporate template) and then formally incorporated into the document in periodic updates. The QAM is based on a Corporate QAM Template that is prepared and approved by the Chief Operating Officers (COOs) and Corporate Quality Assurance. This template is reviewed annually by the COOs, Corporate Quality, and each laboratory. Necessary changes are coordinated by the Vice President of Quality and Environmental Health & Safety (EHS) and distributed to each laboratory for inclusion in the laboratory specific QA Manuals.

Policies in the QAM that require immediate attention may be addressed through the use of Corporate QA/QC Policy Memoranda. QA/QC Policy Memoranda are published from time to time to facilitate immediate changes to QA/QC Policy. QA/QC Policy Memoranda supersede the QAM and all other SOPs (refer to Section 5.3). All policy memoranda are dated, archived and distributed by their placement into the front of the QAM between the signature page and Section 2. At a minimum, each policy memorandum is approved by the same authorized signatories as shown on the cover page of the QA Manual. In addition, Corporate QA/QC Policy Memoranda are signed by the COOs and VP of Quality and EHS. The QA/QC Policy Memoranda are incorporated into the QAM during the periodic updates. Policy memorandum may also include an expiration date if appropriate. An example format can be found in Figure 3-1. A similar procedure is followed for local laboratory changes.

Laboratory-specific QAM changes are approved and documented through the Management of Change process (Refer to SOP No. CA-Q-S-003, Management of Change Procedure).

3.4.2 Control

This manual is considered confidential within TestAmerica and may not be altered in any manner by other than a duly appointed representative from TestAmerica. If the document has been provided to external users or regulators, it is for the exclusive purpose of reviewing TestAmerica Edison's quality systems and shall not be used in any other way without the written permission of an appointed representative of TestAmerica. The procedure for control of distribution is incorporated by reference to TestAmerica Edison SOP No. ED-GEN-002 (Document Control Procedures).

The order of precedence in the event of a conflict between policies is outlined in Section 5.3 of this Quality Assurance Manual.

Figure 3-1.

Example - Format for a QA/QC Policy Memorandum

Corporate (or Laboratory) QA/QC Policy Memorandum # _____

Effective Date: _____ Expiration Date: When Appropriate QAM Section is Revised

Corporate: *(Only needed for Corporate Memorandum – Delete if Laboratory)*

_____	_____
COO - West Date	Vice-President, QA and EHS Date
_____	
COO - East Date	

Local:

_____	_____
Laboratory Director Approval Date	Quality Assurance Approval Date
_____	_____
Operations Manager Approval Date	Date

1. **Purpose**

2. **Procedure**

3. **Attachments**

4. **References/Cross References**

SECTION 4

ORGANIZATION AND MANAGEMENT
(NELAC 5.4.1)

4.1 OVERVIEW

TestAmerica Edison is part of a national network of laboratories known as TestAmerica. This Quality Assurance Manual (QAM) is applicable to the TestAmerica Edison laboratory only.

TestAmerica Edison
777 New Durham Road
Edison, NJ 08817
EPA ID: NJ00312

The Corporate organization chart can be found in Figure 4-1 and the laboratory's organization chart can be found in Appendix 2. The locations of other TestAmerica labs are as follows:

TestAmerica Anchorage
TestAmerica Austin
TestAmerica Buffalo
TestAmerica Burlington
TestAmerica Cedar Falls
TestAmerica Chicago
TestAmerica Connecticut
TestAmerica Corpus Christi
TestAmerica Dayton
TestAmerica Denver
TestAmerica Honolulu
TestAmerica Houston
TestAmerica Irvine
TestAmerica King of Prussia
TestAmerica Knoxville
TestAmerica Los Angeles
TestAmerica Mobile
TestAmerica Morgan Hill
TestAmerica Nashville
TestAmerica North Canton
TestAmerica Ontario
TestAmerica Orlando
TestAmerica Pensacola
TestAmerica Phoenix
TestAmerica Pittsburgh
TestAmerica Portland
TestAmerica Richland
TestAmerica San Francisco
TestAmerica Savannah
TestAmerica Seattle

TestAmerica Spokane
TestAmerica St. Louis
TestAmerica Tacoma
TestAmerica Tallahassee
TestAmerica Tampa
TestAmerica Valparaiso
TestAmerica Watertown
TestAmerica West Sacramento
TestAmerica Westfield

4.2 ROLES AND RESPONSIBILITIES

In order for the Quality Assurance Program to function properly, all members of the staff must clearly understand and meet their individual responsibilities as they relate to the quality program. The following descriptions define each role in its relationship to the Quality Assurance Program. A complete list of job titles with more extensive position descriptions is maintained by laboratory management.

4.2.1 Quality Assurance Program

The responsibility for quality lies with every employee of TestAmerica Edison. All employees have access to the QAM and are responsible for knowing the content of this manual and upholding the standards therein. Each person carries out his/her daily tasks in a manner consistent with the goals and in accordance with the procedures in this manual and the laboratory's SOPs.

4.2.2 Chairman/Chief Executive Officer (CEO)

The Chairman/CEO is the Chairman of the Board of Directors and is ultimately responsible for the quality and performance of all TestAmerica facilities. Together with the President/CEO of the Analytical Division, the Chairman/CEO establishes the overall quality standard and data integrity program for the company, providing the necessary leadership and resources to assure that the standard and integrity program are met.

4.2.3 President/Chief Executive Officer (CEO)

The President/CEO is a member of the Board of Directors and is ultimately responsible for the quality and performance of all TestAmerica facilities. Together with the Chairman/CEO, the President/CEO establishes the overall quality standard and data integrity program for the Analytical Division, providing the necessary leadership and resources to assure that the standard and integrity program are met.

4.2.4 Chief Operating Officer (COO) – East and West

The COOs serve as the ranking executives for all respective analytical laboratory operational functions and report to the President/CEO of the Analytical Division. They are responsible for the daily management of all analytical laboratories, long-term planning and development of technical policies and management plans. They ensure the attainment of corporate objectives through the selection, development, motivation, and evaluation of top management personnel.

The COOs approve all operating budgets and capital expenditures. The COOs sign-off on the final QAM template that contains company policies for implementing the Quality Program.

4.2.5 General Manager (GM)

Each GM reports directly to a COO. Each GM has full responsibility for the overall administrative and operational management of their respective laboratories. The GM's responsibilities include allocation of personnel and resources, long-term planning, setting goals, and achieving the financial, business, and quality objectives of TestAmerica. The GM ensures timely compliance with corporate management directives, policies, and management systems reviews. The GM is also responsible for restricting any laboratory from performing analyses that cannot be consistently and successfully performed to meet the standards set forth in this manual.

4.2.6 Vice President of Quality and Environmental Health and Safety (VP-QA/EHS)

The Vice President of QA/EHS reports directly to the Chairman/CEO. With the aid of the Analytical Division and Non-Analytical Division Senior Management Teams, Laboratory Director/ Managers, Quality Directors, EHS Directors, QA Managers and EHS Coordinators, the VP-QA/EHS has the responsibility for the establishment, general overview and Corporate maintenance of the Quality Assurance and Environmental, Health and Safety Program within TestAmerica. Additional responsibilities include:

- Review of QA/QC aspects of Corporate SOPs, national projects and expansions or changes in services.
- Coordination/preparation of the Corporate QAM Template that is used by each laboratory to prepare its own laboratory-specific QAM.
- Maintenance of Corporate Policies, Quality Memorandums and SOPs. Maintenance of data investigation records that are reported to Corporate Management.
- Work with various organizations outside of TestAmerica to further the development of quality standards and represent TestAmerica at various trade meetings.
- Preparation of a monthly report that includes quality metrics across the Analytical Division and a summary of any quality related initiatives and issues.
- With the assistance of the Corporate Senior Management Teams and the EHS Directors, development and implementation of the TestAmerica Environmental, Health and Safety Program.

4.2.7 Quality Directors (Corporate)

The Quality Directors report to the VP-QA/EHS. Together with the VP-QA/EHS, the Quality Directors have the responsibility for the establishment, general overview and maintenance of the Analytical Division's Quality Assurance Program within TestAmerica. The Quality Directors are responsible for:

- Oversight of the QA/QC programs within each laboratory. This includes a final review of each laboratory-specific QAM and receipt of each laboratory's QA monthly report.
- Review of QA/QC aspects of national projects.
- Assistance with certification activities.

4.2.8 Ethics and Compliance Officers (ECOs)

TestAmerica has designated two senior members of the Corporate staff to fulfill the role of Ethics and Compliance Officer (ECO) – VP-QA/EHS and VP-Client and Technical Services. Each ECO acts as a back-up to the other ECO and both are involved when data investigations occur. Each ECO has a direct line of communication to the entire senior Corporate and lab management staff.

The ECOs ensure that the organization distributes the data integrity and ethical practices policies to all employees and ensures annual trainings and orientation of new hires to the ethics program and its policies. The ECO is responsible for establishing a mechanism to foster employee reporting of incidents of illegal, unethical, or improper practices in a safe and confidential environment.

The ECOs monitor and audit procedures to determine compliance with policies and to make recommendations for policy enhancements to the CEOs, COOs, Laboratory Directoror other appropriate individuals within the laboratory. The ECO will assist the laboratory QA Manager in the coordination of internal auditing of ethical policy related activities and processes within the laboratory, in conjunction with the laboratories regular internal auditing function.

The ECOs will also participate in investigations of alleged violations of policies and work with the appropriate internal departments to investigate misconduct, remedy the situation, and prevent recurrence of any such activity.

4.2.9 Vice President of Client and Technical Services

The Vise President (VP) of Client and Technical Services is responsible for offerings to clients including risk management, technical assistance, legal compliance and contract administration. The VP of Client and Technical Services provides support and direction to the Managers of these areas, and supports the COOs in decisions regarding long term planning, resource allocation and capital expenditures.

4.2.10 Director of Technical Services

The Director of Technical Services is responsible for establishing, implementing and communicating TestAmerica's Analytical Division's Technical Policies, SOPs, and Manuals. Other responsibilities include conducting technical assessments as required, acting as a technical resource in national contracts review, coordinating new technologies, establishing best practices, advising staff on technology advances, innovations, and applications.

4.2.11 Chief Information Officer (CIO)

The CIO is responsible for establishing, implementing and communicating TestAmerica's Information Technology (IT) Policies, SOPs and Manuals. Other responsibilities include coordinating new technologies, development of electronic communication tools such as TestAmerica's intranet and internet sites, ensuring data security and documentation of software, ensuring compliance with the NELAC standard, and assistance in establishing, updating, and maintaining Laboratory Information Management Systems (LIMS) at the various TestAmerica facilities.

4.2.12 Environmental Health and Safety Directors (EHSDs) (Corporate)

The EHSDs report directly to the VP-QA/EHS. The EHSDs are responsible for the development and implementation of the TestAmerica Environmental, Health and Safety program. Responsibilities include:

- Consolidation and tracking all safety and health-related information and reports for the company, and managing compliance activities for TestAmerica locations.
- Coordination/preparation of the corporate Environmental, Health and Safety Manual Template that is used by each laboratory to prepare its own laboratory-specific Safety Manual/ CHP.
- Preparation of information and training materials for laboratory EHS Coordinators.
- Assistance in the internal and external coordination of employee exposure and medical monitoring programs to insure compliance with applicable safety and health regulations.
- Serving as Department of Transportation (D.O.T.) focal point and providing technical assistance to location management.
- Serving as Hazardous Waste Management main contact and providing technical assistance to location management.

4.2.13 Laboratory Director/Lead Technical Director

TestAmerica Edison's Laboratory Director is responsible for the overall quality, safety, financial, technical, human resource and service performance of the whole laboratory and reports to their respective GM. The Laboratory Director provides the resources necessary to implement and maintain an effective and comprehensive Quality Assurance and Data Integrity Program.

Specific responsibilities include, but are not limited to:

- Serves as technical director for all fields of testing. The name of the Laboratory Director/Technical Director will be included in the national database. If the Laboratory Director is absent for a period of time exceeding 15 consecutive calendar days, the incumbent must designate another full time staff member meeting the qualifications of the Technical Director to temporarily perform the function of Technical Director. If the absence exceeds 65 consecutive calendar days, the primary accrediting authority must be notified in writing.

- Ensures that all analysts and supervisors have the appropriate education and training to properly carry out the duties assigned to them and ensures that this training has been documented.
- Ensures that personnel are free from any commercial, financial and other undue pressures which might adversely affect the quality of their work.
- Ensures TestAmerica's human resource policies are adhered to and maintained.
- Ensures that sufficient numbers of qualified personnel are employed to supervise and perform the work of the laboratory.
- Ensures that appropriate corrective actions are taken to address analyses identified as requiring such actions by internal and external performance or procedural audits. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs may be temporarily suspended by the Laboratory Director.
- Monitors standards of performance in quality control and quality assurance.
- Monitors the validity of analyses performed and data generated in the lab to assure reliable data.
- Reviews and approves all SOPs prior to their implementation and ensures all approved SOPs are implemented and adhered to.
- Pursues and maintains appropriate laboratory certification and contract approvals. Supports ISO 17025 requirements.
- Ensures client specific reporting and quality control requirements are met.
- Captains the management team, consisting of the QA Manager, the Operations Manager, the Project Management Director, the Client Services Manager, the Service Center Manager, the Environmental, Health and Safety Manager and the Support Services Manager as direct reports.

4.2.14 Quality Assurance (QA) Manager

The QA Manager has responsibility and authority to ensure the continuous implementation of the quality system based on ISO 17025.

The QA Manager reports directly to the Laboratory Director and has access to Corporate QA for advice and resources. This position is able to evaluate data objectively and perform assessments without outside (i.e., managerial) influence. Corporate QA may be used as a resource in dealing with regulatory requirements, certifications and other quality assurance related items. The QA Manager directs the activities of the QA staff to accomplish specific responsibilities, which include, but are not limited to:

- Having functions independent from laboratory operations for which he/she has quality assurance oversight.
- Maintaining and updating the QAM.
- Monitoring and evaluating laboratory certifications; scheduling proficiency testing samples.
- Monitoring and communicating regulatory changes that may affect the laboratory to management.

- Training and advising the laboratory staff on quality assurance/quality control procedures that are pertinent to their daily activities.
- Having a general knowledge of the analytical test methods for which data audit/review is performed (and/or having the means of getting this information when needed).
- Arranging for or conducting the annual internal audits of quality systems and lab technical operations.
- The laboratory QA Manager will maintain records of all ethics-related training, including the type and proof of attendance.
- Maintain, improve, and evaluate the corrective action database and the corrective and preventive action systems.
- Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs are temporarily suspended following the procedures outlined in Section 13.
- Monitoring standards of performance in quality control and quality assurance.
- Coordinating of document control of SOPs, MDLs, control limits, and miscellaneous forms and information.
- Review a percentage of all final data reports for internal consistency. Review of Chain of Custody (COC), correspondence with the analytical request, batch QC status, completeness of any corrective action statements, 5% of calculations, format, holding time, sensibility and completeness of the project file contents.
- Review of external audit reports and data validation requests.
- Follow-up with audits to ensure client QAPP requirements are met.
- Establishment of reporting schedule and preparation of various quality reports for the Laboratory Director, clients and/or Corporate QA.
- Development of suggestions and recommendations to improve quality systems.
- Research of current state and federal requirements and guidelines.
- Captains the QA team to enable communication and to distribute duties and responsibilities.

4.2.15 LAN Analyst

The LAN Analyst reports directly to the Regional Desktop Support Supervisor. Responsibilites include:

- Works with Corporate IT to solve information systems problems and to standardize laboratory IT equipment and processes.
- Monitors and supports office automation so that LAN is operational for internal and external communications.
- Troubleshoots problems throughout laboratory relating to computers, software, telephones and other electronic equipment.
- Responsible for new user setup on network, LIMS, telephone and voice mail.
- Installs or upgrades computers and other equipment.

- Maintains tape backups for multiple computer servers including LIMS.
- Maintains historical files of software, software operating procedures (manuals), software changes/modifications (Change Log) and software version numbers.
- Maintains log of repairs and service performed on LIMS hardware.
- Maintains awareness of any environmental conditions of the facility housing the LIMS that may compromise LIMS raw data and informs management.

4.2.16 Operations Manager

The Operations Manager manages and directs the analytical production sections of the laboratory. He/She reports directly to the Laboratory Director. Specific responsibilities include:

- Evaluates the level of internal/external non-conformances for all departments.
- Continuously evaluates production capacity and improves capacity utilization.
- Continuously evaluates turnaround time and addresses any problems that may hinder meeting the required and committed turnaround time from the various departments.
- Develops and improves the training of all analysts in cooperation with the Laboratory Director and QA Manager and in compliance with regulatory requirements.
- Works with the Department Managers to ensure that scheduled instrument maintenance is completed.
- Is responsible for efficient utilization of supplies.
- Constantly monitors and modifies the processing of samples through the departments.
- Fully supports the quality system and, if called upon in the absence of the QA Manager, serves as his substitute in the interim.

4.2.17 Reports Production Manager

The Reports Production Manager reports directly to the Laboratory Director. The person in this position manages the timely and thorough completion of data packages in accordance with project requirements.

4.2.18 Environmental, Health and Safety Manager

The Environmental, Health and Safety Manager reports directly to the Laboratory Director. The duties of this position consist of:

- Supervises the Environmental, Health and Safety/Facilities Team.
- Conduct ongoing, necessary safety training and conduct new employee safety orientation.
- Assist in developing and maintaining the Chemical Hygiene/Safety Manual.
- Administer dispersal of all Material Safety Data Sheet (MSDS) information.
- Perform regular chemical hygiene and housekeeping instruction.
- Give instruction on proper labeling and practice.
- Serve as chairman of the laboratory safety committee.

- Provide and train personnel on protective equipment.
- Oversee the inspection and maintenance of general safety equipment – fire extinguishers, safety showers, eyewash fountains, etc. and ensure prompt repairs as needed.
- Supervise and schedule fire drills and emergency evacuation drills.
- Determine what initial and subsequent exposure monitoring, if necessary to determine potential employee exposure to chemicals used in the laboratory.
- When determined necessary, conduct exposure monitoring assessments.
- Determine when a complaint of possible over-exposure is "reasonable" and should be referred for medical consultation.
- Assist in the internal and external coordination of the medical consultation/monitoring program conducted by TestAmerica's medical consultants.
- Staying current with the hazardous waste regulations.
- Continuing training on hazardous waste issues.
- Reviewing and updating annually the Hazardous Waste Contingency Plan in the Environmental Health & Safety Manual.
- Auditing the staff with regard to compliance with the Hazardous Waste Contingency Plan.
- Contacting the hazardous waste subcontractors for review of procedures and opportunities for minimization of waste.

4.2.19 Department Managers

Department Managers report to the Operations Manager. Responsibilities include:

- Ensure that analysts in their department adhere to applicable SOPs and the QA Manual. They perform frequent SOP and QA Manual review to determine if analysts are in compliance and if new, modified, and optimized measures are feasible and should be added to these documents.
- With regard to analysts, participates in the selection, training (as documented in Section 8.1), development of performance objectives and standards of performance, appraisal (measurement of objectives), scheduling, counseling, discipline, and motivation of analysts and documents these activities in accordance with systems developed by the QA and Personnel Departments. They evaluate staffing sufficiency and overtime needs. Training consists of familiarization with SOP, QC, Safety, and computer systems.
- Encourage the development of analysts to become cross-trained in various methods and/or operate multiple instruments efficiently while performing maintenance and documentation, self-supervise, and function as a department team.
- Provide guidance to analysts in resolving problems encountered daily during sample prep/analysis in conjunction with the Operations Manager, and/or QA Manager. Each is responsible for 100% of the data review and documentation, non-conformance issues, the timely and accurate completion of performance evaluation samples and MDLs, for his department.

- Ensure all logbooks are maintained, current, and properly labeled or archived.
- Report all non-conformance conditions to the QA Manager, Operations Manager, and/or Laboratory Director.
- Ensure that preventive maintenance is performed on instrumentation as detailed in the QA Manual or SOPs. He is responsible for developing and implementing a system for preventive maintenance, troubleshooting, and repairing or arranging for repair of instruments.
- Maintain adequate and valid inventory of reagents, standards, spare parts, and other relevant resources required to perform daily analysis.
- Achieve optimum turnaround time on analyses and compliance with holding times.
- Conduct efficiency and cost control evaluations on an ongoing basis to determine optimization of labor, supplies, overtime, first-run yield, capacity (designed vs. demonstrated), second- and third-generation production techniques/instruments, and long-term needs for budgetary planning.
- Develop, implement, and enhance calibration programs.
- Provide written responses to external and internal audit issues.

4.2.20 Laboratory Analysts and Technicians

Laboratory analysts and technicians are responsible for conducting analysis and performing all tasks assigned to them by their department manager or supervisor. The responsibilities of the analysts are listed below:

- Perform analyses by adhering to analytical and quality control protocols prescribed by current SOPs, this QA Manual, and project-specific plans honestly, accurately, timely, safely, and in the most cost-effective manner.
- Document standard and sample preparation, instrument calibration and maintenance, data calculations, sample matrix effects, and any observed non-conformance on worklists, benchsheets, lab notebooks and/or the Non-Conformance Database.
- Report all non-conformance situations, instrument problems, matrix problems and QC failures, which might affect the reliability of the data, to their Department Manager, the Laboratory Director, and/or the QA Manager or member of QA staff.
- Perform 100% review of the data generated prior to entering and submitting for secondary level review.
- Suggest method improvements to the Department Manager, the Laboratory Director, and the QA Manager. These improvements, if approved, will be incorporated. Ideas for the optimum performance of their assigned area, for example, through the proper cleaning and maintenance of the assigned instruments and equipment, are encouraged.
- Work cohesively as a team in their department to achieve the goals of accurate results, optimum turnaround time, cost effectiveness, cleanliness, complete documentation, and personal knowledge of environmental analysis.

4.2.21 Sample Control Manager

The Sample Control Manager reports to the Laboratory Director. The responsibilities are outlined below:

- Direct the logging of incoming samples into the LIMS.
- Ensure the verification of data entry from login.
- Manages the preparation and shipment of bottle kits to clients.
- Oversees the responsibilities of all Sample Control Technicians.
- Supervises the storage and disposal of all samples.

4.2.22 Customer Service Manager

The Customer Service Manager reports to the Laboratory Director and serves as the primary interface between the laboratory and the Sales and Marketing staff. Responsibilities include:

- Compiles and interprets receipts forecast to show near term business trends.
- Prepares proposals for new business opportunities.
- Provides general sales support to Account Executives for business development activities started in the field.
- Develops and maintains business materials and organized information resource files that include project descriptions, resumes, original proposals, boilerplates, and company qualifications materials.

4.2.23 Manager, Project Management

The Manager, Project Management reports to the Laboratory Director and serves as the interface between the laboratory's technical departments and the laboratory's clients. The staff consists of the Project Management team. With the overall goal of total client satisfaction, the functions of this position are outlined below:

- Technical training and growth of the Project Management team.
- Technical liaison for the Project Management team.
- Human resource management of the Project Management team.
- Responsible to ensure that clients receive the proper sampling supplies.
- Accountable for response to client inquiries concerning sample status.
- Responsible for assistance to clients regarding the resolution of problems concerning COC
- Ensuring that client specifications, when known, are met by communicating project and quality assurance requirements to the laboratory.
- Notifying the supervisors of incoming projects and sample delivery schedules.
- Accountable to clients for communicating sample progress in daily status meeting with agreed-upon due dates.

- Responsible for discussing with client any project-related problems, resolving service issues, and coordinating technical details with the laboratory staff.
- Responsible for staff familiarization with specific quotes, sample log-in review, and final report completeness.
- Monitor the status of all data package projects in-house to ensure timely and accurate delivery of reports.
- Inform clients of data package-related problems and resolve service issues.
- Coordinate requests for sample containers and other services (data packages).

4.2.24 Project Manager

The Project Managers report directly to the Director of Project Management and serve as liaisons between the laboratory and its clients. The Project Manager's responsibilities include:

- Ensure client specifications are met by communicating project and quality assurance requirements to the laboratory.
- Notify laboratory personnel of incoming projects and sample delivery schedules.
- Monitor the status of all projects in-house to ensure timely delivery of reports.
- Inform clients of project-related problems, resolving service issues and coordinating technical issues with the laboratory staff.
- Accountable for response to client inquiries concerning sample status.
- Responsible for assistance to clients regarding the resolution of problems concerning COC.
- Ensuring that client specifications, when known, are met by communicating project and quality assurance requirements to the laboratory.
- Notifying the supervisors of incoming projects and sample delivery schedules.
- Coordinate client requests for sample containers and other services.
- Schedule sample pick-ups from client offices or project sites and notifying the laboratory staff of incoming samples.
- Coordinate subcontract work.
- Respond to client inquiries concerning sample status.
- Performs final completeness review of data packages prior to release to client.

4.2.25 Project Management Assistant

The Project Management Assistant coordinates and monitors scheduling, timely completion and maintenance of project documentation files and completion of project set up and final report review, invoicing, and EDD's. Assists the Project Manager in servicing the client's needs. Specific responsibilities include:

- Reviews login confirmation reports for accuracy and corrects as needed.

- Generates diskettes for electronic data deliverables (EDD's) for electronic delivery to clients.
- Enters data that was subcontracted to other laboratories.
- Monitors report due dates for timely delivery.
- Assists Project Manager in changing compound lists, TAT, deliverables and other client specific requirements in the LIMs project and/or job database.
- Invoices completed data packages and generates credit or debit invoices to ensure proper payment.

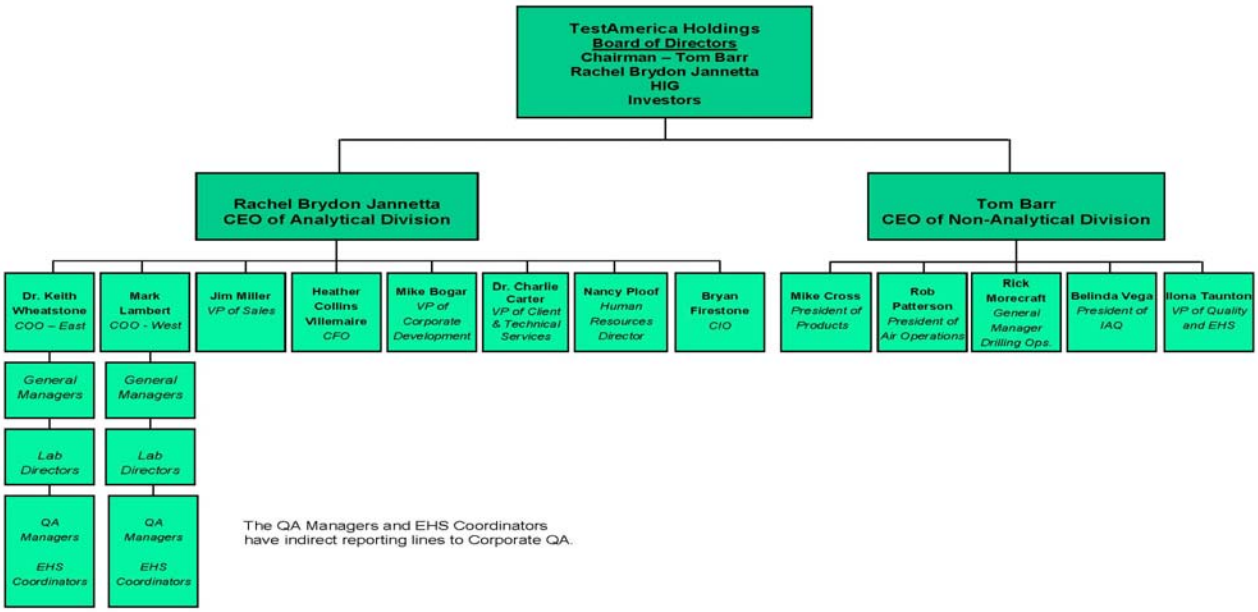
4.3 DEPUTIES

The following table defines who assumes the responsibilities of key personnel in their absence:

Key Personnel	Deputy
Laboratory Director/Manager	Lab Operations Manager
QA Manager	Laboratory Director
Laboratory Operations Manager	Laboratory Director
EHS Coordinator	Laboratory Director or EH&S Manager

Figure 4-1.

Corporate Organization Chart



SECTION 5

QUALITY SYSTEM
(NELAC 5.4.2)

5.1 QUALITY POLICY STATEMENT

The management of TestAmerica and TestAmerica Edison are committed to providing data of known quality to its clients by adhering to approved methodologies, regulatory requirements and the QA/QC protocols described in this manual.

In all aspects of the laboratory and business operations, management is dedicated in maintaining the highest ethical standards. An Ethics Policy sign-off can be viewed in Appendix 1. Training on ethical and legal responsibilities is provided annually and each employee signs off annually on the policy as a condition of employment.

It is TestAmerica's Policy to continually improve systems and provide support to quality improvement efforts in laboratory, administrative and managerial activities. The company recognizes that the implementation of a quality assurance program requires management's commitment and support as well as the involvement of the entire staff.

TestAmerica Edison strives to provide clients with the highest level of professionalism and the best service practices in the industry.

Every staff member at TestAmerica Edison plays an integral part in quality assurance and is held responsible and accountable for the quality of their work. It is, therefore, required that all laboratory personnel are trained and agree to comply with applicable procedures and requirements established by this document.

5.2 ETHICS AND DATA INTEGRITY

TestAmerica is committed to ensuring the integrity of its data and meeting the quality needs of its clients. The 7 elements of TestAmerica's Ethics and Data Integrity Program include:

- An Ethics Policy (Policy No. CA-L-P-001) and employee ethics statements (Appendix 1).
- An Ethics and Compliance Officer (ECO).
- A training program.
- Self-governance through disciplinary action for violations.
- A confidential mechanism for anonymously reporting alleged misconduct and a means for conducting internal investigations of all alleged misconduct. (SOP No. CA-L-S-001)
- Procedures and guidance for recalling data if necessary (SOP No. CA-L-S-001).
- An effective external and internal monitoring system that includes procedures for internal audits (Section 16).

As an American Council of Independent Laboratories (ACIL) member, all TestAmerica laboratories adhere to the following ACIL Code of Ethics:

- Produce results, which are accurate and include QA/QC information that meets client pre-defined Data Quality Objectives (DQOs).
- Present services in a confidential, honest and forthright manner.
- Provide employees with guidelines and an understanding of the ethical and quality standards of our industry.
- Operate our facilities in a manner that protects the environment and the health and safety of employees and the public.
- Obey all pertinent federal, state and local laws and regulations and encourage other members of our industry to do the same.
- Educate clients as the extent and kinds of services available.
- Assert competency only for work for which adequate personnel and equipment are available and for which adequate preparation has been made.
- Promote the status of environmental laboratories, their employees, and the value of services rendered by them.

5.3 QUALITY SYSTEM SUPPORTING DOCUMENTATION

The laboratory's Quality System is communicated through a variety of documents prepared by the laboratory and company management:

- Quality Assurance Manual (QAM) Template
- Quality Assurance Manual – Each laboratory has a lab specific quality assurance manual.
- Corporate SOPs and Policies - Corporate SOPs and Policies are developed for use by all relevant laboratories. They are incorporated into the laboratory's normal SOP distribution, training and tracking system. Corporate SOPs may be general or technical.
- Work Instructions - A subset of procedural steps, tasks or forms associated with an operation of a management system (e.g., checklists, preformatted bench sheets, forms).
- Laboratory SOPs – General and Technical
- Corporate TestAmerica QA/QC Policy Memorandums (Refer to Section 3.4).
- Laboratory QA/QC Policy Memorandums (Refer to Section 3.4).

5.3.1 Order of Precedence

In the event of a conflict or discrepancy between policies, the order of precedence is as follows:

- TestAmerica QA/QC Policy Memorandum - Corporate
- Laboratory QA/QC Policy Memorandum
- Quality Assurance Manual
- Corporate SOPs and Policies
- Laboratory SOPs and Policies

- Other (Work Instructions (WI), memos, flow charts, etc.)

5.4 QA/QC OBJECTIVES FOR THE MEASUREMENT OF DATA

Quality Assurance (QA) and Quality Control (QC) are activities undertaken to achieve the goal of producing data that accurately characterize the sites or materials that have been sampled. Quality Assurance is generally understood to be more comprehensive than Quality Control. Quality Assurance can be defined as the integrated system of activities that ensures that a product or service meets defined standards.

Quality Control is generally understood to be limited to the analyses of samples and to be synonymous with the term *"analytical quality control"*. QC refers to the routine application of statistically based procedures to evaluate and control the accuracy of results from analytical measurements. The QC program includes procedures for estimating and controlling precision and bias and for determining reporting limits.

Request for Proposals (RFPs) and Quality Assurance Project Plans (QAPP) provide a mechanism for the client and the laboratory to discuss the data quality objectives in order to ensure that analytical services closely correspond to client needs. The client is responsible for developing the QAPP. In order to ensure the ability of the laboratory to meet the Data Quality Objectives (DQOs) specified in the QAPP, clients are advised to allow time for the laboratory to review the QAPP before being finalized. Additionally, the laboratory will provide support to the client for developing the sections of the QAPP that concern laboratory activities.

Historically, laboratories have described their QC objectives in terms of precision, accuracy, representativeness, comparability, completeness, selectivity and sensitivity (PARCCSS).

5.4.1 Precision

The laboratory objective for precision is to meet the performance for precision demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Precision is defined as the degree of reproducibility of measurements under a given set of analytical conditions (exclusive of field sampling variability). Precision is documented on the basis of replicate analysis, usually duplicate or matrix spike (MS) duplicate samples. The calculation of precision is described in Section 25.

5.4.2 Accuracy

The laboratory objective for accuracy is to meet the performance for accuracy demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Accuracy is defined as the degree of bias in a measurement system. Accuracy may be documented through the use of laboratory control samples (LCS) and/or MS. A statement of accuracy is expressed as an interval of acceptance recovery about the mean recovery. The calculation of accuracy is described in Section 25.

5.4.3 Representativeness

The laboratory objective for representativeness is to provide data which is representative of the sampled medium. Representativeness is defined as the degree to which data represent a characteristic of a population or set of samples and is a measurement of both analytical and field sampling precision. The representativeness of the analytical data is a function of the procedures used in procuring and processing the samples. The representativeness can be documented by the relative percent difference between separately procured, but otherwise identical samples or sample aliquots.

The representativeness of the data from the sampling sites depends on both the sampling procedures and the analytical procedures. The laboratory may provide guidance to the client regarding proper sampling and handling methods in order to assure the integrity of the samples.

5.4.4 Comparability

The comparability objective is to provide analytical data for which the accuracy, precision, representativeness and reporting limit statistics are similar to these quality indicators generated by other laboratories for similar samples, and data generated by the laboratory over time.

The comparability objective is documented by inter-laboratory studies carried out by regulatory agencies or carried out for specific projects or contracts, by comparison of periodically generated statements of accuracy, precision and reporting limits with those of other laboratories, and by the degree to which approval from the US EPA or other pertinent regulatory agencies is obtained for any procedure for which significant modifications have been made.

5.4.5 Completeness

The completeness objective for data is 90% (or as specified by a particular project), expressed as the ratio of the valid data to the total data over the course of the project. Data will be considered valid if they are adequate for their intended use. Data usability will be defined in a QAPP, project scope or regulatory requirement. Data validation is the process for reviewing data to determine its usability and completeness. If the completeness objective is not met, actions will be taken internally and with the data user to improve performance. This may take the form of an audit to evaluate the methodology and procedures as possible sources for the difficulty or may result in a recommendation to use a different method.

5.4.6 Selectivity

Selectivity is defined as: The capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. Target analytes are separated from non-target constituents and subsequently identified/detected through one or more of the following, depending on the analytical method: extractions (separation), digestions (separation), interelement corrections (separation), use of matrix modifiers (separation), specific retention times (separation and identification), confirmations with different columns or detectors (separation and identification), specific wavelengths (identification), specific mass spectra (identification), specific electrodes (separation and identification), etc..

5.4.7 Sensitivity

Sensitivity refers to the amount of analyte necessary to produce a detector response that can be reliably detected (Method Detection Limit) or quantified (Reporting Limit).

5.5 CRITERIA FOR QUALITY INDICATORS

The laboratory prepares tables that summarize the precision and accuracy acceptability limits for analyses performed at TestAmerica Edison. This summary tables includea an effective date, are updated each time new limits are generated and are located in the Active Work Instruction folder on the shared QA lab network drive. Unless otherwise noted, limits within these tables are laboratory generated. Some acceptability limits are derived from US EPA methods when they are required. Where US EPA method limits are not required, TestAmerica Edison has developed limits from evaluation of data from similar matrices. Criteria for the development of control limits is contained in Section 25.

5.6 STATISTICAL QUALITY CONTROL

Statistically-derived precision and accuracy limits are required by selected methods (such as SW-846) and programs [such as the Ohio Voluntary Action Plan (VAP)]. TestAmerica Edison routinely utilizes statistically-derived limits to evaluate method performance and determine when corrective action is appropriate. The analysts are instructed to use the current limits in the laboratory (dated and approved by the QA Manager) and entered into the Laboratory Information Management System (LIMS). The Quality Assurance department maintains an archive of all limits used within the laboratory. If a method defines the QC limits, the method limits are used.

If a method requires the generation of historical limits, the lab develops such limits from recent data following the guidelines described in Section 25. All calculations and limits are documented and dated when approved and effective. On occasion, a client requests contract-specified limits for a specific project.

Surrogate recoveries are determined for a specific time period as defined above.

Current QC limits are entered and maintained by the QA department. As sample results and the related QC are generated, the sample QC values are compared with the current active limits to determine if they are within the acceptable range. The analyst then evaluates if the sample needs to be rerun or re-extracted/rerun or if a comment should be added to the report explaining the reason for the QC outlier.

5.6.1 QC Charts

As the QC limits are calculated, QC charts may be generated showing warning and control limits for the purpose of evaluating trends. The QA Manager evaluates these as applicable to determine if adjustments need to be made or for corrective actions to methods. All findings are documented and kept on file.

5.7 QUALITY SYSTEM METRICS

In addition to the QC parameters discussed above, the entire Quality System is evaluated on a monthly basis through the use of specific metrics (refer to Section 17). These metrics are used to drive continuous improvement in the laboratory's Quality System.

SECTION 6

DOCUMENT CONTROL
(NELAC 5.4.3)

6.1 OVERVIEW

The QA Department is responsible for the control of documents used in the laboratory to ensure that approved, up-to-date documents are in circulation and out-of-date (obsolete) documents are archived or destroyed. The following documents, at a minimum, must be controlled at each laboratory Facility:

- Laboratory Quality Assurance Manual
- Laboratory Standard Operating Procedures (SOP)
- Laboratory Policies
- Work Instructions and Forms
- Corporate Policies and Procedures distributed outside the intranet

The Corporate staff posts Corporate Manuals, SOPs, Policies, Work Instructions, White Papers and Training Materials on the company intranet site. These are collectively termed "Official Documents" and encompass the Policies and Procedures that all facilities are required to employ. These official documents are only considered controlled when they are read on the company intranet site. Printed copies are considered uncontrolled unless the laboratory physically distributes them as controlled documents. A detailed description of the procedure for issuing, authorizing, controlling, distributing, and archiving official documents is found in Corporate SOP No. CW-Q-S-001, Corporate Document Control and Archiving. TestAmerica Edison SOP No. ED-GEN-002 (Document Control) details lab specific document control procedures.

The laboratory QA Department also maintains access to various references and document sources integral to the operation of the laboratory. This includes reference methods and regulations. Instrument manuals (hard or electronic copies) are also maintained by the laboratory.

The laboratory maintains control of records for raw analytical data and supporting records such as audit reports and responses, logbooks, standard logs, training files, MDL studies, Proficiency Testing (PT) studies, certifications and related correspondence, and Corrective Action Reports. Raw analytical data consists of bound logbooks, instrument printouts, any other notes, magnetic media, electronic data and final reports. Discussion on records control is described in Section 15.

The maintenance of purchasing data is discussed in Section 9.

The maintenance of sales and marketing contracts is discussed in Section 7.

6.2 DOCUMENT APPROVAL AND ISSUE

The pertinent elements of a control system for each document include a unique name and number, the number of pages of the item, the effective date, revision number and the

laboratory's name. The QA Manager is responsible for the maintenance of the system and maintains the items as described in TestAmerica Edison SOP No. ED-GEN-002 (Document Control).

Controlled documents are authorized by the QA Department and other management. In order to develop a new document, a manager submits an electronic draft to the QA Department for suggestions and approval before use. Upon approval, QA personnel add the identifying version information to the document and retains the official document on file. The official document is provided as needed to those using it. Controlled documents shall be available at all locations where the operational activity described in the document is performed (may include electronic access). Controlled documents are identified as such and records of their distribution are kept by the QA Department. Document control may be achieved by either electronic or hardcopy distribution.

The QA Department maintains a list of the official versions of controlled documents.

Quality System Policies and Procedures will be reviewed at a minimum of every two years and revised as appropriate. Changes to documents occur when a procedural change warrants a revision of the document.

6.3 PROCEDURES FOR DOCUMENT CONTROL POLICY

Corporate Document Control procedures are described in SOP No. CW-Q-S001 (Corporate Document Control and Archiving). For changes to local Standard Operating Procedures, the lab QA Manual, work instructions and other local controlled document types refer to TestAmercia Edison SOP No. ED-GEN-002 (Document Control). Changes to SOPs, are further described in TestAmerica corporate SOP No. CW-Q-S-002, (Writing a Standard Operating Procedure (SOP). Uncontrolled copies of these documents must not be used within the laboratory. Previous revisions and back-up copies of all local controlled documents are maintained by the QA department. Electronic copies of the current documents are accessible to lab staff on the Public server in the QA folder for the applicable revision. Additionally, these documents are accessible through the TestAmerica Edison intranet site.

6.4 OBSOLETE DOCUMENTS

All invalid or obsolete documents are removed, or otherwise prevented from unintended use. The laboratory has specific procedures as described above to accomplish this. In general, obsolete documents are collected from employees according to distribution lists and are marked obsolete on the cover or destroyed. At least one copy of the obsolete document is archived as described in Section 15.

SECTION 7

REVIEW OF WORK REQUEST

7.1 OVERVIEW

TestAmerica Edison has established procedures for the review of work requests and contracts, oral or written. The procedures include evaluation of the laboratory's capability and resources to meet the contract's requirements within the requested time period. All requirements, including the methods to be used, must be adequately defined, documented and understood. For many environmental sampling and analysis programs, testing design is site or program specific and does not necessarily "fit" into a standard laboratory service or product. It is TestAmerica's intent to provide both standard and customized environmental laboratory services to our clients.

A thorough review of technical and QC requirements contained in contracts is performed to ensure project success. The appropriateness of requested methods, and the lab's capability to perform them must be established. Projects, proposals and contracts are reviewed for adequately defined requirements and TestAmerica's capability to meet those requirements. Alternate test methods that are capable of meeting the clients' requirements may be proposed by the lab. A review of the lab's capability to analyze non-routine analytes is also part of this review process.

All projects, proposals and contracts are reviewed for the client's requirements in terms of compound lists, test methodology requested, sensitivity (detection and reporting levels), accuracy, and precision requirements (% Recovery and RPD). The reviewer ensures that the laboratory's test methods are suitable to achieve these regulatory and client requirements and that the laboratory holds the appropriate certifications and approvals to perform the work. The laboratory and any potential subcontract laboratories must be certified, as required, for all proposed tests.

The laboratory must determine if it has the necessary physical, personnel and information resources to meet the contract, and if the personnel have the expertise needed to perform the testing requested. Each proposal is checked for its impact on the capacity of the laboratory's equipment and personnel. As part of the review, the proposed turnaround time will be checked for feasibility.

Electronic or hard copy deliverable requirements are evaluated against the lab's capacity for production of the documentation.

If the laboratory cannot provide all services but intends to subcontract such services, whether to another TestAmerica facility or to an outside firm, this will be documented and discussed with the client prior to contract approval. (Refer to Section 8 for Subcontracting Procedures.)

The laboratory informs the client of the results of the review if it indicates any potential conflict, deficiency, lack of accreditation, or inability of the lab to complete the work satisfactorily. Any discrepancy between the client's requirements and TestAmerica's capability to meet those requirements is resolved in writing before acceptance of the contract. It is necessary that the contract be acceptable to both the laboratory and the client. Amendments initiated by the client and/or TestAmerica, are documented in writing.

All contracts, QAPPs, Sampling and Analysis Plans (SAPs), contract amendments, and documented communications become part of the project record.

The review process is repeated when there are amendments to the original contract by the client, and the participating personnel are informed of the changes.

7.2 REVIEW SEQUENCE AND KEY PERSONNEL

Appropriate personnel will review the work request at each stage of evaluation.

For routine projects and other simple tasks, a review by the Project Manager (PM) is considered adequate. The PM confirms that the laboratory has any required certifications, that it can meet the clients' data quality and reporting requirements and that the lab has the capacity to meet the clients turn around needs. It is recommended that, where there is a sales person assigned to the account, an attempt should be made to contact that sales person to inform them of the incoming samples.

For new, complex or large projects, the proposed contract may be reviewed by the National Account Manager or Executive Director of Sales (as applicable), who will provide input as to which lab will receive the work based on the scope of work and other requirements, including certification, testing methodology, and available capacity to perform the work. The contract review process is outlined in SOP No. CA-L-P-002**,** Contract Compliance Policy.

This review encompasses all facets of the operation. The scope of work is distributed to the appropriate personnel, as needed based on scope of contract, to evaluate all of the requirements shown above (not necessarily in the order below) :

- Legal & Contracts Director
- General Manager
- The Laboratory Project Management Director
- The Laboratory Operations Manager
- Laboratory and/or Corporate Technical Directors
- Laboratory and/or Corporate Information Technology Managers/Directors
- Key, Regional and/or National Account representatives
- Laboratory and/or Corporate Quality Managers
- Laboratory and/or Corporate Environmental Health and Safety Managers/Directors
- The Laboratory Director reviews the formal laboratory quote and makes final acceptance for their facility.

The National Account Director, Legal Contracts Director, or local account representative then submits the final proposal to the client.

In the event that one of the above personnel is not available to review the contract, his or her back-up will fulfill the review requirements.

The Legal & Contracts Director maintains copies of all signed contracts. Locally the A/R & Cash Application Associate maintains copies of signed contracts.

7.3 DOCUMENTATION

Appropriate records are maintained for every contract or work request. All stages of the contract review process are documented and include records of any significant changes.

The contract will be distributed to and maintained by the appropriate sales/marketing personnel. A copy of the contract and formal quote will be filed with the laboratory PM and the Lab Director.

Records are maintained of pertinent discussions with a client relating to the client's requirements or the results of the work during the period of execution of the contract. The PM keeps a phone log of conversations with the client.

7.3.1 Project-Specific Quality Planning

Communication of contract specific technical and QC criteria is an essential activity in ensuring the success of site specific testing programs. To achieve this goal, TestAmerica Edison assigns a PM to each client. The PM is the first point of contact for the client. It is the PM's responsibility to ensure that project specific technical and QC requirements are effectively evaluated and communicated to the laboratory personnel before and during the project. QA department involvement may be needed to assist in the evaluation of custom QC requirements.

PM's are the direct client contact and they ensure resources are available to meet project requirements. Although PM's do not have direct reports or staff in production, they coordinate opportunities and work with laboratory management and supervisory staff to ensure available resources are sufficient to perform work for the client's project. Project management is positioned between the client and laboratory resources.

Prior to work on a new project, the dissemination of project information and/or project opening meetings may occur to discuss schedules and unique aspects of the project. Items to be discussed may include the project technical profile, turnaround times, holding times, methods, analyte lists, reporting limits, deliverables, sample hazards, or other special requirements. The PM introduces new projects to the laboratory staff through project kick-off meetings or to the supervisory staff during production meetings. These meetings provide direction to the laboratory staff in order to maximize production and client satisfaction, while maintaining quality. In addition, project notes may be associated with each sample batch as a reminder upon sample receipt and analytical processing.

During the project, any change that may occur within an active project is agreed upon between the client/regulatory agency and the PM/laboratory. These changes (e.g., use of a non-standard method or modification of a method) and approvals must be documented prior to implementation. Documentation pertains to any document, e.g., letter, e-mail, variance, contract addendum, which has been signed by both parties.

Such changes are also communicated to the laboratory during production status meetings. Such changes are updated to the project notes and are introduced to the managers at these meetings. The laboratory staff is then introduced to the modified requirements via the PM or the individual

laboratory Department Manager. After the modification is implemented into the laboratory process, documentation of the modification is made in the case narrative of the data report(s).

TestAmerica strongly encourages client visits to the laboratory and for formal/informal information sharing session with employees in order to effectively communicate ongoing client needs as well as project specific details for customized testing programs.

SECTION 8

SUBCONTRACTING OF TESTS
(NELAC 5.4.5)

8.1 OVERVIEW

For the purpose of this quality manual, the phrase subcontract laboratory refers to a laboratory external to the corporate network. The phrase "work sharing" refers to internal transfers of samples between company laboratories. The term outsourcing refers to the act of subcontracting tests.

When contracting with our clients, the laboratory makes commitments regarding the services to be performed and the data quality for the results to be generated. When we must outsource testing for our clients because project scope, changes in laboratory capabilities, capacity or unforeseen circumstances, we must be assured that the subcontractors or work sharing laboratories understand the requirements and will meet the same commitments we have made to the client. Refer to the SOP on Subcontracting Procedures (CA-L-S-002) and the Work Sharing Process SOP (CA-C-S-001).

When outsourcing analytical services, the laboratory will assure, to the extent necessary, that the subcontract or work sharing laboratory maintains a program consistent with the requirements of this document, the requirements specified in NELAC/ISO 17025 and/or the client's Quality Assurance Project Plan (QAPP). All QC guidelines specific to the client's analytical program are transmitted to the subcontractor and agreed upon before sending the samples to the subcontract facility. Additionally, work requiring accreditation will be placed with an appropriately accredited laboratory. The laboratory performing the subcontracted work will be identified in the final report, as will non-NELAC accredited work where required.

Project Managers (PMs), Customer Service Managers (CSM), or Regional Account Executives (RAE) for the Export Lab are responsible for obtaining client approval prior to outsourcing any samples. The laboratory will advise the client of a subcontract or work sharing arrangement in writing and when possible approval from the client shall be retained in the project folder.

Note: In addition to the client, some regulating agencies, such as the US Army Corps of Engineers and the USDA, require notification prior to placing such work**.**

8.2 QUALIFYING AND MONITORING SUBCONTRACTORS

Whenever a PM becomes aware of a client requirement or laboratory need where samples must be outsourced to another laboratory, the other laboratory(s) shall be selected based on the following:

- The first priority is to attempt to place the work in a qualified network laboratory;
- Firms specified by the client for the task (Documentation that a subcontractor was designated by the client must be maintained with the project file. This documentation can be as simple as placing a copy of an e-mail from the client in the project folder);
- Firms listed as pre-qualified and currently under a subcontract with the company;

- Firms identified in accordance with the company's Small Business Subcontracting program as small, women-owned, veteran-owned and/or minority-owned businesses;
- In addition, the firm must hold the appropriate certification to perform the work required.

All intra-company laboratories are pre-qualified for outsourcing provided they hold the appropriate accreditations, can adhere to the project/program requirements, and the client approved sending samples to that laboratory. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented). The originating laboratory is responsible for communicating all technical, quality, and deliverable requirements as well as other contract needs. Refer to SOP No. CA-C-S-001, Work Sharing Process.

When the potential sub-contract laboratory does not meet the above criteria, then to begin the process, Account Executives or PMs may nominate a laboratory as a subcontractor based on need. The decision to nominate a laboratory must be approved by the Laboratory Director/Manager. The Laboratory Director requests that the QA Manager begin the process of approving the subcontract laboratory. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented).

8.2.1 The QA Manager must ensure that the supporting documentation is on file prior to initiation of any work. In some cases a network laboratory or Corporate QA may have already completed an approval of a subcontracting laboratory. A listing of all approved subcontracting laboratories and supporting documentation is available on the TestAmerica intranet site. If this option is used, the laboratory must ensure that the subcontracting lab is capable of meeting the needs of the current project. A letter or e-mail is sent to the lab requesting the following information:

8.2.1.1 A copy of their Quality Assurance Manual (controlled if possible). Ensure data quality limits for relevant methods are acceptable and that training procedures are adequate. (Optional if Laboratory is NELAC accredited.)

8.2.1.2 Evidence of a current SOP per method. A copy of the first page and signature page of the SOP is acceptable. A table of contents including effective dates may also be acceptable. The SOP can be examined if an on-site audit is performed. (Optional if Laboratory is NELAC accredited.)

8.2.1.3 The most recent 2 sets of full proficiency testing (PT) results relevant to the analyses of interest and any associated corrective action. (Optional if Laboratory is NELAC accredited.)

8.2.1.4 Copy of necessary certifications verifying that the required approvals are current. Ensure that all needed analytes are included; some may not be accredit-able (if so, document). Certificate and scope of International Standard accreditation are required, when applicable. Project Management requests a copy of the current certification at the start-up phase of the client's project and each subsequent project and notification of any revocation of accreditation.

8.2.1.5 Example final report to confirm format is compliant and provides the necessary information. (Optional if Laboratory is NELAC accredited.)

8.2.1.6 Statement of Qualification (SOQ) or summary list of Technical Staff and Qualifications – position, education and years of experience. (Optional if Laboratory is NELAC accredited.)

8.2.1.7 USDA permit if soils less than three feet deep from New York, North Carolina, South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Louisiana, Arkansas, Texas, Oklahoma, New Mexico, Arizona, California, Hawaii, or outside the continental U. S. are to be analyzed. These samples require special shipping measures; check with the EHS Department. It may be necessary to heat-treat the samples before shipping if the subcontract laboratory does not have a USDA permit; however, some analytes/tests may be irrelevant after heat treatment.

8.2.1.8 Insurance Certificate. This is required by TestAmerica's Chief Financial Officer.

8.2.1.9 State Audit with Corrective Action Response. (Optional if Laboratory is NELAC accredited.)

8.2.1.10 Description of Ethics and Data Integrity Plan. (Optional if Laboratory is NELAC accredited.)

8.2.1.11 DoD work includes additional requirements as described in Section 8.1 above.

8.2.1.12 Copy of Raw Data Associated with First Project Sent to the Laboratory. The raw data is reviewed by the QA Manager and the PM to ensure that the results meet the client's needs. This requirement can be skipped if an on-site visit of the laboratory is planned. (Optional if Laboratory is NELAC accredited.) (This requirement is effective as of the effective date of this section. Laboratories worked with previously [minimum of 6 months] are grandfathered in.)

Note: The lab does not need to keep hard copy documentation on file if information on the intranet site is sufficient to meet the needs of the project.

Note: There are some instances where a subcontracting laboratory accredited by a State or Agency program may not require all elements listed below. If the accreditation is NELAC, follow the guidelines below. If the accreditation is not NELAC, contact Corporate QA for approval.

8.2.2 The client will assume responsibility for the quality of the data generated from the use of a subcontractor they have requested the lab to use. The qualified subcontractors on the intranet site are known to meet minimal standards. The company does not certify laboratories. The subcontractor is on our approved list and can only be recommended to the extent that we would use them.

8.2.3 The status and performance of qualified subcontractors will be monitored periodically by the Laboratory who originally posts a subcontracting lab to the intranet site.

- Complaints shall be investigated. Documentation of the complaint, investigation and

corrective action will be maintained in the subcontractor's file on the intranet site. Complaints must be posted using the Vendor Performance Report (Form No. CW-F-WI-009).

- Information must be updated on the intranet when new information is received from the subcontracted laboratories.
- Subcontractors in good standing will be retained on the intranet listing. The QA Manager will notify all network laboratories and Corporate QA if any laboratory is removed from the intranet site. This notification will be posted on the intranet site and e-mailed to all Lab Directors/Managers, QA Managers and Sales Directors.

8.3 OVERSIGHT AND REPORTING

The PM must request that the selected subcontractor be presented with a subcontract, if one is not already executed between the laboratory and the subcontractor. The subcontract must include terms which flow down the requirements of our clients, either in the subcontract itself or through the mechanism of work orders relating to individual projects. A standard subcontract and the Lab Subcontractor Vendor Package (posted on the intranet) can be used to accomplish this, and the Legal & Contracts Director can tailor the document or assist with negotiations, if needed. The PM (or sales personnel) responsible for the project must advise and obtain client consent to the subcontract as appropriate, and provide the scope of work to ensure that the proper requirements are made a part of the subcontract and are made known to the subcontractor.

Prior to sending samples to the subcontracted laboratory, the PM confirms their certification status to determine if it's current and scope-inclusive. The information is documented on a and retained in the project folder. For network laboratories, certifications can be viewed on the company website.

The Sample Control department is responsible for ensuring compliance with QA requirements and applicable shipping regulations when shipping samples to a subcontracted laboratory.

All subcontracted samples must be accompanied by a Chain of Custody (COC). A copy of the original COC sent by the client must be included with all samples subbed within the network.

The PM will communicate with the subcontracted laboratory to monitor the status of the analyses, facilitate successful execution of the work and ensure the timeliness and completeness of the analytical report.

Non-NELAC accredited work must be identified in the subcontractor's report as appropriate. If NELAC accreditation is not required, the report does not need to include this information.

Reports submitted from subcontractor laboratories are not altered and are included in their original form in the final project report. This clearly identifies the data as being produced by a subcontractor facility. If subcontract laboratory data is incorporated into the laboratories EDD (i.e., imported), the report must explicitly indicate which lab produced the data for which methods and samples.

Note: The results submitted by a network work sharing laboratory may be transferred electronically and the results reported by the network work sharing lab are identified on the final report. The report must explicitly indicate which lab produced the data for which methods and samples. The final report must include a copy of the completed COC for all work sharing reports.

8.4 CONTINGENCY PLANNING

The Laboratory Director may waive the full qualification of a subcontractor process temporarily to meet emergency needs. In the event this provision is utilized, Corporate QA must be informed, and the QA Manager will be required to verify adequacy of proficiency scores and certifications. The laboratory must also request a copy of the raw data to support the analytical results for the first project submitted to the subcontract laboratory unless the laboratory has NELAC accreditation. The raw data is reviewed by the QA Manager and the PM to ensure that the results meet the client's needs. The QA Manager will request full documentation and qualify the subcontractor under the provisions above. The approval process should be completed within 30 calendar days of subcontracting.

SECTION 9

PURCHASING SERVICES AND SUPPLIES
(NELAC 5.4.6)

9.1 OVERVIEW

Evaluation and selection of suppliers and vendors is performed, in part, on the basis of the quality of their products, their ability to meet the demand for their products on a continuous and short term basis, the overall quality of their services, their past history, and competitive pricing. This is achieved through evaluation of objective evidence of quality furnished by the supplier, which can include certificates of analysis, recommendations, and proof of historical compliance with similar programs for other clients. To ensure that quality critical consumables and equipment conform to specified requirements, all purchases from specific vendors are approved by a member of the supervisory or management staff.

Capital expenditures are made in accordance with the Controlled Purchases Procedure, CW-F-S-004. Only one quote is required where the item being purchased is a sole source product, Examples of sole source capital expenditures are laboratory test equipment, client specified purchases and building leases. A minimum of two quotes is required where the opportunity exists to source from more than one vendor. All documentation related to the purchase of capital items will be maintained in the individual CapEx files located in Corporate Purchasing. Data will be held in accordance with the record retention policy.

TestAmerica will enter into formal contracts with vendors when it is advantageous to do so. Contracts will be signed in accordance with the Authorization Matrix Policy, CW-F-P-002. Examples of items that are purchased through vendor contracts are laboratory instruments, consumables, copiers and office supplies. Request for Proposals (RFP's) will be issued where more information is required from the potential vendors than just price. RFP's allow TestAmerica to determine if a vendor is capable of meeting requirements such as supplying all of the TestAmerica facilities, meeting required quality standards and adhering to necessary ethical and environmental standards. The RFP process also allows potential vendors to outline any additional capabilities they may offer.

Non-capital expenditure items are purchased through the requisition and approval process in JD Edwards or through other TestAmerica authorized methods (approved web-sites, purchasing cards). Labs have the ability to select from the approved vendors in JD Edwards.

9.2 GLASSWARE

Glassware used for volumetric measurements must be Class A or verified for accuracy according to laboratory procedure. Pyrex (or equivalent) glass should be used where possible. For safety purposes, thick-wall glassware should be used where available.

9.3 REAGENTS, STANDARDS & SUPPLIES

Chemical reagents, solvents, glassware, and general supplies are ordered as needed to maintain sufficient quantities on hand. Purchasing guidelines for equipment and reagents must

meet with the requirements of the specific method and testing procedures for which they are being purchased. Solvents and acids are pre-tested in accordance with Corporate SOP on Solvent & Acid Lot Testing & Approval, SOP No. CA-Q-S-001.

9.3.1 Purchasing

The nature of the analytical laboratory demands that all material used in any of the procedures is of a known quality. The wide variety of materials and reagents available makes it advisable to specify recommendations for the name, brand, and grade of materials to be used in any determination. This information is contained in the method SOP. When in need of reagents, standards or other consumable supplies analysts may check the required items out of the on-site consignment system that contains items approved for laboratory use.

For items not typically available in the on-site consignment area analysts should contact their department manager for approval prior to ordering.

9.3.2 Receiving

It is the responsibility of the Shipping-Maintenance Technician to receive the shipment. It is the responsibility of the analyst who ordered the materials to date the material when received. Once the ordered reagents or materials are received, the analyst compares the information on the label or packaging to the original order to ensure that the purchase meets the quality level specified. Material Safety Data Sheets (MSDSs) are kept in the office of the Health and Safety Coordinater and online through the Company's intranet website. Anyone may review these for relevant information on the safe handling and emergency precautions of on-site chemicals.

9.3.3 Specifications

There are many different grades of analytical reagents available to the analyst. All methods in use in the laboratory specify the grade of reagent that must be used in the procedure. If the quality of the reagent is not specified, it may be assumed that it is not significant in that procedure and, therefore, any grade reagent may be used. It is the responsibility of the analyst to check the procedure carefully for the suitability of grade of reagent.

Chemicals must not be used past the manufacturer's expiration date and must not be used past the expiration time noted in a method SOP. If dates are not provided, the laboratory may contact the manufacturer to determine an expiration date.

The laboratory assumes a five year expiration date on inorganic dry chemicals unless noted otherwise by the manufacturer or by the reference source method.

- An expiration date can not be extended if the dry chemical is discolored or appears otherwise physically degraded, the dry chemical must be discarded.

- Expiration dates can be extended if the dry chemical is found to be satisfactory based on acceptable performance of quality control samples (Continuing Calibration Verification (CCV), Blanks, Laboratory Control Sample (LCS), etc.).

- If the dry chemical is used for the preparation of standards, the expiration dates can be extended 6 months if the dry chemical is compared to an unexpired independent source in performing the method and the performance of the dry chemical is found to be satisfactory. The comparison must show that the dry chemical meets CCV limits. The comparison studies are maintained in the QA office.

Wherever possible, standards must be traceable to national or international standards of measurement or to national or international reference materials. Records to that effect are available to the user.

Compressed gases in use are checked for pressure and secure positioning daily. The minimum total pressure must be 500 psig or the tank must be replaced. The quality of the gases must meet method or manufacturer specification or be of a grade that does not cause any analytical interference.

Water used in the preparation of standards or reagents must have a conductivity (resistivity) of greater than 1.0 megaohm-cm at 25°C. The conductivity is checked and recorded daily. If the water's conductivity is less than the specified limit, the Department Manager and QA Manager must be notified immediately in order to notify all departments, decide on cessation (based on intended use) of activities, and make arrangements for correction.

The laboratory may purchase reagent grade (or other similar quality) for use in the laboratory. This water must be certified "clean" by the supplier for all target analytes or otherwise verified by the laboratory prior to use. This verification is documented.

Standard lots are verified before first time use if the laboratory switches manufacturers or has historically had a problem with the type of standard.

Purchased VOA vials must be certified clean and the certificates must be maintained. If uncertified VOA vials are purchased, all lots must be verified clean prior to use. This verification must be maintained.

9.3.4 Storage

Reagent and chemical storage is important from the aspects of both integrity and safety. Light-sensitive reagents may be stored in brown-glass containers. Table 9-1 details specific storage instructions for reagents and chemicals. Section 22 discusses conditions for standard storage.

9.4 PURCHASE OF EQUIPMENT/INSTRUMENTS/SOFTWARE

When a new piece of equipment is needed, either for additional capacity or for replacing inoperable equipment, the analyst or supervisor makes a supply request to the Department Manager and/or the Laboratory Director/Manager. If they agree with the request the procedures outlined in Policy No. CA-T-P-001, Qualified Products List, are followed. A decision is made as to which piece of equipment can best satisfy the requirements. The appropriate written requests are completed and purchasing places the order.

Upon receipt of a new or used piece of equipment, it is given a short name, such as HP-20, added to the equipment list described in Section 21 that is maintained by the QA Department

and IT must be notified so that can be linked for back-ups. Its capability is assessed to determine if it is adequate or not for the specific application. For instruments, a calibration curve is generated, followed by MDLs, Demonstration of Capabilities (DOCs), and other relevant criteria (see Section 20). For software, its operation must be deemed reliable and evidence of instrument verification must be retained by the IT Department or QA Department as specified in the laboratory's procedure for software verification. Software certificates supplied by the vendors are filed with the LIMS Administrator. The manufacturer's operation manual is retained at the bench.

9.5 SERVICES

Service to analytical instruments (except analytical balances) is performed on an as needed basis. Routine preventative maintenance is discussed in Section 21. The need for service is determined by analysts and/or Department Managers. The service providers that perform the services are approved by the Department Managers, Operations Manager and/or Laboratory Director.

9.6 SUPPLIERS

TestAmerica selects vendors through a competitive proposal / bid process, strategic business alliances or negotiated vendor partnerships (contracts). The level of control used in the selection process is dependent on the anticipated spend and the potential impact on TestAmerica business. Vendors that provide test and measuring equipment, solvents, standards, certified containers, instrument related service contracts or subcontract laboratory services shall be subject to more rigorous controls than vendors that provide off-the-shelf items of defined quality that meet the end use requirements. The JD Edwards purchasing system includes all suppliers /vendors that have been approved for use.

Evaluation of suppliers is accomplished by ensuring the supplier ships the product or material ordered and that the material is of the appropriate quality. This is documented by signing off on packing slips or other supply receipt documents. The purchasing documents contain the data that adequately describe the services and supplies ordered.

Any issues of vendor performance are to be reported immediately by the laboratory staff to the Corporate Purchasing Group by completing a Vendor Performance Report (CW-F-WI-009).

The Corporate Purchasing Group will work through the appropriate channels to gather the information required to clearly identify the problem and will contact the vendor to report the problem and to make any necessary arrangements for exchange, return authorization, credit, etc.

As deemed appropriate, the Vendor Performance Reports will be summarized and reviewed to determine corrective action necessary, or service improvements required by vendors

The laboratory has access to a listing of all approved suppliers of critical consumables, supplies and services. This information is provided through the JD Edwards purchasing system.

9.6.1 New Vendor Procedure

TestAmerica employees who wish to request the addition of a new vendor must complete a J.D. Edwards Vendor Add Request Form (CW-F-WI-007 – refer to Figure 9-2).

New vendors are evaluated based upon criteria appropriate to the products or services provided as well as their ability to provide those products and services at a competitive cost. Vendors are also evaluated to determine if there are ethical reasons or potential conflicts of interest with TestAmerica employees that would make it prohibitive to do business with them as well as their financial stability. The QA Department and/or the Technology Director are consulted with vendor and product selection that have an impact on quality.

Table 9-1.

Storage of Reagents and Chemicals

Chemical	Storage Requirements
Concentrated Acids and Bases	Stored in the original containers at room temperature. All organic acids must be stored separately from inorganic acids. Acids should not be stored with bases.
Bulk Dry Chemicals	Stored in the original containers at room temperature. All organic acids must be stored separately from inorganic acids. Acids should not be stored with bases.
Working Solutions containing Organic Compounds	Stored as per method recommendation/ requirement. They are generally stored refrigerated at 4°C± 2°C.
Working Solutions containing only Inorganics	Stored at room temperature; refrigeration is optional.
Flammable Solvents	Stored in solvent cabinets at room temperature.
Non-Flammable Solvents	Stored separately from the flammable solvents in cabinets at room temperature.

Figure 9-1
Example – JD Edwards Vendor Add Request Form

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JD Edwards Vendor Add Request Form

Vendor name:	Lab location and individual making request:
Vendor address (remit to):	Vendor phone:
Vendor address (remit to):	Vendor fax:
Contact name:	Product / service provided:

Reason for Vendor Addition: Check all reasons that apply

☐ Cost Reduction	Estimated Annual Savings $
☐ Replace Current Vendor	Reason?
	Vendor being Replaced?
☐ New Product / Service	Describe:
☐ ISO Approved (Required for Aerotech / P&K only)	

Small Business:

Does this vendor help us to meet our small business objectives: _____

If yes, which category: _____

Personal and Ethical Considerations:

Is there any personal conflict of interest with a TestAmerica employee and the vendor listed above? _____
_____

Have ethical considerations been taken into account in your evaluation of this vendor?_____
_____

Can this product be sourced from another TestAmerica facility?_____

Please complete form and email to NCPurchasing@testamericainc.com or fax to (330) 966-9275.

I approve the addition of this vendor:

_____ _____

Purchasing Manager - Patrick Eckman Corporate Controller - Leslie Bowers

Form No. CW-F-WI-007

SECTION 10

SERVICE TO THE CLIENT
(NELAC 5.4.7)

10.1 OVERVIEW

TestAmerica Edison cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. It is the laboratory's goal to meet all client requirements in addition to statutory and regulatory requirements discussed in Section 5. The laboratory has procedures to ensure confidentiality to clients (Section 16 and 26).

ISO 17025/NELAC 2003 states that a laboratory "shall afford clients or their representatives cooperation to clarify the client's request". This topic is discussed in Section 7.

10.2 SPECIAL SERVICES

The laboratory's standard procedures for reporting data are described in Section 26. When requested the following special services are provided:

- The laboratory will provide the client or the client's representative reasonable access to the relevant areas of the laboratory for the witnessing of tests performed for the client.
- The laboratory will work with client-specified third party data validators as specified in the client's contract.
- The laboratory will provide the client with all requested information pertaining to the analysis of their samples. An additional charge may apply for additional data/information that was not requested prior to the time of sample analysis or previously agreed upon.

10.3 CLIENT COMMUNICATION

Project managers are an important communication link to the clients. The lab shall inform its clients of any delays in project completion as well as any non-conformances in either sample receipt (refer to Section 24) or sample analysis. Project management will maintain ongoing client communication throughout the entire client project.

Laboratory management (including the Laboratory Director, the Operations Manager, the Department Managers and the QA Manager) is available to discuss any technical questions or concerns that the client may have.

10.4 REPORTING

The laboratory will work with the client to produce any special communication reports required by the contract.

10.5 CLIENT SURVEYS

The laboratory assesses both positive and negative client feedback. The results are used to improve overall laboratory quality and client service.

TestAmerica's Sales and Marketing teams periodically develops lab and client specific surveys to assess client satisfaction.

SECTION 11

COMPLAINTS
(NELAC 5.4.8)

11.1 OVERVIEW

TestAmerica Edison believes that effective client complaint handling processes have important business and strategic value. Listening to and documenting client concerns captures 'client knowledge' that helps to continually improve processes and improving client satisfaction. An effective client complaint handling process also provides assurance to the data user that the laboratory will stand behind its data, service obligations and products.

A client complaint is any expression of dissatisfaction with any aspect of our business services, communications, responsiveness, data, reports, invoicing and other functions expressed by any party, whether received verbally or in written form. Client inquiries, complaints or noted discrepancies are documented, communicated to management, and addressed promptly and thoroughly.

The laboratory has procedures for dealing with both external and internal complaints.

The nature of the complaint is identified, documented and investigated, and an appropriate action is determined and taken. In cases where a client complaint indicates that an established policy or procedure was not followed, the QA Department must evaluate whether a special audit must be conducted to assist in resolving the issue. A written confirmation or letter to the client, outlining the issue and response taken is recommended as part of the overall action taken.

The process of complaint resolution and documentation utilizes the procedures outlined in Section 13 (Corrective Actions) and is documented following the procedures outlined in TestAmerica Edison SOP No. ED-GEN-003 (Non-Conformances and Corrective Action). It is the laboratory's goal to provide a satisfactory resolution to complaints in a timely and professional manner.

11.2 EXTERNAL COMPLAINTS

An employee that receives a complaint initiates the complaint resolution process and the documentation of the complaint.

Complaints fall into two categories: correctable and non-correctable. An example of a correctable complaint would be one where a report re-issue would resolve the complaint. An example of a non-correctable complaint would be one where a client complains that their data was repeatedly late. Non-correctable complaints should be reviewed for preventive action measures to reduce the likely hood of future occurrence and mitigation of client impact.

The general steps in the complaint handling process are:

- Receiving Complaints
- Complaint Investigation and Service Recovery
- Process Improvement

The laboratory shall inform the initiator of the complaint of the results of the investigation and the corrective action taken, if any.

11.3 INTERNAL COMPLAINTS

Internal complaints include, but are not limited to: errors and non-conformances, training issues, internal audit findings, and deviations from methods. Corrective actions may be initiated by any staff member who observes a nonconformance and shall follow the procedures outlined in Section 13. In addition, Corporate management, Sales and Marketing and Information Technology (IT) may initiate a complaint by contacting the laboratory or through the corrective action system described in Section 13.

11.4 MANAGEMENT REVIEW

The number and nature of client complaints is reported by the QA Manager to the laboratory and QA Director in the QA Monthly report. Monitoring and addressing the overall level and nature of client complaints and the effectiveness of the solutions is part of the Annual Management Review (Section 17)

SECTION 12

CONTROL OF NON-CONFORMING WORK
(NELAC 5.4.9)

12.1 OVERVIEW

When data discrepancies are discovered or deviations and departures from laboratory standard procedures, policies and/or client requests have occurred, corrective action is taken immediately. First, the laboratory evaluates the significance of the nonconforming work. Then, a corrective action plan is initiated based on the outcome of the evaluation. If it is determined that the nonconforming work is an isolated incident, the plan could be as simple as adding a qualifier to the final results and/or making a notation in the case narrative. If it is determined that the nonconforming work is a systematic or improper practices issue, the corrective action plan could include a more in depth investigation and a possible suspension of an analytical method. In all cases, the actions taken are documented using the laboratory's corrective action system (refer to Section 13).

Due to the frequently unique nature of environmental samples, sometimes departures from documented policies and procedures are needed. When an analyst encounters such a situation, the problem is presented to the Department Manager for advice. The Department Manager may elect to discuss it with the Laboratory Director and Operations Manager or have a representative contact the client to decide on a logical course of action. Once an approach is agreed upon and the procedure completed the information detailing the deviation can is supplied to the client within the case narrative of the final report.

Project Management may encounter situations where a client may request that a special procedure be applied to a sample that is not standard lab practice. Based on a technical evaluation, the lab may accept or opt to reject the request based on technical or ethical merit. An example might be the need to report a compound that the lab does not normally report. The lab would not have validated the method for this compound following the procedures in Section 20. The client may request that the compound be reported based only on the calibration. Such a request would need to be approved by the Laboratory Director and QA Manager, documented and included in the project folder. Deviations must also be noted in the case narrative of the final report with a statement that the compound is not reported in compliance with NELAC (or the analytical method) requirements and the reason. Data being reported to a non-NELAC state would need to note the change made to how the method is normally run. (Refer to Section 20.3.2 for additional requirements.)

12.2 RESPONSIBILITIES AND AUTHORITIES

SOP No. CA-L-S-001, Internal Investigation of Potential Data Discrepancies and Determination for Data Recall, outlines the general procedures for the reporting and investigation of data discrepancies and alleged incidents of misconduct or violations of the company's data integrity policies as well as the policies and procedures related to the determination of the potential need to recall data.

Under certain circumstances the Laboratory Director, the Operations Manager, a Lab Department Manager, the QA Manager may exceptionally authorize departures from

documented procedures or policies. The departures may be a result of procedural changes due to the nature of the sample; a one-time procedure for a client; QC failures with insufficient sample to reanalyze, etc... In most cases, the client will be informed of the departure prior to the reporting of the data. Any departures must be well documented using the laboratory's corrective action procedures described in Section 13. This information may also be documented in logbooks and/or data review checklists as appropriate. Any impacted data must be referenced in a case narrative and/or flagged with an appropriate data qualifier.

Any nonconforming work or data discrepancy discovered by any laboratory staff member must be reported to facility senior laboratory management within 24-hours. The Senior Management staff is compromised of the Laboratory Director, Operations Manager, the QA Manager, and the Department Managers. The reporting of issues involving alleged violations of the company's Data Integrity or Manual Integration procedures must be conveyed to an Ethics and Compliance Officer (ECO) and Quality Director within 24 hours.

Whether an inaccurate result was reported due to calculation or quantitation errors, data entry errors, improper practices, or failure to follow SOPs, the data must be evaluated to determine the possible effect.

The Laboratory Director, Operations Manager, QA Manager, ECOs, COO's – East and West, General Managers and the Quality Directors – East and West have the authority and responsibility to halt work, withhold final reports, or suspend an analysis for due cause as well as authorize the resumption of work.

12.3 EVALUATION OF SIGNIFICANCE AND ACTIONS TAKEN

For each nonconforming issue reported, an evaluation of its significance and the level of management involvement needed is made. This includes reviewing its impact on the final data, whether or not it is an isolated or systematic issue, and how it relates to any special client requirements.

SOP No. CA-L-S-001 distinguishes between situations when it would be appropriate for the laboratory QA Manager and Laboratory Director (or his/her designee) to make the decision on the need for client notification (written or verbal) and data recall (report revision) and when the decision must be made with the assistance of the ECO's and Corporate Management. Laboratory level decisions are documented and approved using the laboratory's standard nonconformance/corrective action reporting (Section 13) in lieu of the data recall determination form contained in SOP No. CA-L-S-001.

12.4 PREVENTION OF NONCONFORMING WORK

If it is determined that the nonconforming work could recur, further corrective actions must be made following the laboratory's corrective action system (Section 13).

On a monthly basis, the QA Department evaluates non-conformances to determine if any nonconforming work has been repeated multiple times. If so, the laboratory's corrective action process may be followed.

12.5 METHOD SUSPENSION/RESTRICTION (STOP WORK PROCEDURES)

In some cases it may be necessary to suspend/restrict the use of a method or target compound which constitutes significant risk and/or liability to the laboratory. Suspension/restriction procedures can be initiated by any of the persons noted in Section 12.2, Paragraph 5 above.

Prior to suspension/restriction, confidentiality will be respected, and the problem and the required corrective and preventive action will be stated in writing and presented to the Laboratory Director.

The Laboratory Director shall arrange for the appropriate personnel to meet with the QA Manager as needed. This meeting shall be held to confirm that there is a problem, that suspension/restriction of the method is required and will be concluded with a discussion of the steps necessary to bring the method/target or test fully back on line. In some cases that may not be necessary if all appropriate personnel have already agreed there is a problem and there is agreement on the steps needed to bring the method, target or test fully back on line.

The QA Manager will also initiate a corrective action report as described in Section 13 if one has not already been started. A copy of any meeting notes and agreed upon steps should be faxed or e-mailed by the laboratory to the appropriate General Manager and member of Corporate QA. This fax/e-mail acts as notification of the incident.

After suspension/restriction, the lab will hold all reports to clients pending review. No faxing, mailing or distributing through electronic means may occur. The report must not be posted for viewing on the internet. It is the responsibility of the Laboratory Director to hold all reporting and to notify all relevant laboratory personnel regarding the suspension/restriction (i.e., Project Management, Log-in, etc…). Clients will NOT generally be notified at this time. Analysis may proceed in some instances depending on the non-conformance issue.

Within 72 hours, the QA Manager will determine if compliance is now met and reports can be released, OR determine the plan of action to bring work into compliance, and release work. A team, with all principals involved (Laboratory Director, Operations Manager, QA Manager, Department Managers) can devise a start-up plan to cover all steps from client notification through compliance and release of reports. Project Management, the Director of Client Services and Sales and Marketing should be notified if clients must be notified or if the suspension/restriction affects the laboratory's ability to accept work. The QA Manager must approve start-up or elimination of any restrictions after all corrective action is complete. This approval is given by final signature on the completed corrective action report as described in Section 13.

SECTION 13

CORRECTIVE ACTION
(NELAC 5.4.10)

13.1 OVERVIEW

A major component of TestAmerica's Quality Assurance (QA) Program is the problem investigation and feedback mechanism designed to keep the laboratory staff informed on quality related issues and to provide insight to problem resolution. When nonconforming work or departures from policies and procedures in the quality system or technical operations are identified, the corrective action procedure provides a systematic approach to assess the issues, restore the laboratory's system integrity, and prevent reoccurrence. Corrective actions are documented using Non-Conformance Memos (NCM) and Corrective Action Reports (CAR) (refer to Figure 13-1).

13.2 DEFINITIONS

- **Correction***:* Actions necessary to correct or repair analysis specific non-conformances. The acceptance criteria for method specific QC and protocols as well as the associated corrective actions are contained in the method specific SOPs. The analyst will most frequently be the one to identify the need for this action as a result of calibration checks and QC sample analysis**.** No significant action is taken to change behavior, process or procedure.

- **Corrective Action***:* The action taken is not only a correction made to the immediate event, but a change in process, procedure or behavior that is required to eliminate the causes of an existing nonconformity, defect, or other undesirable situation in order to prevent recurrence.

13.3 GENERAL

Problems within the quality system or within analytical operations may be discovered in a variety of ways, such as QC sample failures, internal or external audits, proficiency testing (PT) performance, client complaints, staff observation, etc..

The purpose of a corrective action system is to:

- Identify non-conformance events and assign responsibility for investigation.
- Resolve non-conformance events and assign responsibility for any required corrective action.
- Identify Systematic Problems before they become serious.
- Identify and track Client complaints and provide resolution (see more on client complaints in Section 11).

13.3.1 Non-Conformance Memos (NCM) - is used to document the following types of non-conformances which typically require short-term corrective actions:

- Deviations from an established procedure or SOP

- QC outside of limits (non matrix related)
- Isolated Reporting / Calculation Errors

13.3.2 **Corrective Action Report (CAR)** - is used to document the following types of non-conformances which typically require longer term corrective actions:

- Questionable trends that are found in the monthly review of NCMs.
- Client complaints
- Issues found while reviewing NCMs that warrant further investigation.
- Internal and External Audit Findings
- Failed or Unacceptable PT results.
- Corrective actions that cross multiple departments in the laboratory.
- Systematic Reporting / Calculation Errors

13.4 CLOSED LOOP CORRECTIVE ACTION PROCESS

Any employee in the company can initiate a corrective action. There are four main components to a closed-loop corrective action process once an issue has been identified: Cause Analysis, Selection and Implementation of Corrective Actions (both short and long term), Monitoring of the Corrective Actions, and Follow-up.

13.4.1 Cause Analysis

- Upon discovery of a non-conformance event, the event must be defined and documented. An NCM or CAR must be initiated, someone is assigned to investigate the issue and the event is investigated for cause. Table 13-1 provides some general guidelines on determining responsibility for assessment.
- The cause analysis step is the key to the process as a long term corrective action cannot be determined until the cause is determined.
- If the cause is not readily obvious, the Department Manger, Operations Manager, Lab Director, or QA Manager (or QA designee) is consulted.

13.4.2 Selection and Implementation of Corrective Actions

- Where corrective action is needed, the laboratory shall identify potential corrective actions. The action(s) most likely to eliminate the problem and prevent recurrence are selected and implemented. Responsibility for implementation is assigned.
- Corrective actions shall be to a degree appropriate to the magnitude of the problem identified through the cause analysis.
- Whatever corrective action is determined to be appropriate, the laboratory shall document and implement the changes. The NCM or CAR is used for this documentation.

13.4.3 Monitoring of the Corrective Actions

- The Department Manager and QA Manager are responsible for ensuring that the corrective action taken was effective.

- Ineffective actions will be documented and re-evaluated until acceptable resolution is achieved. Department Managers are accountable to the Laboratory Director to ensure final acceptable resolution is achieved and documented appropriately.
- Each CAR is entered into a database for tracking purposes and a monthly summary of all corrective actions is printed out for review to aid in ensuring that the corrective actions have taken effect.
- The QA Manager reviews monthly NCMs and CARs for trends. Highlights are included in the QA monthly report (refer to Section 17). If a significant trend develops that adversely affects quality, an audit of the area is performed and corrective action implemented.
- Any out-of-control situations that are not addressed acceptably at the laboratory level may be reported to the Corporate Quality Director by the QA Manager, indicating the nature of the out-of-control situation and problems encountered in solving the situation.

13.4.4 Follow-up Audits

- Follow-up audits may be initiated by the QA Manager and shall be performed as soon as possible when the identification of a nonconformance casts doubt on the laboratory's compliance with its own policies and procedures, or on its compliance with state or federal requirements. (Section 16 includes additional information regarding internal audit procedures.)
- These audits often follow the implementation of the corrective actions to verify effectiveness. An additional audit would only be necessary when a critical issue or risk to business is discovered.

13.5 TECHNICAL CORRECTIVE ACTIONS

In addition to providing acceptance criteria and specific protocols for technical corrective actions in the method SOPs, the laboratory has general procedures to be followed to determine when departures from the documented policies and procedures and quality control have occurred (refer to Section 12 for information regarding the control of non-conforming work). The documentation of these procedures is through the use of an NCM or CAR.

Table 13-1 includes examples of general technical corrective actions. For specific criteria and corrective actions refer to the analytical methods or specific method SOPs.

Table 13-1 provides some general guidelines for identifying the individual(s) responsible for assessing each QC type and initiating corrective action. The table also provides general guidance on how a data set should be treated if associated QC measurements are unacceptable. Specific procedures are included in Method SOPs, QAM Sections 20 and 21, and SOP CA-L-S-001 (Internal Investigation of Potential Data Discrepancies and Determination for Data Recall). All corrective actions are reviewed at a minimum monthly by the QA Manager and highlights are included in the QA monthly report.

To the extent possible, samples shall be reported only if all quality control measures are acceptable. If the deficiency does not impair the usability of the results, data will be reported with an appropriate data qualifier and/or the deficiency will be noted in the case narrative. Where

sample results may be impaired, the Project Manager is notified and appropriate corrective action (e.g., reanalysis) is taken and documented.

13.6 BASIC CORRECTIONS

When mistakes occur in records, each mistake shall be crossed-out, and not erased, deleted, made illegible, or otherwise obliterated (e.g. no white-out), and the correct value entered alongside. All such corrections shall be initialed (or signed) and dated by the person making the correction. In the case of records stored electronically, the original "uncorrected" file must be maintained intact and a second "corrected" file is created.

This same process applies to adding additional information to a record. All additions made later than the initial must also be initialed (or signed) and dated.

When corrections are due to reasons other than obvious transcription errors, the reason for the corrections (or additions) shall also be documented.

Figure 13-1.
Example - Corrective Action Report

CORRECTIVE ACTION REPORT

TestAmerica Edison
Data Inquiry Request Form / Corrective Action Form

Date Initiated:	Job #:	Send Response to:
Date Needed:	Analyses:	Name:
		Address:
Client:	Lab :	
	Deliverable / Report Type	Phone:
Contact:	PDF/EDD ____ Full ____	FAX:
	Bound ____ Reduced ____	Email:
Project:	Unbound ____ ResQA ____	
	CD ____ Other ____	Send Via: FAX Mail UPS Email Courier

1. Type of Non-Conformance:

_____ Missing Sample/Analysis	_____ Results in Question	_____ Insufficient Data for Validation	_____ EDD
_____ Wrong Sample Identification	_____ Holdtime Violation	_____ Explanation of Analysis	____ OTHER
_____ Missing Pages	_____ Calibration in Question		

2. Explanation of Details:

Initiator Signature:		**Date:**	

3. Required Actions: **Actions Completed:**

√ if needed	Department	Actions Required:	Initials:	Date:
	PM			
	LOGIN			
	VOAGC/MS			
	BNAMS			
	PEST/BNAGC			
	METALS			
	WETCHEM			
	SUBWORK			
	IT			
	ORG PREP			
	RP			

4. Final Approval of Data Inquiry Actions Taken:

Intiator Signature:		**Date:**	

5. STL ERROR YES __ NO__ (IF YES, PLEASE COMPLETE SECTIONS 5 - 7) **CORRECTIVE ACTION ID#:**

6. Quality Assurance Review and Assignment of Further Action: *(to be completed by QA Manager - use page 2 if needed)*
Recommended Corrective Action:

7. Final Resolution of Corrective Action: *(to be completed by Dept. Supervisor - use page 2 if needed)*

Supervisor Signature:		**Date:**	

8. Quality Assurance Final Approval *(QA Manager or designee use only)*:

QA Signature:		**Date:**	

EDS-WI-012,
Rev2
November 27, 2007

Page 1

Table 13-1.

General Corrective Action Procedures

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Initial Instrument Blank *(Analyst)*	- Instrument response < MDL.	- Prepare another blank. - If same response, determine cause of contamination: reagents, environment, instrument equipment failure, etc..
Initial Calibration Standards *(Analyst, Supervisor)*	- Correlation coefficient > 0.99 or standard concentration value. - % Recovery within acceptance range. - See details in Method SOP.	- Reanalyze standards. - If still unacceptable, remake standards and recalibrate instrument.
Independent Calibration Verification (Second Source) *(Analyst, Supervisor)*	- % Recovery within control limits.	- Remake and reanalyze standard. - If still unacceptable, then remake calibration standards or use new primary standards and recalibrate instrument.
Continuing Calibration Standards *(Analyst, Data Reviewer)*	% Recovery within control limits.	- Reanalyze standard. - If still unacceptable, then recalibrate and rerun affected samples.
Matrix Spike / Matrix Spike Duplicate (MS/MSD) *(Analyst, Data Reviewer)*	- % Recovery within limits documented in lab Work Instructions and/or Method SOP.	- If the acceptance criteria for duplicates or matrix spikes are not met because of matrix interferences, the acceptance of the analytical batch is determined by the validity of the LCS. - If the LCS is within acceptable limits the batch is acceptable. - The results of the duplicates, matrix spikes and the LCS are reported with the data set.
Laboratory Control Sample (LCS) *(Analyst, Data Reviewer)*	- % Recovery within limits specified in lab Work Instructions and/or Method SOP.	- Batch must be re-prepared and re-analyzed. **Note:** If there is insufficient sample or the holding time cannot be met, contact client and report with flags.
Surrogates *(Analyst, Data Reviewer)*	- % Recovery within limits of method or within three standard deviations of the historical mean.	- See Method SOP - Record in Non-Conformance summary

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Method Blank (MB_ *(Analyst, Data Reviewer)*	< Reporting Limit [1]	- Reanalyze blank. - If still positive, determine source of contamination. If necessary, reprocess (i.e. digest or extract) entire sample batch. Report blank results.
Proficiency Testing (PT) Samples *(QA Manager, Department Manager/Supervisor)*	- Criteria supplied by PT Supplier.	- Any failures or warnings must be investigated for cause. Failures may result in the need to repeat a PT sample to show the problem is corrected.
Internal / External Audits *(QA Manager, Department Manager/Supervisor, Laboratory Director/Manager)*	- Defined in Quality System documentation such as SOPs, QAM, etc.	- Non-conformances must be investigated through CAR system and necessary corrections must be made.
Reporting / Calculation Errors (Depends on issue – possible individuals include: Analysts, Data Reviewers, Project Managers, Department Manager/ Supervisor, QA Manager, Corporate QA, Corporate Management)	- SOP CA-L-S-001, Internal Investigation of Potential Data Discrepancies and Determination for Data Recall.	- Corrective action is determined by type of error. Follow the procedures in SOP CA-L-S-001.
Client Complaints *(Project Managers, Lab Director/Manager, Sales and Marketing)*		- Corrective action is determined by the type of complaint. For example, a complaint regarding an incorrect address on a report will result in the report being corrected and then follow-up must be performed on the reasons the address was incorrect (e.g., database needs to be updated).
QA Monthly Report (Refer to Section 17 for an example) (QA Manager, Lab Director/Manager, Department Supervisors/Managers)	- QAM, SOPs.	- Corrective action is determined by the type of issue. For example, CARs for the month are reviewed and possible trends are investigated.

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Health and Safety Violation (Safety Officer, Lab Director/Manager, Department Supervisor/Manager)	- Environmental Health and Safety (EHS) Manual.	- Non-conformance is investigated and corrected through CAR system.

Note:

1. Except as noted below for certain compounds, the method blank should be below the detection limit. Concentrations up to five times the reporting limit will be allowed for the ubiquitous laboratory and reagent contaminants such as: methylene chloride, toluene, acetone, 2-butanone and phthalates **provided** they appear in similar levels in the reagent blank and samples. This allowance presumes that the detection limit is below any regulatory limit to which the data are to be compared and that blank subtraction will not occur.

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SECTION 14.0

PREVENTIVE ACTION
(NELAC 5.4.11)

14.1 OVERVIEW

The laboratory's preventive action programs improve, or eliminate potential causes of nonconforming product and/or nonconformance to the quality system. This preventive action process is a proactive continuous process improvement activity that can be initiated through feedback from clients, employees, business providers, and affiliates. The QA Department has the overall responsibility to ensure that the preventive action process is in place, and that relevant information on actions is submitted for management review.

Dedicating resources to an effective preventive action system emphasizes TestAmerica Edison's commitment to its Quality Assurance (QA) program. It is beneficial to identify and address negative trends before they develop into complaints, problems and corrective actions. Additionally, customer service and satisfaction can be improved through continuous improvements to laboratory systems.

Opportunities for improvement may be discovered during management reviews, the QA Metrics Report, internal or external audits, proficiency testing performance, client complaints, staff observation, etc..

The monthly Quality Assurance Metrics Report shows performance indicators in all areas of the quality system. These areas include revised reports, corrective actions, audit findings, internal auditing and data authenticity audits, client complaints, PT samples, holding time violations, SOPs, ethics training, etc. These metrics are used to help evaluate quality system performance on an ongoing basis and provide a tool for identifying areas for improvement.

The laboratory's Corrective Action process (Section 13) is integral to implementation of preventive actions. A critical piece of the corrective action process is the implementation of actions to prevent further occurrence of a non-compliance event. Historical review of corrective action provides a valuable mechanism for identifying preventive action opportunities.

14.1.1 The following elements are part of a preventive action system:

- Identification of an opportunity for preventive action.
- Process for the preventive action.
- Define the measurements of the effectiveness of the process once undertaken.
- Execution of the preventive action.
- Evaluation of the plan using the defined measurements.
- Verification of the effectiveness of the preventive action. /=
- Close-Out by documenting any permanent changes to the Quality System as a result of the Preventive Action. Documentation of Preventive Action is incorporated into the monthly QA reports, corrective action process, management review, and the Management of Change process (see below).

Note: There may be varying levels of formality and documentation during the preventive action process due to the simplicity/complexity of the action taken.

14.1.2 Any Preventive Actions undertaken or attempted shall be taken into account during the Annual Management Review (Section 17). A highly detailed recap is not required; a simple recount of success and failure within the preventive action program will provide management a measure for evaluation.

14.2 MANAGEMENT OF CHANGE

The Management of Change process is designed to manage significant events and changes that occur within the laboratory. Through these procedures, the potential risks inherent with a new event or change are identified and evaluated. The risks are minimized or eliminated through pre-planning and the development of preventive measures. The types of changes covered under this system include: Facility Changes, Major Accreditation Changes, Addition or Deletion to Division's Capabilities or Instrumentation, Key Personnel Changes, Laboratory Information Management System (LIMS) changes. This process is discussed in further detail in SOP CA-Q-S-003, Management of Change.

SECTION 15.0

CONTROL OF RECORDS
(NELAC 5.4.12)

TestAmerica Edison maintains a record system appropriate to its needs and that complies with applicable standards or regulations as required. The system produces unequivocal, accurate records that document all laboratory activities. The laboratory retains all original observations, calculations and derived data, calibration records and a copy of the analytical report for a minimum of five years after it has been issued.

15.1 OVERVIEW

The laboratory has established procedures for identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records. A record index is listed in Table 15-1. Quality records are maintained by the Quality Assurance (QA) Manager in a database which is backed up as part of the regular network backup. Records are of two types; either electronic or hard copy paper formats depending on whether the record is computer or hand generated (some records may be in both formats). Technical records are maintained by the individual department managers (analytical and reports production).

Table 15-1. Record Index[1]

Technical Records	Official Documents	QA Records	Project Records	Administrative Records
Retention: 5 Years from analytical report issue*	5 Years from document retirement date*	5 Years from archival* **Data Investigation:** 5years or the life of the affected raw data storage whichever is greater (beyond 5 years if ongoing project or pending investigation)	5 Years from analytical report issue*	**Personnel:** 7 Years (HR Records must be maintained as per Policy CW-L-P-001) **Finance:** See Accounting and Control Procedures Manual
Raw Data Logbooks[2] Standards Certificates Analytical Records Lab Reports	Quality Assurance Manual (QAM)	Internal and External Audits/ Responses	Sample receipt and COC Documentation	Finance and Accounting
	Work Instructions	Certifications	Contracts and Amendments	EH&S Manual, Permits, Disposal Records
	SOPs	Corrective/Preventive Action	Correspondence	Employee Handbook
	Manuals	Management Reviews	QAPP	Personnel files, Employee Signature & Initials, Administrative Training Records (e.g., Ethics)
		Method & Software Validation, Verification data	SAP	
		Data Investigation	Telephone Logbooks	Administrative Policies
	Policies		Lab Reports	Technical Training Records

[1] Record Types encompass hardcopy and electronic records.
[2] Examples of Logbook types: Maintenance, Instrument Run, Preparation (standard and samples), Standard and Reagent Receipt, Archiving, Balance Calibration, Temperature (hardcopy or electronic records).
* Exceptions listed in Table 15-2.

All records are legible and stored and retained in such a way that they are secure and readily retrievable at the laboratory in a suitable environment which prevents damage or deterioration and prevents loss. Records are maintained for a minimum of five years unless other wise specified by a client or regulatory requirement.

For raw data and project records, record retention shall be calculated from the date the project report is issued. For other records, such as Controlled Documents, QA, or Administrative Records, the retention time is calculated from the date the record is formally retired. Records related to the programs listed in Table 15-2 have lengthier retention requirements and are subject to the requirements in Section 15.1.3. Policy CW-L-P-001 (Record Retention) provides additional information on record retention requirements.

15.1.1 Programs with Longer Retention Requirements

Some regulatory programs have longer record retention requirements than the standard record retention time. These are detailed in Table 15-3 with their retention requirements. In these cases, the longer retention requirement is enacted. If special instructions exist such that client data cannot be destroyed prior to notification of the client, the container or box containing that data is marked as to who to contact for authorization prior to destroying the data.

Table 15-2. Special Record Retention Requirements

Program	[1]Retention Requirement
Drinking Water – All States	10 years (project records)
NY Potable Water NYCRR Part 55-2	10 years

[1]Note: Extended retention requirements must be noted with the archive documents or addressed in facility-specific records retention procedures.

15.1.2 All records are held secure and in confidence. Records maintained at the laboratory are located in the warehouses of the main building and the VOA building. Removal and return of records is tracked by way of in and out cards in each storage box.

15.1.3 The laboratory has procedures to protect and back-up records stored electronically and to prevent unauthorized access to or amendment of these records. All analytical data is maintained as hard copy or in a secure readable electronic format. For analytical reports that are maintained as copies in PDF format, see section 20.12.1 'Computer and Electronic Data Related Requirements' for more information.

15.1.4 The record keeping system allows for historical reconstruction of all laboratory activities that produced the analytical data, as well as rapid recovery of historical data. The history of the sample from when the laboratory took possession of the samples must be readily understood through the documentation. This shall include inter-laboratory transfers of samples and/or extracts.

- The records include the identity of personnel involved in sampling, sample receipt, preparation, or testing. All analytical work contains the initials (at least) of the personnel involved. The laboratory's copy of the chain of custody is stored in the job file. The chain of custody would indicate the name of the sampler. If any sampling notes are provided with a job, they are also stored in the job file.

- All information relating to the laboratory facilities equipment, analytical test methods, and related laboratory activities, such as sample receipt, sample preparation, or data verification are documented.

- The record keeping system facilitates the retrieval of all working files and archived records for inspection and verification purposes (e.g., set format for naming electronic files, set format for what is included with a given analytical data set Instrument data is stored sequentially by instrument. A given day's analyses are maintained in the order of the analysis. Run logs are maintained for each instrument or method; a copy of each day's run long or instrument sequence is stored with the data to aid in re-constructing an analytical sequence. Where an analysis is performed without an instrument, bound logbooks or bench sheets are used to record and file data. Standard and reagent information is recorded in logbooks or entered into the LIMS for each method as required.

- Changes to hardcopy records shall follow the procedures outlined in Section 13 and 20. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

- The reason for a signature or initials on a document is clearly indicated in the records such as "sampled by," "prepared by," "reviewed by", or "Analyzed by".

- All generated data except those that are generated by automated data collection systems, are recorded directly, promptly and legibly in permanent dark ink.

- Hard copy data may be scanned into PDF format for record storage as long as the scanning process can be verified in order to ensure that no data is lost and the data files and storage media must be tested to verify the laboratory's ability to retrieve the information prior to the destruction of the hard copy that was scanned.

- Also refer to Section 20.13.1 'Computer and Electronic Data Related Requirements'.

15.2 TECHNICAL AND ANALYTICAL RECORDS

15.2.1 The laboratory retains records of original observations, derived data and sufficient information to establish an audit trail, calibration records, staff records and a copy of each analytical report issued, for a minimum of five years unless otherwise specified by a client or regulatory requirement (refer to Section 15.1). The records for each analysis shall contain sufficient information to enable the analysis to be repeated under conditions as close as

possible to the original. The records shall include the identity of laboratory personnel responsible for the sampling (where applicable), performance of each analysis and checking of results.

15.2.2 Observations, data and calculations are recorded at the time they are made and are identifiable to the specific task.

15.2.3 Changes to hardcopy records shall follow the procedures outlined in Section 13 and 20. Changes to electronic records in LIMS or instrument data are recorded in audit trails.
The essential information to be associated with analysis, such as strip charts, tabular printouts, computer data files, analytical notebooks, and run logs, include (previous discussions relate where most of this information is maintained – specifics may be added below):

- laboratory sample ID code**;**
- Date of analysis and time of analysis is required if the holding time is seventy-two (72) hours or less, or when time critical steps are included in the analysis (e.g., drying times, incubations, etc.); instrumental analyses have the date and time of analysis recorded as part of their general operations. Where a time critical step exists in an analysis, location for such a time is included as part of the documentation in a specific logbook or on a benchsheet
- Instrumentation identification and instrument operating conditions/parameters. Operating conditions/parameters are typically recorded in the applicable SOP.
- analysis type**;**
- all manual calculations and manual integrations**;**
- analyst's or operator's initials/signature**;**
- sample preparation including cleanup, volumes, weights, instrument printouts, meter readings, calculations, reagents**;**
- test results**;**
- standard and reagent origin, receipt, preparation, and use**;**
- calibration criteria, frequency and acceptance criteria**;**
- data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions**;**
- quality control protocols and assessment**;**
- electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries; and
- Method performance criteria including expected quality control requirements.

15.3 LABORATORY SUPPORT ACTIVITIES

In addition to documenting all the above-mentioned activities, the following are retained QA records and project records (previous discussions in this section relate where and how these data are stored):

- all original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts' work sheets and data output records (chromatograms, strip charts, and other instrument response readout records);
- a written description or reference to the specific test method used which includes a description of the specific computational steps used to translate parametric observations into a reportable analytical value;
- copies of final reports;
- archived SOPs;
- correspondence relating to laboratory activities for a specific project;
- all corrective action reports, audits and audit responses;
- proficiency test results and raw data; and
- results of data review, verification, and crosschecking procedures

15.3.1 Sample Handling Records

Sample handling and tracking is discussed in Section 24. Records of all procedures to which a sample is subjected while in the possession of the laboratory are maintained. These include but are not limited to records pertaining to:

- sample preservation including appropriateness of sample container and compliance with holding time requirement;
- sample identification, receipt, acceptance or rejection and login;
- sample storage and tracking including shipping receipts, sample transmittal / COC forms; and
- procedures for the receipt and retention of samples, including all provisions necessary to protect the integrity of samples.

15.4 ADMINISTRATIVE RECORDS

The laboratory also maintains the administrative records in either electronic or hard copy form. See Table 15-1.

15.5 RECORDS MANAGEMENT, STORAGE AND DISPOSAL

15.5.1 All records (including those pertaining to test equipment), certificates and reports are safely stored, held secure and in confidence to the client. Certification related records are available to the accrediting body upon request.

15.5.2 All information necessary for the historical reconstruction of data is maintained by the laboratory. Records that are stored only on electronic media must be supported by the hardware and software necessary for their retrieval.

15.5.3 Records that are stored or generated by computers or personal computers have hard copy, write-protected backup copies, or an electronic audit trail controlling access**.**

15.5.4 TestAmerica Edison has a record management system for control of laboratory notebooks, instrument logbooks, standards logbooks, and records for data reduction, validation, storage and reporting. The procedures are detailed in TestAmerica Edison SOP No. ED-GEN-002 (Document Control).

15.5.5 Records are considered archived when it is moved to the lab warehouse. Access to archived hard-copy information is documented with in/out records used in archived boxes to note data that is removed and returned. All records shall be protected against fire, theft, loss, environmental deterioration, and vermin. In the case of electronic records, electronic or magnetic sources, storage media are protected from deterioration caused by magnetic fields and/or electronic deterioration. Access to the data is limited to laboratory and company employees**.**

15.5.6 In the event that the laboratory transfers ownership or goes out of business, TestAmerica Edison shall ensure that the records are maintained or transferred according to client's instructions. Upon ownership transfer, record retention requirements shall be addressed in the ownership transfer agreement and the responsibility for maintaining archives is clearly established. In addition, in cases of bankruptcy, appropriate regulatory and state legal requirements concerning laboratory records must be followed. In the event of the closure of the laboratory, all records will revert to the control of the corporate headquarters. Should the entire company cease to exist, as much notice as possible will be given to clients and the accrediting bodies who have worked with the laboratory during the previous 5 years of such action.

15.5.7 **<u>Records Disposal</u>**

15.5.7.1 Records are removed from the archive and disposed after 5 years unless otherwise specified by a client or regulatory requirement. On a project specific or program basis, clients may need to be notified prior to record destruction. Records are destroyed in a manner that ensures their confidentiality such as shredding, mutilation or incineration.

15.5.7.2 Electronic copies of records must be destroyed by erasure or physically damaging off-line storage media so no records can be read.

15.5.7.3 If a third party records management company is hired to dispose of records, a "Certificate of Destruction" is required. [Refer to Policy No. CW-L-P-001 (Records Retention).]

SECTION 16

AUDITS
(NELAC 5.4.13)

16.1 OVERVIEW

Audits measure laboratory performance and insure compliance with accreditation/certification and project requirements. Audits specifically provide management with an on-going assessment of the quality of results produced by the laboratory, including how well the policies and procedures of the QA system and the Ethics and Data Integrity Program are being executed. They are also instrumental in identifying areas where improvement in the QA system will increase the reliability of data. There are two principle types of audits: Internal and External. Internal audits are performed by laboratory or corporate personnel. External audits are conducted by regulators, clients or third-party auditing firms. In either case, the assessment to program requirements is the focus.

Table 16-1. Audit Types and Frequency

Internal Audits	Description	Performed by	Frequency
	Analyst & Method Compliance	QA Department or Designee	- 100% of all methods over a two year period. - 100% of all analysts annually.
	Instrument	QA Department or Designee	100% of all organic instruments and any inorganic chromatography instruments over a two year period.
	Work Order/ Final Report	QA Department or Designee	- 1 complete report each month.
	Support Systems	QA Department or Designee	- Annual for entire labs support departments & equipment (e.g., thermometers, balances), can be divided into sub-sections over the course of the year.
	Performance Audits (Double-Blind PTs)	Corporate QA, Laboratory QA Department or Designee	- As needed.
	Special	QA Department or Designee	- As Needed
External Audits	**Description**	**Performed by**	**Frequency**
	Program / Method Compliance	Regulatory Agencies, Clients, accreditation organizations	- As required by program and/or clients needs
	Performance Audits	Provided by a third party.	- As required by a client or regulatory agency. Generally provided semi-annually through the analysis of PT samples.

16.2 INTERNAL AUDITS

Annually, the laboratory prepares a schedule of internal audits to be performed throughout the year. As previously stated, these audits verify and monitor that operations continue to comply with the requirements of the laboratory's QA Manual and the Corporate Ethics Program. A

schedule of the internal audits is maintained by the QA Manager in the *Internal Audit Workbook*. An example can be found in Figure 16-1.

It is the responsibility of the QA Manager to plan and organize audits in consideration of the laboratory work load and the department personnel schedules so that all pertinent personnel and operations are thoroughly reviewed. When designees (other than QA department personnel & approved by the QA Manager), perform audits, the QA Manager shall insure that these persons do not audit their own activities except when it can be demonstrated that an effective audit will be carried out. In general, the auditor:

- is neither the person responsible for the process being audited nor the immediate supervisor of the person responsible for the project/process.
- Is free of any conflicts of interest.
- Is free from bias and influences that could affect objectivity.

Laboratory personnel (e.g., supervisors and analysts) may assist with both method and support system audits as long as the items listed in the above paragraph are observed. These audits are conducted according to defined criteria listed in the checklists of the *Internal Audit Workbook.* These personnel must be approved by the QA Manager; and must complete the audit checklists in their entirety. This process introduces analyst experience and insight into the laboratory's auditing program.

The auditor must review the previous audit report and identify all items for verification of corrective actions. A primary focus will be dedicated to the ability of the laboratory to correct root-cause deficiencies and that the corrective action has been implemented and sustained as documented.

16.2.1 Systems

An annual systems audit is required to ensure compliance to analytical methods and SOPs, the laboratory's Data Integrity and Ethics Policies, NELAC quality systems, client and State requirements. This audit is performed in portions throughout the year through method, analyst, instrument, work order/final report and support system audits. Audits are documented and reported to management within 1 week of their performance. Systems audits cover all departments of the facility, both operational and support. The multiple audits are compiled into one systems audit package at the end of the year (*Internal Audit Workbook*).

16.2.1.1 Method, Analyst, Instrument and Work Order/Final Report Audits

Procedures for the method compliance, analyst, instrument and work order/final report audits are incorporated by reference to SOP No. CA-Q-S-004, Method Compliance and Data Authenticity Audits. These audits are not mutually exclusive. For example, the performance of a method audit will also cover multiple analysts and instruments. The laboratory's goal is to review all analysts and instruments as described in SOP No. CA-Q-S-004. The laboratory will also audit all methods within a two year time period and audit a minimum of one Work Order/Final Report from receiving through reporting on a monthly basis.

16.2.1.2 Support Systems

Support system audits are performed to ensure that all departments & ancillary equipment are operating according to prescribed criteria. Support system audits include the review of both non-analytical and operational departments. Support equipment audits (e.g., metrology items) include the review of balance calibrations, weight calibrations; water quality testing, etc.. Non-analytical may include sample receiving and bottle preparation. These types of support audits ensure that the operations are being performed to support ethical data as well as ensuring the accuracy & precision of the utilized equipment.

These audits can be performed in portions throughout the year or in one scheduled session. However, the audit schedule must document that these aspects are reviewed annually. Many of the metrology systems are considered to be surveillance activities that can be monitored by QA personnel or delegated to specified department personnel. These surveillance activities are performed on a semi-annual basis unless issues warrant a greater frequency or previous audits continually showing no deficiencies allow the frequency to be reduced to once a year.

An example audit checklist can be found in Figure 16-2. Instructions for reporting findings are included in the *Internal Audit Workbook*. In general, findings are reported to management within 1 week of the audit and a response is due from management within 30 days.

16.2.2 Performance Audits

Corporate QA may arrange for double blind PT studies to be performed in the laboratories. Results are given to Management and Corrective actions of any findings are coordinated at each facility by the QA Managers and Laboratory Directors/Managers. These studies are performed on an as needed basis. They may be performed when concerns are raised regarding the performance of a particular method in specific laboratories, periodically to evaluate methods that may not normally be covered in the external PT program or may be used in the process of developing best practices. The local QA Manager may also arrange for PT studies on an as needed basis. (Refer to Section 16.3.2 for additional information on Performance Audits.)

16.2.3 Special Audits

Special audits are conducted on an as needed basis, generally as a follow up to specific issues such as client complaints, corrective actions, PT results, data audits, system audits, validation comments, regulatory audits or suspected ethical improprieties. Special audits are focused on a specific issue, and report format, distribution, and timeframes are designed to address the nature of the issue.

16.3 EXTERNAL AUDITS

TestAmerica facilities are routinely audited by clients and external regulatory authorities. External audits are performed when certifying agencies or clients conduct on-site inspections or submit performance testing samples for analysis. It is TestAmerica's policy to cooperate fully with regulatory authorities and clients. The laboratory makes every effort to provide the auditors with access to personnel, documentation, and assistance. The laboratory department managers are responsible for providing corrective actions to the QA Manager who coordinates the response for any deficiencies discovered during an external audit. Audit responses are due

in the time allotted by the client or agency performing the audit. This time frame is generally 30 days.

TestAmerica Edison cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. The client may only view data and systems related directly to the client's work. All efforts are made to keep other client information confidential.

16.3.1 Confidential Business Information (CBI) Considerations

During on-site audits, on-site auditors may come into possession of information claimed as business confidential. A business confidentiality claim is defined as "a claim or allegation that business information is entitled to confidential treatment for reasons of business confidentiality or a request for a determination that such information is entitled to such treatment." When information is claimed as business confidential, the laboratory must place on (or attach to) the information at the time it is submitted to the auditor, a cover sheet, stamped or typed legend or other suitable form of notice, employing language such as "trade secret", "proprietary" or "company confidential". Confidential portions of documents otherwise non-confidential must be clearly identified. CBI may be purged of references to client identity by the responsible laboratory official at the time of removal from the laboratory. However, sample identifiers may not be obscured from the information. Additional information regarding CBI can be found in within the 2003 NELAC standards.

16.3.2 Performance Audits

The laboratory is involved in performance audits conducted semi-annually through the analysis of PT samples provided by a third party. The laboratory generally participates in the following types of PT studies: Water Supply (WS), Water Pollution (WP) and Solid/Hazardous Waste (SHW) as provided by the NJDEP Office of Quality Assurance (the lab's primary NELAC accreditation body).

- It is TestAmerica's policy that PT samples be treated as typical samples in the production process. Further, where PT samples present special or unique problems in the regular production process they may need to be treated differently, as would any special or unique request submitted by any client. The QA Manager must be consulted and in agreement with any decisions made to treat a PT sample differently due to some special circumstance.

- PTs generally do not have holding times associated with them. In the absence of any holding time requirement, it is recommended that the holding time begin when the PT sample is prepared according to the manufacturers instructions. Holding times should apply to full volume PT samples only if the provider gives a meaningful "sampling date". If this is not provided, it is recommended that the date/time of opening of the full volume sample be considered the beginning of holding time.

- Login will obtain the COC information from the documentation provided with the PTs with review by QA or other designated staff.

- Vials will be prepared as required in the instruction set provided with the samples. After preparation to full volume the sample may be spiked, digested, concentrated, etc., as would be done for any normal sample requiring similar analysis.

- PT samples will not undergo multiple preps, multiple runs, multiple methods (unless being used to evaluate multiple methods), multiple dilutions, UNLESS this is what would be done to a normal client sample (e.g. if a client requests, as PT clients do, that we split VOA coeluters, then dual analysis IS normal practice).

- The type, composition, concentration and frequency of quality control samples analyzed with the PT samples shall be the same as with routine environmental samples.

- Instructions may be included in the laboratory's SOPs for how low level samples are analyzed, including concentration of the sample or adjustment of the normality of titrant. When a PT sample falls below the range of the routine analytical method, the low-level procedure may be used.

- No special reviews shall be performed by operation and QA, UNLESS this is what would be done to a normal client sample. To the degree that special report forms or login procedures are required by the PT supplier, it is reasonable that the laboratory WOULD apply special review procedures, as would be done for any client requesting unusual reporting or login processes.

- Written responses to unacceptable PT results are required. In some cases it may be necessary for blind QC samples to be submitted to the laboratory to show a return to control.

16.4 AUDIT FINDINGS

Internal or External Audit findings should be documented using the corrective action process and database (refer to Section 13). The laboratory is expected to prepare a response to audit findings within 30 days of receipt of an audit report unless the report specifies a different time frame. The response may include action plans that could not be completed within the 30 day timeframe. In these instances, a completion date must set and agreed to by operations management and the QA Manager.

Responsibility for developing and implementing corrective actions to findings is the responsibility of the Department Manager where the finding originated. Findings that are not corrected by specified due dates are reported monthly to management in the QA monthly report.

If any audit finding casts doubt on the effectiveness of the operations or on the correctness or validity of the laboratory's test results, the laboratory shall take timely corrective action, and shall notify clients in writing if the investigations show that the laboratory results have been affected. Once corrective action is implemented, a follow-up audit is scheduled to ensure that the problem has been corrected.

The procedures must be in accordance to SOP No. CA-L-S-001, Internal Investigations of Data Discrepancies and Determination of Data Recall.

Clients must be notified promptly in writing, of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any test report or amendment to a test report. The investigation must begin within 24-hours of discovery of the problem and all efforts are made to notify the client within two weeks after the completion of the investigation.

Figure 16-1.

Example - Internal Audit Workbook

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica <Name>
Last Updated: 9/10/2007

Workbook Instruction No. CA-Q-WI-011

Internal Audit Workbook
Summary Page

Note: Click on the (Summary Page) to located on each audit sheet to return to this page.
*** The lab may choose to audit these areas with each method/analyst/instrument audit. The auditor must document on the checklist that this item is audited as part of the <defined> audit.**

Area Audited	Audit Type	Audit Cycle	Scheduled	Date Audited	Date Closed	Comments
(Click on the Area to get to that Spreadsheet)						
Balances	System	6 mo				
Temperature Logs/Thermometers	System	6 mo				
Sample Storage and Disposal	System	1 yr				
Maintenance Logs *	System	6 mo				
Volatile Storage Blanks	System	6 mo				
Lab Water Quality Testing	System	6 mo				
Sample Log In	System	1 yr				
Shipping Procedures	System	1 yr				
Computer Operations (LIMS)	System	1 yr				
SOP & Document Distribution System	System	1 yr				
Archiving Electronic & Paper Records	System	1 yr				
Statistical Process Control	System	1 yr				
Data Review System	System	1 yr				
Final Report Generation	System	1 yr				
Standards/Reagents *	System	6 mo				
Manual Integration *	System	1 yr				
Corrective Action System	System	1 yr				
Training Records	System	6 mo				
MDLs	System	1 yr				
SOPs - Prep/Review/Update Process	System	1 yr				
Purchasing/Procurement	System	1 yr				
Eppendorf/Diluter/Dispenser Calibration Check	System	6 mo				
Subcontract Lab Approval	System	1 yr				
Customer Complaint System	System	1 yr				
Methods	Method	2 yr				
.....	.....	.....				
.....	.....	.....				
.....	.....	.....				

Page 1 of 1

Figure 16-2.

Example – Internal Audit System Checklist: Corrective Actions

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica <Location>

INTERNAL AUDIT - Corrective Actions

[Printed Name(s) or Date(s)]

(Summary Page)

Area Audited:
Auditor:
Date:
Persons Contacted During Audit:

Date Reported to Department Manager:
Reported To:

Date Reported to Lab Director/Manager:
Reported To:

Date Response Due:

Response Received and Accepted by QA Manager:

Associated Corrective Action Report Number(s):

Scheduled Follow-up:

Item	Requirement	Ref.	Y	N	NA	Evidence/Comments	Follow Up
1	Does the laboratory have a corrective action program in place?	5.4.10.1					
2	Does the laboratory have a current corrective action SOP or is this information in the QA Manual?	5.4.10.1					
3	Do all laboratory personnel have documented training and access to initiate corrective actions?	5.4.10.1					
4	Are causes clearly identified by department, staff name, scope of issue (how many reports affected)?	5.4.10.6					
5	Is a root cause for the issue identified?	5.4.10.2					
6	Is a corrective action (plan) clearly described?						
7	Was the corrective action fully implemented?						
8	Is documentation (if applicable) completed as specifed by the corrective action (training, revised SOP, etc)						
9	Has a follow-up assessment been conducted to verify the corrective action was successful?						
10	Are corrective actions reviewed on a regular basis by management?	5.4.10.6a 5					
11	Is there a defined distribution flow for corrective action notifications, review, closure, and follow-up?	5.4.10.6a					
12	Are non-conformances reviewed on a regular basis and used, if necessary, to initiate root cause corrective actions?						
13	Does the lab have a documented procedure for QC corrective action (i.e., documented within each method / parameter SOP or in the QA Manual)?	4.10.1					
14	***Verify Corrective Actions from previous systems audits. List Items:***						
15							
16							
17							

Auditor Signature:_____

Primary Reference(s): Corporate SOP CA-Q-S-002, Acceptable Manual Integration Practices
NELAC Standard, June 2003
DoD Quality Systems Manual, Version 3, January 2006
EPA Manual for the Certification of Laboratories Analyzing Drinking Water

SECTION 17

MANAGEMENT REVIEWS
(NELAC 5.4.14)

17.1 QUALITY ASSURANCE REPORT

A comprehensive QA Report shall be prepared each month by the laboratory's QA Department and forwarded to the Laboratory Director for review and comments. The final report shall be submitted to the Laboratory Director as well as the appropriate Quality Director and General Manager. All aspects of the QA system are reviewed to evaluate the suitability of policies and procedures. At a minimum, the report content will contain the items listed below. During the course of the year, the Laboratory Director/Manager, General Manager or Corporate QA may request that additional information be added to the report.

The TestAmerica QA Report template is comprised of a discussion of three key QA issues facing the laboratory and ten specific sections (Figure 17-1):

- **Metrics:** Describe actions or improvement activities underway to address any outlying quality metrics.
- **SOPs:** Report SOPs that have been finalized and report status of any outstanding SOP reviews.
- **Corrective Actions:** Describe highlights and the most frequent cause for report revisions and corrective/preventive action measures underway. Include a discussion of any recalls handled at the lab level as per Section 6.2.2 in the Investigation/Recall SOP (SOP: CA-L-S-001). Include a section for client feedback and complaints. Include both positive and negative feedback. Describe the most serious client complaints and resolutions in progress.
- **MDLs and Control Limits:** Report which MDLs/ MDL verifications are due. Report the same for Control Limits.
- **Audits:** Report Internal and External Audits that were conducted. Include all relevant information such as which methods, by whom, corrective actions needed by when and discuss unresolved audit findings.
- **Performance Testing (PT) Samples:** Report the PT tests that are currently being tested with their due dates, report recent PT results by study, acceptable, total reported and the month and year.
- **Certifications:** Report on any certification programs being worked on by due date, packages completed. Describe any issues, lapses, or potential revocations.
- **Regulatory Updates:** Include information on new state or federal regulations that may impact the laboratory. Report new methods that require new instrumentation, deletion of methods, changes in sampling requirements and frequencies etc…
- **Miscellaneous:** Include any issues that may impact quality within the laboratory.
- **Next Month:** Report on plans for the upcoming month.
- **Lab Director Comments Section:** This section gives the Laboratory Director the opportunity to comment on issues discussed in the report and to document plans to resolve

these issues. Unresolved issues that reappear in subsequent monthly reports must be commented on by the Laboratory Director/Manager.

- **Metrics:** The report also includes statistical results that are used to assess the effectiveness of the quality system. Effective quality systems are the responsibility of the entire laboratory staff. Each laboratory provides their results in a template provided by Corporate QA (Figure 17-2).

On a monthly basis, Corporate QA compiles information from all the monthly laboratory reports. The VP-QA/EHS prepares a report that includes a compilation of all metrics and notable information and concerns regarding the QA programs within the laboratories. The report also includes a listing of new regulations that may potentially impact the laboratories. This report is presented to the Analytical Division Senior Management Team and General Managers.

17.2 ANNUAL MANAGEMENT REVIEW

The senior lab management team (Laboratory Director/Lead Technical Director and QA Manager), conducts an annual review of its quality systems and LIMS to ensure its continuing suitability and effectiveness in meeting client and regulatory requirements and to introduce any necessary changes or improvements. Corporate Operations and Corporate QA personnel may be included in this meeting at the discretion of the Laboratory Director/Manager. The LIMS review consists of examining any audits, complaints or concerns that have been raised through the year that are related to the LIMS. The laboratory will summarize any critical findings that can not be solved by the lab and report them to Corporate IT.

This review uses information generated during the preceding year to assess the “big picture” by ensuring that routine quality actions taken and reviewed on a monthly basis are not components of larger systematic concerns. The monthly review (refer to Section 17.1) should keep the quality systems current and effective, therefore, the annual review is a formal senior management process to review specific existing documentation. Significant issues from the following documentation are compiled or summarized by the QA Manager prior to the review meeting:

- Matters arising from the previous annual review.
- Prior Monthly QA Reports issues.
- Laboratory QA Metrics.
- Review of report reissue requests.
- Review of client feedback and complaints.
- Issues arising from any prior management or staff meetings.
- Minutes from prior Senior Management team meetings. Issues that may be raised from these meetings include:
    - Adequacy of staff, equipment and facility resources.
    - Adequacy of policies and procedures.
    - Future plans for resources and testing capability and capacity.

- The annual internal double blind PT program sample performance (if performed),

- Compliance to the Ethics Policy and Data Integrity Plan. Including any evidence/incidents of inappropriate actions or vulnerabilities related to data Integrity.

The annual review includes the previous 12 months. Based on the annual review, a report is generated by the QA Manager and management. The report is distributed to the appropriate General Manager and the Quality Director. The report includes, but is not limited to:

- The date of the review and the names and titles of participants.
- A reference to the existing data quality related documents and topics that were reviewed.
- Quality system or operational changes or improvements that will be made as a result of the review [e.g., an implementation schedule including assigned responsibilities for the changes (Action Table)].

The QA Manual is also reviewed at this time and revised to reflect any significant changes made to the quality systems.

17.3 POTENTIAL INTEGRITY RELATED MANAGERIAL REVIEWS

Potential integrity issues (data or business related) must be handled and reviewed in a confidential manner until such time as a follow-up evaluation, full investigation, or other appropriate actions have been completed and issues clarified. The Corporate Data Investigation/ Recall SOP shall be followed (SOP No. CA-L-S-001). All investigations that result in finding of inappropriate activity are documented and include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients.

The Chairman/CEO, President/CEO, COOs and Quality Directors receive a monthly report from the VP of Quality and EHS summarizing any current data integrity or data recall investigations as described in SOP No. CA-L-S-001. The General Manager's are also made aware of progress on these issues for their specific labs.

Figure 17-1.

Example - QA Monthly Report to Management

LABORATORY: x
PERIOD COVERED: Month/Year
PREPARED BY: x DATE: Month Day, Year
DISTRIBUTED TO: xx (Include LD, GM, QA Director, etc…)

THREE KEY ISSUES FOR MONTH:
Include a discussion of three key issues that were focused in on this month.
1. x
2. x
3. x

---

1. METRICS
Describe actions or improvement activities underway to address any outlying quality metrics.

2. SOPs

See Tab for SOP specifics.

The following SOPs were finalized (or reviewed for accuracy): (See Tab)

The following SOPs are due to QA: xx

In QA to complete: xx

3. CORRECTIVE ACTION

Highlights: xx

Revised Reports:
Describe the most frequent cause for report revisions and corrective/preventive action measures underway.

Data Investigations/Recalls (Corporate Data Investigation/Recall SOP) :
Include a discussion of any recalls handled at the lab level as Corp SOP.

Client Feedback and Complaints:
Include both positive and negative feedback.

Describe the most serious client complaints) and resolutions in progress.

4. MDLs AND CONTROL LIMITS

MDLs Due:

Control Limits Due:

5. AUDITS

INTERNAL AUDITS

Discuss Any Outstanding Issues (or Attach Summary):

EXTERNAL AUDITS
Discuss Any Outstanding Issues (or Attach Summary):

6. PT SAMPLES

The following PT samples are now in house (Due Dates):
xx

7. CERTIFICATIONS

Certification Packages Being Worked On (Include Due Date):
x

Describe any issues, lapses, or potential revocations.

8. REGULATORY UPDATE
Include information on new state or federal regulations that may impact the laboratory – new methods that require new instrumentation, deletion of methods, changes in sampling requirements or frequencies, …

9. MISCELLANEOUS
Include any issues that may impact quality within the laboratory.

10. NEXT MONTH
Items planned for next month.

LAB DIRECTOR COMMENTS AND PLANNED CORRECTIVE ACTIONS:	
LAB DIRECTOR REVIEW:	DATE:

Figure 17-2.

Example - Laboratory Metrics Categories

Reports for month
Reports revised due to lab error
% Revised Reports
# of Data Recall Investigations
# of Reports Actually Recalled
Corrective Action Reports
Corrective Action Reports still open
Total Number of Unresolved Open Corrective Action Reports
% of Unresolved Open Corrective Action Reports
# Reports independent QA reviewed
% QA Data Review: Reports
# Technical staff (Analysts/technicians, including Temps)
# of Analyst work product reviewed year-to-date
# of Analytical instruments w/electronic data file storage capability
# of Analytical instruments reviewed for data authenticity year-to-date
% Analyst/Instrument Data Authenticity Audits
 # Client Complaints
 # Client Compliments
# of planned internal audits
# of planned internal method audits performed year-to-date
% Annual Internal Audits Complete
# of Open Internal Audit Findings Past Due
Total Number of External Audit Findings
# of Open External Audit Findings Past Due
% External Audit Findings Past Due
# of PT analytes participated and received scores
# of PT analytes not acceptable
% PT Cumulative Score
 # PT Repeat Analyte Failures Cumulative (analyte failed more than once in 4 consecutive studies by PT Type) (only applies to failed analytes)
SOPs

SOPs Reviewed/revised within 24 months
Methods **or Administrative procedures** without approved SOPs
SOP Status
Method certification Losses due to performance/audit issues
Hold Time Violations due to lab error
Date of Last Comprehensive Ethics Training Session
 # Staff that haven't Received Comprehensive Ethics Training (>30 Days From Employment Date)
MDL Status (Good, Fair, or Poor) >90%, >70%, <70%
Training Documentation Records (Good, Fair, or Poor)
LQM Revision/review Date
QAM Updated to New Integrated Template
Last Annual Internal Audit Date (Opened, Closed)
Last Management QS Review Date
#SOPs required for 12 month review cycle (DOD *or drinking water)*
#SOPs for 12 month cycle/revised within 12 months *(Includes QS and Methods Listed in QSM)*
12 month % SOP Status *(Includes QS and Methods Listed in QSM)*

SECTION 18

PERSONNEL
(NELAC 5.5.2)

18.1 OVERVIEW

TestAmerica's management believes that its highly qualified and professional staff is the single most important aspect in assuring a high level of data quality and service. The staff consists of professionals and support personnel as outlined in the organization chart in Appendix 2.

All personnel must demonstrate competence in the areas where they have responsibility. Any staff that is undergoing training shall have appropriate supervision until they have demonstrated their ability to perform their job function on their own. Staff shall be qualified for their tasks based on appropriate education, training, experience and/or demonstrated skills as required.

The laboratory employs sufficient personnel with the necessary education, training, technical knowledge and experience for their assigned responsibilities.

All personnel are responsible for complying with all QA/QC requirements that pertain to the laboratory and their area of responsibility. Each staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular area of responsibility. Technical staff must also have a general knowledge of lab operations, test methods, QA/QC procedures and records management.

Laboratory management is responsible for formulating goals for lab staff with respect to education, training and skills and ensuring that the laboratory has a policy and procedures for identifying training needs and providing training of personnel. The training shall be relevant to the present and anticipated responsibilities of the lab staff.

The laboratory only uses personnel that are employed by or under contract to, the laboratory. Contracted personnel, when used, must meet competency standards of the laboratory and work in accordance to the laboratory's quality system.

18.2 EDUCATION AND EXPERIENCE REQUIREMENTS FOR TECHNICAL PERSONNEL

TestAmerica makes every effort to hire analytical staff that posses a college degree (AA, BA, BS) in an applied science with some chemistry in the curriculum. Exceptions can be made based upon the individual's experience and ability to learn. There are competent analysts and technicians in the industry who have not earned a college degree. Selection of qualified candidates for laboratory employment begins with documentation of minimum education, training, and experience prerequisites needed to perform the prescribed task. Minimum education and training requirements for TestAmerica employees are outlined in job descriptions and are generally summarized for analytical staff in the table below.

The laboratory maintains job descriptions for all personnel who manage, perform or verify work affecting the quality of the environmental testing the laboratory performs. Job Descriptions are located on the TestAmerica intranet site's Human Resources web-page (Also see Section 4 for

position descriptions/responsibilities). These position descriptions detail the minimum education and experience required for each position.

Experience and specialized training are occasionally accepted in lieu of a college degree (basic lab skills such as using a balance, colony counting, aseptic or quantitation techniques, etc. are also considered as applicable).

When an analyst does not meet the minimum requirements, they can perform a task under the direct supervision of a qualified analyst, peer reviewer or Department Manager, and are considered an analyst in training. The person supervising an analyst in training is accountable for the quality of the analytical data and must review and approve data and associated corrective actions.

18.3 TRAINING

TestAmerica is committed to furthering the professional and technical development of employees at all levels.

Orientation to the laboratory's policies and procedures, in-house method training, and employee attendance at outside training courses and conferences all contribute toward employee proficiency. Below are examples of various areas of required employee training:

Required Training	Time Frame*	Employee Type
Environmental Health & Safety	Refer to EH&S Manual	All
Ethics Orientation – New Hires	1 week of hire	All
Ethics - Comprehensive	90 days of hire	All
Data Integrity	30 days of hire	Technical and PMs
Quality Assurance	90 days of hire	All
Ethics – Comprehensive Refresher	Annually	All
Initial Demonstration of Capability (DOC)	Prior to unsupervised method performance	Technical

The laboratory maintains records of relevant authorization/competence, education, professional qualifications, training, skills and experience of technical personnel (including contracted personnel) as well as the date that approval/authorization was given. These records are kept on file at the laboratory. Also refer to "Demonstration of Capability" in Section 20.

The training of technical staff is kept up to date by:

- Each employee must have documentation in their training file that they have read, understood and agreed to follow the most recent version of the laboratory QA Manual and SOPs in their area of responsibility. This documentation is updated as SOPs are updated.
- Documentation from any training courses or workshops on specific equipment, analytical techniques or other relevant topics are maintained in their training file.
- Documentation of proficiency (refer to Section 20).

- An Ethics Agreement signed by each staff member (renewed each year) and evidence of annual ethics training.
- A Confidentiality Agreement signed by each staff member signed at the time of employment.
- Human Resources maintains documentation and attestation forms on employment status & records; benefit programs; timekeeping/payroll; and employee conduct (e.g., ethics). This information is maintained in the employee's secured personnel file.

Further details of the laboratory's training program are described in the TestAmerica SOP No. ED-GEN-022, Training.

18.4 DATA INTEGRITY AND ETHICS TRAINING PROGRAM

Establishing and maintaining a high ethical standard is an important element of a Quality System. Ethics and data integrity training is integral to the success of TestAmerica and is provided for each employee at TestAmerica. It is a formal part of the initial employee orientation within 1 week of hire, comprehensive training within 90 days, and an annual refresher for all employees. Senior management at each facility performs the ethics training for their staff.

In order to ensure that all personnel understand the importance TestAmerica places on maintaining high ethical standards at all times; TestAmerica has established an Ethics Policy No. CA-L-P-001 and an Ethics Statement/Agreement (Appendix 1). All initial and annual training is documented by signature on the signed Ethics Policy and Code of Ethical Conduct demonstrating that the employee has participated in the training and understands their obligations related to ethical behavior and data integrity.

Violations of this Ethics Policy will not be tolerated. Employees who violate this policy will be subject to disciplinary actions up to and including termination. Criminal violations may also be referred to the Government for prosecution. In addition, such actions could jeopardize TestAmerica's ability to do work on Government contracts, and for that reason, TestAmerica has a Zero Tolerance approach to such violations.

Employees are trained as to the legal and environmental repercussions that result from data misrepresentation. Key topics covered in the presentation include:

- Organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting.
- Ethics Policy (Appendix 1)
- How and when to report ethical/data integrity issues. Confidential reporting.
- Record keeping.
- Discussion regarding data integrity procedures.
- Specific examples of breaches of ethical behavior (e.g. peak shaving, altering data or computer clocks, improper macros, etc., accepting/offering kickbacks, illegal accounting practices, unfair competition/collusion)
- Internal monitoring. Investigations and data recalls.

- Consequences for infractions including potential for immediate termination, debarment, or criminal prosecution.
- Importance of proper written narration / data qualification by the analyst and project manager with respect to those cases where the data may still be usable but are in one sense or another partially deficient.

Additionally, a data integrity hotline (1-800-736-9407) is maintained by TestAmerica and administered by the Corporate Quality Department.

SECTION 19

ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS
(NELAC 5.5.3)

19.1 OVERVIEW

TestAmerica Edison is a 42,000 ft^2 secure laboratory facility with controlled access and designed to accommodate an efficient workflow and to provide a safe and comfortable work environment for employees. All visitors sign in and are escorted by laboratory personnel. Access is controlled by various measures.

The laboratory is equipped with structural safety features. Each employee is familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. The laboratory provides and requires the use of protective equipment including safety glasses, protective clothing, gloves, etc.. OSHA and other regulatory agency guidelines regarding required amounts of bench and fume hood space, lighting, ventilation (temperature and humidity controlled), access, and safety equipment are met or exceeded.

Traffic flow through sample preparation and analysis areas is minimized to reduce the likelihood of contamination. Adequate floor space and bench top area is provided to allow unencumbered sample preparation and analysis space. Sufficient space is also provided for storage of reagents and media, glassware, and portable equipment. Ample space is also provided for refrigerated sample storage before analysis and archival storage of samples after analysis. Laboratory HVAC and deionized water systems are designed to minimize potential trace contaminants.

The laboratory is separated into specific areas for sample receiving, sample preparation, volatile organic sample analysis, non-volatile organic sample analysis, inorganic sample analysis, and administrative functions.

19.2 ENVIRONMENT

Laboratory accommodation, test areas, energy sources, lighting are adequate to facilitate proper performance of tests. The facility is equipped with heating, ventilation, and air conditioning (HVAC) systems appropriate to the needs of environmental testing performed at this laboratory.

The environment in which these activities are undertaken does not invalidate the results or adversely affect the required accuracy of any measurements.

The laboratory provides for the effective monitoring, control and recording of environmental conditions that may effect the results of environmental tests as required by the relevant specifications, methods, and procedures. Such environmental conditions include humidity, and temperature levels in the laboratory (as appropriate).

When any of the method or regulatory required environmental conditions change to a point where they may adversely affect test results, analytical testing will be discontinued until the environmental conditions are returned to the required levels (refer to Section 12).

Environmental conditions of the facility housing the computer network and LIMS are regulated to protect against raw data loss.

19.3 WORK AREAS

There is effective separation between neighboring areas when the activities therein are incompatible with each other. Examples include:

- Volatile organic chemical handling areas, including sample preparation and waste disposal, and volatile organic chemical analysis areas.

Access to and use of all areas affecting the quality of analytical testing is defined and controlled by secure access to the laboratory building as described below in the Building Security section.

Adequate measures are taken to ensure good housekeeping in the laboratory and to ensure that any contamination does not adversely affect data quality. These measures include regular cleaning to control dirt and dust within the laboratory.

Work areas are available to ensure an unencumbered work area. Work areas include:

- Access and entryways to the laboratory.
- Sample receipt areas.
- Sample storage areas.
- Chemical and waste storage areas.
- Data handling and storage areas.
- Sample processing areas.
- Sample analysis areas.

19.4 FLOOR PLAN

A floor plan can be found in Appendix 3.

19.5 BUILDING SECURITY

Building keys are distributed to employees as necessary. All employees are required to sign in and out in department specific employee logbooks.

Visitors to the laboratory sign in and out in a visitor's logbook. A visitor is defined as any person who visits the laboratory who is not an employee of TestAmerica Edison. In addition to signing into the laboratory, the Environmental, Health and Safety Manual contains requirements for visitors and vendors. There are specific safety forms that must be reviewed and signed.

Visitors (with the exception of company employees) are escorted by laboratory personnel at all times, or the location of the visitor is noted in the visitor's logbook.

SECTION 20.0

TEST METHODS AND METHOD VALIDATION
(NELAC 5.5.4)

20.1 OVERVIEW

TestAmerica Edison uses methods that are appropriate to meet our clients' requirements and that are within the scope of the laboratory's capabilities. These include sampling, handling, transport, storage and preparation of samples, and, where appropriate, an estimation of the measurement of uncertainty as well as statistical techniques for analysis of environmental data.

Instructions are available in the laboratory for the operation of equipment as well as for the handling and preparation of samples. All instructions, Standard Operating Procedures (SOPs), reference methods and manuals relevant to the working of the laboratory are readily available to all staff. Deviations from published methods are documented (with justification) in the laboratory's approved SOPs. SOPs are submitted to clients for review at their request. Significant deviations from published methods require client approval and regulatory approval where applicable.

20.2 STANDARD OPERATING PROCEDURES (SOPs)

TestAmerica Edison maintains SOPs that accurately reflect all phases of the laboratory such as assessing data integrity, corrective actions, handling customer complaints as well as all analytical methods and sampling procedures. The method SOPs are derived from the most recently promulgated/approved, published methods and are specifically adapted to the laboratory facility. Modifications or clarifications to published methods are clearly noted in the SOPs. All SOPs are controlled in the laboratory (refer to Section 6 on Document Control):

- All SOPs contain a revision number, effective date, and appropriate approval signatures. Controlled copies are available to all staff.
- Procedures for preparation, review, revision and control are incorporated by reference to SOPs: **CW-Q-S-002** (Writing a Standard Operating Procedure (SOP) and TestAmerica Edison SOP No. ED-GEN-002 (Document Control).
- SOPs are reviewed at a minimum of every 2 years (annually for Drinking Water and DoD SOPs), and where necessary, revised to ensure continuing suitability and compliance with applicable requirements.

20.3 LABORATORY METHODS MANUAL

For each test method, the laboratory shall have available the published referenced method as well as the laboratory developed SOP. Refer to the corporate SOP CW-Q-S-002 "Writing a Standard Operating Procedure" for content and requirements of technical and non-technical SOPs.

Note: If more stringent standards or requirements are included in a mandated test method or regulation than those specified in this manual, the laboratory shall demonstrate that such requirements are met. If it is not clear which requirements are more stringent, the standard from

the method or regulation is to be followed. Any exceptions or deviations from the referenced methods or regulations are noted in the specific analytical SOP.

20.4 SELECTION OF METHODS

Since numerous methods and analytical techniques are available, continued communication between the client and laboratory is imperative to assure the correct methods are utilized. Once client methodology requirements are established, this and other pertinent information is summarized by the Project Manager. These mechanisms ensure that the proper analytical methods are applied when the samples arrive for log-in. For non-routine analytical services (e.g., special matrices, non-routine compound lists, etc..), the method of choice is selected based on client needs and available technology. The methods selected should be capable of measuring the specific parameter of interest, in the concentration range of interest, and with the required precision and accuracy.

20.4.1 Sources of Methods

Routine analytical services are performed using standard EPA-approved methodology. In some cases, modification of standard approved methods may be necessary to provide accurate analyses of particularly complex matrices. When the use of specific methods for sample analysis is mandated through project or regulatory requirements, only those methods shall be used.

In general, TestAmerica Edison follows procedures from the referenced methods shown below in 20.4.1.1.

When clients do not specify the method to be used or methods are not required, the methods used will be clearly validated and documented in an SOP and available to clients and/or the end user of the data.

20.4.1.1 The analytical methods used by the laboratory are those currently accepted and approved by the U. S. EPA and the state or territory from which the samples were collected. Reference methods include:

- Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act, and Appendix A-C; 40 CFR Part 136, USEPA Office of Water. Revised as of July 1, 1995, Appendix A to Part 136 - Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (EPA 600 Series)
- Methods for Chemical Analysis of Water and Wastes, EPA 600 (4-79-020), 1983.
- Methods for the Determination of Inorganic Substances in Environmental Samples, EPA-600/R-93/100, August 1993.
- Methods for the Determination of Metals in Environmental Samples, EPA/600/4-91/010, June 1991. Supplement I: EPA-600/R-94/111, May 1994.
- Methods for the Determination of Organic Compounds in Drinking Water, EPA-600/4-88-039, December 1988, Revised, July 1991, Supplement I, EPA-600-4-90-020, July 1990, Supplement II, EPA-600/R-92-129, August 1992. Supplement III EPA/600/R-95/131 - August 1995 (EPA 500 Series) (EPA 500 Series methods)

- Technical Notes on Drinking Water Methods, EPA-600/R94-173, October 1994
- Statement of Work for Inorganics Analysis, ILM04.1, USEPA Contract Laboratory Program Multi-media, Multi-concentration.
- Statement of Work for Organics Analysis, OLM04.2, USEPA Contract Laboratory Program, Multi-media, Multi-concentration.
- Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, OLMO4.1, USEPA Contract Laboratory Program, September 1998.
- Standard Methods for the Examination of Water and Wastewater, 18th/19th /20th edition; Eaton, A.D. Clesceri, L.S. Greenberg, A.E. Eds; American Water Works Association, Water Pollution Control Federation, American Public Health Association: Washington, D.C.
- Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996.
- Annual Book of ASTM Standards, American Society for Testing & Materials (ASTM), Philadelphia, PA.
- Manual for the Certification of Laboratories Analyzing Drinking Water (EPA 815-R-05-004, January 2005)
- Code of Federal Regulations (CFR) 40, Parts 136, 141, 172, 173, 178, 179 and 261

The laboratory reviews updated versions to all the aforementioned references for adaptation based upon capabilities, instrumentation, etc., and implements them as appropriate. As such, the laboratory strives to perform only the latest versions of each approved method as regulations allow or require.

Other reference procedures for non-routine analyses may include methods established by specific states (e.g., Underground Storage Tank methods), ASTM or equipment manufacturers. Sample type, source, and the governing regulatory agency requiring the analysis will determine the method utilized.

The laboratory shall inform the client when a method proposed by the client may be inappropriate or out of date. After the client has been informed, and they wish to proceed contrary to the laboratory's recommendation, it will be documented.

20.4.2 Demonstration of Capability

Before the laboratory may institute a new method and begin reporting results, the laboratory shall confirm that it can properly operate the method. In general, this demonstration does not test the performance of the method in real world samples, but in an applicable and available clean matrix sample. If the method is for the testing of analytes that are not conducive to spiking, demonstration of capability may be performed on quality control samples.

20.4.2.1 A demonstration of capability is performed whenever there is a change in instrument type, method or personnel.

20.4.2.2 The initial demonstration of capability must be thoroughly documented and approved by the Department Manager and QA Manager prior to independently analyzing client

samples. All associated documentation must be retained in accordance with the laboratories archiving procedures (refer to Section 15, Control of Records).

20.4.2.3 The laboratory must have an approved SOP, demonstrate satisfactory performance, and conduct a method detection limit study (when applicable). There may be other requirements as stated within the published method or regulations (i.e., retention time window study).

Note: In some instances, a situation may arise where a client requests that an unusual analyte be reported using a method where this analyte is not normally reported. If the analyte is being reported for regulatory purposes, the method must meet all procedures outlined within this QA Manual (SOP, MDL, and Demonstration of Capability). If the client states that the information is not for regulatory purposes, the result may be reported as long as the following criteria are met:

- The instrument is calibrated for the analyte to be reported using the criteria for the method and ICV/CCV criteria are met (unless an ICV/CCV is not required by the method).
- The reporting limit is set at or above the low standard of the curve for the analyte.
- The client request is documented and the lab informs the client of its procedure for working with unusual compounds. The final report must be footnoted: *Reporting Limit based on the low standard of the calibration curve.*
- Refer to Section 12 (Control of Non-Conforming Work).

20.4.3 <u>Initial Demonstration of Capability (IDOC) Procedures</u>

20.4.3.1 The spiking standard used must be prepared independently from those used in instrument calibration.

20.4.3.2 The analyte(s) shall be diluted in a volume of clean matrix sufficient to prepare four aliquots at the concentration specified by a method or the laboratory SOP.

20.4.3.3 At least four aliquots shall be prepared (including any applicable clean-up procedures) and analyzed according to the test method (either concurrently or over a period of days).

20.4.3.4 Using all of the results, calculate the mean recovery in the appropriate reporting units and the standard deviations for each parameter of interest.

20.4.3.5 When it is not possible to determine the mean and standard deviations, such as for presence, absence and logarithmic values, the laboratory will assess performance against criteria described in the Method SOP.

20.4.3.6 Compare the information obtained above to the corresponding acceptance criteria for precision and accuracy in the test method (if applicable) or in laboratory generated acceptance criteria (LCS or interim criteria) if there is no mandatory criteria

established. If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter.

20.4.3.7 When one or more of the tested parameters fail at least one of the acceptance criteria, the analyst must proceed according to either option listed below:

- Locate and correct the source of the problem and repeat the test for all parameters of interest beginning with 20.4.3.3 above.
- Beginning with 20.4.3.3 above, repeat the test for all parameters that failed to meet criteria. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with 20.4.3.1 above.

A certification statement (see Figure 20-1) shall be used to document the completion of each initial demonstration of capability. A copy of the certification is archived in the analyst's training folder.

20.5 LABORATORY DEVELOPED METHODS AND NON-STANDARD METHODS

Any new method developed by the laboratory must be fully defined in an SOP/Methods Manual (Section 20.2) and validated by qualified personnel with adequate resources to perform the method. Method specifications and the relation to client requirements must be clearly conveyed to the client if the method is a non-standard method (not a published or routinely accepted method). The client must also be in agreement to the use of the non-standard method. The information included in the checklist below (Figure 20-2) is needed before samples are accepted for analysis by a new method.

20.6 VALIDATION OF METHODS

Validation is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled. (From 2003 NELAC Standard)

All non-standard methods, laboratory designed/developed methods, standard methods used outside of their scope, and major modifications to published methods must be validated to confirm they are fit for their intended use. The validation will be as extensive as necessary to meet the needs of the given application. The results are documented with the validation procedure used and contain a statement as to the fitness for use.

20.6.1 Method Validation and Verification Activities for All New Methods

While method validation can take various courses, the following activities can be required as part of method validation. Method validation records are designated QC records and are archived accordingly.

20.6.1.1 Determination of Method Selectivity

Method selectivity is the demonstrated ability to discriminate the analyte(s) of interest from other compounds in the specific matrix or matrices from other analytes or interference. In some

cases to achieve the required selectivity for an analyte, a confirmation analysis is required as part of the method.

20.6.1.2 Determination of Method Sensitivity

Sensitivity can be both estimated and demonstrated. Whether a study is required to estimate sensitivity depends on the level of method development required when applying a particular measurement system to a specific set of samples. Where estimations and/or demonstrations of sensitivity are required by regulation or client agreement, such as the procedure in 40 CFR Part 136 Appendix B, under the Clean Water Act, these shall be followed. The laboratory determinations of MDLs are described in Section 20.7.

20.6.1.3 Relationship of Limit of Detection (LOD) to the Quantitation Limit (QL)

An important characteristic of expression of sensitivity is the difference in the LOD and the QL. The LOD is the minimum level at which the presence of an analyte can be reliably concluded. The QL is the minimum level at which both the presence of an analyte and its concentration can be reliably determined. For most instrumental measurement systems, there is a region where semi-quantitative data is generated around the LOD (both above and below the estimated MDL or LOD) and below the QL. In this region, detection of an analyte may be confirmed but quantification of the analyte is unreliable within the accuracy and precision guidelines of the measurement system. When an analyte is detected below the QL, and the presence of the analyte is confirmed by meeting the qualitative identification criteria for the analyte, the analyte can be reliably reported, but the amount of the analyte can only be estimated. If data is to be reported in this region, it must be done so with a qualification that denotes the semi-quantitative nature of the result.

20.6.1.4 Determination of Interferences

A determination that the method is free from interferences in a blank matrix is performed.

20.6.1.5 Determination of Range

Where appropriate, a determination of the applicable range of the method may be performed. In most cases, range is determined and demonstrated by comparison of the response of an analyte in a curve to established or targeted criteria. The curve is used to establish the range of quantitation and the lower and upper values of the curve represent upper and lower quantitation limits. Curves are not limited to linear relationships.

20.6.1.6 Determination of Accuracy and Precision

Accuracy and precision studies are generally performed using replicate analyses, with a resulting percent recovery and measure of reproducibility (standard deviation, relative standard deviation) calculated and measured against a set of target criteria.

20.6.1.7 Documentation of Method

The method is formally documented in an SOP. If the method is a minor modification of a standard laboratory method that is already documented in an SOP, an SOP Attachment describing the specific differences in the new method is acceptable in place of a separate SOP.

20.6.1.8 Continued Demonstration of Method Performance

Continued demonstration of Method Performance is addressed in the SOP. Continued demonstration of method performance is generally accomplished by batch specific QC samples such as LCS, method blanks or PT samples.

20.7 METHOD DETECTION LIMITS (MDL)/ LIMITS OF DETECTION (LOD)

Method detection limits (MDL) are initially determined in accordance with 40 CFR Part 136, Appendix B. MDL is also sometimes referred to as Limit of Detection (LOD). The MDL theoretically represents the concentration level for each analyte within a method at which the Analyst is 99% confident that the true value is not zero. The MDL is determined for each analyte initially during the method validation process and updated as required in the analytical methods, whenever there is a significant change in the procedure or equipment, or based on project specific requirements (refer to 20.7.10). The analyst prepares at least seven replicates of solution spiked at one to five times the estimated method detection limit (most often at the lowest standard in the calibration curve) into the applicable matrix with all the analytes of interest. Each of these aliquots is extracted (including any applicable clean-up procedures) and analyzed in the same manner as the samples. Where possible, the seven replicates should be analyzed over 2-4 days to provide a more realistic MDL.

20.7.1 MDL's are initially performed for each individual instrument and non-microbiological method analysis. Unless there are requirements to the contrary, the laboratory will use the highest calculated MDL for all instruments used for a given method as the MDL for reporting purposes. This MDL is not required for methods that are not readily spiked (e.g. pH, turbidity, etc.) or where the lab does not report values to the MDL. Titration and gravimetric methods where there is no additional preparation involved, the MDL is based on the lowest discernable unit of measure that can be observed.

20.7.2 MDL's must be run against acceptable instrument QC, including ICV's and Tunes. This is to insure that the instrument is in proper working condition and falsely high or low MDL's are not calculated.

20.7.3 Use only clean matrix which is free of target analytes (e.g.: Laboratory reagent water, Ottawa Sand) unless a project specific MDL is required in a field sample matrix.

20.7.4 The Reporting Limit (also may be referred to as Limit of Quantitation or LOQ) should generally be between 2 and 5 times the MDL. If the MDL is being performed during method development, use this guideline to determine the Reporting Limit for the analysis. If a sample is diluted, the reported MDL is adjusted according to the dilution factor.

20.7.5 The calculated MDL cannot be greater than the spike amount.

20.7.6 If the most recent calculated MDL does not permit qualitative identification of the analyte then the laboratory may use technical judgment for establishing the MDL (e.g., calculate what level would give a qualitative ID, compare with IDL (20.8), spike at a level where qualitative ID is determined and assign that value as MDL, minimum sensitivity requirements, Standard deviation of method blanks over time, etc.). These alternate verification procedures must be documented in the laboratory SOP on MDL's.

20.7.7 Each of the 7 spikes must be qualitatively identifiable (e.g., appear in both columns for dual column methods, characteristic ions for GCMS mass spectra, etc). Manual integrations to force the baseline for detection are not allowed.

20.7.8 The initial MDL is calculated as follows:

$$MDL = t_{(n-1,\ 1-a\ =\ 0.99)} \times (\text{Standard Deviation of replicates})$$

where $t_{(n-1,\ 1-a\ =\ 0.99)} = 3.143$ for seven replicates.

20.7.9 Subsequent to the initial MDL determination, periodic MDL verification, confirmation or determinations may be performed by the procedure in 40 CFR Part 136, Appendix B or alternatively by other technically acceptable practices (e.g., method blanks over time, single standard spikes that have been subjected to applicable sample prep processes, etc.). The procedures utilized are documented in TestAmerica Edison SOP No. ED-GEN-005 (MDL Determination).

20.7.10 Because of the inherent variability in results outside of the calibration range, TestAmerica does not recommend the reporting of results below the lowest calibration point in a curve; however, it is recognized that some projects and agencies require the reporting of results below the RL. Any result that falls between the MDL and the Reporting limit, when reported, will be qualified as an estimated value.

20.7.11 Detections reported down to the MDL must be qualitatively identified.

20.7.12 MDLs and Reporting limits are adjusted in LIMs based on moisture content and sample aliquot size.

20.8 INSTRUMENT DETECTION LIMITS (IDL)

20.8.1 The IDL is sometimes used to assess the reasonableness of the MDLs or in some cases required by the analytical method or program requirements. IDLs are most used in metals analyses but may be useful in demonstration of instrument performance in other areas.

20.8.2 IDLs are calculated to determine an instrument's sensitivity independent of any preparation method. IDLs are calculated either using 7 replicate spike analyses, like MDL but without sample preparation, or by the analysis of 10 instrument blanks and calculating 3 x the absolute value of the standard deviation.

20.8.3 If IDL is > than the MDL, it may be used as the reported MDL.

20.9 VERIFICATION OF DETECTION AND REPORTING LIMITS

20.9.1 Once an MDL is established, it must be verified, on each instrument, by analyzing a quality control sample (prepared as a sample) at approximately 2-3 times the calculated MDL for single analyte analyses (e.g. most wet chemistry methods, Atomic Absorption, etc.) and 1-4 times the calculated MDL for multiple analyte methods (e.g. GC, GCMS, ICP, etc.). The analytes must be qualitatively identified or see section 20.6.7 for other options. This verification does not apply to methods that are not readily spiked (e.g. pH, turbidity, etc.) or where the lab does not report to the MDL. If the MDL does not verify, then the lab will not report to the MDL, or redevelop their MDL or use the level where qualitative identification is established (See 20.6.7). MDLs must be verified at least annually

20.9.2 When a Reporting limit is established, it must be initially verified by the analysis of a low level standard or QC sample (LCS at 1-2 the reporting limit) and annually thereafter. Unless there are requirements to the contrary the acceptance criteria is ± 50%. The annual requirement is waved for methods that have an annually verified MDL as described in Section 20.9.1).

20.10 RETENTION TIME WINDOWS

Most organic analyses and some inorganic analyses use chromatography techniques for qualitative and quantitative determinations. For every chromatography analysis or as specific in the reference method, each analyte will have a specific time of elution from the column to the detector. This is known as the analyte's retention time. The variance in the expected time of elution is defined as the retention time window. As the key to analyte identification in chromatography, retention time windows must be established on every column for every analyte used for that method. These records are kept with the files associated with an instrument for later quantitation of the analytes.

For GC, HPLC and IC methods, there must be sufficient separation between analyte peaks so as to not misidentify analytes. In the mid-level standard, the distance between the valley and peak height cannot be any less than 25% of the sum of the peak heights of the analytes. This also applies to GCMS in the case where the two compounds share the same quantitation ion.

Note: Some analytes do not separate sufficiently to be able to identify or quantitate them as separate analytes (e.g. m-xylene and p-xylene) and are quantitated and reported as a single analyte (e.g. m,p-xylenes).

Once the analyst has determined that the instrument is in optimum working condition through calibration and calibration verification procedures, he or she uses a mid-range calibration or calibration verification standard to establish the retention times for each of the individual analytes in a method. The analyst makes three injections of the same standard over a 72-hour (24 hr period for 300.0) period, tabulating the retention times for each analyte for each of the three injections. The width of retention time window is normally the average absolute retention time ± 3 Standard Deviations. A peak outside the retention time window will not be identified by the computer as a positive match of the analyte of interest

It is possible for the statistically calculated RT window to be too tight and need to be adjusted based on analyst experience. In these instances method default retention time windows may be used (e.g., for 8000 series methods a default of 0.03 minutes may be used, and EPA CLP 0.05 minutes is used). The same concept is applied when any peak outside of that window will not be identified by the computer as a positive match.

The calibration verification standard at the beginning of a run may be used to adjust the RT for an analyte. This is essentially re-centering the window but the size of the window remains the same. The RTs are verified when all analytes are within their RT windows and are properly identified.

20.11 EVALUATION OF SELECTIVITY

The laboratory evaluates selectivity by following the checks within the applicable analytical methods, which include mass spectral tuning, second column confirmation, ICP interelement interference checks, chromatography retention time windows, sample blanks, spectrochemical, atomic absorption or fluorescence profiles, and specific electrode response factors.

20.12 ESTIMATION OF UNCERTAINTY OF MEASUREMENT

20.12.1 Uncertainty is "a parameter associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand" (as defined by the International Vocabulary of Basic and General Terms in Metrology, ISO Geneva, 1993, ISBN 92-67-10175-1). Knowledge of the uncertainty of a measurement provides additional confidence in a result's validity. Its value accounts for all the factors which could possibly affect the result, such as adequacy of analyte definition, sampling, matrix effects and interferences, climatic conditions, variances in weights, volumes, and standards, analytical procedure, and random variation. Some national accreditation organizations require the use of an "expanded uncertainty": the range within which the value of the measurand is believed to lie within at least a 95% confidence level with the coverage factor k=2.

20.12.2 Uncertainty is not error. Error is a single value, the difference between the true result and the measured result. On environmental samples, the true result is never known. The measurement is the sum of the unknown true value and the unknown error. Unknown error is a combination of systematic error, or bias, and random error. Bias varies predictably, constantly, and independently from the number of measurements. Random error is unpredictable, assumed to be Gaussian in distribution, and reducible by increasing the number of measurements.

20.12.3 The uncertainty associated with results generated by the laboratory can be determined by using the Laboratory Control Sample (LCS) accuracy range for a given analyte. The LCS limits are used to assess the performance of the measurement system since they take into consideration all of the laboratory variables associated with a given test over time (except for variability associated with the sampling). The percent recovery of the LCS is compared either to the method-required LCS accuracy limits or to the statistical, historical, in-house LCS accuracy limits.

20.12.4 To calculate the uncertainty for the specific result reported, multiply the result by the decimal of the lower end of the LCS range percent value for the lower end of the uncertainty range, and multiply the result by the decimal of the upper end of the LCS range percent value

for the upper end of the uncertainty range. These calculated values represent a 99%-certain range for the reported result. As an example, suppose that the result reported is 1.0 mg/l, and the LCS percent recovery range is 50 to 150%. The uncertainty range would be 0.5 to 1.5 mg/l, which could also be written as 1.0 +/- 0.5 mg/l.

20.12.5 In the case where a well recognized test method specifies limits to the values of major sources of uncertainty of measurement (e.g. 524.2, 525, etc) and specifies the form of presentation of calculated results, no further discussion of uncertainty is required.

20.13 CONTROL OF DATA

The laboratory has policies and procedures in place to ensure the authenticity, integrity, and accuracy of the analytical data generated by the laboratory.

20.13.1 Computer and Electronic Data Related Requirements

The three basic objectives of our computer security procedures and policies are shown below. More detail is outlined in TestAmerica Edison SOP No. ED-IT-002. The laboratory is currently running the EnviroLMS which is a custom in-house developed LIMS system that has been highly customized to meet the needs of the laboratory. It is referred to as LIMS for the remainder of this section. The LIMS utilizes Informix which is an industry standard relational database platform. It is referred to as Database for the remainder of this section.

20.13.1.1 **Maintain the Database Integrity:** Assurance that data is reliable and accurate through data verification (review) procedures, password-protecting access, anti-virus protection, data change requirements, as well as an internal LIMS permissions procedure.

- LIMS Database Integrity is achieved through data input validation, internal user controls, and data change requirements.
- Spreadsheets and other software developed in-house must be verified with documentation through hand calculations prior to use.

  Note: "Commercial off-the-shelf software in use within the designed application range is considered to be sufficiently validated." *From NELAC 2003 Standard.* However, laboratory specific configurations or modifications are validated prior to use.

- In order to assure accuracy, all data entered or transferred into the LIMS data system goes through a minimum of two levels of review.
- The QA department performs random data audits to ensure the correct information has been reported.
- Changes to reports are documented in the project file**.**
- Analytical data file security is provided through three policies.
  - The first policy forbids unauthorized personnel from using laboratory data acquisition computers.
  - The second policy is the implementation of network passwords and login names that restrict directory access.

- The third layer is maintained through the LIMS and includes the use of username/password combinations to gain access to the LIMS system, the fact that all data in the LIMS is associated with the user to added/reviewed the data, and the restriction of review authority of data.

- All software installations will be in accordance with any relevant copyright licensing regulations.
- All software installed on any computer within the laboratory must be approved by the Information Technology Department regional support technician assigned to the laboratory. Shrink-wrapped or otherwise sealed OEM software that is directly related to instrument usage does not need approval but the Information Technology department must be notified of the installation.
- Anti-virus software shall be installed on all servers and workstations. The anti-virus software shall be configured to check for virus signature file and program updates on a daily basis and these updates will be pushed to all servers and workstations. The anti-virus software will be configured to clean any virus-infected file if possible, otherwise the file will be deleted. Disks and CDs brought from any outside source that are not OEM software must be scanned for viruses before being accessed.

- **Interlab LIMS Permissions Policy**
  - PURPOSE - The purpose of this policy is to provide a mechanism for maintaining the integrity of information contained in each laboratory's LIMS while providing the necessary access for information sharing to staff at other laboratory facilities.
  - DEFINITIONS - Host Laboratory: The laboratory facility that 'owns' the LIMS system or 'hosts' a project/job.
  - POLICIES

    (a) All permissions for the laboratory's LIMS system must only be granted by a representative of that laboratory.
    - If someone outside of the host lab needs permissions for Project Management or other uses, they must go through the Lab Director or his/her designated representative.
    - Permissions must never be granted without the knowledge of the host laboratory.

    (b) Only laboratory analytical or QA staff from the home laboratory may have edit permissions for laboratory analysis data.

    (c) Any changes made in laboratory's LIMS system:
    - Must be documented and traceable.
    - If made by staff of an affiliate lab, written permission from the home lab to make the changes (email approval is sufficient) is required.
    - No corrections may be made in another laboratories system without their knowledge.

    (d) Data qualifiers in laboratory reports must only be corrected, edited, etc. by the staff at the host laboratory.

    (e) Full analytical data "View" only permissions may be granted to outside Project Management and Sales staff. Search permissions may also be granted so status may be checked.

    (f) All qualifiers must be approved by QA staff before adding to standard reference tables

    (g) Please contact Corporate QA or IT staff if you have any questions regarding implementation or interpretation of this policy.

20.13.1.2 **Ensure Information Availability:** Protection against loss of information or service through scheduled back-ups, secure storage of media, line filter, Uninterruptible Power Supply (UPS), and maintaining older versions of software as revisions are implemented.

- Insured by timely backup procedures on reliable backup media, stable file server network architecture, and UPS protection
- UPS Protection:
  - Each fileserver is protected by an appropriate power protection/backup unit. In the event of a power outage, there is approximately 15-30 minutes of up-time for the servers prior to shutdown. This allows for proper shutdown procedures to be followed with the fileservers.
- File Server Architecture
  - All files are maintained on multiple Windows 2000 or newer servers which are secured physically by the Information Technology department. Access to these servers is limited to members of the Information Technology staff.
  - All supporting software is maintained for at least 5 years from the last raw data generated using that software.
- System Back-up Overview and Procedures
  - Data from both servers and instrument attached PC's are backed up and purged in compliance with the corporate back-up policy.
  - A Maintenance Plan has been defined to create a daily archive of all data within the LIMS database to a backup location. This backup is initiated automatically by either the database or back-up system.
  - Backup tapes will be stored in compliance with the corporate Data Backup Policy. Backup verifications are carried out in accordance with the corporate Data Backup Policy.
  - Instrument data back-ups are verified on a periodic basis by the QA department when performing electronic data audits.

20.13.1.3 Maintain Confidentiality: Ensure data confidentiality through physical access controls, and encryption of when electronically transmitting data.

- All servers are located in a secure area of the IT department. Access to the servers is limited to IT staff members and the lab director.
- The reporting portion of the LIMS system requires a project manager to enter their unique password anytime they create a report that displays a signature on it (.PDF).

20.13.2 Data Reduction

The complexity of the data reduction depends on the analytical method and the number of discrete operations involved (e.g., extractions, dilutions, instrument readings and concentrations). The analyst calculates the final results from the raw data or uses appropriate computer programs to assist in the calculation of final reportable values.

For manual data entry, e.g., Wet Chemistry, the data is reduced by the analyst and then verified by the Department Manager or alternate analyst prior to updating the data in LIMS. The spreadsheets, or any other type of applicable documents, are signed by both the analyst and alternate reviewer to confirm the accuracy of the manual entry(s).

Manual integration of peaks will be documented and reviewed and the raw data will be flagged in accordance with the TestAmerica Corporate SOP CA-Q-S-002, *Acceptable Manual Integration Practices*.

Analytical results are reduced to appropriate concentration units specified by the analytical method, taking into account factors such as dilution, sample weight or volume, etc. Blank correction will be applied only when required by the method or per manufacturer's indication; otherwise, it should not be performed. Calculations are independently verified by appropriate laboratory staff. Calculations and data reduction steps for various methods are summarized in the respective analytical SOPs or program requirements.

20.13.2.1 All raw data must be retained in the job folder, computer file (if appropriate), and/or runlog. All criteria pertinent to the method must be recorded. The documentation is recorded at the time observations or calculations are made and must be signed or initialed/dated (month/day/year). It must be easily identifiable who performed which tasks if multiple people were involved.

20.13.2.2 In general, concentration results are reported in milligrams per liter (mg/l) or micrograms per liter (µg/l) for liquids and milligrams per kilogram (mg/kg) or micrograms per kilogram (µg/kg) for solids. The units "mg/l" and "mg/kg" are the same as "parts per million (ppm)". The units "µg/l" and "µg/kg" are the same as "parts per billion (ppb)." For values greater than 10,000 mg/l, results can be reported in percent, i.e., 10,000 mg/l = 1%.

- Several environmental methods, such as color, turbidity, conductivity, use very specific, non-concentration units to report results (e.g., NTU, umhos/cm, etc).

- Occasionally, the client requests that results be reported in units which take into account the measured flow of water or air during the collection of the sample. When they provide this information, the calculations can be performed and reported.

20.13.2.3 In reporting, the analyst or the instrument output records the raw data result using values of known certainty plus one uncertain digit. If final calculations are performed external to LIMS, the results should be entered in LIMS with at least three significant figures. In general, results are reported to 2 significant figures on the final report.

20.13.2.4 For those methods that do not have an instrument printout or an instrumental output compatible with the LIMS System, the results are entered directly into LIMS by the analyst. LIMS has a defined significant figure criterion for each analyte.

20.13.2.5 The laboratory strives to import data directly from instruments or calculation spreadsheets to ensure that the reported data are free from transcription and calculation errors. For those analyses with an instrumental output compatible with the LIMS, the raw results and dilution factors are transferred into LIMS electronically after reviewing the quantitation report, and removing unrequested or poor spectrally-matched compounds. The analyst prints a copy of what has been entered to check for errors. This printout and the instrument's printout of calibrations, concentrations, retention times, chromatograms, and mass spectra, if applicable, are retained with

the data file. The data file is stored on the instrument computer; periodically, this file is transferred to the server and, eventually, to a tape file.

20.13.3 Logbook / Worksheet Use Guidelines

Logbooks and worksheets are filled out 'real time' and have enough information on them to trace the events of the applicable analysis/task. (e.g. calibrations, standards, analyst, sample ID, date, time on short holding time tests, temperatures when applicable, calculations are traceable, etc.)

- Corrections are made following the procedures outlined in Section 13.
- Logbooks are controlled by the QA department. A record is maintained of all logbooks in the lab.
- Unused portions of pages must be "Z"'d out, signed and dated.
- Worksheets are created with the approval of the Department Manager/QA Manager at the facility. The QA Manager controls all worksheets following the procedures in Section 6.

20.13.4 Review / Verification Procedures

Data review procedures are outlined in TestAmerica Edison SOP No. ED-GEN-021 (Data Review). All data, regardless of regulatory program or level of reporting, are subject to a thorough review process. The individual analyst continually reviews the quality of the data through calibration checks, quality control sample results and performance evaluation samples. Data review is initiated by the analyst during, immediately following, and after the completed analysis.

All levels of the review are documented on Data Review Checklists that are specific to each laboratory section per TestAmerica Edison SOP no. ED-GEN-021 (Internal QA Inspections and Corrective Action).

20.13.4.1 Primary Review

The primary review is often referred to as a "bench-level" review. In most cases, the analyst who generates the data (e.g., logs in, prepares and/or analyzes the samples) is the primary reviewer. In some cases, an analyst may be reducing data for samples run by an auto-sampler set up by a different analyst. In this case, the identity of both the analyst and the primary reviewer is identified in the raw data.

One of the most important aspects of primary review is to make sure that the test instructions are clear, and that all project specific requirements have been understood and followed.

Once an analysis is complete, the primary reviewer ensures, where applicable, that:

- Sample preparation information is complete, accurate, and documented.
- Calculations have been performed correctly.

- Quantitation has been performed accurately.
- Qualitative identifications are accurate.
- Manual integrations are appropriate.
- Data flags to indicate manual integrations are recorded.
- Manual integrations are authorized by a date and signature or initials of primary analyst.
- Client specific requirements have been followed.
- Method and process SOPs have been followed.
- Method QC criteria have been met.
- QC samples are within established limits.
- Dilution factors are correctly recorded and applied.
- Non-conformances and/or anomalous data have been properly documented and appropriately communicated.
- COC procedures have been followed.
- Primary review is documented by date and initials/signature of primary analyst.

Any anomalous results and/or non-conformances noted during the Primary Review are documented on the Data Review Checklist and, if necessary, on an NCM; and are communicated to the Department Manager and the Project Manager for resolution. Resolution can require sample reanalysis, or it may require that data be reported with a qualification. Non-conformances are documented per Section 12.0.

20.13.4.2 Secondary Review

The secondary review is also a complete technical review of the data and is performed by the Section Manager, analyst or data specialist. The secondary review is documented on the same Data Review Checklist as the primary review.

The following items, at a minimum, are reviewed:

- Qualitative Identification
- Quantitative Accuracy
- Calibration
- QC Samples
- Method QC Criteria
- Adherence to method and process SOPs
- Accuracy of Final Client Reporting Forms
- Manual Integrations – Minimal requirement is to spot-check raw data files for manual integration, as verified by date and initials or signature of secondary data reviewer. Some regulatory programs require 100% secondary review of manual integrations.
- Completeness
- Special Requirements/Instructions

If problems are found during the secondary review, the reviewer must work with the appropriate personnel to resolve them. If changes are made to the data, such as alternate qualitative identifications, identifications of additional target analytes, re-quantitation, or re-integration, the secondary reviewer must contact the laboratory

analyst and/or primary reviewer of the data so that the primary analyst and/or reviewer is aware of the appropriate reporting procedures.

20.13.4.3 Completeness Review

The completeness review includes the generation of a project narrative and/or cover letter which outlines anomalous data and non-compliances using project narrative notes and NCMs or NCMs (non-compliance reports) generated during the primary and secondary review. The completeness review addresses the following items:

- Is the project report complete?
- Does the data meet with the client's expectations?
- Were the data quality objectives of the project met?
- Are QC outages and/or non-conformances approved and appropriately explained in the narrative notes?

The laboratory Department Manager(s), Data Management personnel and the Project Manager contribute to the completeness review.

20.13.4.4 A visual summary of the flow of samples and information through the laboratory, as well as data review and validation, is presented in Figure 20-3.

20.13.5 <u>Manual Integrations</u>

Computerized data systems provide the analyst with the ability to re-integrate raw instrument data in order to optimize the interpretation of the data. Though manual integration of data is an invaluable tool for resolving variations in instrument performance and some sample matrix problems, when used improperly, this technique would make unacceptable data appear to meet quality control acceptance limits. Improper re-integrations lead to legally indefensible data, a poor reputation, or possible laboratory decertification. Because guidelines for re-integration of data are not provided in the methods and most methods were written prior to widespread implementation of computerized data systems, the laboratory trains all analytical staff on proper manual integration techniques using SOP CA-Q-S-002 as the guidelines**.**

20.13.5.1 The analyst must adjust baseline or the area of a peak in some situations, for example when two compounds are not adequately resolved or when a peak shoulder needs to be separated from the peak of interest. The analyst must use professional judgment and common sense to determine when manual integrating is required. Analysts are encouraged to ask for assistance from a senior analyst or manager when in doubt.

20.13.5.2 Analysts shall not increase or decrease peak areas to for the sole purpose of achieving acceptable QC recoveries that would have otherwise been unacceptable. The intentional recording or reporting of incorrect information (or the intentional omission of correct information) is against company principals and policy and is grounds for immediate termination.

20.13.5.3 Client samples, performance evaluation samples, and quality control samples are all treated equally when determining whether or not a peak area or baseline should be manually adjusted.

20.13.5.4 All manual integrations receive a second level review. Manual integrations must be indicated on an expanded scale "after" chromatograms such that the integration performed can be easily evaluated during data review. Expanded scale "before" chromatograms are also required for all manual integrations on QC parameters (calibrations, calibration verifications, laboratory control samples, internal standards, surrogates, etc.) unless the laboratory has another documented corporate approved procedure in place that can demonstrate an active process for detection and deterrence of improper integration practices.

Figure 20-1.
Example - Demonstration of Capability Documentation

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Initial Demonstration of Capability
Certification Statement

Date: _____

Analyst Name: _____

Matrix: _____

Reference Method: _____

TestAmerica Edison SOP No.: _____

We the undersigned certify that:

1. The analyst identified above, using the cited test method, which is in use at this facility for the analysis of samples under the National Environmental Laboratory Accreditation Program, have met the Initial Demonstration of Capability.
2. The test method was performed by the analyst identified on this certification.
3. Copies of the test method and SOP are available for all personnel on site.
4. The data associated with the IDC are true, complete and representative.[1]
5. All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at the facility, and that the associated information is available for review by authorized inspectors.

_____
Analyst Signature Date

_____
Section Manager/Supervisor Signature Date

_____
Quality Assurance Manager Signature Date

[1] ***True:*** Consistent with supporting data.
Accurate: Based on good laboratory practices consistent with sound scientific principle.
Complete: Includes the results of all supporting performance testing.
Self Explanatory: Data properly labeled and stored so that the results are clear and require no additional explanation.

TestAmerica Edison Work Instruction No. EDS-WI-030
Rev 1

Figure 20-2.

Example - New Method / Additional Analyte Checklist

New Method / Additional Analyte Checklist

The following items are **required** to be completed prior to the acceptance of client samples. Fill in any blanks that do not apply with "NA". Provide associated instrument QC when samples or QC samples are analyzed (includes run log).

New Method _____ Added Analytes _____

1_____ Standard Operating Procedure

- Note: For addition of analytes to an existing method, a completed Management of Change Checklist can be used to add the analytes, include RL and matrix.

  _____ Analysis SOP
  _____ Preparation SOP
  _____ SOP for any other relevant process
  _____ Pages from any applicable logbooks (instrument, standards, etc)

2_____Evaluation of Selectivity. As applicable: e.g. Retention Time Window Study, second column confirmation, Interelement correction checks, spectral or fluorescence profiles, etc.

3_____ Initial Calibration Curve (Include Tune verification or similar (e.g. degradation checks) if applicable)

4_____ Method Detection Limit (MDL) Study (summary and raw data)

_____ Water
_____ Soil
_____ Other

5_____ Reporting Limit Verification standard

- Spike a blank matrix at the RL and process through the entire method. MDL study should be able to be used if recovery is good. Note the spike level(s) and recovery(~~y~~ies)

6_____ Demonstration of Capability (DOC) per analyst (Precision and Accuracy (P&A) verification)

- 4 LCS for each matrix – most acceptance criteria are in the methods. The MDL study may be used if DOC criteria are met.
- Non-Standard methods – 3 x (1 LCS at LOQ-25%, 50%, 75% of the calibration range + Blank) prepared each day. (see NELAC Chpt 5, appendix C.3.3 (b))

8_____ Acceptable PT sample(s) if available

Notes: PT sample required for all new methods
PT sample required for all new analytes under NELAP

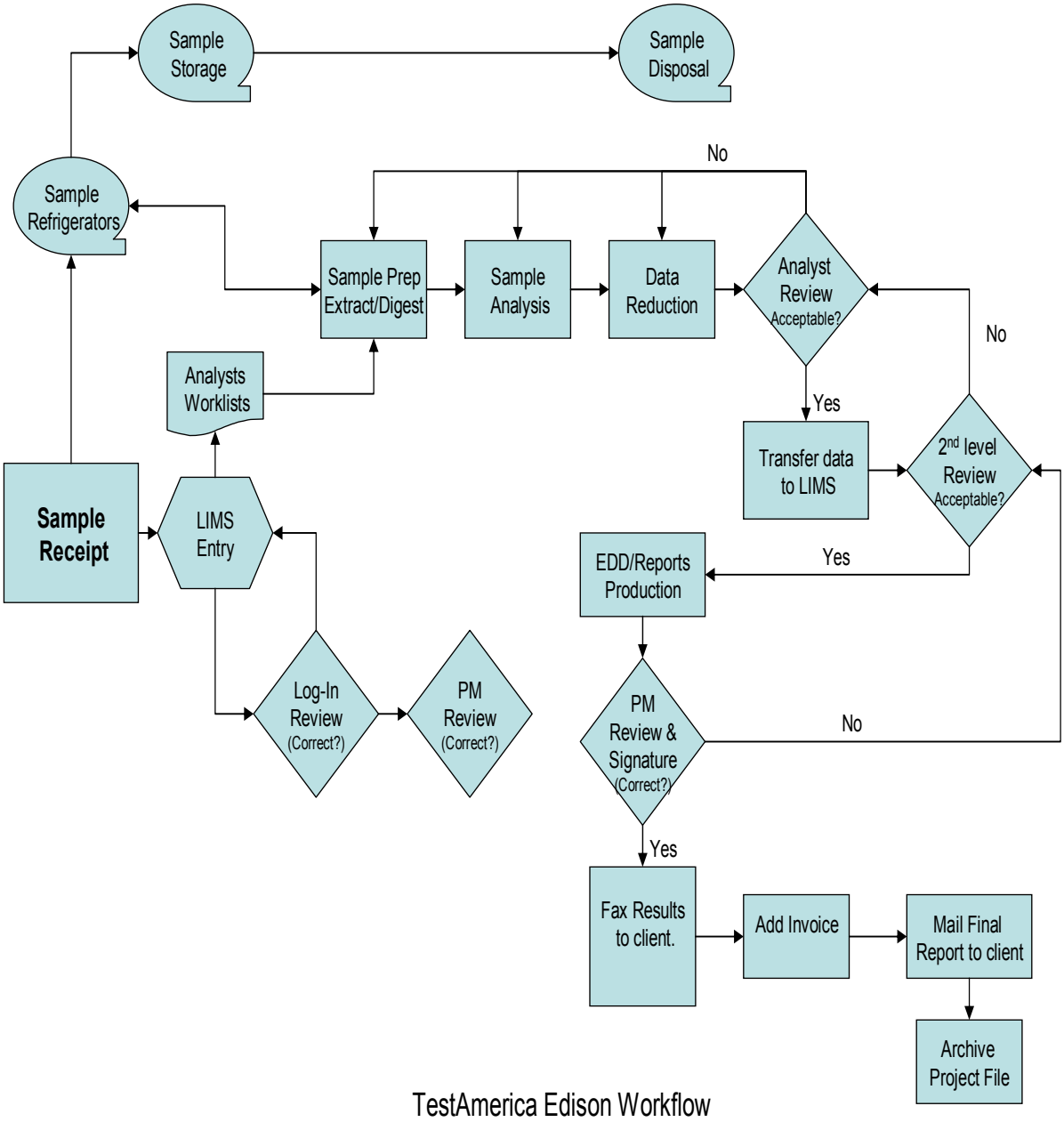
Submitted by _____ Date _____

9_____ Certification/Approval from Regulatory Agency where available.

QA Review / Acceptance _____ Date _____

Figure 20-3.

Generalized Work Flow



SECTION 21

EQUIPMENT (AND CALIBRATIONS)
(NELAC 5.5.5)

21.1 OVERVIEW

TestAmerica purchases the most technically advanced analytical instrumentation for sample analyses. Instrumentation is purchased on the basis of accuracy, dependability, efficiency and sensitivity. Each laboratory is furnished with all items of sampling, preparation, analytical testing and measurement equipment necessary to correctly perform the tests for which the laboratory has capabilities. Each piece of equipment is capable of achieving the required accuracy and complies with specifications relevant to the method being performed. Before being placed into use, the equipment (including sampling equipment) is calibrated and checked to establish that it meets its intended specification. The calibration routines for analytical instruments establish the range of quantitation. Calibration procedures are specified in laboratory SOPs. A list of laboratory equipment and instrumentation is presented in Table 21-1.

Equipment is only operated by authorized and trained personnel. Manufacturers instructions for equipment use are readily accessible to all appropriate laboratory personnel.

21.2 PREVENTIVE MAINTENANCE

21.2.1 TestAmerica Edison follows a well-defined program to ensure proper equipment operation and to prevent the failure of laboratory equipment or instrumentation during use. This program of preventive maintenance helps to avoid delays due to instrument failure.

21.2.2 Routine preventive maintenance procedures and frequency, such as lubrication, cleaning, and replacements, should be performed according to the procedures outlined in the manufacturer's manual. Qualified personnel must also perform maintenance when there is evidence of degradation of peak resolution, a shift in the calibration curve, loss of sensitivity, or failure to continually meet one of the quality control criteria.

21.2.2.1 Calibrations, routine maintenance, and adjustments are part of the analysts' and Department Managers' responsibilities. However, service contracts may be in place for some instruments to cover any major repairs.

21.2.2.2 High purity gases, reagents, and spare parts are kept on hand to minimize repair time and optimize instrument performance.

21.2.3 Table 21-2 summarizes the schedule for routine maintenance. It is the responsibility of each Department Manager to ensure that instrument maintenance logs are kept for all equipment in his/her department. Preventative maintenance procedures may also be outlined in analytical SOPs or instrument manuals. (Note: for some equipment, the log used to monitor performance is also the maintenance log. Multiple pieces of equipment may share the same log as long as it is clear as to which instrument is associated with an entry.)

21.2.4 Instrument maintenance logs are controlled and are used to document instrument problems, instrument repair and maintenance activities. Maintenance logs shall be kept for all

major pieces of equipment. Instrument maintenance logs may also be used to specify instrument parameters.

21.2.4.1 Documentation must include all major maintenance activities such as contracted preventive maintenance and service and in-house activities such as the replacement of electrical components, lamps, tubing, valves, columns, detectors, cleaning and adjustments.

21.2.4.2 Each entry in the instrument log includes the Analyst's initials, the date, a detailed description of the problem (or maintenance needed/scheduled), a detailed explanation of the solution or maintenance performed, and a verification that the equipment is functioning properly (state what was used to determine a return to control. e.g. CCV run on *'date'* was acceptable, or instrument recalibrated on 'date' with acceptable verification, etc.).

21.2.4.3 When maintenance or repair is performed by an outside agency, service receipts detailing the service performed may be affixed into the logbooks adjacent to pages describing the maintenance performed. This stapled in page must be signed across the page entered and the logbook so that it is clear that a page is missing if only half a signature is found in the logbook.

21.2.5 In addition, the maintenance records contain:

- The identification of the instrument/equipment **(**instrument's Serial Number and Model Number)
- The date the instrument/equipment was put into use.
- If available, the condition when the instrument was received (e.g. new, used, reconditioned).
- Any maintenance procedures and frequency or a reference to their location.

21.2.6 If an instrument requires repair (subjected to overloading or mishandling, gives suspect results, or otherwise has shown to be defective or outside of specified limits) it shall be taken out of operation and tagged as out of service or otherwise isolated until such a time as the repairs have been made and the instrument can be demonstrated as operational by calibration and/or verification or other test to demonstrate acceptable performance. The laboratory shall examine the effect of this defect on previous analyses (refer to Sections 12 and 13).

21.2.7 In the event of equipment malfunction that cannot be resolved, service shall be obtained from the instrument vendor manufacturer, or qualified service technician, if such a service can be tendered. If on-site service is unavailable, arrangements shall be made to have the instrument shipped back to the manufacturer for repair. Back up instruments, which have been approved, for the analysis shall perform the analysis normally carried out by the malfunctioning instrument. If the back up is not available and the analysis cannot be carried out within the needed timeframe, the samples shall be subcontracted using the procedures outlined in Section 8.

If an instrument is sent out for service or transferred to another facility, it must be recalibrated and verified (including new initial MDL study) prior to return to lab operations.

21.3 SUPPORT EQUIPMENT

This section applies to all devices that may not be the actual test instrument, but are necessary to support laboratory operations. These include but are not limited to: balances, ovens, refrigerators, freezers, incubators, water baths, field sampling devices, temperature measuring devices, thermal/pressure sample preparation devices and volumetric dispensing devices if quantitative results are dependent on their accuracy, as in standard preparation and dispensing or dilution into a specified volume. All raw data records associated with the support equipment are retained to document instrument performance.

21.3.1 Weights and Balances

The accuracy of the balances used in the laboratory is checked every working day, before use. All balances are placed on stable counter tops.

Each balance is checked prior to use with at least two certified ASTM type 1 weights spanning its range of use (weights that have been calibrated to ASTM type 1 weights may also be used for daily verification). ASTM type 1 weights used only for calibration of other weights (and no other purpose) are inspected for corrosion, damage or nicks at least annually and if no damage is observed, they are calibrated at least every 5 years by an outside calibration laboratory. Any weights (including ASTM Type 1) used for daily balance checks or other purposes are recalibrated/recertified annually to NIST standards (this may be done internally if laboratory maintains “calibration only” ASTM type 1 weights).

All balances are serviced annually by a qualified service representative, who supplies the laboratory with a certificate that identifies traceability of the calibration to the NIST standards.

All of this information is recorded in logs, and the recalibration/recertification certificates are kept on file.

21.3.2 pH, Conductivity, and Turbidity Meters

The pH meters used in the laboratory are accurate to $\pm$ 0.1 pH units, and have a scale readability of at least 0.05 pH units. The meters automatically compensate for the temperature, and are calibrated with at least two working range buffer solutions before each use.

Conductivity meters are also calibrated before each use with a known standard to demonstrate the meters do not exceed an error of 1% or one umhos/cm.

Turbidity meters are also calibrated before each use. All of this information is documented in logs.

Consult pH and Conductivity, and Turbidity SOPs for further information.

21.3.3 Thermometers

All thermometers are calibrated on an annual basis with a NIST-traceable thermometer. IR thermometers are calibrated quarterly.

The NIST thermometer is recalibrated every three years (unless thermometer has been exposed to temperature extremes or apparent separation of internal liquid) by an approved outside service and the provided certificate of traceability is kept on file. The NIST thermometer has increments of 0.2 ºC, and has a range applicable to all method and certification requirements. The NIST traceable thermometer is used for no other purpose than to calibrate other thermometers.

All of this information is documented in logbooks. Monitoring method-specific temperatures, including incubators, heating blocks, water baths, and ovens, is documented in method-specific logbooks. More information on this subject can be found in the TestAmerica Edison Sop No. ED-GEN-014 (Thermometer Calibration).

21.3.4 Refrigerators/Freezer Units, Waterbaths, Ovens and Incubators

The temperatures of all refrigerator units and freezers used for sample and standard storage are monitored each working day.

Ovens, waterbaths and incubators are monitored on days of use.

All of this equipment has a unique identification number, and is assigned a unique thermometer for monitoring.

Sample storage refrigerator temperatures are kept between > 0ºC and ≤ 6 ºC.

Specific temperature settings/ranges for other refrigerators, ovens waterbaths, and incubators can be found in method specific SOPs.

All of this information is documented in Daily Temperature Logbooks and method-specific logbooks.

21.3.5 Autopipettors, Dilutors, and Syringes

Mechanical volumetric dispensing devices including burettes (except Class A Glassware) are checked for accuracy at least quarterly. Glass micro-syringes are considered the same as Class A glassware.

The laboratory maintains a sufficient inventory of autopipettors, and dilutors of differing capacities that fulfill all method requirements.

These devices are given unique identification numbers, and the delivery volumes are verified gravimetrically, at a minimum, on a quarterly basis.

For those dispensers that are not used for analytical measurements, a label is applied to the device stating that it is not calibrated. Any device not regularly verified can not be used for any quantitative measurements. Refer to TestAmerica Edison Sop No. ED-GEN-011 (Calibration of Laboratory Pipettes).

Micro-syringes are purchased from Hamilton Company and National Scientific Company. Each syringe is traceable to NIST. The laboratory keeps on file an “Accuracy and Precision

Statement of Conformance" from Hamilton and National Scientific attesting established accuracy.

21.3.6 Autoclaves

TestAmerica Edison utilizes autoclaves in the sample preparation step for certain mercury analysis procedures. These autoclaves have direct reading temperature and pressure gauges. These gauges are checked for accuracy on an annual basis.

21.3.7 Field Sampling Devices (Isco Auto Samplers)

Each Auto Sampler (ISCO) is assigned a unique identification number in order to keep track of the calibration. This number is also recorded on the sampling documentation.

The Auto Sampler is calibrated as needed based on manufacturers recommendations.

21.4 INSTRUMENT CALIBRATIONS

Calibration of analytical instrumentation is essential to the production of quality data. Strict calibration procedures are followed for each method. These procedures are designed to determine and document the method detection limits, the working range of the analytical instrumentation and any fluctuations that may occur from day to day.

Sufficient raw data records are retained to allow an outside party to reconstruct all facets of the initial calibration. Records contain, but are not limited to, the following: calibration date, method, instrument, analyst(s) initials or signatures, analysis date, analytes, concentration, response, type of calibration (Avg RF, curve, or other calculations that may be used to reduce instrument responses to concentration.)

Sample results must be quantitated from the initial calibration and may not be quantitated from any continuing instrument calibration verification unless otherwise required by regulation, method or program.

If the initial calibration results are outside of the acceptance criteria, corrective action is performed and any affected samples are reanalyzed if possible. If the reanalysis is not possible, any data associated with an unacceptable initial calibration will be reported with appropriate data qualifiers (refer to Section 13).

Note: Instruments are calibrated initially and as needed after that and at least annually

21.4.1 CALIBRATION STANDARDS

Calibration standards are prepared using the procedures indicated in the Reagents and Standards section of the determinative method SOP. However, the general procedures are described below.

21.4.1.1 For each analyte and surrogate (if applicable) of interest, prepare calibration standards at the minimum number of concentrations as stated in the analytical methods. If a reference or mandated method does not specify the number of calibration standards, the minimum number is three, not including blanks or a zero standard. All of the standard solutions are prepared using Class A volumetric glassware, calibrated pipettes, and/or microsyringes and appropriate laboratory quality solvents and stock standards.

21.4.1.2 Standards for instrument calibration are obtained from a variety of sources. All standards are traceable to NIST whenever possible. Dilution standards are prepared from stock standards purchased from commercial suppliers. A standards preparation log is maintained for each department, containing concentration, date of receipt, date of standard preparation, any dilutions made, lot number, supplier, type of solvent and a unique code number to identify the standard.

21.4.1.3 The lowest concentration calibration standard that is analyzed during an initial calibration must be at or below the stated reporting limit for the method based on the final volume of extract (or sample).

21.4.1.4 The other concentrations define the working range of the instrument/method or correspond to the expected range of concentrations found in actual samples that are also within the working range of the instrument/method. Results of samples not bracketed by initial instrument calibration standards (within calibration range to 3 significant figures) must be reported as having less certainty, e.g., defined qualifiers or flags (additional information may be included in the case narrative). The lowest calibration standard must be at or below the reporting limit. The exception to these rules is ICP methods or other methods where the referenced method does not specify two or more standards.

21.4.1.5 Given the number of target compounds addressed by some of the organic methods, it may be necessary to prepare several sets of calibration standards, each set consisting of the appropriate number of solutions at different concentrations. The initial calibration will then involve the analysis of each of these sets of the appropriate number of standards.

21.4.1.6 All initial calibrations are verified with a standard obtained from a second source and traceable to a national standard, when available (or vendor certified different lot if a second source is not available). For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst would be considered a second source. This verification occurs immediately after the calibration curve has been analyzed, and before the analysis of any samples.

21.4.2 CALIBRATION FOR ORGANIC METHODS (GC, HPLC, GC/MS)

21.4.2.1 Many of the organic analytical methods utilize an internal standard calibration (GCMS and some GC). Because of the complex nature of the multipeak chromatograms produced by the method, some instruments necessitate the use of external standard calibration (most GC and HPLC). Surrogate compounds are

included in the calibration processes for all appropriate organic analyses. For more details on the calibration types listed below, refer to SOP No. CA-Q-S-005, Calibration Curves.

21.4.2.2 Once the operating parameters have been established according to the method, each instrument is calibrated for the appropriate method. The analyst prepares five or more standard solutions at various concentrations containing all of the analytes of interest, internal standards, and surrogates that are appropriate for the method. Note: There are a several EPA methods that have different requirements and are exceptions (e.g. EPA 547) where a minimum of 3 calibration standards are prepared and analyzed.

21.4.2.3 The standard solutions are introduced into the instrument in the same manner as samples are; whether it be by direct injection, by headspace analysis, or by purge and trap. The calibration factor (CF) for methods that use external standards, and the response factor (RF) for methods that use internal standards are calculated for the five standards.

- External standard calibration involves comparison of instrument responses from the sample to the responses from the target compounds in the calibration standards. Sample peak areas (or peak heights) are compared to peak areas (or heights) of the standards. The ratio of the response to the amount of analyte in the calibration standard is defined as the Calibration factor (CF).

- Internal standard calibration involves the comparison of instrument responses from the target compounds in the sample to the responses of specific standards added to the sample or sample extract prior to injection. The ratio of the peak area (or height) of the target compound in the sample or sample extract to the peak area (or height) of the internal standard in the sample or sample extract is compared to a similar ratio derived for each calibration standard. The ratio is termed the response factor (RF), and may also be known as a relative response factor in other methods.

In many cases, internal standards are recommended. These recommended internal standards are often brominated, fluorinated, or stable isotopically labeled analogs of specific target compounds, or are closely related compounds whose presence in environmental samples is highly unlikely. The use of specific internal standards is available in the method SOP.

Whichever internal standards are employed, the analyst needs to demonstrate that the measurement of the internal standard is not affected by method analytes and surrogates or by matrix interferences. In general, internal standard calibration is not as useful for GC and HPLC methods with non-MS detectors because of the inability to chromatographically resolve many internal standards from the target compounds. The use of MS detectors makes internal standard calibration practical because the masses of the internal standards can be resolved from those of the target compounds even when chromatographic resolution cannot be achieved.

When preparing calibration standards for use with internal standard calibration, add the same amount of the internal standard solution to each calibration standard, such that the concentration of each internal standard is constant across all of the calibration standards, whereas the concentrations of the target analytes will vary. The internal standard solution will contain one or more internal standards and the concentration of the individual internal standards

may differ within the spiking solution (e.g., not all internal standards need to be at the same concentration in this solution). The mass of each internal standard added to each sample extract immediately prior to injection into the instrument or to each sample prior to purging must be the same as the mass of the internal standard in each calibration standard. The volume of the solution spiked into sample extracts should be such that minimal dilution of the extract occurs (e.g., 10 uL of solution added to a 1 mL final extract results in only a negligible 1% change in the final extract volume which can be ignored in the calculations).

An ideal internal standard concentration would yield a response factor of 1 for each analyte. However, this is not practical when dealing with more than a few target analytes. Therefore, as a general rule, the amount of internal standard should produce an instrument response (e.g., area counts) that is no more than 100 times that produced by the lowest concentration of the least responsive target analyte associated with the internal standard. This should result in a minimum response factor of approximately 0.01 for the least responsive target compound. Refer to SOP No. CA-Q-S-005, Calibration Curves, for specific calculations.

21.4.2.4 Policies regarding the use of calibration standard results for creating the calibration curve are as follows:

- A low calibration standard may be excluded from the calibration if the signal-to-noise ratio or spectral criteria are not suitable. The reporting level must be elevated to be the lowest calibration standard used for calibration.

- The upper calibration standard may be excluded if it saturates the detector or is obviously becoming non-linear. Any sample exceeding the upper standard used in the calibration must be diluted and re-analyzed.
- Mid-calibration standards may not be excluded unless an obvious reason is found, i.e., cracked vial, incorrectly made, etc. The failed standard should be re-run immediately and inserted into the initial calibration. If not useful, recalibration is required.

21.4.2.5 <u>Percent RSD Corrective Action</u>

Given the potentially large numbers of analytes that may be analyzed in some methods, it is likely that some analytes may exceed the acceptance limit for the RSD for a given calibration. In those instances, the following steps are recommended, but not required.

21.4.2.5.1 The first step is generally to check the instrument operating conditions. This option will apply in those instances where a linear instrument response is expected. It may involve some trade-offs to optimize performance across all target analytes. For instance, changes to the operating conditions necessary to achieve linearity for problem compounds may cause the RSD for other compounds to increase, but as long as all analytes meet the RSD limits for linearity, the calibration is acceptable.

21.4.2.5.2 If the RSD for any analyte is greater than the applicable acceptance criteria in the applicable analytical method, the analyst may wish to review the results (area counts, calibration or response factors, and RSD) for those analytes to ensure that the problem is not associated with just one of the initial calibration standards. If the problem appears to be associated with a single standard, that one standard

may be reanalyzed and the RSD recalculated. Replacing the standard may be necessary in some cases.

21.4.2.5.3 A third alternative is to narrow the calibration range by replacing one or more of the calibration standards with standards that cover a narrower range. If linearity can be achieved using a narrower calibration range, document the calibration linearity, and proceed with analyses. The changes to the upper end of the calibration range will affect the need to dilute samples above the range, while changes to the lower end will affect the overall sensitivity of the method. Consider the regulatory limits or action levels associated with the target analytes when adjusting the lower end of the range.

Note: When the purpose of the analysis is to demonstrate compliance with a specific regulatory limit or action level, the laboratory must ensure that the method quantitation limit is at least as low as the regulatory limit or action level.

21.4.2.6 Alternatively, the least squares regression may be used to determine linearity. A five point line must result in a correlation coefficient (r) of 0.990 or better using the least squares method to be considered acceptable. In many cases it may be preferred that the curves be forced through zero (not to be confused with including the origin as an additional data point, which is not allowed). **Note:** EPA method 8000B does not allow forcing through zero however the agency has revaluated this position and has since changed this stance to allow forcing through zero. In addition, from EPA Method 8000C: "However, the use of a linear regression or forcing the regression through zero may NOT be used as a rationale for reporting results below the calibration range demonstrated by the analysis of the standards.").

21.4.2.7 Instead of a linear curve model (either Average RF or least squares regression), a second order curve (Quadratic) may be used (and preferred) as long as it contains at least six data points. As a rule of thumb, if there is a consistent trend in RFs (or CFs) in the calibration curve, either up or down, then quadratic curve fit may be indicated as the preferred calibration routine for that analyte. The coefficient of determination (COD or r^2) for the quadratic curve must be at least 0.99 for it to be considered acceptable. For more details on the calculations see Calibration Curve SOP CA-Q-S-005. Some limitations on the use of Quadratic Curve fits:

21.4.2.7.1 Care MUST be exercised to assure that the results from this equation are real, positive, and fit the range of the initial calibration.

21.4.2.7.2 They **may not** be used to mask instrument problems that can be corrected by maintenance. (Not to be used where the analyte is normally found to be linear in a properly maintained instrument).

21.4.2.7.3 They **may not** be used to compensate for detector saturation. If it is suspected that the detector is being saturated at the high end of the curve, remove the higher concentration standards from the curve and try a 1st order fit or average RF.

21.4.3 Calibration for Inorganic Analyses

EPA Method 7000 from EPA SW-846 is a general introduction to the quality control requirements for metals analysis. For inorganic methods, quality control measures set out in the individual methods and in the *Standard Methods for the Examination of Water and Wastewater* (20th Edition) may also be included. Test America Edison's inorganic Standard Operating Procedures detail the method calibration requirements.

In general, inorganic instrumentation is calibrated with external standards. Some exceptions include Inductively Coupled Plasma (ICP) and Inductively Coupled Plasma Mass Spectrometry (ICPMS). These analyses may use an internal standard to compensate for viscosity or other matrix effects. While the calibration procedures are much the same for inorganics as they are for organics, CF's or RF's are not used. The calibration model in 21.4.2.6 is generally used for most methods, however in some instances the model from section 21.4.2.7 may be used. A correlation coefficient (r) of 0.995 or greater must be used to accept a calibration curve generated for an inorganic procedure. Correlation coefficients are determined by hand-held scientific calculators or by computer programs [state what your lab uses] and documented as part of the calibration raw data. Coefficients of calibration curves used for quantitation must be documented as part of the raw data. Curves are not allowed to be stored in calculator memories and must be written on the raw data for the purposes of data validation.

21.4.3.1 "Calibrations" for titrimetric analyses are performed by standardizing the titrants against a primary standard solution. See specific methods in *Standard Methods for the Examination of Water and Wastewater* (20th Edition) for more information.

21.4.3.2 Spreadsheets that are used for general chemistry calculations must have all cells containing calculations locked to prevent accidental changes to the calculations.

21.4.3.3 Instrument technologies (e.g. ICP) with validated techniques from the instrument manufacturer or other methods using a zero point and single point calibration require the following:

21.4.3.3.1 The instrument is calibrated using a zero point and a single point calibration standard.

21.4.3.3.2 The linear range is established by analyzing a series of standards, one at the reporting limit (RL).

21.4.3.3.3 Sample results within the established linear range do not need to be qualified.

21.4.3.3.4 The zero point and single standard is run daily with each analytical batch.

21.4.3.3.5 A standard at the RL is analyzed daily with each analytical batch and must meet established acceptance criteria.

21.4.3.3.6 The linearity is verified at a frequency established by the manufacturer or method.

21.4.4 Calibration Verification

The calibration relationship established during the initial calibration must be verified at periodic intervals as specified in the laboratory method SOPs in accordance with the referenced analytical methods and NELAC (2003) standard, Section 5.5.5.10. The process of calibration

verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models.

Note: The process of calibration verification referred to is fundamentally different from the approach called "calibration" in some methods. As described in those methods, the calibration factors or response factors calculated during calibration are used to update the calibration factors or response factors used for sample quantitation. This approach, while employed in other EPA programs, amounts to a daily single-point calibration, and is not appropriate nor permitted in SW-846 chromatographic procedures for trace environmental analyses.

21.4.4.1 Generally, the initial calibrations must be verified at the beginning of each 12-hour analytical shift during which samples are analyzed. (Some methods may specify more or less frequent verifications). The 12-hour analytical shift begins with the injection of the calibration verification standard (or the MS tuning standard in MS methods). The shift ends after the completion of the analysis of the last sample or standard that can be injected within 12 hours of the beginning of the shift.

21.4.4.2 A continuing instrument calibration verification (CCV) must be repeated at the beginning and, for methods that have quantitation by external calibration models, at the end of each analytical batch. Some methods have more frequent CCV requirements see specific SOPs. Most Inorganic methods require the CCV to be analyzed after ever 10 samples.

21.4.4.3 The acceptance limits for calibration verifications can be found in each method SOP. As a rule of thumb: GCMS ± 20%, GC and HPLC ± 15%, Inorganics: ± 10 or 15%. Actual methods may have wider or tighter limits; see the method SOP for specifics.

21.4.4.4 If the response (or calculated concentration) for an analyte is within the acceptance limits of the response obtained during the initial calibration, then the initial calibration is considered still valid, and the analyst may continue to use the CF, RF or % drift values from the initial calibration to quantitate sample results.

21.4.4.5 If the response (or calculated concentration) for any analyte varies from the mean response obtained during the initial calibration by more than the acceptance criteria, then the initial calibration relationship may no longer be valid. If routine corrective action procedures fail to produce a second consecutive (immediate) calibration verification within acceptance criteria, then either the laboratory has to demonstrate performance after corrective action with two consecutive successful calibration verifications, or a new initial instrument calibration must be performed. However, sample data associated with an unacceptable calibration verification may be reported as qualified data under the following special conditions:

21.4.4.5.1 When the acceptance criteria for the calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise, the samples affected by the unacceptable calibration verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted.

21.4.4.5.2 When the acceptance criteria for the calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise, the samples affected by the unacceptable verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted. Alternatively, a reporting limit standard may be analyzed to demonstrate that the laboratory can still support non-detects at their reporting limit.

21.4.4.6 Verification of Linear Calibrations

Calibration verification for linear calibrations involves the calculation of the percent drift or the percent difference of the instrument response between the initial calibration and each subsequent analysis of the verification standard. Use the equations below to calculate % Drift or % Difference, depending on the procedure specified in the method SOP. Verification standards are evaluated based on the % Difference from the average CF or RF of the initial calibration or based on % Drift or % Recovery if a linear or quadratic curve is used.

The Percent Difference is calculated as follows:

$$\% \text{ Difference} = \frac{(\text{CF(v) or RF(v)}) - (\text{Avg. CF or RF})}{(\text{Avg. CF or RF})} \times 100$$

Where: CF(v) or RF(v) = CF or RF from verification standard
Avg. CF or RF = Average CF or RF from Initial Calibration.

The Percent Drift is calculated as follows:

$$\% \text{ Drift} = \frac{\text{Result} - \text{True Value}}{\text{True Value}} \times 100$$

The Percent Recovery is calculated as follows:

$$\% \text{ Recovery} = \frac{\text{Result}}{\text{True Value}} \times 100$$

21.4.4.7 Verification of a Non-Linear Calibration

Calibration verification of a non-linear calibration is performed using the percent drift or percent recovery calculations described in 21.4.4.6 above.

Regardless of whether a linear or non-linear calibration model is used, if initial verification criterion is not met, then no sample analyses may take place until the calibration has been verified or a new initial calibration is performed that meets the specifications listed in the method SOPs. If the calibration cannot be verified after the analysis of a single verification standard, then adjust the instrument operating conditions and/or perform instrument maintenance, and

analyze another aliquot of the verification standard. If the calibration cannot be verified with the second standard, then a new initial calibration is performed.

All target analytes and surrogates, including those reported as non-detects, must be included in periodic calibration verifications for purposes of retention time confirmation and to demonstrate that calibration verification criteria are being met.

All samples must be bracketed by periodic analyses of standards that meet the QC acceptance criteria (e.g., calibration and retention time). The frequency is found in the determinative methods or SOPs.

Note: If an internal standard calibration is being used (basically GCMS) then bracketing standards are not required, only daily verifications are needed. The results from these verification standards must meet the calibration verification criteria and the retention time criteria (if applicable).

21.5 POLICY ON TENTATIVELY IDENTIFIED COMPOUNDS (TICS) – GC/MS ANALYSIS

For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. Data system library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other.

Note: If the TIC compound is not part of the client target analyte list but is calibrated by the laboratory and is both qualitatively and/or quantitatively identifiable, it will not be reported as a TIC. If the compound is reported on the same form as true TICs, it must be qualified and/or narrated that the reported compound is qualitatively and quantitatively (if verification in control) reported compared to a known standard that is in control (where applicable).

For example, the RCRA permit or waste delisting requirements may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches may the analyst assign a tentative identification. Guidelines for making tentative identifications and subsequent quantitation are found in the applicable analytical method SOPs.

21.6 POLICY ON GC/MS TUNING

Prior to any GCMS analytical sequence, including calibration, the instrument parameters for the tune and subsequent sample analyses within that sequence must be set.

Prior to tuning/auto-tuning the mass spec, the parameters may be adjusted within the specifications set by the manufacturer or the analytical method. These generally don't need any adjustment but it may be required based on the current instrument performance. If the tune verification does not pass it may be necessary to clean the source or perform additional maintenance. Any maintenance is documented in the maintenance log.

21.6.1 The concentration of the BFB or DFTPP must be at or below the concentrations that are referenced in the analytical methods. Part of the purpose of the tune is to demonstrate

sensitivity and analyzing solutions at higher concentrations does not support this purpose. Tune failures may be due to saturation and a lower BFB/DFTPP concentration may be warranted.

21.6.2 Tune evaluations usually utilize the "Autofind" function and are set up to look at the apex +/- 1 scan and average the three scans. Background correction is required prior to the start of the peak but no more than 20 scans before. Background correction cannot include any part of the target peak.

21.6.3 Other Options or if Auto Tune Fails:

21.6.3.1 Sometimes the instrument does not always correctly identify the apex on some peaks when the peak is not perfectly shaped. In this case, manually identify and average the apex peak +/- 1 scan and background correct as in 21.6.4 above. This is consistent with EPA 8260 and 8270.

21.6.3.2 Or the scan across the peak at one half peak height may be averaged and background corrected. This is consistent with Standard Methods 6200, EPA 624 and EPA 625.

21.6.3.3 Adjustments such as adjustments to the repeller and ion focus lenses, adjusting the EM Voltage, etc. may be made prior to tune verification as long as all of the subsequent injections in the 12 hour tune cycle are analyzed under the same MS tune settings and it is documented in the run sequence log and/or maintenance log that an adjustment was made. Excessive adjusting (more than 2 tries) without clear documentation is not allowed. Necessary maintenance is performed and documented in instrument log.

21.6.3.4 A single scan at the Apex (only) may also be used for the evaluation of the tune. For SW 846 and EPA 600 series methods, background correction is still required.

21.6.3.5 Cleaning the source or other maintenance may be performed and then follow steps for tune evaluation above. Note: If significant maintenance was performed, see methods 8000B or 8000C then the instrument may require recalibration prior to proceeding.

21.6.4 Tune evaluation printouts must include the chromatogram and spectra as well as the Tune evaluation information. In addition, the verifications must be sent directly to the printer or pdf file (no screen prints for DFTPP or BFB tunes). This ability should be built into the instrument software.

21.6.5 All MS tune settings must remain constant between running the tune check and all other samples. It is recommended that a separate tune method not be used, however a separate method may be used as long as the MS conditions between the methods are the same as the sample analysis method and tracked so any changes that are made to the analysis method are also made to the tune method.

Table 21-1.

Example - Laboratory Equipment and Instrumentation

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
METALS ICP	Thermo Jarrell Ash (1)	61E Trace	341490	1994	NEW
	Thermo Jarrell Ash (2)	61E Trace	356490	1998	NEW
	Thermo Jarrell Ash (3)	61E Trace	493890	2000	NEW
	Thermo Jarrell Ash (4)	ICAP 6500 Duo View	20073407	2008	NEW
ICPMS	Agilent Technologies	7500ce	JP51201560	2006	NEW
ICPMS Heat Exchanger	PolyScience	3370	G57335		
ICPMS Autosampler	Cetac	ASX520	120536A520		
GFAA	Perkin Elmer AA	5100	130244	1986	NEW
	Perkin Elmer Zeeman	5100	130244	1986	NEW
	Perkin Elmer HGA	600	6128	1986	NEW
	Perkin Elmer Autosampler	AS-60	6577	1986	NEW
Mercury Analyzer	Leeman Labs	Hydra AA	HA-3010	2004	NEW
	Leeman Labs	Hydra AA	HA-4008	2004	NEW
Hotblock 1	Environmental Express Limited		2772CEC1378	2003	NEW
Hotblock 2	Environmental Express Limited		2391CEC1273	2004	NEW
Autoclave	Steril-Matic	MEA 109-85-E	95-2678	1996	NEW
Hot Plate 1	Fisher Scientific		1000132	2004	NEW
Hot Plate 2	Fisher Scientific		1000153	2004	NEW
Hot Plate 3	Fisher Scientific		1000168	2003	NEW
Hot Plate 4	Fisher Scientific		1000169	2005	NEW
Hot Plate 5	Fisher Scientific		1000170	2005	NEW
Hot Plate 6	Fisher Scientific		1000203	2004	NEW

Instrument Type		Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
Hot Plate 7		Fisher Scientific		1000210	2005	NEW
Hot Plate 8		Fisher Scientific		1000220	2005	NEW
Hotblock 2		Environmental Express Limited		2391CEC1273	2004	NEW
Balance # 35		Acculab		18255989	2005	NEW
Balance # 33		Ohaus		F0461200521139	2001	NEW
Autoclave		Steril-Matic	MEA 109-85-E	95-2678	1996	NEW
GC/MS Semivolatiles						
(BNAMS1/GC)	GC	Hewlett-Packard	5971	3223A43511	1986	NEW
	MS		7673	3118A02442		
	Tower			3013A21967		
	Tray			3249A30680		
	Controller			3249A30674		
(BNAMS2/GC)	GC	Hewlett-Packard		2618A07933	1986	NEW
	MS		5971	3234A04110		
	Tower		7673A	2704A08901		
	Tray			2718A08680		
	Controller			2607A02892		
(BNAMS3/GC)	GC	Hewlett-Packard		3140A38366	1986	NEW
	MS		5971	3188A02926		
	Tower		7673	3266A31274		
	Tray			3021A21499		
	Controller			3138A27180		
(BNAMS4GC)	GC	Hewlett-Packard		3108A34490	1986	NEW
	MS		5971A	3114A02077		
	Tower		7673A	2546A02861		

Instrument Type		Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
	Tray			2942A20598		
	Controller			2803A11211		
(BNAMS6/GC)	GC	Hewlett-Packard		3336A54722	1990	NEW
	MS		5971	3234A04274		
	Tower		7673	2843A13155		
	Tray			2933A11253		
	Controller			3018A21811		
(BNAMS7GC)	GC	Hewlett-Packard		3235A45833	1990	NEW
	MS		5972	3307A00368		
	Tower		7673A	2546602130		
	Tray			2633A02968		
	Controller			2511A01985		
(BNAMS8/GC)	GC	Hewlett-Packard		336A56444	1990	NEW
	MS		5972	3435A01857		
	Tower		A0C-20i	C11144007149		
	Tray			C11154103496		
	Controller			626059SA		
(BNAMS9/GC)	GC	Agilent Technologies		CN10349071	2004	NEW
	MS		5973	US35120328		
	Tower		7683	CN35134357		
	Tray			CN40427800		
	Controller			CN40427800		
(BNAMS10/GC)	GC	Agilent Technologies		CN10403063	2004	NEW
	MS		5973	US35120373		

Instrument Type		Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
	Tower		7683	CN40334758		
	Tray			CN40327770		
	Controller			CN40327770		
BNAGC2	GC	Hewlett-Packard	5890 II	3336A55994	1986	NEW
	Tower 1		7673	3004A20530		
	Tower 2			3613A21129		
	Tray			3021A21938		
	Controller			3244A30371		
BNAGC8	GC	Hewlett-Packard	5890	3121A35833	1986	NEW
	Tower 1		7673A	2704805765		
	Tray			3131A25914		
	Controller			2921A03449		
Manifold Gases		Western Enterprise	Innovator HBAC2-5-4	28452	2004	NEW
GC/MS Volatiles						
VOAMS1		Agilent	5975	US60532504	2006	NEW
GC		Agilent	6890N	CN10606023		
Autosampler		OI	4551A	D60345B194		
Concentrator		OI	4660	D608466853		
Spiker		OI	SAM	E610475713		
VOAMS2		Hewlett-Packard	5970	2716A10839	1986	
GC		Hewlett-Packard	5890	2750A15931		
Autosampler		Tekmar	2016	89191011		
Concentrator		Tekmar	2000	88084010		

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
VOAMS3	Agilent	5973inert	US35120382	2004	NEW
GC	Agilent	6890N	CN10406105		
Autosampler	EST	Centurion	CENT140051304		
Concentrator A	EST	Encon	367060704		
Concentrator B	EST	Encon	368060704		
VOAMS4	Hewlett-Packard	5970	3114A13079	1988	NEW
GC	Hewlett-Packard	5890 II	2938A25805	1988	
Autosampler 1	Tekmar	2016	92344012	1988	
Autosampler 2	Tekmar	2032	94027002	1994	
Concentrator	Tekmar	2000	9008008	1988	
VOAMS5	Hewlett-Packard	5971	3234A04198	1996	NEW
GC	Hewlett-Packard	5890 II	3033A33368		
Autosampler	Archon	5100A	11957-696A		
Concentrator	OI	4560	D310219		
VOAMS6	Agilent	5973inert	US35120322	2004	NEW
GC	Agilent	6890N	CN10406076	2004	
Autosampler	OI	4551A	D54645B461	2005	
Concentrator	OI	4660	D548466579	2005	
Spiker	OI	SAM	C425475656	2004	

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
VOAMS7	Agilent	5973inert	US43110514	2004	NEW
GC	Agilent	6890N	CN10437064	2006	
Autosampler	Teledyne Tekmar	Aquatek 70	US06045001	2006	
Concentrator	Teledyne Tekmar	Velocity XPT	US06041002	2006	
VOAMS8	Hewlett-Packard	5971	3118A02630	1998	NEW
GC	Hewlett-Packard	5890 II	3126A36935		
Autosampler	EST Archon	5100A	12206		
Concentrator	OI	4560	I418460464		
VOAMS9	Hewlett-Packard	5971	3118A03332	1998	NEW
GC	Hewlett-Packard	5890 II	3203A40292		
Autosampler	EST Archon	5100A	12207		
Concentrator	OI	4560	C302089		
VOAMS10	Hewlett-Packard	5972	3307A00392	2000	USED
GC	Hewlett-Packard	5890	2728414257		
Autosampler	Tekmar	2016	94312017		
Concentrator	Tekmar	3000	94087010		
VOAMS11	Agilent	5973N	US30965664	2003	NEW
GC	Agilent	6890N	CN10324011		
Autosampler	EST Archon	5100A	13970		
Concentrator	EST	Encon	279061703		

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
VOAMS12	Agilent	5973inert	US43110519	2004	NEW
GC	Agilent	6890N	CN10439051	2005	
Autosampler	EST	Archon 5100A	14448	2005	
Concentrator	EST	Encon	430051605	2005	
Turbo Pump Upgrade	Agilent	Performance	56115832	2005	
VOAMS13	Agilent	5973inert	US43110517	2004	NEW
GC	Agilent	6890N	CN10439052	2005	
Autosampler	EST	Archon 5100A	14449	2005	
Concentrator	EST	Encon	431051605	2005	
Turbo Pump Upgrade	Agilent	Performance	56069171	2005	
Balance #10	Sartorius		10101550	1993	NEW
Balance #22	Mettler	PB1501	2115517886	1997	NEW
Balance #6	Sartorius		37020195	2006	NEW
Balance #50	Ohaus	Explorer Pro	1125573353	2006	NEW
Oven	Fisher Isotemp Oven	13-246-516G	502N0045	2005	NEW
Oven	Baxter	DX-1	199012	2000	USED
GC Volatiles					
GC1	Agilent	6890N	US10610006	2006	NEW
Autosampler	OI	4552	14608		
Concentrator	OI	4660	D607466340		
Autosampler	OI	4551A	D60745B342		
Concentrator	OI	4660	D607466341		
Spiker	OI	SAM	E610475713		

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
GC2	Hewlett-Packard	5890II	2921A23492	1993	NEW
Autosampler 1	Tekmar	7050	US04156005	2004	
Headspace 1	Tekmar	7000	US04156003	2004	
Autosampler 2	Tekmar	7050	US04148014	2004	
Headspace 2	Tekmar	7000	US04163001	2004	
GC3	Hewlett-Packard	5890II	3310A49242	1996	NEW
PID	OI	4430	91-I107		
Autosampler	Dynatech Archon	5100	11780-795		
Concnetrator	OI	4560	J437460274		
SCREEN1/2 GC	Hewlett-Packard	5890 II	2950A29246	1989	NEW
Autosampler 1	Tekmar	7050	91025014	1989	
Headspace 1	Tekmar	7000	91163066	1989	
Autosampler 2	Tekmar	7050	91168012	1989	
Headspace 2	Tekmar	7000	90255003	1989	
SCREEN3/4 GC	Hewlett-Packard	5890	2908A21857	1998	NEW
Autosampler 1	Tekmar	7050	91346013		
Headspace 1	Tekmar	7000	91339015		
Autosampler 2	Tekmar	7050	90256011		
Headspace 2	Tekmar	7000	91025010		
H-Nu PID	H-nu Systems	PI101	801023	1989	NEW
Hood Ductless Fume	Air Science	PurAir15	P41007	2004	NEW

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
GC Semivolatiles BNAGC1 GC Network Injector Module Tray	Agilent Technologies	6890N G2613A G2614A	US10248079 CN24428026 CN24322270	2005	NEW
BNAGC3 GC Network Tower Tray	Hewlett Packard	5890 II	2643A12162 C11144007157KG C11154003268KG	1987	NEW
BNAGC4 GC Network Injector Module 1 Injector Module 2 Tray	Agilent Technologies	6890N G2913A G2914A G2614A	US10610005 CN43820808 CN43820804 CN43830663	2006	NEW
BNAGC5 GC Tower Tray Controller	Hewlett-Packard	6890 7673	2728A14513 2704A0854 2920A10887 01866	1997	NEW
BNAGC6 GC Tower 1 Tower 2 Tray Controller	Hewlett-Packard	5890 II 7673	3203A40054 3120A28315 3202A27987 3228A29094 3138A27180	1997	NEW
BNAGC7 GC Tower 1 Tray Controller	Hewlett-Packard	5890 7673A	2443A03923 2546A02013 2718A05293 2929A15891	1999	NEW
Pest/PCB GC1 GC Mainframe Injector Module Controller Tray	Hewlett-Packard	5890A G1513A G1512A 18596C	2612A07669 CN22321930 CN00005085 US72101578	1992	NEW
GC2 GC Mainframe Injector Module 1 Injector Module 2 Controller Tray	Hewlett-Packard	5890A 18593A 18593A 18594A 18596A	2750A15933 2932A14269 2704A8875 2749A09358 2718A08934	1992	NEW

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
GC3 Series II GC Injector Module Controller Tray	Hewlett-Packard	 5890A 18593B 18594B 18596B	 3223A42873 3228A31372 3049A23890 3202A27453	1992	NEW
GC4 Series II Plus GC Injector Module Controller Tray	Hewlett-Packard	 5890A 18593B 18594B 18596B	 336A54563 3013A22344 3227A29129 3624A42191	1997	NEW
GC5 GC Network Injector Module Tray	Agilent Technologies	 6890N G2613A G2614A	 US10226033 CN22025340 CN21420543	2002	NEW
GC6 GC Mainframe Injector Module Controller Tray	Hewlett-Packard	 5890A G1513A G1512A 18596C	 2950A26642 CN13420438 CN00004777 US20407961	1998	NEW
GC7 GC Mainframe Injector Module Controller Tray	Hewlett-Packard	 5890A 18593A 18594A 18596A	 3029A29927 C11144007141 626059 C11154103504	1998	NEW
GC8 GC Plus Injector Module Controller Tray	Agilent Technologies	 6890 G1513A G1512A 18596C	 US00004463 CN15221154 3631A05939 3050A23572	2000	NEW
GC9 GC Plus Injector Module Controller Tray	Agilent Technologies	 6890 G1513A G1512A 18596C	 US00043694 CN13420437 CN00004150 US13807350	2001	NEW
GC11 GC Plus Injector Module Controller Tray	Agilent Technologies	 6890 G2513A G2512A 18596C	 US00008746 US64600228 US72202100 US22408138	2003	NEW
<u>WET CHEMISTRY</u>					
Spectrophotometer	HACH	DR2800	1205122	2007	NEW
Spectrophotometer	HACH	DR2800	1204684	2007	NEW
Spectrophotometer	HACH	DR2800	11204422	2007	NEW

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
Turbidimeter	HF Scientific	Micro 100	200604033	2006	NEW
Ion Selective Meter	Orion	720A	006825	1994	NEW
Ion Selective Meter	Orion	720A+	092904	2007	NEW
pH Meter	Orion	320	010005	2002	NEW
pH Meter	Orion	320	009986	2002	NEW
Oven	VWR	1320	0402001	2001	NEW
Oven	Fisher	230G		1997	NEW
Oven	VWR	1300U		2001	NEW
Oven	VWR	1305U		2001	NEW
Oven	Fisher	230G		1997	NEW
Oven (Muffle Furnace)	Fisher	550-14	901N002	2002	NEW
Balance #27	A&D	HR-200	12315883	2005	NEW
Balance #29	A&D	HR-200	12315872	2005	NEW
Balance #16	Sartorius		3403003	2003	NEW
Balance #26	Sartorius	1712MP8	3503054	2003	NEW
Balance #51	Ohaus	Scout Pro	7125010794	2006	NEW
Balance #14	Mettler		122423439	2006	NEW
Water Bath	Precision	50	9302-112	1995	USED
Water Bath	Precision	50	9305-024	1995	USED
Water System (Log-in)	Millipore		07348-C	1990	NEW
Water System (Extr. room)	Barnstead	D11911	1191020210415	1995	NEW
FTIR	Perkin Elmer	1600	139038	1991	USED
Printer	Epson	FX-870	61P107612	2003	NEW
Fixed IR	Buck Scientific	404	1026	2004	NEW
COD reactor	HACH	45600	980300017418	2007	NEW
COD reactor	HACH	45600	900402268	2007	NEW
COD reactor	HACH	DRB 200	1202323	2007	NEW

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
COD reactor	HACH	DRB 200	1209887	2007	NEW
Auto-analyzer	Lachat	QUICKEM 8000	A83000	1997	NEW
Auto-analyzer	Lachat	8000 Series	8300-1658	2000	NEW
Block Digester	Lachat	BD-46	1800-375	2000	NEW
TOC Analyzer	Shimadzu	TOC 5000	31242909	1997	USED
Autosampler	Shimadzu S/N	ASI-5000	31816800	1997	USED
Solid Sample Module (1)	Shimadzu	SSM-5000A	31303115	1997	USED
TOC Soil Analyzer (2)	Thermo Electron Corp.	Flash EA 1112 Series	20034945	2004	NEW
Printer	Epson	LQ570	41NE28676	1997	NEW
TOC Analyzer	Shimadzu	TOC-VCSH	H51104335164	2006	NEW
Autosampler	Shimadzu	ASI-V	H52104301656SA	2006	NEW
Solid Sample Module (2)	Shimadzu	SSM-500A	H52504300040NK	2006	NEW
BOD Meter	YSI	5000	97S0534AE	1998	NEW
Incubator	GCA Precision Scientific			1998	NEW
Hot Plate	Fisher Scientific		103N0071	2001	NEW
Hot Plate	Corning	PC-400	370301092774	2007	NEW
Hot Plate	Fisher Scientific	PC-420	390502148495	2007	NEW
Hot Plate	Fisher Scientific	PC-620	220897070707	2007	NEW
Conductivity Meter	Fisher Scientific	Accumetab30	AB 81209007	2002	NEW
Vortex mixer	Thermolyne	M63215	632000855604	2002	NEW
Dishwasher	Miele Professional	G7783CD	208479	2003	NEW
Easy-Dist Distillation	Westco		1095	2003	NEW
Easy-Dist Distillation	Westco		J097	2003	NEW
Easy-Dist Distillation	Westco		1063	2007	NEW

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
Easy-Dist Distillation	Westco		1110	2007	NEW
Discreet Analyzer (1)	Konelab	20	S2019177	2003	NEW
Discreet Analyzer (2)	Konelab	20	2519236	2003	NEW
Dell Computer	Dell		246175	2003	NEW
BOD Aerator	Thomas Scientific	DOA-P104d-AA	1187	1998	NEW
BOD Plus Assay Liquid Handler DO meter YSI 52	Mantech Assoc., Inc.	 221 & 222 52CE	 27OC3XB215 O3C0812 AM	2003	NEW
PC-Titration Plus Autotitrator Interface Titra-Rinse 1 Titra-Rinse 2 Buret Module 1 Buret Module 2 Titration Module	Mantech Assoc., Inc	 PC-1000-102/4 PC-1000-408 PC-1000-408 PC-1104-00 PC-1104-00 PC-1300-475	 MS-0H4-373 MS-0G4-198 MS-0G4-200 MS-0H4-627 MS-0H4-625 MS-0B5-657	2004	NEW
Ion Chromatograph Pump #1 Pump #2 Conduct. Detector Injector & Oven 2-Ch Interface Liq. Handling #1 Liq. Handling #2 Dil. Autosampler	Metrohm Peak, Inc.	 818 818 819 820 830 833 833 838	 04187 04197 03181 04147 04184 04154 04118 03198	2005	NEW
Filter pump	Emerson		SA55-NXGTB 4142		NEW
Filter pump	Emerson	SA55JXgtd-4144	G8ECX	2002	NEW
Redox meter	VWR	8005	001149	1997	NEW
<u>SAMPLE LOGIN</u> Balance #13	 Satorius	 LC421	 50709085	 1995	 NEW
Isotemp Oven 1	Fisher	637G	410B01117	2005	NEW
Isotemp Oven 2	Fisher	637G	505N0063	2005	NEW

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
ORGANIC EXTRACTIONS					
N-EVAP #1	Organomation	8125	51004	2004	NEW
N-EVAP #2	Organomation	N-EVAP 112	10253	1990	NEW
Water Bath #1	Fisher Scientific	15-491	605021280	2005	NEW
Water Bath #2	Fisher Scientific			1995	NEW
Sonicator #1	Sonic & Material, Inc.	VCX 500	3353027	2006	NEW
Sonicator #2	Sonic & Material, Inc.	VCX 500	3353028	2006	NEW
Sonicator #3	Tekmar	TM500	7918	1990	NEW
Sonicator #4	Tekmar	TM500	7918	1990	NEW
Sonicator #5	Sonic & Material, Inc.	VCX 500	41748	2004	NEW
Sonicator #6	Sonic & Material, Inc.	VCX 500	41755	2004	NEW
Muffle Furnace #1	Thermolyne	F6010	40800875	1990	NEW
Muffle Furnace #2	Thermolyne	F6028C		1990	NEW
Large Muffle Furnace	Wilt Industries	210	041213	2001	NEW
Dishwasher #1	Miele Professional	G7783CD	53075564	2003	NEW
Dishwasher #2	Miele Professional	G7783CD	53075571	2003	NEW
Vacuum Pump #1	Emerson electric MLD	5KH36KN90HX	UNL231171	1990	NEW
Vortex	Scientific Industries	6560	2-318564	1995	NEW
Electric Mixer	Barnstead/Thermolyne		125404091646	1995	NEW
Mini Hotplate/Stir	VWR Scientific	220	33918-604	1995	NEW
Centrifuge #1	Sigma	2-5	78646	2001	NEW
Centrifuge #2	Sigma	2-5	78647	2001	NEW
Centrifuge #3	Sigma	2-5	80226	2001	NEW
Balance # 60	Ohaus	Scout Pro	7125471186	2007	NEW
Balance #28	A&D	HR-200	12315879	2005	NEW
Balance #30	A&D	HR-200	12315880	2005	NEW

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
Soxtherm 1 Controller Chiller	OI Analytical	Type 07-5101	4012355 4012359 101365037	2002	NEW
Soxtherm 2 Controller Chiller	OI Analytical	Type 07-5101	4092019 4011812 101365037	2002	NEW
Soxtherm 3 Controller Chiller	OI Analytical	Type 07-5101	4012357 4012351 101361121	2002	NEW
Soxtherm 4 Controller Chiller	OI Analytical	Type 07-5101	4012356 4002886 101361121	2002	NEW
Soxtherm 5 Controller Chiller	OI Analytical	Type 07-5101	4012354 4010016 102002023	2002	NEW
Soxtherm 6 Controller Chiller	OI Analytical	Type 07-5101	4012358 4012353 102002023	2002	NEW
Soxtherm 7 Controller Chiller	OI Analytical	Type 07-5101	4010019 4012352 101200022	2002	NEW
Soxtherm 8 Controller Chiller	OI Analytical	Type 07-5101	4012360 4010000 101200022	2002	NEW
Soxtherm 9 Controller Chiller	OI Analytical	Type 07-5101	4092025 4012352 102002024	2003	NEW
Soxtherm10 Controller Chiller	OI Analytical	Type 07-5101	4092023 4092014 102002024	2003	NEW
Soxtherm11 Controller Chiller	OI Analytical	Type 07-5101	4080905 4022012 101361126	2005	NEW
Soxtherm12 Controller Chiller	OI Analytical	Type 07-5101	4033530 4092012 101361126	2005	NEW
Soxtherm13 Controller Chiller	Lab Synergy VWR	SOX416 1177PD	4051582 4051747 106500017	2006	NEW

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
Soxtherm 14 (uses controller & Chiller on Sox13)	Lab Synergy	SOX416	4051583	2006	NEW
GPC 3	J2 Scientific	AIM3300	4349A1864	2004	NEW
GPC 4	J2 Scientific	JNM3300	4413A2363	2004	NEW
Rotator 1	AP & R Machine & Tool		222307	2003	NEW
Rotator 2	AP & R Machine & Tool		222306	2003	NEW
Rotator 3	AP & R Machine & Tool		222305	2003	NEW
Rotator 4	AP & R Machine & Tool		222304	2003	NEW
Rotator 5	AP & R Machine & Tool		222303	2003	NEW
Rotator 6	AP & R Machine & Tool		222302	2003	NEW
Wrist Action Shaker 1	Burrell	75		2003	NEW
Wrist Action Shaker 2	Labline	3589	12910443	2003	NEW
TCLP Extraction1 Apparatus/Timer included	Assoc. Design and Mfg. Co.	3740-12 BRE	1352	1997	NEW
TCLP Extraction2 Apparatus/Timer included	Assoc. Design and Mfg. Co.	3740-12 BRE	1053	1997	NEW
TCLP Extraction3 Apparatus/Timer included	Assoc. Design and Mfg. Co.	3740-12 BRE	1249	1997	NEW
TCLP Extraction4 Apparatus/Timer included	Environmental Express Limited	LE 1002	3384-12-473	May05	NEW
TCLP Extraction5 Apparatus/Timer included	Environmental Express Limited	LE 1002	3384-12-472	May05	NEW
TCLP Extraction6 Apparatus/Timer included	Assoc. Design and Mfg. Co.	3740-12 BREII	2125	Sep06	NEW
TCLP Extraction7 Apparatus/Timer included	Assoc. Design and Mfg. Co.	3740-12 BREII	2126	Sep06	NEW
FIELD SERVICES pH/Temp meter	Thermo Orion	230A+	17254	2002	NEW
pH/Temp meter	Thermo Orion	250A+	15035	2000	NEW
pH/Temp meter	Orion	250A+	009440	1996	NEW
Conductivity meter	HACH	CO150	980600006104	1998	NEW

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
Conductivity meter	HACH	Sension 5	21000005660	2002	NEW
DO meter	HACH	Sension 6	0200001321	2002	NEW
DO meter	HACH	Sension 6	001200002352	2000	NEW
Turbidity meter	La Motte	2020	0119-0997	1998	NEW
Turbidity meter	La Motte	2020	3897-5102	2002	NEW
pH/Temp meter	Oakton	Oakton 100 Series	99129	2002	NEW
pH/Temp meter	Oakton	Oakton 100 Series	24602	1998	NEW
Conductivity meter	Orion	105	001167	1998	NEW
Conductivity meter	Orion	115	002723	1998	NEW
DO meter	Orion	810	003068	1995	NEW
DO meter	Orion	810	003454	1998	NEW
Turbidity meter	LaMotte	2020	3649-3802	2002	NEW
pH/ORP meter	Cole Parmer	05669-20	643409		NEW
pH/ORP meter	HACH	Sension 1	40300004238		NEW
pH/ORP meter	HACH	Sension 1	31100003358	2005	NEW
DO meter	YSI	55-12FT	02F0321		NEW
Cond./Salinity/ TDS meter	HACH	Sension 5	30500006215		NEW
pH/ ORP meter	HACH	Sension 1	050400020239	2005	NEW
pH/ ORP meter	HACH	Sension 1	050400022762	2005	NEW
Cond./Salinity/ TDS meter	HACH	Sension 5	050300013668	2005	NEW
DO meter	HACH	Sension 6	50100008829	2005	NEW
Cond./Salinity/ TDS meter	YSI	33	93L12159		NEW
Turbidity meter	LaMotte	2020e	ME 10036	2005	NEW
Turbidity meter	LaMotte	2020e	ME 10117	2005	NEW
Cond./Salinity/ TDS meter	HACH	Sension 5	050506C50148	2005	NEW
DO meter	HACH	Sension 6	050500C60212	2005	NEW
DO meter	HACH	Sension 6	050500C60066	2005	NEW
pH/ ORP meter	HACH	Sension 1	050600C10445	2005	NEW
pH/ ORP meter	HACH	Sension 1	4030004162	2005	NEW
pH/mV meter	Oakton		136730	2006	NEW
Conductivity meter	Hach		031000002532	2006	NEW
DO meter	Hach		040800001267	2006	NEW
pH/mV meter	Hach		041200010302	2006	NEW
Conductivity meter	Hach		050100002708	2006	NEW

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
DO meter	Hach		040700001191	2006	NEW
pH/ mV meter	Oakton		23938	2006	NEW
pH/ mV meter	Hach		040200003831	2006	NEW
Conductivity meter	Hach		050100002707	2006	NEW
DO meter	Hach		030500007618	2006	NEW
pH/ mV	Hach		041200004666	2006	NEW
Turbidity meter	LaMotte		4969-1604	2006	NEW
Turbidity meter	LaMotte		4943-1604	2006	NEW
Turbidity meter	LaMotte		1909-2900	2006	NEW
pH/mV meter	Hach		041200002902	2006	NEW
pH/mV meter	Oakton		36297	2006	NEW
pH/mV meter	Hach		41200002933	2006	NEW
pH meter	Orion		017900	2006	NEW
pH meter	Orion		010863	2006	NEW
Conductivity meter	Hach		050500C50193	2006	NEW
pH meter	Hach		040800010007	2006	NEW
Chlorine meter	Hach	Pocket Colorimeter II	040200011290	2006	NEW
Chlorine meter	Hach	Pocket Colorimeter	020100174404	2006	NEW
Chlorine meter	Hach	Pocket Colorimeter II	040200011345	2006	NEW
Chlorine meter	Hach	Pocket Colorimeter	961200102549	2006	NEW
Water level meter	Solonist		37993	Feb05	NEW
Water level meter	Solonist		37995	Feb05	NEW
PID meter	RAE Systems	PGM-7600	110-010953	May05	NEW
PID meter	RAE Systems	Mini RAE 2000	110-010984	May05	NEW
PID meter	RAE Systems	Mini Rae 2000	110-01094	May05	NEW
Comp sampler	ISCO	603704001-3700	205C01376	May05	NEW
Comp sampler	ISCO	603704001-3700	205C01380	May05	NEW
Submersible pump	Grundfos	MP1 / 1A106003	05141-8349	May05	NEW
Submersible pump	Grundfos	MP1 / 1A106003	05141-8361	May05	NEW
Submersible pump	Grundfos	A1A106003P1	0621-0014	Jul06	NEW

Instrument Type	Manufacturer	Model Number	Serial Number	Year Put Into Service	Condition When Received
Submersible pump	Proactive S/N	SS Monsoon	1371	Jul06	NEW
Pump control box	Grundfos	91126028	H0412210120	May05	NEW
Pump control box	Grundfos	91126028	H0412210120	May05	NEW
Generator	Honda	EZGP-1145763	EB-3000C	May05	NEW
Generator	Honda	EZGP-1151238	EB-3000C	Jun05	NEW
Control Pack	QED	MP-15	1300	May05	NEW
Control Pack	QED	MP-15	1297	May05	NEW
Control Pack	QED	MP-15	1298	May05	NEW
Control Pack	QED	MP-15	1299	May05	NEW
Bladder Pump	QED	MP-SPK-4P	10993	May05	NEW
Bladder Pump	QED	MP-SPK-4P	10997	May05	NEW
Bladder Pump	QED	MP-SPK-4P	10995	May05	NEW
Bladder Pump	QED	MP-SPK-4P	10996	May05	NEW
Bladder Pump	QED	MP-SPK-4P	11191	May05	NEW
Bladder Pump	QED	MP-SPK-4P	11192	May05	NEW
Compressor	Coleman / Honda	CT5090412	D02812339	Jun05	NEW
Multi-probe meter	YSI	556 MPS	06F1362AC	Jul06	NEW
Oil/Water interface probe	Solonist		122 007364-1	Aug06	NEW

Table 21-2

Schedule of Routine Maintenance

Instrument	Procedure	Frequency
AA (Graphite Furnace)	Clean lens and furnace head Replace windows Check or change cuvette Check & drain compressor drain Clean atomizer cell/furnace hood Nebulizer cleaned/dried Check/change marble stones Clean filters Change graphite tube/platform Empty waste container Remove carbon tube and check wear Check sample introduction probe	Daily As required Daily Daily Daily Weekly or as required Weekly Weekly As required Daily Daily Daily
Leeman Mercury Analyzer	Check tubing for wear Fill rinse tank with 10% HCl Change dryer tube Fill reductant bottle with 10% Stannous Chloride	Daily Daily As needed Daily
ICP	Check pump tubing Check liquid argon supply Check fluid level in waste container Check filters Clean or replace filters Check torch Check sample spray chamber for debris Clean and align nebulizer Check entrance slit for debris Change printer ribbon Replace pump tubing	Daily Daily Daily Weekly As required Daily Monthly Monthly Monthly As required As required
ICP MS	Change pump tubing Clean torch Check / clean nebulizer Clean cones Check air filters Check multiplier voltages & do cross calibration Replace sample uptake tubing Check rotary pump oil Check oil mist filters Check chiller water level	Weekly or As required Weekly or As required Weekly or As required Weekly or As required Weekly or As required Weekly or As required Weekly or As required Weekly or As required Monthly Monthly
UV-Vis Spectrophotometer	Clean ambient flow cell Precision check/alignment of flow cell Wavelength verification check	As required As required Semi-annually
Auto Analyzers	Clean sampler Check all tubing Clean inside of colorimeter Clean pump well and pump rollers Clean wash fluid receptacle Oil rollers/chains/side rails Clean optics and cells	Daily Daily Daily Quarterly Weekly Weekly Quarterly

Instrument	Procedure	Frequency
Hewlett Packard/Agilent GC/MS	Ion gauge tube degassing Pump oil-level check Pump oil changing Analyzer bake-out Analyzer cleaning Resolution adjustment COMPUTER SYSTEM AND PRINTER: Air filter cleaning Change data system air filter Printer head carriage lubrication Paper sprocket cleaning Drive belt lubrication	As required Monthly Annually As required As required As required As required As required As required As required As required
Gas Chromatograph	Compare standard response to previous day or since last initial calibration Check carrier gas flow rate in column Check temp. of detector, inlet, column oven Septum replacement Glass wool replacement Check system for gas leaks with SNOOP Check for loose/frayed wires and insulation Bake injector/column Change/remove sections of guard column Replace connectors/liners Change/replace column(s)	Daily Daily via use of known compound retention Daily As required As required W/cylinder change as required Monthly As Required As Required As Required As Required
Electron Capture Detector (ECD)	Detector wipe test (Ni-63) Detector cleaning	Semi-annually As required
Flame Ionization Detector (FID)	Detector cleaning	As required
Photoionization Detector (PID)	Change O-rings Clean lamp window	As required As required
HPLC	Change guard columns Change lamps Change pump seals Replace tubing Change fuses in power supply Filter all samples Change autosampler rotor/stator	As required As required Semi-annually or as required As required As required Daily As required
Balances	Class “S” traceable weight check Clean pan and check if level Field service	Daily, when used Daily At least Annually
Conductivity Meter	0.01M KCl calibration Conductivity cell cleaning	Daily As required
Turbidimeter	Check light bulb	Daily, when used
Deionized/Distilled Water	Daily conductivity check Check deionizer light Monitor for VOA’s System cleaning Replace cartridge & large mixed bed resins	Daily Daily Daily As required As required

Instrument	Procedure	Frequency
Drying Ovens	Temperature monitoring Temperature adjustments	Daily As required
Refrigerators/ Freezers	Temperature monitoring Temperature adjustment Defrosting/cleaning	Daily As required As required
Vacuum Pumps/ Air Compressor	Drained Belts checked Lubricated	Weekly Monthly Semi-annually
pH/Specific Ion Meter	Calibration/check slope Clean electrode	Daily As required
BOD Incubator	Temperature monitoring Coil and incubator cleaning	Daily Monthly
Centrifuge	Check brushes and bearings	Every 6 months or as needed
Water baths	Temperature monitoring Water replaced	Daily Monthly or as needed

Table 21-3.

Periodic Calibration

Instrument	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Analytical Balance	Accuracy determined using A2LA-accredited NIST weights. Minimum of 2 standards bracketing the weight of interest. Inspected and calibrated annually.	Daily	See Method SOP	Clean, check level, insure lack of drafts, and that unit is warmed up, recheck. If fails, call service.
Top Loading Balance	Accuracy determined using-A2LA-accredited NIST weights. Minimum of 2 standards bracketing the weight of interest. Inspected and calibrated annually.	Daily	See Method SOP	Clean. Replace.
A2LA-accredited NIST Weights	Accuracy determined by accredited weights and measurement laboratory.	1 year	As per certificate.	Replace.
NIST-Traceable Thermometer	Accuracy determined by A2LA-accredited weights and measurement laboratory.	3 years	As per certificate.	Replace.
Thermometer	Against NIST-traceable thermometer	Yearly at appropriate temperature range for intended use	± 3°C	Replace
InfraRed Temperature Guns	Against NIST-traceable thermometer	Quarterly at appropriate temperature range for intended use.	± 1.5°C	Repair/replace

Instrument	Type of Calibration/ Number of Standards	Frequency	Acceptance Limits	Corrective Action
Refrigerator	Temperature checked using NIST-traceable thermometer.	Daily. If out of range, check again in two hours.	4 ± 2°C	Adjust. Repair. While waiting for repair, seal door, attach "Out of Service" sign, move items to functional unit. Notify supervisor.
Oven	Temperature checked using NIST-traceable thermometer.	When in use.	104 ± 1°C (drying) 180 ± 2°C (TDS)	Adjust. Replace.
Incubator	Temperature checked using NIST-traceable thermometer.	When in use.	BOD: 20 ± 1.0°C	Adjust. Replace.
Water Bath	Temperature checked using NIST-traceable thermometer.	When in use.	± 2°C	Adjust. Replace.
Volumetric Dispensing Devices (Eppendorf ® pipette, automatic dilutor or dispensing devices)	One delivery by weight. Using DI water, dispense into tared vessel. Record weight with device ID number.	Quarterly	± 2% Calculate using Calculation Worksheet (EDS-WI-027)	Adjust. Replace.
Glass Microliter Syringes	None	Accuracy must be initially demonstrated if syringe was not received with a certificate attesting to established accuracy.	± 1%	Not applicable.
Conductivity Meter	Cell impedance calibrated with KCl standards.	Each use	See Method SOP	Recalibrate.
Conductivity Meter	Cell constant determined with five KCl standards.	Quarterly	See Method SOP	Recalibrate.
Deionized Water	Check conductivity with conductivity meter in Inorganics Department.	Daily	<1.0 µmhos/cm^2	Record on log. Report discrepancies to Department Manager.

SECTION 22

MEASUREMENT TRACEABILITY
(NELAC 5.5.6)

22.1 OVERVIEW

Traceability of measurements shall be assured using a system of documentation, calibration, and analysis of reference standards. Laboratory equipment that are peripheral to analysis and whose calibration is not necessarily documented in a test method analysis or by analysis of a reference standard shall be subject to ongoing certifications of accuracy. At a minimum, these must include procedures for checking specifications of ancillary equipment: balances, thermometers, temperature, Deionized (DI) and Reverse Osmosis (RO) water systems, automatic pipettes and other volumetric measuring devices. With the exception of Class A Glassware (including glass microliter syringes that have a certificate of accuracy), quarterly accuracy checks are performed for all mechanical volumetric devices. Wherever possible, subsidiary or peripheral equipment is checked against standard equipment or standards that are traceable to national or international standards. The following definitions are provided by the American Association for Laboratory Accreditation (A2LA):

"Traceability is the property of a measurement result whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons, each step in the chain having stated uncertainties." There are six essential elements:

- An unbroken chain of comparison
- A calculated measurement uncertainty for each step in the chain to allow for an overall uncertainty calculation
- Documentation of each step in each calibration report
- All steps in the chain are performed by individuals with evidence of technical competence and accredited by a recognized accreditation body
- Reference to International Standard (SI) units
- Recalibration at appropriate intervals to preserve traceability

Calibration is defined as "determining and documenting the deviation of the indication of a measuring instrument (or the stated value of a material measure) from the conventional 'true' value of the measurand."

Uncertainty is defined as "a parameter associated with the result of a measurement that characterizes the dispersion of the value that could reasonably be attributed to the measurand." Measurement of Uncertainty is discussed is Section 20 of this QA Manual.

22.2 NIST-TRACEABLE WEIGHTS AND THERMOMETERS

Reference standards of measurement shall be used for calibration only and for no other purpose, unless it can be shown that their performance as reference standards would not be invalidated.

For NIST-traceable weights and thermometers, the laboratory requires that all calibrations be conducted by a calibration laboratory accredited by A2LA, NVLAP (National Voluntary Laboratory Accreditation Program), APLAC (Asia-Pacific Laboratory Accreditation Cooperation), or EA (European Cooperation for Accreditation). A certificate and scope of accreditation is kept on file at the laboratory. Refer to Section 21 for calibration of weights and thermometers.

22.3 REFERENCE STANDARDS / MATERIALS

Reference standards/materials, where commercially available, are traceable to certified reference materials. Commercially prepared standard materials are purchased from vendors accredited by A2LA and NVLAP with an accompanying Certificate of Analysis that documents the standard purity. If a standard cannot be purchased from a vendor that supplies a Certificate of Analysis, the purity of the standard is documented by analysis. (Refer to Section 9 for additional information on purchasing). The receipt of all reference standards must be documented. Reference standards are labeled with a unique Standard Identification Number and expiration date. All documentation received with the reference standard is retained as a QC record and references the Standard Identification Number.

All reference, primary and working standards/materials, whether commercially purchased or laboratory prepared, must be checked regularly to ensure that the variability of the standard or material from the 'true' value does not exceed method requirements. The accuracy of calibration standards is checked by comparison with a standard from a second source. In cases where a second standard manufacturer is not available, a vendor certified different lot is acceptable for use as a second source. For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst would be considered a second source. The appropriate Quality Control (QC) criteria for specific standards are defined in laboratory SOPs. In most cases, the analysis of an Initial Calibration Verification (ICV) or LCS (where there is no sample preparation) is used as the second source confirmation. These checks are generally performed as an integral part of the analysis method (e.g. calibration checks, laboratory control samples).

All standards and materials must be stored and handled according to method or manufacturer's requirements in order to prevent contamination or deterioration. Refer to Table 9-1 in Section 9 for general storage requirements and to TestAmerica Edison SOP No. ED-GEN-008 (Preparation, Purity and Storage of Reagents and Standards.) For safety requirements, please refer to method SOPs and the laboratory Environmental Health and Safety Manual.

22.4 DOCUMENTATION AND LABELING OF STANDARDS, REAGENTS, AND REFERENCE MATERIALS

Reagents must be at a minimum the purity required in the test method. The date of reagent receipt and the expiration date are documented. The lots for most of the common solvents and

acids are tested for acceptability prior to company wide purchase. Refer to SOP No. CA-Q-S-001, Solvent and Acid Lot Testing and Approval.

All manufacturer or vendor supplied Certificate of Analysis or Purity must be retained, stored appropriately, and readily available for use and inspection. These records are maintained by the individual analytical departments. Records must be kept of the date of receipt and date of expiration of standards, reagents and reference materials. In addition, records of preparation of laboratory standards, reagents, and reference materials must be retained, stored appropriately, and be readily available for use and inspection. Refer to TestAmerica Edison SOP No. ED-GEN-008 (Preparation, Purity and Storage of Reagents and Standards) for additional details.

Commercial materials purchased for preparation of calibration solutions, spike solutions, etc.., are usually accompanied with an assay certificate or the purity is noted on the label. If the assay purity is 96% or better, the weight provided by the vendor may be used without correction. If the assay purity is less than 96% a correction will be made to concentrations applied to solutions prepared from the stock commercial material.

22.4.1 All standards, reagents, and reference materials must be labeled in an unambiguous manner. Standards are logged into a Standards Preparation Logbook and are assigned a unique identification number. The following information is typically recorded in the Standards Preparation Logbook:

- Standard ID
- Description of Standard
- Preparer's name
- Final volume and number of vials prepared
- Solvent type and lot number
- Preparation Date
- Expiration Date
- Standard source type (stock or daughter)
- Standard type (spike, surrogate, other)
- Parent standard ID (if applicable)
- Parent Standard Analyte Concentration (if applicable)
- Parent Standard Amount used (if applicable)
- Final concentration of each analyte
- Comment box (text field)

Records are maintained standard and reference material preparation. These records show the traceability to purchased stocks or neat compounds. These records also include method of preparation, date of preparation, expiration date and preparer's name or initials. Preparation procedures are provided in the Method SOPs.

22.4.2 All standards, reagents, and reference materials must be clearly labeled with a minimum of the following information:

- Expiration Date
- Standard ID
- Special Health/Safety warnings if applicable

22.4.3 In addition, the following information may be helpful:

- Date of receipt for commercially purchased items or date of preparation for laboratory prepared items
- Date opened (for multi-use containers, if applicable)
- Description of standard (if different from manufacturer's label or if standard was prepared in the laboratory)
- Concentration (if applicable)
- Initials of analyst preparing standard or opening container

All containers of prepared reagents must include a preparation date, expiration date and an ID number to trace back to preparation.

Procedures for preparation of reagents can be found in the Method SOPs.

Standard ID numbers must be traceable through associated logbooks, worksheets and raw data.

All reagents and standards must be stored in accordance to the following priority: 1) with the manufacturer's recommendations; 2) with requirements in the specific analytical methods; and 3) according to Table 22-1.

Table 22-1.

Standard Sources and Preparation

General		
Standard Type	**Expiration**	**Storage Requirements**
Ampule	Vendor's expiration date	4 °C
Neat Material	Vendor's expiration date or if none, 2 years	Protect from light
Volatile Organics, GC/MS and GC (prepared in methanol)		
Standard Type	**Expiration**	**Storage Requirements**
Stock (Ampulated)	Vendor's expiration date	4 °C
Stock (from neat)	6 months	4 °C
Working Standard (all except CLP)		-10°C to -20°C, protect from light
Gases or reactive compounds	1 Week	
Calibration	1 Month	
Internal	1 Month	
Surrogate	1 Month	
BFB	1 Month	
Matrix Spike and/or LCS	1 Month	
Working Standards (CLP)	1 Week	-10°C to -20°C, protect from light
Working Standards (prepared in H2O)	Daily	None
Semivolatiles GC/MS		
Standard Type	**Expiration**	**Storage Requirements**
Stock	1 Year or manufacturer's expiration date, whichever is less	2°C to 6°C, protect from light
Secondary Dilution	1 Year or manufacturer's expiration date, whichever is less	
Initial Calibration	6 months	
Continuing Calibration	6 months	
Internal	6 months	
Surrogate	6 months	

DFTPP	6 months	2°C to 6°C, protect from light
Matrix Spike and/or LCS	6 months	
GPC Calibration	Manufacturer's date of expiration	

Semivolatiles GC

Standard Type	Expiration	Storage Requirements
Stock	Manufacturer's date of expiration	2°C to 6°C, protect from light -or- based on manufacturer's instructions
Secondary Dilution	6 Months	
Calibration	6 Months	
Internal	6 Months	
Surrogate	6 Months	
Matrix Spike and/or LCS	6 Months	
GPC Calibration	7 days	
Florisil Cartridge Check	6 Months	
Resolution Check	6 Months	

Metals (including Mercury)

Standard Type	Expiration	Storage Requirements
Stock	1 year	Room Temperature, pH < 2
Secondary Dilution	6 Months	
Calibration (GFAA & Hg)	Daily	
Calibration (ICP)	1 Month	
Check Standards (GFAA & Hg)	Daily	
Check Standards (ICP)	1 Month	
Matrix Spike and/or LCS	6 Months	

Wet Chemistry

Standard Type	Expiration	Storage Requirements
All	See Method Specific SOP	See Method Specific SOP

SECTION 23.0

SAMPLING
(NELAC 5.5.7)

23.1 OVERVIEW

TestAmerica Edison provides sampling services and field analysis. Sampling and field analytical procedures are described in the following SOPs:

- Low Flow Monitoring Well Purging and Sampling, SOP No. ED-FLD-008
- Measurement of Temperatures in the Field Waste Sampling, SOP No. ED-FLD-001
- Field Analysis of Oxidation-Reduction Potential, SOP No. ED-FLD-002
- Field Analysis of pH, SOP No. ED-FLD-003
- Field Analysis of Dissolved Oxygen by Electrode, SOP No. ED-FLD-004
- Field Analysis of the Specific Conductance of Waters, SOP No. ED-FLD-005
- Field Analysis of Turbidity in Water, SOP No. ED-FLD-005

23.2 SAMPLING CONTAINERS

The laboratory offers clean sampling containers for use by clients. These containers are obtained from reputable container manufacturers and meet EPA specifications as required. Any certificates of cleanliness that are provided by the supplier are maintained at the laboratory.

Preservatives

Upon request, preservatives are provided to the client in pre-cleaned sampling containers. In some cases containers may be purchased pre-preserved from the container supplier. Whether prepared by the laboratory or bought pre-preserved, the grades of the preservatives are at a minimum:

- Hydrochloric Acid – Reagent ACS (Certified VOA Free) or equivalent
- Methanol – Purge and Trap grade
- Nitric Acid – Instra-Analyzed or equivalent
- Sodium Bisulfate – ACS Grade or equivalent
- Sodium Hydroxide – Instra-Analyzed or equivalent
- Sulfuric Acid – Instra-Analyzed or equivalent
- Sodium Thiosulfate – ACS Grade or equivalent

23.2.1 Preparing Container Orders

When new containers arrive at the laboratory, the date of receipt is recorded on the packing list received with them for retained documentation. Upon request, the containers are subsequently sent to clients for use in collecting samples. The shipping date, type and number of containers are maintained on file by the lab. Shipping personnel insure that container stock is rotated so that "first in" is "first out." When a client requests containers, a client services representative creates a container request in LIMS; it is then stored permanently in LIMS with a unique container order number. Copies of the container request are printed for the shipping department. One copy goes to the client with the containers; one copy is filed in the shipping department.

The laboratory also provides EnCore, TerraCore or other soil sampling devices when requested.

If containers are provided directly to the client from the manufacturer or from other sources, the laboratory will not be responsible for any of the above records.

23.3 FIELD QUALITY CONTROL (QC)

Common field quality control samples are defined in the following paragraphs. The frequency of field quality control samples should be specified in the site specific Quality Assurance Project Plan (QAPP) or by the client. TestAmerica provides trip blanks for VOC analysis with the sample containers for all volatile organic analyses. Blanks generated in the field will be analyzed along with the field samples (exception soil samples where the blank is aqueous).

23.3.1 Equipment Blank / Rinsate Blank - The equipment blank, sometimes referred to as a rinsate blank, is a sample of the water used to decontaminate sampling equipment. The source water should be as free of target analytes as possible. An aliquot of this water is poured over or through the sample collection device after decontamination, collected in a sample container, preserved with appropriate reagents, and returned to the laboratory. This serves as a check on sampling device cleanliness, and will also be affected by the site and sample handling conditions evaluated by the other types of blanks. The sampling time for the equipment blank should begin when the equipment is rinsed and the water is collected.

23.3.2 Field Blank - The field blank is water that is as free of target analytes as possible and from the same source as the equipment blank. The water is poured into a sampling container at the sampling site, preserved with the appropriate reagents, and returned to the laboratory. This serves as a check on reagent and environmental contamination. The sampling time for the field blank should be when the blank is prepared in the field.

23.3.3 Trip Blank - The trip blank pertains to volatile analysis only. This serves as a check on sample contamination originating from sample transport, sample container contamination, shipping and storage, or from certain site conditions. Trip blanks are often referred to as travel blanks. They are prepared using pre-cleaned sample containers. They are filled with organic-free water (the source of the organic free water is the same source of water used to prepare volatile standards, method blanks, LCS and sample dilutions), sealed and taken into the field with the empty containers which will be used for sampling. The recommended frequency is one trip blank per cooler (in duplicate or triplicate), per volatiles method. Unless otherwise specified,

the sampling time for the trip blank is the time of receipt at the laboratory (When the "Trip" ends).

23.3.4 Field Duplicates - Field duplicates are replicate samples collected from the same sampling point or location during a field collection event. This control sample is used to demonstrate the ability of both the sampling and analytical process to generate data of acceptable precision.

23.4 DEFINITION OF HOLDING TIME

The date and time of sampling documented on the chain-of-custody (COC) form establishes the day and time zero. As a general rule, when the maximum allowable holding time is expressed in "days" (e.g 14 days, 28 days), the holding time is based on calendar day measured. Holding times expressed in "hours" (e.g. 6 hours, 24 hours, etc.) are measured from date and time zero. The first day of holding time ends twenty-four hours after sampling. Holding times for analysis include any necessary reanalysis.

23.4.1 Semi-Volatile - Holding times for sample preparation for semi-volatile organics are measured from the sampling date until the day solvent contacts the sample.. Holding times for analysis are measured from the date of initiation of extraction to the time of injection into the gas chromatograph.

23.4.2 Volatiles - Holding times for volatile organics are measured from the date of sampling to the date and time of injection into the gas chromatograph. The holding time requirement for lab preservation of samples collected in Encore samples is expressed and measured in hours.

23.4.3 Inorganics - For inorganic and metals analysis, the preparation/digestion/distillation must be started within the maximum holding time as measured from the sampling date (and time where applicable).

23.5 SAMPLING CONTAINERS, PRESERVATION REQUIREMENTS, HOLDING TIMES

The preservation and holding time criteria specified in the following tables are derived from the source documents for the methods. If method required holding times (refer to Tables 23-1 to 23-8) or preservation requirements are not met, the reports will be qualified using a flag, footnote or case narrative. As soon as possible or "ASAP" is an EPA designation for tests for which rapid analysis is advised, but for which neither EPA nor the laboratory have a basis for a holding time.

23.6 SAMPLE ALIQUOTS / SUBSAMPLING

Taking a representative sub-sample from a container is necessary to ensure that the analytical results are representative of the sample collected in the field. The size of the sample container, the quantity of sample fitted within the container, and the homogeneity of the sample need consideration when sub-sampling for sample preparation. It is the laboratory's responsibility to take a representative subsample or aliquot of the sample provided for analysis. In that regard the following guidelines apply to analysts:

Analysts should handle each sample as if it is potentially dangerous. At a minimum, safety glasses, gloves, and lab coats must be worn when preparing aliquots for analysis.

Subsampling procedures are detailed in TestAmerica Edison SOP No. ED-GEN-007 (Subsampling).

Tables 23-1 to 23-8 detail holding times, preservation and container requirements, and sample volumes for SDWA and NPDES methods. ***Please note****: the holding times are program specific and different programs may have different holding times for equivalent methods (e.g., there are difference in Holding times for many Organic analytes between SDWA and NPDES. RCRA methods may also be different.)*

Table 23-1
Holding Times, Preservation and Container Requirements: NPDES, RCRA - Inorganic

Analytical Parameters	Matrix	Minimum Sample Size[5]	NPDES[1, 2, 3, 11] Method	Requirements	RCRA (SW846) [3, 4, 12] Method	Requirements
Acidity	Water	100 mL	2310B	250 mL plastic or glass, Cool, 4ºC, 14 days	---	Not Applicable
	Solid[(5)]	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Alkalinity	Water	100 mL	2320B	250 mL plastic or glass, Cool, 4ºC, 14 days	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Ammonia	Water	400 mL	350.1 4500 NH3 H	500 mL plastic or glass, Cool, 4ºC H_2SO_4 to pH < 2, 28 days	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Biochemical Oxygen Demand (BOD) and CBOD	Water	200 mL	5210B	1000 mL plastic or glass, Cool, 4ºC 48 hours	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Bromide	Water	100 mL	300.0	250 mL plastic or glass, No preservative required, 28 days	9056	Cool, 4ºC, analyze ASAP after collection

Analytical Parameters	Matrix	Minimum Sample Size[5]	NPDES[1, 2, 3, 11] Method	Requirements	RCRA (SW846)[3, 4, 12] Method	Requirements
	Solid	Not Applicable	---	Not Applicable	DI Leach/ 9056	Not Specified
	Waste	Not Applicable	---	Not Applicable	DI Leach/ 9056	Not Specified
Chemical Oxygen Demand (COD)	Water	100 mL	410.4	250 mL glass or plastic, Cool, 4ºC, H_2SO_4 to pH < 2, 28 days	---	Not Applicable
,	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Chloride	Water	50 mL	300.0 4500- Cl B/ 4500- Cl E	250 mL plastic or glass, No preservative required, 28 days	9056	Cool, 4ºC, analyze ASAP after collection.
					9253	Cool, 4ºC, 28 days
	Solid	25g	---	Not Applicable	DI Leach/ 9056/9253	Not Specified
	Waste	25g	---	Not Applicable	DI Leach/ 9056/9253	Not Specified
Chromium (Cr^{+6})	Water	300 mL	3500 Cr-D	200 mL quartz, TFE, or polypropylene HNO_3 to pH <2 Cool, 4ºC Analyze ASAP after collection	7196A	200 mL plastic or glass, Cool, 4ºC, 24 hours
					7199	Ammonium sulfate buffer pH 9-9.5 24 hours
	Solid	10 g	---	Not Applicable	3060A/ 7196A 3060A/ 7199	4 oz. plastic or glass with Teflon-lined cap, 30 days to digestion, 168 hours after digestion
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Color	Water	100 mL	2120B	250 mL plastic or glass, Cool, 4ºC, 48 hours	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not	---	Not Applicable	---	Not Applicable

Analytical Parameters	Matrix	Minimum Sample Size[5]	NPDES[1, 2, 3, 11] Method	Requirements	RCRA (SW846)[3, 4, 12] Method	Requirements
		Applicable				
Cyanide (Total)	Water	500 ml	4500-CN E	500 ml plastic or glass, NaOH to pH >12; 0.6g ascorbic acid[(6)] Cool, 4ºC, 14 days	9012A	500 ml plastic or glass, NaOH to pH >12 0.6g ascorbic acid[(13)] Cool, 4ºC, 14 days
	Solid	50g	--	Not Applicable	9012A	8 or 16 oz glass Teflon-lined cap, Cool, 4ºC, 14 days
	Waste	50g	--	Not Applicable	9012A	8 or 16 oz glass Teflon-lined cap, Cool, 4ºC
Cyanide (Available)	Water	IL	1677	1 liter plastic or glass, NaOH to pH >12 0.6g ascorbic acid[(6)] Cool, 4ºC,	---	Not Applicable
	Solid	50g	---	Not Applicable	---	Not Applicable
	Waste	50g	---	Not Applicable	---	Not Applicable
Flashpoint (Ignitability)	Liquid	Not Applicable	---	Not Applicable	1010/ 1020A	No requirements, 250 mL amber glass, Cool, 4ºC is recommended
	Solid	50g	--	Not Applicable	1030	4 oz glass Teflon-lined cap
	Waste	Not Applicable	--	Not Applicable	---	Not Applicable
Fluoride	Water	300 mL	300.0	500 mL plastic, No preservation required, 28 days	9056	Cool, 4ºC, analyze ASAP after collection
					9214	Cool, 4ºC, polyethylene container
	Solid	Not Applicable	---	Not Applicable	DI Leach/ 9056/9214	Not Specified
	Waste	Not	---	Not Applicable	DI Leach/	Not Specified

Analytical Parameters	Matrix	Minimum Sample Size[5]	NPDES[1, 2, 3, 11] Method	Requirements	RCRA (SW846)[3, 4, 12] Method	Requirements
		Applicable			9056/9214	
Hardness (Total)	Water	50 mL	2340B	250 mL glass or plastic, HNO_3 to pH < 2, 6 months	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Nitrate	Water	100 mL	300.0 353.2	250 mL plastic or glass, Cool, 4ºC, 48 hours.	9056	Cool, 4ºC, analyze ASAP after collection
	Solid	Not Applicable	---	Not Applicable	DI Leach/ 9056	Not Specified
	Waste	Not Applicable	---	Not Applicable	DI Leach/ 9056	Not Specified
Nitrite	Water	50 mL	300.0 353.2 4500-NO2 B	250 mL plastic or glass Cool, 4ºC, 48 hours	9056	Cool, 4ºC, analyze ASAP after collection
	Solid	Not Applicable	---	Not Applicable	DI Leach/ 9056	Not Specified
	Waste	Not Applicable	---	Not Applicable	DI Leach/ 9056	Not Specified
Nitrate-Nitrite	Water	100 mL	353.2 4500-NO3 F	250 mL plastic or glass, H_2SO_4 to pH < 2, 28 days	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Ortho-phosphate	Water	50 mL	300.0 4500-P,E	100 mL plastic or glass, Filter on site Cool, 4ºC, 48 hours	9056	Cool, 4ºC, analyze ASAP after collection
	Solid	Not Applicable	---	Not Applicable	DI Leach/ 9056	Not Specified
	Waste	Not	---	Not Applicable	DI	Not Specified

Analytical Parameters	Matrix	Minimum Sample Size[5]	NPDES[1, 2, 3, 11] Method	Requirements	RCRA (SW846) [3, 4, 12] Method	Requirements
		Applicable			Leach/ 9056	
Paint Filter Liquids Test	Water	Not Applicable	---	Not Applicable	---	Not Applicable
	Solid	100 g	---	Not Applicable	9095A	Not Specified
	Waste	100 ml or g	---	Not Applicable	9095A	Not Specified
pH (includes Corrosivity)	Water	50 mL	4500-H B	100 mL plastic or glass. 15 minutes (7)	9040B 9040C	100 mL plastic or glass. Analyze immediately. This test should be performed in the field.[10]
	Solid	Not Applicable	---	Not Applicable	9040B 9045C	4 oz glass or plastic, Cool, 4ºC, Analyze as soon as possible.[10]
	Waste	Not Applicable	---	Not Applicable	9040B 9045C	4 oz glass or plastic, Cool, 4ºC, Analyze as soon as possible.[10]
Phenolics	Water	100 mL	420.1	500 mL glass, Cool, 4ºC, H_2SO_4 to pH < 2, 28 days	9065 9066	1 liter glass recommended, Cool, 4□C, H_2SO_4 to pH < 4, 28 days
	Solid	25g	---	Not Applicable	9065 9066	4 oz glass Teflon-lined cap
	Waste	25g	---	Not Applicable	9065 9066	4 oz glass Teflon-lined cap
Settleable Solids	Water	1000 mL	160.5	1000 mL plastic or glass, Cool, 4ºC, 48 hours	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Phosphorus, Total	Water	50 ml	4500-P, E	100 mL plastic or glass, Cool, 4ºC, H_2SO_4 to pH < 2, 28 days	---	Not Applicable
	Solid	Not	---	Not Applicable	---	Not Applicable

Analytical Parameters	Matrix	Minimum Sample Size[5]	NPDES[1, 2, 3, 11] Method	Requirements	RCRA (SW846)[3, 4, 12] Method	Requirements
		Applicable				
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Specific Conductance	Water	100 mL	2510B	250 mL plastic or glass, Cool, 4ºC, 28 days	9050A	250 mL plastic or glass, Cool, 4ºC, 28 days
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Sulfate (SO_4)	Water	100 mL	300.0 D516-90	100 mL plastic or glass, Cool, 4ºC, 28 days	9056	Cool, 4ºC, analyze ASAP after collection
					9038	Cool, 4ºC, 28 days
	Solid	Not Applicable	---	Not Applicable	DI Leach/ 9056/ 9038	Not Specified
	Waste	100 mL	---	Not Applicable	DI Leach/ 9056/ 9038	Not Specified
Sulfide	Water	100 mL	4500-S E	500 mL plastic or glass, Cool, 4ºC, Add 2 mL zinc acetate plus NaOH to pH > 9, 7 days	9030B 9034	500 mL plastic, no headspace, Cool, 4ºC, Add 4 drops of 2N zinc acetate per 100 mL of sample, adjust the pH to > 9 with 6 N NaOH solution, 7 days
	Solid	50 g	---	Not Applicable	9030B 9034	Cool, 4ºC, fill surface of solid with 2N Zinc acetate until moistened, store headspace-free, 7 days
	Waste	50 g	---	Not Applicable	9030B 9034	Cool, 4ºC, fill surface of solid with 2N Zinc

Analytical Parameters	Matrix	Minimum Sample Size[5]	NPDES[1, 2, 3, 11] Method	Requirements	RCRA (SW846)[3, 4, 12] Method	Requirements
						acetate until moistened, store headspace-free, 7 days
Total Dissolved Solids (Filterable)	Water	100 mL	2540C	250 mL plastic or glass, Cool, 4ºC, 7 days	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Total Organic and Inorganic Carbon (TOC & TIC)	Water	100 mL	5310B	100 mL glass, Cool, 4ºC, H_2SO_4 to pH < 2, 28 days	9060	100 mL glass or 40 mL VOA vials, Cool, 4ºC, H_2SO_4 or HCl to pH < 2, 28 days
	Solid	Not Applicable	---	Not Applicable	9060	4 oz glass Teflon-lined cap
	Waste	Not Applicable	---	Not Applicable	9060	Not Specified
Total Solids	Water	100 mL	2540B	250 mL plastic or glass, Cool, 4ºC, 7 days	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Total Suspended Solids (Nonfilterable)	Water	100 mL	2540D	250 mL plastic or glass, Cool, 4ºC, 7 days	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Turbidity	Water	50 mL	180.1 2130B	250 mL plastic or glass, Cool, 4ºC, 48 hours	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable

Analytical Parameters	Matrix	Minimum Sample Size[5]	NPDES[1, 2, 3, 11] Method	Requirements	RCRA (SW846) [3, 4, 12] Method	Requirements
Volatile Solids	Water	100 mL	160.4	250 mL plastic or glass, Cool, 4ºC, 7 days	---	Not Applicable
	Solid	Not Applicable	---	Not Applicable	---	Not Applicable
	Waste	Not Applicable	---	Not Applicable	---	Not Applicable
Water Content	Water	Not Applicable	---	Not Applicable	---	Not Applicable
	Solid	10 g	---	Refer to specific method used	---	Refer to specific method used
	Waste	10 g	---	Refer to specific method used	---	Refer to specific method used
Metals[(8)] (excludes Hg)	Water	300 mL	200 series	1 liter glass or polyethylene container, HNO_3 to pH $\leq$ 2, [(9)] 6 months	6010B/ 6020	1 liter glass or polyethylene container, HNO_3 to pH $\leq$ 2, 6 months
	Solid	10 g	200 series	8 or 16 oz glass or polyethylene container storage at 4 ºC	6010B/ 6020	8 or 16 oz glass or polyethylene container, storage at 4ºC, 6 months
	Waste	10 g	200 series	Not Applicable	6010B/ 6020	8 or 16 oz glass or polyethylene container, storage at 4ºC, 6 months
Mercury (CVAA)	Water	300 mL	245.1	1 liter glass or polyethylene container, HNO_3 to pH $\leq$ 2, 28 days	7470A	1 liter glass or polyethylene container, HNO_3 to pH $\leq$ 2, 28 days
	Solid	10 g	245.5	8 or 16 oz glass or polyethylene container, Cool, 4ºC, 28 days	7471A	8 or 16 oz glass or polyethylene container, Cool, 4ºC, 28 days
	Waste	10 g	--	Not Applicable	7471A	8 or 16 oz glass or polyethylene container, Cool, 4ºC, 28 days

[1] National Pollutant Discharge Elimination System – MCAWW, March 1983
[2] Holding times are calculated from date of collection
[3] Method not listed in 40 CFR Part 136
[4] Resource Conservation and Recover Act, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), Third Edition, September 1986. Contains Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995) and Final Update III (December 1996)
[5] Minimum sample size indicates sample amount needed for a single analysis. Matrix spikes or duplicates will require an additional sample amount of at least this amount for each additional QC sample aliquot required.
[6] Should only be used in the presence of residual chlorine. (Alternatively, sodium arsenite may be used).
[7] For compliance testing, the analysis must be performed in the field at the time of analysis. If transported to the laboratory for analysis, the analysis will be performed as soon as practical and reported qualified.
[8] For dissolved metals, samples must be filtered on site before adding HNO_3 preservative (or before shipping to laboratory).
[9] Acid preservation may be omitted for shipping and laboratory will acidify at least 24 hours prior to analysis.
[10] Holding Time is listed as "As Soon as Possible" in SW 846. Per EPA MICE, the recommended maximum holding time for pH in water is 24 hours and pH in soil is 7 days. There are no mandated regulatory requirements.
[11] Aqueous samples must be preserved at ≤6 °C unless otherwise indicated, and should not be frozen unless data demonstrating that sample freezing does not adversely impact sample integrity is maintained on file and accepted as valid by the regulatory authority. Also, for purposes of NPDES monitoring, the specification of "≤ °C" is used in place of the "4 °C" and "<4 °C" sample temperature requirements listed in some methods. It is not necessary to measure the sample temperature to three significant figures (1/100th of 1 degree); rather, three significant figures are specified so that rounding down to 6 °C may not be used to meet the ≤6 °C requirement. The preservation temperature does not apply to samples that are analyzed immediately (less than 15 minutes).
[12] For samples with a temperature requirement of 4^oC, a sample temperature of just above the water freezing temperature to < 6^oC is acceptable.
[13] If oxidizing agents are present, add 5 mL 0.1 N $NaAsO_2$ or 0.06 g of ascorbic acid per L. See Cyanide SOP for additional information about other interferences

Table 23-2
Holding Times, Preservation and Container Requirements: NPDES, RCRA – Organic

Analytical Parameters	Matrix	Minimum Sample Size[4]	NPDES[1, 2, 5]		RCRA (SW846) [2, 3, 6]	
			Method	Requirements	Method	Requirements
Herbicides	Water	1L-	--	Not Applicable	8151A	1 liter amber glass with Teflon-lined cap. If residual chlorine present, add 3 mL 10% sodium thiosulfate solution per gallon. Cool, 4ºC, Extraction, 7 days Analysis, 40 days of the start of the extraction
	Solid	50 g	--	Not Applicable	8151A	4 or 8 oz glass widemouth with Teflon-lined cap, Cool 4 ºC, Extraction, 14 days Analysis, 40 days of the start of the extraction
	Waste	50 g	--	Not Applicable	8151A	4 or 8 oz glass widemouth with Teflon-lined cap. Cool 4 ºC Extraction, 14 days Analysis, 40 days of the start of the extraction
Organo-phosphorus Pesticides	Water	1L	---	Not Applicable	8141A	1 liter amber glass with Teflon-lined cap. If residual chlorine present, add 3 mL 10% sodium thiosulfate solution per gallon. Cool, 4ºC, Extraction, 7 days Analysis, 40 days

Analytical Parameters	Matrix	Minimum Sample Size[4]	NPDES[1, 2, 5]		RCRA (SW846) [2, 3, 6]	
			Method	Requirements	Method	Requirements
						of the start of the extraction
	Solid	50 g	---	Not Applicable	8141A	4 or 8 oz glass widemouth with Teflon-lined cap Cool, 4ºC, Extraction, 14 days Analysis, 40 days of the start of the extraction
	Waste	50 g	---	Not Applicable	8141A	4 or 8 oz glass widemouth with Teflon-lined cap, Cool, 4ºC, Extraction, 14 days Analysis, 40 days of the start of the extraction
Pesticides/ PCBs	Water	1L	608	1 liter amber glass with Teflon-lined cap, Adjust pH to 5-9 if extraction not to be done within 72 hours of sampling. Add sodium thiosulfate if residual chlorine present and aldrin is being determined. Cool, 4ºC, Extraction, 7 days Analysis, 40 days after extraction	8081A 8082	1 liter amber glass with Teflon-lined cap, If residual chlorine present, add 3 mL 10% sodium thiosulfate per gallon, Cool, 4ºC, Extraction, 7 days Analysis, 40 days of the start of the extraction
	Solid	50 g	---	Not Applicable	8081A 8082	4 or 8 oz glass wide mouth with Teflon-lined cap,

Analytical Parameters	Matrix	Minimum Sample Size[4]	NPDES[1, 2, 5]		RCRA (SW846) [2, 3, 6]	
			Method	Requirements	Method	Requirements
						Cool, 4ºC, Extraction, 14 days Analysis, 40 days of the start of the extraction
	Waste	50 g	---	Not Applicable	8081A 8082	4 or 8 oz glass wide mouth with Teflon-lined cap, Cool, 4ºC Extraction, 14 days Analysis, 40 days of the start of the extraction
PAHs by HPLC	Water	1L	---	1 liter amber glass with Teflon-lined cap, Adjust pH to 5-9 if extraction not to be done within 72 hours of sampling. Add sodium thiosulfate if residual chlorine present. Cool, 4ºC, Extraction, 7 days Analysis, 40 days after extraction	8310	1 liter amber glass with Teflon-lined cap, If residual chlorine present, add 3 mL sodium thiosulfate per gallon, Cool, 4ºC, Extraction, 7 days Analysis, 40 days of the start of the extraction
	Solid	50 g	---	Not Applicable	8310	4 or 8 oz glass wide mouth with Teflon-lined cap, Cool, 4ºC, Extraction, 14 days Analysis, 40 days of the start of the extraction
	Waste	50 g	---	Not Applicable	8310	4 or 8 oz glass wide mouth with

Analytical Parameters	Matrix	Minimum Sample Size[4]	NPDES[1, 2, 5]		RCRA (SW846) [2, 3, 6]	
			Method	Requirements	Method	Requirements
						Teflon-lined cap, Cool, 4ºC Extraction, 14 days Analysis, 40 days of the start of the extraction
Petroleum Hydrocarbons/Oil and Grease	Water	1 L	1664	1 liter glass, Cool, 0-4 ºC HCl or H_2SO_4 to pH <2 28 days	9070	1 liter glass with Teflon-lined cap, Cool, 4ºC, HCl to pH <2, 28 days
	Solid	30 g	1664	8 or 16 oz. wide mouth glass jar, Cool, 0-4 ºC, 28 days	9071A	8 oz. glass with Teflon-lined cap, Holding Time not specified
	Waste	---	---	Not Applicable	9071A	8 oz. glass with Teflon-lined cap, Holding Time not specified
Total Semi-Volatile Petroleum products	Water	1L	---	Not Applicable	NJDEP-OQA-QAM-025	1L narrow mouth bottle, Cool, 4ºC, HCl to pH<2 Extraction, 7 days Analysis, within 40 days of extraction, If unpreserved extract within 4 hours of sampling
	Solid	30g	---	Not Applicable	NJDEP-OQA-QAM-025	4 oz. wide mouth jar minimum air space, Cool, 4º C, Extraction, 7 days Analysis, within 40 days of extraction
	Waste	30g	---	Not Applicable	NJDEP-OQA-QAM-025	4 oz. wide mouth jar minimum air space, Cool, 4º C, Extraction, 7 days Analysis, within 40 days of extraction
Semivolatiles by GC/MS	Water	1L	625	1 liter amber glass with	8270C	1 liter amber glass with Teflon-lined

Analytical Parameters	Matrix	Minimum Sample Size[4]	NPDES[1, 2, 5]		RCRA (SW846) [2, 3, 6]	
			Method	Requirements	Method	Requirements
				Teflon-lined cap, Cool, 4ºC, Extraction, 7 days Analysis, 40 days		cap, If residual chlorine present, add 3 mL 10 % sodium thiosulfate solution per gallon, Cool, 4ºC, Extraction, 7 days Analysis, within 40 days of extraction
	Solid	50 g	---	Not Applicable	8270C	8 or 16 oz glass wide mouth with Teflon-lined cap, Cool, 4ºC, Extraction, 14 days Analysis, within 40 days of extraction
	Waste	50 g	---	Not Applicable	8270C	8 or 16 oz glass wide mouth with Teflon-lined cap, Cool, 4ºC, Extraction, 14 days Analysis, within 40 days of extraction
PAHs by GC/MS/SIM (other analytes are available)	Water	1L	---	Not Applicable	8270C SIM	1 liter amber glass with Teflon-lined cap, If residual chlorine present, add 3 mL 10% sodium thiosulfate solution per gallon, Cool, 4ºC, Extraction, 7 days Analysis, within 40 days of extraction
	Solid	50 g	---	Not Applicable	8270C SIM	8 or 16 oz glass wide mouth with Teflon-lined cap, Cool, 4ºC, Extraction, 14

Analytical Parameters	Matrix	Minimum Sample Size[4]	NPDES[1, 2, 5]		RCRA (SW846) [2, 3, 6]	
			Method	Requirements	Method	Requirements
						days Analysis, within 40 days of extraction
	Waste	50 g	---	Not Applicable	8270C SIM	8 or 16 oz glass wide mouth with Teflon□-lined cap, Cool, 4ºC, Extraction, 14 days Analysis, within 40 days of extraction
Volatile Organics by GC/MS	Water	40 mL	624	40 mL glass, VOA vial (in triplicate) with Teflon-lined septa without headspace, Cool, 4ºC, Add sodium thiosulfate if residual chlorine present, 7 days with pH > 2, 14 days with pH < 2	8260B	40 mL glass, VOA vial (in triplicate) with Teflon-lined septa without headspace, Cool, 4ºC, Add sodium thiosulfate if residual chlorine present, 1:1 HCl to pH < 2, 14 days with pH <2
	Solid	5 g or 25 g	--	Not Applicable	8260B	4 or 8 oz glass with Teflon-lined cap, Cool 4 ºC, 14 days. Field preserved with sodium bisulfate solution for low level analysis, or with methanol for medium level analysis. Soil sample can also be taken by using the EnCore™ sampler and preserved in the lab within 48

Analytical Parameters	Matrix	Minimum Sample Size[4]	NPDES[1, 2, 5]		RCRA (SW846) [2, 3, 6]	
			Method	Requirements	Method	Requirements
						hours of sampling. Maximum holding time for Encore Sampler is 48 hours (before the sample is added to methanol or sodium bisulfate). Cool, 4ºC.
	Waste	5 g or 25 g	--	Not Applicable	8260B	4 or 8 oz glass with Teflon-lined cap, Cool 4 ºC, 14 days. Field preserved with sodium bisulfate solution for low level analysis, or with methanol for medium level analysis. Soil sample can also be taken by using the EnCore™ sampler and preserved in the lab within 48 hours of sampling. Maximum holding time for Encore Sampler is 48 hours (before the sample is added to methanol or sodium bisulfate). Cool, 4ºC.

[1] National Pollutant Discharge Elimination System – 40 CFR 136, Appendix A
[2] Holding times are calculated from the date of collection.
[3] Resource Conservation and Recovery Act, Test Methods for Evaluating Solid Wate, Physical/Chemical Methods, Third Edition, September 1986. Contains Final Update I (July 1992), Final Update IIA (August 1993), Final Update II (September 1994), Final Update IIB (January 1995), and Final Update III (December 1996)
[4] Minimum sample size indicates sample amount needed for a single analysis. Matrix spikes or duplicates will require an additional sample amount of at least this amount for each additional QC sample aliquot required.
[5] Aqueous samples must be preserved at ≤6 °C unless otherwise indicated, and should not be frozen unless data demonstrating that sample freezing does not adversely impact sample integrity is maintained on file and accepted as valid by the regulatory authority. Also, for purposes of NPDES monitoring, the specification of "≤ °C" is used in place of the "4 °C" and "<4 °C" sample temperature requirements listed in some methods. It is not necessary to measure the sample temperature to three significant figures (1/100th of 1 degree); rather, three significant figures are specified so that rounding down to 6 °C may not be used to meet the ≤6 °C requirement. The preservation temperature does not apply to samples that are analyzed immediately (less than 15 minutes).
[6] For samples with a temperature requirement of 4oC, a sample temperature of just above the water freezing temperature to < 6 ºC is acceptable.

Table 23-3.
Holding Times, Preservation and Container Requirements: Drinking Water (SDWA)

Analytical Parameters	Matrix	Minimum Sample Size	Requirements[1, 2, 3, 22]
Asbestos	Water	1 L	1L Plastic/Glass, 4ºC, 48 hours[5]
Coliforms (Total and Fecal)	Water	120 mL	120 ml Plastic/Glass,[19] $Na_2S_2O_3$, 10ºC, 30 hours[20]
Cyanide	Water	500 mL	500 ml Plastic/Glass, NaOH to pH >12 Ascorbic acid[9] or Sodium arsenite,[9] 4ºC, 14 days
Fluoride	Water	250 mL	250 ml Plastic/Glass
Heterotrophic Plate Count	Water	120 mL	120 ml Plastic/Glass,[19] $Na_2S_2O_3$, 10ºC, 8 hours/24 hours [21]
Mercury	Water	250 mL	250 ml, Plastic/Glass, HNO_3 to pH<2, 28 days
Metals[4]	Water	250 mL	250 ml Plastic/Glass, HNO_3 to pH<2,[23] 6 months
Nitrate	Water	250 mL	250 ml Plastic/Glass, 4ºC, 48 hours[6]
Nitrate-Nitrite	Water	250 mL	250 ml Plastic/Glass, H_2SO_4 to pH<2, 28 days
Nitrite	Water	250 mL	250 ml Plastic/Glass, 4ºC, 48 hours
THMs Only	Water	3 X 40 mL	3 x 40 ml glass,[8] Na2S2O3,[9] HCl to pH <2 may also be used, 4ºC, 14 days
Volatile Organic Compounds	Water	3 X 40 mL	3 x 40 ml glass,[8] HCl to pH <2, Na2S2O3,[9] or Ascorbic acid, [9] 4ºC, 14 days
EDB, DBCP, 1,2,3-TCP (EPA 504.1)	Water	3 X 40 mL	3 x 40 ml glass,[8] Na2S2O3, 4ºC, 14 days
Organochlorine Pesticides/PCBs (EPA 505)[10]	Water	3 X 40 mL	3 x 40 ml glass,[8] Na2S2O3, 4ºC, 14 days[11]
Nitrogen and Phos. Pesticides (EPA 507)	Water	1 L	1 L Glass-Amber,[8] $Na_2S_2O_3$, 4ºC, 14 days[12]
Total PCBs (EPA 508A)	Water	1 L	1 L Glass-Amber,[8] 4ºC, 14 days[13]
Pesticides and PCBs (EPA 508.1)[14]	Water	1 L	1 L Glass-Amber,[8] HCl to pH<2, $Na_2S_2O_3$,[9] 4ºC, 14 days[13]
Chlorinated Acids (EPA 515.1)	Water	1 L	1 L Glass-Amber,[8] $Na_2S_2O_3$, 4ºC, 14 days[12]
Semivolatiles (EPA 525.2)	Water	1 L	1 L Glass-Amber,[8] HCl to pH<2, $Na_2S_2O_3$,[9] 4ºC, 14 days[13]
N-Methylcarbamoyl oxamines and N-Methcarbamates (EPA 531.1)	Water	3 X 60 mL	3 x 60 ml glass,[8] Na2S2O3, Monochloroacetic Acid buffer to pH<3, 4ºC, 28 days
Glyphosate (EPA 547)	Water	3 X 60 mL	3 x 60 ml glass,[8] Na2S2O3, 4ºC, 14 days

Analytical Parameters	Matrix	Minimum Sample Size	Requirements[1, 2, 3, 22]
Diquat/Parquat (EPA 549.1)	Water	1 L	1 L glass-Amber[8] (Silanized or PVC amber), H_2SO_4 to pH<2, Na2S2O3,[9] 4ºC, 7 days[15]
Chlorinated Disinfection Byproducts, Chlorinated Solvents, and Halogenated Pesticides/Herbicides (EPA 551)	Water	3 X 60 mL	3 x 60 ml glass,[8] Phosphate Buffer and Ammonium Chloride[19], 4ºC, 14 days[16]
Haloacetic Acids (EPA 552.1)	Water	250 mL	250 ml glass-Amber,[8] Ammonium Chloride, 4ºC, 28 days[17]

[1] Sample preservation should be performed immediately upon sample collection. For composite chemical samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.
[2] When any sample is to be shipped by common carrier or sent through the United States mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring compliance. For the preservation requirements of Table 6-8, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid, (HCl) in water, solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).
[3] Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.
[4] All metals except Hg.
[5] Instructions for containers, preservation procedures and holding times as specified in Method 100.2 must bed adhered to for all compliance analysis including those conducted with Method 100.1.
[6] If the sample is chlorinated, the holding time for an un-acidified sample kept at 4°C is extended to 14 days.
[7] Nitrate-Nitrite refers to a measurement of total nitrite.
[8] With Teflon lined septum.

[9] If chlorinated add reagent prior to acidification (for Cyanide, add before NaOH).
[10] Heptaclor has a 7 day hold time
[11] 14 days until extraction. 24 hours after extraction.
[12] 14 days until extraction. 28 days after extraction.
[13] 14 days until extraction. 30 days after extraction.
[14] For cyanazine, cool to 4°C only.
[15] 7 days until extraction. 21 days after extraction.
[16] 14 days until extraction. 14 days after extraction.
[17] 28 days until extraction. 48 hours after extraction.
[18] Sodium Sulfite may be used as a dechlorinating agent in some instances. Verify with laboratory prior to sampling.
[19] Sterilized. Plastic must be Polypropylene.
[20] 40 CFR part 141.74 regulations to avoid filtration or disinfection state 8 hours (DW compliance testing). Most facilities are using either disinfection or filtration so the 8 would not apply in most cases.
[21] 40 CFR part 141.74 regulations for Disinfection By-Product rule state 8 hours (DW compliance testing) where SM 9215 allows up to 24 hours if sample is stored between > 0 and < 4° C
[22] For samples with a temperature requirement of 4°C, a sample temperature of just above the water freezing temperature to < 6°C is acceptable.
[23] Acid preservation may be omitted for shipping and laboratory will acidify at least 24 hours prior to analysis.

Table 23-4
Holding Times, Preservation and Container Requirements: U.S. EPA Contract Laboratory Program Statement of Work

Analytical Parameters	Matrix	Minimum Sample Size	Requirements[1]
Cyanide, Total and Amenable to Chlorination	Water	500 mL	500 mL, glass or polyethylene container, 0.6 g ascorbic acid (only in presence of residual chlorine) NaOH to pH > 12, Cool, 4ºC, 12 days
	Soil/Sediment	25 g	8 or 16 oz glass with Teflon-lined lids, Cool, 4ºC, 12 days
ICAP and GFAA (excludes mercury)	Water	100 mL	1 liter glass or polyethylene container, HNO_3 to pH =2, 180 days
	Soil/Sediment	25 g	4 or 8 oz glass or polyethylene container, Cool, 4ºC, 180 days
Mercury (CVAA)	Water	100 mL	1 liter glass or polyethylene container, HNO_3 to pH =2, 26 days
	Soil/Sediment	25 g	8 or 16 oz glass with Teflon-lined lids, Cool, 4ºC, 26 days
Pesticides/PCBs	Water	1 L	1 liter amber glass with Teflon□-lined cap, Cool, 4ºC, Extraction within 5 days of sample receipt Analysis within 40 days after start of extraction
	Soil/Sediment	50 g	8 or 16 oz glass wide mouth with Teflon-lined cap, protect from light, Cool, 4ºC, Extraction within 10 days of sample receipt Analysis within 40 days after start of extraction
Semivolatiles	Water	1L	1 liter amber glass with Teflon□-lined cap, Cool, 4ºC, Extraction within 5 days of sample receipt Analysis within 40 days after start of extraction
	Soil/Sediment	50 g	8 or 16 oz glass wide mouth with Teflon□-lined cap, Cool, 4ºC, Extraction within 10 days of sample receipt Analysis within 40 days after start of extraction
Volatiles	Water	40 mL	40 mL glass with Teflon□-lined cap, no entrapped air bubbles pH <2, Cool, 4ºC,

Analytical Parameters	Matrix	Minimum Sample Size	Requirements[1]
			10 days
	Soil/Sediment	25 g	4 or 8 oz glass with Teflon-lined lids, Cool, 4ºC, 10 days

[1] Holding times are calculated from the verified time of sample receipt (VTSR).

Table 23-5
Holding Times, Preservation and Container Requirements: TCLP and SPLP

Analytical Parameters	Matrix	Minimum Sample Size[3]	TCLP[1] Method 1311 and SPLP[2] Method 1312 Requirements	
			From Field Collection to TCLP/SPLP Extraction	From TCLP/SPLP Extraction to Preparative Extraction to Determinative Analysis
Mercury	Liquid Solid Waste	1L	1L glass, Cool, 4ºC, 28 days	Glass or polyethylene 28 days
Metals (Except mercury)	Liquid Solid Waste	1L	1L glass, Cool, 4ºC, 180 days	Glass or polyethylene 180 days
Semivolatiles	Liquid Solid Waste	1L	1L glass, Cool 4ºC, 14 days	1L glass Extract leachate within 7 days of TCLP extraction, Analyze extract within 40 days
Volatiles	Liquid Solid Waste	6 oz	4 oz glass, Cool 4ºC, 14 days	40 mL glass, 14 days

[1] TCLP = Toxicity Characteristic Leaching Procedure
[2] SPLP = Synthetic Precipitation Leaching Procedures
[3] Smaller sample size is adequate for solid samples or individual fractions. A combination volume of 30 oz. is recommended for semivolatiles and metals. A separate 4 oz. container should always be used for the volatile fraction. Volatile fractions should be stored with minimal headspace.

Table 23-6
Holding Times, Preservation and Container Requirements: NPDES – Bacteria, Protozoa, Toxicity Tests

Analytical Parameters	Matrix	Minimum Sample Size	Requirements[1, 2, 3, 4]
Total, Fecal, and E.coli Coliforms	Water	100 mL	100 mL Plastic/Glass, 0.0008 % $Na_2S_2O_3$,[6] 10ºC, 6 hours
Fecal Streptococci	Water	100 mL	100 mL Plastic/Glass, 0.0008 % $Na_2S_2O_3$,[6] 10ºC, 6 hours
Enterococci	Water	100 mL	100 mL Plastic/Glass, 0.0008 % $Na_2S_2O_3$,[6] 10ºC, 6 hours
Cryptosporidium	Water	500 mL	500 mL LPDE Plastic, 0-8ºC, 96 Hours
Giardia	Water	500 mL	500 mL LPDE Plastic, 0-8ºC, 96 Hours
Toxicity – Acute/Chronic	Water	2 L	2L Plastic/Glass, $\leq$ 6ºC,[5] 36 Hours

[1] Plastic should be Polypropylene or other sterilizable plastic.
[2] Sample preservation should be performed immediately upon sample collection. For composite chemical samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.
[3] When any sample is to be shipped by common carrier or sent through the United States mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring compliance. For the preservation requirements of Table 6-8, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid, (HCl) in water, solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).
[4] Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.
[5] Samples must not be frozen. Sufficient ice should be placed with the samples in the shipping container to ensure that ice is still present when the samples arrive at the laboratory. However, even if ice is present, when samples arrive, it is necessary to measure the temperature of the samples and confirm that the < 6°C temperature has not been exceeded.
[6] Should only be used in the presence of residual chlorine.

Table 23-7.
Holding Times, Preservation and Container Requirements: NPDES - Radiological

Analytical Parameters	Matrix	Minimum Sample Size	Requirements[1, 2, 3]
Alpha, Beta, Radium	Water	1 L	1 L Plastic/Glass, HNO_3 to pH<2, 6 months

[1] Sample preservation should be performed immediately upon sample collection. For composite chemical samples, each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.
[2] When any sample is to be shipped by common carrier or sent through the United States mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring compliance. For the preservation requirements of Table 6-8, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater).
[3] Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.

Table 23-8.
Holding Times, Preservation and Container Requirements: Air Samples

Analytical Parameters	Matrix	Minimum Sample Size	Requirements[1, 2]
Volatile Organics	Air	6L or 1L	Summa Cannister, 30 days,
Volatile Organics	Air	1 L	Tedlar Bag, 72 hrs[3,4]

[1] Plastic should be Polyethylene.
[2] Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.
[3] Holding Time is based on SW 846 Method 0040 "SAMPLING OF PRINCIPAL ORGANIC HAZARDOUS CONSTITUENTS FROM COMBUSTION SOURCES USING TEDLAR® BAGS". Some states specifically enforce this holding time (e.g. Florida, New Jersey) and others have not specified this information in their regulatory requirements.
[4] The holding time is 72 hours unless the laboratory has a documented validation study that indicates a longer HT is acceptable for the analytes of interest.

SECTION 24

HANDLING OF SAMPLES
(NELAC 5.5.8)

Sample management procedures at TestAmerica Edison ensure that sample integrity and custody are maintained and documented from sampling/receipt through disposal.

24.1 CHAIN OF CUSTODY (COC)

The COC form is the written documented history of any sample and can be initiated at the time of sampling. This form is completed by the sampling personnel and accompanies the samples to the laboratory where it is received and stored under the laboratory's custody. The purpose of the COC form is to provide a legal written record of the handling of samples from the time of collection until they are received at the laboratory. It also serves as the primary written request for analyses from the client to the laboratory. The COC form acts as a purchase order for analytical services when no other contractual agreement is in effect. An example of a COC form may be found in Figure 24-1.

24.1.1 Field Documentation

The information the sampler needs to provide at the time of sampling on the container label is:

- Sample identification
- Date and time
- Preservative

During the sampling process, the COC form is completed and must be legible (see Figure 24-1). This form includes information such as:

- Client name, address, phone number and fax number (if available)
- Project name and/or number
- The sample identification
- Date, time and location of sampling
- Sample collectors name
- Matrix description
- Container description
- Total number of each type of container
- Preservatives used
- Analysis requested
- Requested turnaround time (TAT)
- Any special instructions
- Purchase Order number or billing information (e.g. quote number) if available
- The date and time that each person received or relinquished the sample(s), including their signed name.

The samples are stored in a cooler with ice, as applicable, and remain solely in the possession of the client's field technician until the samples are delivered to the laboratory. The sample collector must assure that each container is in his/her physical possession or in his/her view at all times, or stored in such a place and manner to preclude tampering. The field technician relinquishes the samples in writing on the COC form to the sample control personnel at the laboratory or to a TestAmerica courier. Samples are only considered to be received by lab when personnel at the laboratory have physical contact with the samples.

Note: Independent couriers are not required to sign the COC form. The COC is usually kept in the sealed sample cooler. The receipt from the courier is filed in the appropriate job folder.

24.1.2 Legal / Evidentiary Chain-of-Custody

TestAmerica Edison may, upon special request, adhere to legal/evidentiary chain of custody requirements. If TestAmerica agrees to such procedures the samples are identified for legal/evidentiary purposes on the COC, login will complete the custody seal (Figure 24-2), retain the shipping record with the COC, and initiate an internal COC (Figure 24-3) for laboratory use by analysts and a sample disposal record (Figure 24-4).

24.2 SAMPLE RECEIPT

Samples are received at the laboratory by designated sample receiving personnel and a unique laboratory project identification number is assigned. Each sample container shall be assigned a unique sample identification number that is cross-referenced to the client identification number such that traceability of test samples is unambiguous and documented. Each sample container is affixed with a durable sample identification label. Sample acceptance, receipt, tracking and storage procedures are summarized in the following sections.

24.2.1 Laboratory Receipt

When samples arrive at the laboratory, sample receiving personnel inspect the coolers and samples. The integrity of each sample must be determined by comparing sample labels or tags with the COC and by visual checks of the container for possible damage. Any non-conformance, irregularity, or compromised sample receipt must be documented via the Sample Receipt Log and Variance Report (TestAmerica Edison Work Instruction No. EDS-WI-003) and brought to the immediate attention of the appropriate Project Manager who will, in turn, contact the client. The COC, shipping documents, documentation of any non-conformance, irregularity, or compromised sample receipt, record of client contact, and resulting instructions become part of the project record. The following is a generalized outline of sample receipt procedures at TestAmerica Edison. Complete detailed procedures for Sample Receipt are found in TestAmerica Edison SOP No. ED-SPM-001 (Sample Receipt, Login, Identification and Storage).

24.2.1.1 Upon inspection of the cooler and custody seals, the sample custodian opens and inspects the contents of the cooler, and records the cooler temperature. If the cooler arrival temperature exceeds the required or method specified temperature range by $\pm 2^{o}C$ (for samples with a temperature requirement of $4^{o}C$, a cooler temperature of just above the water freezing temperature to $6^{o}C$ is acceptable); sample receipt is considered "compromised" and the procedure described in Section 24.3 is followed.

(NOTE: Samples that are delivered to the laboratory immediately after collection may not meet this criteria. In these cases, the samples shall be considered acceptable if there is evidence that the chilling process has begun, such as arrival on ice). All documents are immediately inspected to assure agreement between the test samples received and the COC.

24.2.1.2 Any non-conformance, irregularity, or compromised sample receipt as described in Section 24.3 is documented in the *Sample Receipt Log/Variance Report* (ED-WI-003) and brought to the immediate attention of the Project Manager for resolution with the client. The COC, shipping documents, documentation of any non-conformance, irregularity, or compromised sample receipt, record of client contact, and resulting instructions become part of the permanent project record.

24.2.1.3 After inspecting the samples, the sample receiving personnel sign and date the COC form, make any necessary notes of the samples' conditions and store them in appropriate refrigerators or storage locations.

24.2.1.4 If samples are received without a COC, TestAmerica will provide a generic COC form to be completed by the client when the samples are brought to the laboratory. The client is always provided with a copy of the completed COC form for their records.

24.2.1.5 If analyses with short holding times are requested, the dates and times are inspected to ensure that holding times have not already expired.

24.2.1.6 Samples received after normal working hours are left in their coolers and placed in a cold storage location. The person receiving the samples must, at a miniumum, record the date and time received, the presence or absence of ice and custody seals, the temperature of samples, presence and type of packing material, and initials.

24.2.1.7 Any deviations from the checks described in Section 24.2.1 that question the suitability of the sample for analysis, or incomplete documentation as to the tests required will be resolved by consultation with the client. If the sample acceptance criteria (Section 24.3) are not met, the laboratory shall either:

- Retain all correspondence and/or records of communications with the client regarding the disposition of rejected samples, or
- Fully document any decision to proceed with sample analysis that does not meet sample acceptance criteria.

24.2.2 <u>Sample Log-in</u>

The following is a generalized outline of sample log-in procedures at TestAmerica Edison. Complete detailed procedures for Sample Log-in are found in TestAmerica Edison SOP No. ED-SPM-001 (Sample Receipt, Login, Identification and Storage).

All samples that are received by the laboratory are logged into the LIMS to allow the laboratory to track and evaluate sample progress. Each group of samples that are logged in together (typically one project from a given client/sampling event) is assigned a unique job number. Within each job, each sampling point (or sample) receives a unique lab sample number. Lab sample numbers are generated sequentially over time, and are not re-assigned. A sample may be composed of more than one bottle since different preservatives may be required to perform all analyses requested. Even if multiple containers are received for a single sample, each container is uniquely identified with an alphabetic letter added to the lab sample number. The LIMS generates sample labels that are attached to each bottle for a given sample.

Each job/set of samples is logged into LIMS with a minimum of the following information:

- Client Name, Project Name, Address, Phone, Fax, Report to information, invoice to information (most of this information is "default information" that is stored in the LIMS).
- Date and time sampled;
- Date and time received;
- Job and/or project description, sample description;
- Sample matrix, special sample remarks;
- Reporting requirements (i.e., QC level, report format, invoicing format);
- Turn-around-time requirements;
- Parameters (methods and reporting limits or MDLs are default information for a given parameter)

24.3 SAMPLE ACCEPTANCE POLICY

The laboratory has a written sample acceptance policy (Figure 24-5) that clearly outlines the circumstances under which samples shall be accepted or rejected. These include:

- a COC filled out completely;
- samples must be properly labeled;
- proper sample containers with adequate volume for the analysis and necessary QC;
- samples must be preserved according to the requirements of the requested analytical method;
- sample holding times must be adhered to;
- all samples submitted for water/solid Volatile Organic analyses must have a Trip Blank submitted at the same time;
- the project manager will be notified if any sample is received in damaged condition.

Data from samples which do not meet these criteria are flagged and the nature of the variation from policy is defined. A copy of the sample acceptance policy is provided to each client prior to shipment of samples.

24.4 SAMPLE STORAGE

In order to avoid deterioration, contamination or damage to a sample during storage and handling, from the time of receipt until all analyses are complete, samples are stored in

refrigerators suitable for the sample matrix. (Exception: Samples for metals analysis are stored unrefrigerated). In addition, samples to be analyzed for volatile organic parameters are stored in separate refrigerators designated for volatile organic parameters only. Samples are never to be stored with reagents, standards or materials that may create contamination.

To ensure the integrity of the samples during storage, refrigerator storage blanks are maintained in the volatile sample refrigerators and analyzed every to weeks.

Access to the laboratory is controlled such that sample storage need not be locked at all times unless a project specifically demands it. Samples are accessible to laboratory personnel only. Visitors to the laboratory are prohibited from entering the refrigerator and laboratory areas unless accompanied by an employee of TestAmerica.

24.5 HAZARDOUS SAMPLES AND FOREIGN SOILS

Procedures for the handling and storage of hazardous samples is addressed in the TestAmerica Corporate Safety Manual (Test Amercia Document No. CW-E-M-001) and in TestAmerica Edison SOP No. ED-SPM-001 (Sample Receipt, Login, Identification, And Storage).

Procedures for the acceptance and handling of USDA regulated domestic and foreign soils are detailed in TestAmerica SOP No. ED-SPM-006 (Procedure for Acceptance and Handling of Regulated Domestic and Foreign Soil).

24.6 SAMPLE SHIPPING

In the event that the laboratory needs to ship samples, the samples are placed in a cooler with enough ice to ensure the samples remain just above freezing and at or below 6.0°C during transit. The samples are carefully surrounded by packing material to avoid breakage (yet maintain appropriate temperature). A trip blank is enclosed for those samples requiring water/solid volatile organic analyses. The chain-of-custody form is signed by the sample control technician and attached to the shipping paperwork. Samples are generally shipped overnight express or hand-delivered by a TestAmerica courier to maintain sample integrity. All personnel involved with shipping and receiving samples must be trained to maintain the proper chain-of-custody documentation and to keep the samples intact and on ice. The Environmental, Health and Safety Manual contains additional shipping requirements.

24.7 SAMPLE DISPOSAL

Samples should be retained for a minimum of 30 days after the project report is sent, however, provisions may be made for earlier disposal of samples once the holding time is exceeded. Some samples are required to be held for longer periods based on regulatory or client requirements (e.g., 60 days after project report is sent). The laboratory must follow the longer sample retention requirements where required by regulation or client agreement. Several possibilities for sample disposal exist: the sample may be consumed completely during analysis, the sample may be returned to the customer or location of sampling for disposal, or the sample may be disposed of in accordance with the laboratory's waste disposal procedures, TestAmerica Edison SOP No. ED-SPM-007 (Disposal of Samples and Associated Laboratory Waste). All procedures in the laboratory Environmental, Health and Safety Manual are followed during disposal. Samples are normally maintained in the laboratory no longer than 2 months

from receipt unless otherwise requested. Unused portions of samples found or suspected to be hazardous according to state or federal guidelines may be returned to the client upon completion of the analytical work.

Figure 24-1.

Example: Chain of Custody (COC)

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☐

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THE LEADER IN ENVIRONMENTAL TESTING

4124 (0907)

Client	Project Manager	Date	Chain of Custody Number 411876
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page _____ of _____
City / State / Zip Code	Site Contact / Lab Contact	Analysis (Attach list if more space is needed)	Special Instructions/ Conditions of Receipt
Project Name and Location (State)	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.	Matrix / Containers & Preservatives		

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH												

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other_____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By			1. Received By		
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Figure 24-2.

Example: Custody Seal

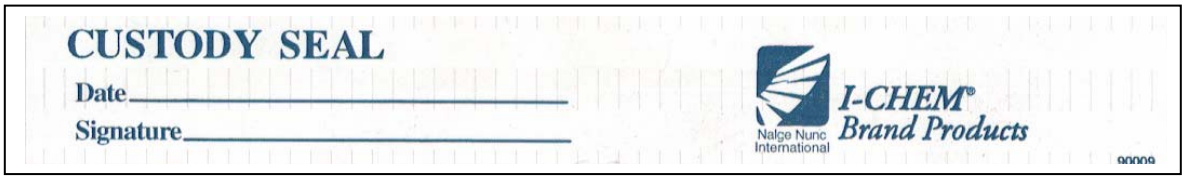


Figure 24-3.

Example: Internal Chain of Custody (COC)

INTERNAL CHAIN OF CUSTODY RECORD
TestAmerica Edison
777 New Durham Road, Edison, NJ 08817
(732) 549 3900

Job # _____ Matrix: _____
Client: _____ Date Received: _____
Site: _____ Refrigerator: _____

_____
_____
_____
_____

Custody Transfer	Date/Time	Reason
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		
_____ to		

SSA = Secured Storage Area

EDS-WI-052, Rev 0
11/21/07

Figure 24-4.

Example: Sample Disposal Record

Sample #	Shelf	Bottle	Day In	Day Out	Name	Disposed

Figure 24-5.

TestAmerica Edison
Sample Acceptance Policy

Samples are considered "compromised" if the following conditions are observed upon sample receipt:

- Cooler and/or samples are received outside of temperature specification.
- Samples are received broken or leaking.
- Samples are received beyond holding time.
- Samples are received without appropriate preservation.
- Samples are received in inappropriate containers.
- COC does not match samples received.
- COC is not properly completed or not received.
- Breakage of any Custody Seal (when present)
- Apparent tampering with cooler and/or samples.
- Headspace in volatiles samples >6mm.
- Seepage of extraneous water or materials into samples.
- Inadequate sample volume.
- Illegible, impermanent, or non-unique sample labeling.

When "compromised" samples are received, it is documented on the hardcopy COC and/or the Sample Receipt Log/Variance Report (ED-WI-003) and the client is contacted for instructions. If the client decides to proceed with the analysis, the project report will clearly indicate any of the above conditions and the resolution.

Figure 24-6.

Example: TestAmerica Edison Sample Receipt Log/Variance Report

SAMPLE RECEIPT LOG/VARIANCE REPORT

TestAmerica Edison Job Number:_____

Date Received:_____ Time Received:_____ Time Staged: _____

Client Name:_____ No. of Coolers Received:_____

Project No./Job or Site Name:_____

Method of Shipment: TestAmerica Courier_____ Client Courier_____ FedEx_____ Other_____

Is an air bill included with shipment? Yes____ No___ (Attach copy to chain of custody form)

Air Bill No._____

Cooler Temp_____ Ice Present : Yes_____ No_____ Thermometer ID:_____

Custody Seal Intact: Yes_____No_____ Custody Seal No._____

Head space in VOA Yes____ No____ Note: _____

Sample Control Technician: _____

Comments:

- ☐ Illegible COC
- ☐ No client/site name
- ☐ Number of containers does not match COC
- ☐ No sample time*
- ☐ No sample date*
- ☐ No matrix*
- ☐ No sample ID*
- ☐ No TAT
- ☐ Analysis doesn't match bottles received*
- ☐ Samples received outside of holding time*
- ☐ No COC received
- ☐ Sample ID's don't match COC ID's*
- ☐ Sample time/date doesn't match COC*
- ☐ Temperature outside acceptable range*
- ☐ No cooler, samples received by hand
- ☐ Samples unpreserved*
- ☐ pH outside specified range*
- ☐ Wrong preservative sticker on bottle*
- ☐ Wrong preservative for requested analysis*
- ☐ Broken sample *
- ☐ Label missing/illegible/washed off *
- ☐ Sample missing *
- ☐ Wrong sample container*
- ☐ Limited volume *
- ☐ No analysis indicated
- ☐ MEOH w/o % solids

***Please note sample # below**

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Project Manager Review:_____ Date:_____

Number of Unused methanol vials/Encores returned:_____

Scale returned: Yes ___ No ____ NA _____ Scale ID: _____

EDS-WI-003 (Sample Reciept Log and Variance Report) Rev 1.doc Rev 1 ***Revision Date: 11/21/07***

SECTION 25.0

ASSURING THE QUALITY OF TEST RESULTS
(NELAC 5.5.9)

25.1 OVERVIEW

In order to assure our clients of the validity of their data, the laboratory continuously evaluates the quality of the analytical process. The analytical process is controlled not only by instrument calibration as discussed in Section 21, but also by routine process quality control measurements (e.g. Blanks, Laboratory Control Samples (LCS), Matrix Spikes (MS), duplicates (DUP), surrogates, Internal Standards (IS)). These quality control checks are performed as required by the method or regulations to assess precision and accuracy. In addition to the routine process quality control samples, Proficiency Testing (PT) Samples (concentrations unknown to laboratory) are analyzed to help ensure laboratory performance.

25.2 CONTROLS

Sample preparation or pre-treatment is commonly required before analysis. Typical preparation steps include homogenization, grinding, solvent extraction, sonication, acid digestion, distillation, reflux, evaporation, and drying. During these pre-treatment steps, samples are arranged into discreet manageable groups referred to as preparation (prep) batches. Prep batches provide a means to control variability in sample treatment. Control samples are added to each prep batch to monitor method performance and are processed through the entire analytical procedure with investigative/field samples.

25.3 NEGATIVE CONTROLS

25.3.1 **Method Blanks** are used to assess preparation and analysis for possible contamination during the preparation and processing steps.

25.3.1.1 The method blank is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (e.g., Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples.

25.3.1.2 The method blank goes through all of the steps of the process (including as necessary: filtration, clean-ups, etc.).

25.3.1.3 The specific frequency of use for method blanks during the analytical sequence is defined in the specific standard operating procedure for each analysis. Generally it is 1 for each batch of samples; not to exceed 20 environmental samples.

25.3.1.4 Evaluation criteria and corrective action for method blanks is defined in the specific standard operating procedure for each analysis. Generally, corrective action is taken if the concentration of a target analyte in the blank is at or above the reporting limit as established by the method or regulation:

- The source of contamination is investigated

- Measures are taken to minimize or eliminate the source of the contamination
- Affected samples are reprocessed or the results are qualified on the final report.

25.3.2 **Calibration Blanks** are prepared and analyzed along with calibration standards where applicable. They are prepared using the same reagents that are used to prepare the standards. In some analyses the calibration blank may be included in the calibration curve.

25.3.3 **Instrument Blanks** are blank reagents or reagent water that may be processed during an analytical sequence in order to assess contamination in the analytical system. In general, instrument blanks are used to differentiate between contamination caused by the analytical system and that caused by the sample handling or sample prep process. Instrument blanks may also be inserted throughout the analytical sequence to minimize the effect of carryover from samples with high analyte content.

25.3.4 **Trip Blanks** are required to be submitted by the client with each shipment of samples requiring aqueous and solid volatiles analyses. A trip blank is prepared by the laboratory by filling a clean container with pure deionized water that has been purged to remove any volatile compounds. Appropriate preservatives are also added to the container. The trip blank is sent with the bottle order and is intended to reflect the environment that the containers are subjected to throughout shipping and handling and help identify possible sources if contamination is found. The field sampler returns the trip blank in the cooler with the field samples. Trip Blanks are also sometimes referred to as Travel Blanks.

25.3.5 **Field Blanks** are sometimes used for specific projects by the field samplers. A field blank prepared in the field by filling a clean container with pure reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)

25.3.6 **Equipment Blanks** are also sometimes created in the field for specific projects. An equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (NELAC)

25.3.7 **Holding Blanks**, also referred to as refrigerator or freezer blanks, are used to monitor the sample storage units for volatile organic compounds during the storage of VOA samples in the laboratory (refer to section 24.4*).*

25.3.8 **Field blanks**, equipment blank and trip blanks, when received, are analyzed in the same manner as other field samples. When known, blanks should not be selected for matrix QC, as it does not provide information on the behavior of the target compounds in the field samples. Usually, the client sample ID will provide information to identify the field blanks with labels such as "FB", "EB", or "TB".

25.4 POSITIVE CONTROLS

Control samples (e.g., QC indicators) are analyzed with each batch of samples to evaluate data based upon (1) Method Performance (Laboratory Control Sample (LCS) or Blank Spike (BS)), which entails both the preparation and measurement steps; and (2) Matrix Effects (Matrix Spike (MS) or Sample Duplicate (MD, DUP), which evaluates field sampling accuracy, precision, representativeness, interferences, and the effect of the matrix on the method performed. Each regulatory program and each method within those programs specify the control samples that are prepared and/or analyzed with a specific batch

Note that frequency of control samples vary with specific regulatory, methodology and project specific criteria. Complete details on method control samples are as listed in each analytical SOP.

25.4.1 Method Performance Control - Laboratory Control Sample (LCS)

25.4.1.1 The LCS measures the accuracy of the method in a blank matrix and assesses method performance independent of potential field sample matrix affects in a laboratory batch.

25.4.1.2 The LCS is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (for example: Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The LCS is spiked with verified known amounts of analytes or is made of a material containing known and verified amounts of analytes, taken through all preparation and analysis steps along with the field samples. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process (such as Phosphorus), a calibration verification standard is reported as the LCS. In some instances where there is no practical clean solid matrix available, aqueous LCS's may be processed for solid matrices; final results may be calculated as mg/kg or ug/kg, assuming 100% solids and a weight equivalent to the aliquot used for the corresponding field samples, to facilitate comparison with the field samples.

25.4.1.3 Certified pre-made reference material purchased from a NIST/A2LA accredited vendor may also be used for the LCS when the material represents the sample matrix or the analyte is not easily spiked (e.g. solid matrix LCS for metals, TDS, etc.).

25.4.1.4 As stated in the opening of this section, the LCS goes through all of the steps of the process (including as necessary: filtration, clean-ups, etc.).

25.4.1.5 The specific frequency of use for LCS during the analytical sequence is defined in the specific standard operating procedure for each analysis. It is generally 1 for each batch of samples; not to exceed 20 environmental samples.

25.4.1.6 If the mandated or requested test method, or project requirements, do not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample (and Matrix Spike) where applicable (e.g. no spike of pH). However, in cases where the components interfere with accurate

assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, at a minimum, a representative number of the listed components (see below) shall be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses, permit specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.

25.4.1.6.1 For methods that have 1-10 target analytes, spike all components.

25.4.1.6.2 For methods that include 11-20 target analytes, spike at least 10 or 80%, whichever is greater.

25.4.1.6.3 For methods with more than 20 target analytes, spike at least 16 components.

25.4.1.6.4 Exception: Due to analyte incompatibility in pesticides, Toxaphene and Chlordane are only spiked at client request based on specific project needs.

25.4.1.6.5 Exception: Due to analyte incompatibility between the various PCB aroclors, aroclors 1016 and 1260 are used for spiking as they cover the range of all of the aroclors. Specific aroclors may be used by request on a project specific basis.

25.4.1.7 **<u>Accuracy Calculation</u>**: Percent Recovery (%R) Calculation (applies to LCS, CCV, Surrogates, and Matrix Spikes.

$$\%R = \frac{AV}{TV} \times 100$$

Where: AV = Analyzed Value
TV = True Value

25.5 SAMPLE MATRIX CONTROLS

25.5.1 Matrix Spikes (MS)

25.5.1.1 The Matrix spike is used to assess the effect sample matrix of the spiked sample has on the precision and accuracy of the results generated by the method used.

25.5.1.2 An MS is essentially a sample fortified with a known amount of the test analyte(s). At a minimum, with each matrix-specific batch of samples processed, an MS is carried through the complete analytical procedure. Unless specified by the client, samples used for spiking are randomly selected and rotated between different client projects.

25.5.1.3 If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. However, in cases where the components

interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, a representative number of the listed components (see LCS analytes 25.4.1.6 above) may be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses, permit-specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.

25.5.1.4 The percent recovery calculation for matrix spikes is essentially the same as the calculation shown in 25.4.1.7 except that:

AV = Sp – Sa

Where: Sp = Spike result
Sa = Sample result

25.5.2 **Surrogate Spikes**

25.5.2.1 Surrogate Spikes are similar to matrix spikes except the analytes are compounds with properties that mimic the analyte of interest and are unlikely to be found in environment samples.

25.5.2.2 Surrogate compounds are added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. The recovery of the surrogates is compared to the acceptance limits for the specific method. Poor surrogate recovery may indicate a problem with sample composition and shall be reported, with data qualifiers, to the client whose sample produced poor recovery.

25.5.3 **Duplicates**

25.5.3.1 For a measure of analytical precision, with each matrix-specific batch of samples processed, a matrix duplicate (MD or DUP) sample, matrix spike duplicate (MSD), or LCS duplicate (LCSD) is carried through the complete analytical procedure. Duplicate samples are usually analyzed with methods that do not require matrix spike analysis. LCSD's are normally not performed except when regulatory agencies or client specifications require them. The recoveries for the spiked duplicate samples must meet the same laboratory established recovery limits as the accuracy QC samples. If an LCSD is analyzed both the LCS and LCSD must meet the same recovery criteria and be included in the final report. The precision measurement is reported as "Relative Percent Difference" (RPD). Poor precision between duplicates (except LCS/LCSD) may indicate non-homogeneous matrix or sampling.

25.5.3.2 **Precision Calculation** (Relative Percent Difference - RPD)

$$RPD = \frac{|S - D|}{\frac{(S + D)}{2}} \times 100$$

Where: S=Sample Concentration
D=Duplicate Concentration

25.5.4 Internal Standards

25.5.4.1 In most organic analyses, internal standards are spiked into all environmental and quality control samples (including the initial calibration standards). An internal standard is also used with some metals analyses. It is added to sample extracts after the extraction (post-prep). The acceptance criteria in most methods are 50% to 200% of the responses in the mid-point of the corresponding calibration curve. Consult the method-specific SOPs for details on the internal standard compounds, calculations and acceptance criteria.

25.5.4.2 When the internal standard recoveries fall outside these limits, if there are not obvious chromatographic interferences, reanalyze the sample to confirm a possible matrix effect. If the recoveries confirm or there was obvious interference, results are reported from the original analysis and a qualifier is added. If the reanalysis meets internal standard recovery criteria, the second run is reported (or both are reported if requested by the client).

25.6 ACCEPTANCE CRITERIA (CONTROL LIMITS)

25.6.1 Each individual analyte in the LCS, MS, or Surrogate Spike is evaluated against the control limits as published in the test method. Where there are no established acceptance criteria, the laboratory calculates control limits with the use of control charts or, in some cases, utilizes client project specific or regulatory mandated control limits. When this occurs, the regulatory or project limits will supersede the laboratory's in-house limits.

Note: For methods, analytes and matrices with very limited data (e.g., unusual matrices not analyzed often), interim limits are established using available data or by analogy to similar methods or matrices.

25.6.2 Once control limits have been established, they are verified, reviewed, and updated if necessary on an annual basis unless the method requires more frequent updating (e.g. EPA SW846 8000 series methods). Control limits are established per method (as opposed to per instrument) regardless of the number of instruments utilized.

25.6.2.1 The lab should consider the effects of the spiking concentration control limits, and to avoid censoring of data. The acceptance criteria for recovery and precision are often a function of the spike concentration used. Therefore, caution must be used when pooling data to generate control limits.

25.6.2.2 Not only should the results all be from a similar matrix, but the spiking levels should also be approximately the same (within a factor of 2). Similarly, the matrix spike and surrogate results should all be generated using the same set of extraction, cleanup and analysis techniques. For example, results from solid samples extracted by ultrasonic extraction are not mixed with those extracted by Soxhlet.

25.6.2.3 The laboratory should try and avoid discarding data that do not meet a preconceived notion of acceptable performance. This results in a censored data set, which, when used to develop acceptance criteria, will lead to unrealistically narrow criteria. For a 99% confidence interval, 1 out of every 100 observations likely will still fall outside the limits. For methods with long analyte lists this may mean occasional failures every batch or two. While professional judgment is important in evaluating data to be used to develop acceptance criteria, specific results are not discarded simply because they do not meet one's expectations. However, data points shall be discarded if they were the result of human or mechanical error or sample concentration exceeded spike level by > 4x.

25.6.3 Laboratory generated % Recovery acceptance (control) limits are generally established by taking ± 3 Standard Deviations (99% confidence level) from the average recovery of a minimum of 20-30 data points (more points are preferred).

25.6.3.1 Regardless of the calculated limit, the limit should be no tighter than the Calibration Verification (ICV/CCV). (Unless the analytical method specifies a tighter limit).

25.6.3.2 In-house limits cannot be any wider than those mandated in a regulated analytical method.

25.6.4 The lab must be able to generate a current listing of their control limits and track when the updates are performed. In addition, the laboratory must be able to recreate historical control limits.

25.6.4.1 The QA department generates Quality Control (QC) Limit Summaries that summarize the precision and accuracy acceptability limits for analyses performed at TestAmerica Edison. These summaries include an effective date, are updated each time new limits are generated and are located in the QA Public folders on the laboratory network drive. Unless otherwise noted, limits within these tables are laboratory generated. The analysts are instructed to use the current approved limits in the laboratory. The Quality Assurance department maintains an archive of all limits used within the laboratory.

25.6.5 A LCS that is within the acceptance criteria establishes that the analytical system is in control and is used to validate the process. Samples that are analyzed with an LCS with recoveries outside of the acceptance limits may be determined as out of control and should be reanalyzed if possible. If reanalysis is not possible, then the results for all affected analytes for samples within the same batch must be qualified when reported. The internal corrective action process (see Section 13) is also initiated if an LCS exceeds the acceptance limits. Sample results may be qualified and reported without reanalysis if:

25.6.5.1 The analyte results are below the reporting limit and the LCS is above the upper control limit.

25.6.5.2 If the analytical results are above the relevant regulatory limit and the LCS is below the lower control limit.

25.6.5.3 Or, for NELAC work, there are an allowable number of Marginal Exceedances (ME):

- <11 analytes – 0 marginal exceedances are allowed.
- 11 – 30 Analytes – 1 marginal exceedance is allowed
- 31-50 Analytes – 2 marginal exceedances are allowed
- 51-70 Analytes – 3 marginal exceedances are allowed
- 71-90 Analytes – 4 marginal exceedances are allowed
- > 90 Analytes – 5 marginal exceedances are allowed

25.6.5.3.1 Marginal exceedances are recovery exceedances between 3 SD and 4 SD from the mean recovery limit (NELAC).

25.6.5.3.2 Marginal exceedances must be random. If the same analyte exceeds the LCS control limit repeatedly, it is an indication of a systematic problem. The source of the error must be located and corrective action taken. The laboratory has a system to monitor marginal exceedances to ensure that they are random.

25.6.5.3.3 Though marginal excedences may be allowed, the data must still be qualified to indicate it is outside of the normal limits.

25.6.6 If the MS/MSDs do not meet acceptance limits, the MS/MSD and the associated spiked sample is reported with a qualifier for those analytes that do not meet limits. If obvious preparation errors are suspected, or if requested by the client, unacceptable MS/MSDs are reprocessed and reanalyzed to prove matrix interference. A more detailed discussion of acceptance criteria and corrective action can be found in applicable method SOP and in Section 13.

25.6.7 If a surrogate standard falls outside the acceptance limits, if there is not obvious chromatographic matrix interference, reanalyze the sample to confirm a possible matrix effect. If the recoveries confirm or there was obvious chromatographic interference, results are reported from the original analysis and a qualifier is added. If the reanalysis meets surrogate recovery criteria, the second run is reported (or both are reported if requested by the client). Under certain circumstances, where all of the samples are from the same location and share similar chromatography, the reanalysis may be performed on a single sample rather than all of the samples and if the surrogate meets the recovery criteria in the reanalysis, all of the affected samples would require reanalysis.

25.7 METHOD DETECTION LIMITS (MDLs)

MDLs, calculated as described in Section 20.7, are updated or verified annually, or more often if required by the method.

25.8 ADDITIONAL PROCEDURES TO ASSURE QUALITY CONTROL

25.8.1 The laboratory has written procedures to assure the accuracy of the test method including calibration (see Section 21), use of certified reference materials (see Section 22) and use of PT samples (see Section 16).

25.8.2 A discussion regarding MDLs, Limit of Detection (LOD) and Limit of Quantitation (LOQ) can be found in Section 20.

25.8.3 Use of formulae to reduce data is discussed in the method standard operating procedures and in Section 21.

25.8.4 Selection of appropriate reagents and standards is included in Section 9 and 22.

25.8.5 A discussion on selectivity of the test is included in Section 5.

25.8.6 Constant and consistent test conditions are discussed in Section 19.

25.8.7 The laboratories sample acceptance policy is included in Section 24.

SECTION 26.0

REPORTING RESULTS
(NELAC 5.5.10)

26.1 OVERVIEW

The results of each test are reported accurately, clearly, unambiguously, and objectively in accordance with State and Federal regulations as well as client requirements. Analytical results are issued in a format that is intended to satisfy customer and laboratory accreditation requirements as well as provide the end user with the information needed to properly evaluate the results. Where there is a conflict between the client requested formats and accreditation requirements or data usability information, accreditation requirements and data usability information will take precedence over client requests. A variety of report formats are available to meet specific needs.

In cases where a client asks for simplified reports, there must be a written request from the client. There still must be enough information that would show any analyses that were out of conformance (QC out of limits) and there should be a reference to a full report that is made available to the client.

Review of reported data is included in Section 20.

26.2 TEST REPORTS

Analytical results are reported in a format that is satisfactory to the client and meets all requirements of applicable accrediting authorities and agencies. A variety of report formats are available to meet specific needs. The report is printed on laboratory letterhead, reviewed, and signed by the appropriate Project Manager. At a minimum, the standard laboratory report shall contain the following information:

26.2.1 A report title (e.g. Laboratory Results) with an "Analytical Results" column header.

26.2.2 The report cover page is printed on company letterhead, which includes the laboratory name, address and telephone number.

26.2.3 A unique identification of the report (e.g. Job Number) and on each page an identification in order to ensure the page is recognized as part of the report and a clear identification of the end.

- **Note:** Page numbers of report are represented on each page of the report. A table of contents with page numbers is provided. The last page of the report is clearly identified as such.

26.2.4 A copy of the chain of custody (COC). (Any COCs involved with Subcontracting are included.)

26.2.5 The name and address of client and a project name/number, if applicable.

26.2.6 Client project manager or other contact

26.2.7 Description and unambiguous identification of the tested sample(s) including the client identification code.

26.2.8 Date of receipt of sample, date and time of collection, and date(s) of test preparation and performance, and time of preparation or analysis if the required holding time for either activity is less than or equal to 72 hours.

26.2.9 Date reported or date of revision, if applicable.

26.2.10 Method of analysis including method reference (EPA, Standard Methods, etc).

26.2.11 Quantitation limits or reporting limit.

26.2.12 Method detection limits (if requested)

26.2.13 Definition of Data qualifiers and reporting acronyms (e.g. ND).

26.2.14 Sample results.

26.2.15 QC data consisting of method blank, surrogate, LCS, and MS/MSD recoveries and control limits.

26.2.16 Condition of samples at receipt including temperature. This may be accomplished by way of the Non-Conformance Summary (i.e., case narrative)

26.2.17 A statement to the effect that the results relate only to the items tested and the sample as received by the laboratory.

26.2.18 A statement that the report shall not be reproduced except in full, without prior express written approval from the laboratory.

26.2.19 A signature and title of the person(s) accepting responsibility for the content of the report and date of issue. Signatories are appointed by the Lab Director. For applying an electronic signature refer to the Electronic Signature Policy (Section 26.4).

26.2.20 When NELAC accreditation is required, the lab shall certify that the test results meet all requirements of NELAC or provide reasons and/or justification if they do not.

26.2.21 The laboratory includes a cover letter.

26.2.22 Where applicable, a narrative to the report that explains the issue(s) and corrective action(s) taken in the event that a specific accreditation or certification requirement was not met.

26.2.23 When Soil samples are analyzed, a specific identification as to whether soils are reported on a “wet weight” or “dry weight” basis.

26.2.24 Appropriate laboratory certification number for the state of origin of the sample, if applicable.

26.2.25 If only part of the report is provided to the client (client requests some results before all of it is complete), it must be clearly indicated on the report (e.g., partial report, or how your lab identifies it), and that a complete report will follow once all of the work has been completed.

26.2.26 Any out of network subcontracted analysis results are provided as a separate report on the official letterhead of the subcontractor. All in-network subcontracting is clearly identified on the report as to which laboratory performed a specific analysis.

26.3 REPORTING LEVEL OR REPORT TYPE

TestAmerica Edison offers several report formats. The packages provide the following information in addition to the information described above:

- Level I is a report with the features described in Section 26.2 above.
- Level II (also called ‘Results/QA) is a Level I report plus summary information, including results for the method blank reported to the laboratory MDL, percent recovery for laboratory control samples and matrix spike samples, and the RPD values for all MSD and sample duplicate analyses.
- NJDEP Reduced Deliverables Format which contains, at minimum, the elements listed in the current NJDEP Technical Requirements for Site Remediation, N.J.A.C. 7:26E.
- NJDEP Full Deliverables Format (Non-USEPA CLP Methods) which contains, at minimum, the elements listed in the current NJDEP Technical Requirements for Site Remediation, N.J.A.C. 7:26E.
- NJDEP Full Deliverables Format (USEPA CLP Methods) which contains, at minimum, the elements listed in the current NJDEP Technical Requirements for Site Remediation, N.J.A.C. 7:26E.
- NYSDEC ASP ‘A’ and ‘B’ Deliverables Format which contain, at minimum, the elements listed in the current *New York State Department of Environmental Conservation Analytical Services Protocol*.

In addition to the various levels of QC packaging, the laboratory also provides reports in diskette deliverable form. Initial reports may be provided to clients by facsimile or email. All faxed or email reports are followed by hardcopy. Procedures used to ensure client confidentiality are outlined in Section 26.7.

26.3.1 Electronic Data Deliverables (EDDs)

EDDs are routinely offered as part of TestAmerica's services. TestAmerica Edison offers a variety of EDD formats including NJ Hazsite Deliverables, Excel, Dbase, GISKEY, and Text Files.

EDD specifications are submitted to the IT department by the PM for review and undergo the contract review process. Once the facility has committed to providing data in a specific electronic format, the coding of the format may need to be performed. This coding is documented and validated. The validation of the code is retained by the IT staff coding the EDD.

EDDs shall be subject to a review to ensure their accuracy and completeness. If EDD generation is automated, review may be reduced to periodic screening if the laboratory can demonstrate that it can routinely generate that EDD without errors. Any revisions to the EDD format must be reviewed until it is demonstrated that it can routinely be generated without errors. If the EDD can be reproduced accurately and if all subsequent EDDs can be produced error-free, each EDD does not necessarily require a review.

26.4 SUPPLEMENTAL INFORMATION FOR TEST

The lab identifies any unacceptable QC analyses or any other unusual circumstances or observations such as environmental conditions and any non-standard conditions that may have affected the quality of a result. This is typically in the form of a footnote or a qualifier and/or a narrative explaining the discrepancy in the front of the report. Refer to Appendix 7 for a list of the laboratory's standard footnotes and qualifiers.

26.4.1 Numeric results with values outside of the calibration range, either high or low are qualified as 'estimated'.

26.4.2 Where quality system requirements are not met, a statement of compliance/non-compliance with requirements and/or specifications, including identification of test results derived from any sample that did not meet NELAC sample acceptance requirements such as improper container, holding time, or temperature.

26.4.3 Where applicable, a statement on the estimated uncertainty of measurements; information on uncertainty is needed when a client's instructions so require.

26.4.4 Opinions and Interpretations - The test report contains objective information, and generally does not contain subjective information such as opinions and interpretations. If such information is required by the client, the Laboratory Director will determine if a response can be prepared. If so, the Laboratory Director will designate the appropriate member of the management team to prepare a response. The response will be fully documented, and reviewed by the Laboratory Director, before release to the client. There may be additional fees charged to the client at this time, as this is a non-routine function of the laboratory.

Note: Review of data deliverable packages for submittal to regulatory authorities requires responses to non-conforming data concerning potential impact on data quality. This

necessitates a limited scope of interpretation, and this work is performed by the QA Department. This is the only form of "interpretation" of data that is routinely performed by the laboratory.

When opinions or interpretations are included in the report, the laboratory provides an explanation as to the basis upon which the opinions and interpretations have been made. Opinions and interpretations are clearly noted as such and where applicable, a comment should be added suggesting that the client verify the opinion or interpretation with their regulator.

26.5 ENVIRONMENTAL TESTING OBTAINED FROM SUBCONTRACTORS

If TestAmerica Edison is not able to provide the client the requested analysis, the samples would be subcontracted following the procedures outlined in Section 8.

Data reported from analyses performed by a subcontractor laboratory are clearly identified as such on the analytical report provided to the client. Results from a subcontract laboratory outside of the TestAmerica network are reported to the client on the subcontract laboratory's original report stationary and the report includes any accompanying documentation.

26.6 CLIENT CONFIDENTIALITY

In situations involving the transmission of environmental test results by telephone, facsimile or other electronic means, client confidentiality must be maintained.

TestAmerica will not intentionally divulge to any person (other than the Client or any other person designated by the Client in writing) any information regarding the services provided by TestAmerica or any information disclosed to TestAmerica by the Client. Furthermore, information known to be potentially endangering to national security or an entity's proprietary rights will not be released.

Note: This shall not apply to the extent that the information is required to be disclosed by TestAmerica under the compulsion of legal process. TestAmerica will, to the extent feasible, provide reasonable notice to the client before disclosing the information.

Note: Authorized representatives of an accrediting authority are permitted to make copies of any analyses or records relevant to the accreditation process, and copies may be removed from the laboratory for purposes of assessment.

26.6.1 Report deliverable formats are discussed with each new client. If a client requests that reports be faxed or e-mailed, the reports are faxed with a cover sheet or e-mailed with the following note that includes a confidentiality statement similar to the following:

This material is intended only for the use of the individual(s) or entity to whom it is addressed, and may contain information that is privileged and confidential. If you are not the intended recipient, or the employee or agent responsible for delivering this material to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by telephone at the 732-549-3900 (or for e-mails: please notify us immediately by e-mail or by phone (732-549-3900) and delete this material from any computer).

26.7 FORMAT OF REPORTS

The format of reports are designed to accommodate each type of environmental test carried out and to minimize the possibility of misunderstanding or misuse.

26.8 AMENDMENTS TO TEST REPORTS

Corrections, additions, or deletions to reports are only made when justification arises through supplemental documentation. Justification is documented using the laboratory's corrective action system (refer to Section 13).

The revised report is retained on the Archive data server, as is the original report. The revised report is stored in the Archive data server under the original job number followed by "R". The revised report will have the word "REVISED" next to the report title (i.e., 'Laboratory Results – REVISED'). Any subsequent revisions will be filed on the server under the original job number followed by 'R' and a revision number (ex. R1, R2, R3).

When the report is re-issued, a notation of "REVISED "is placed on the cover/signature page of the report *or at the top of the narrative page* with a brief explanation of reason for the re-issue.

26.9 POLICIES ON CLIENT REQUESTS FOR AMENDMENTS

26.9.1 Sample Reanalysis Policy

Because there is a certain level of uncertainty with any analytical measurement a sample reanalysis may result in either a higher or lower value from an initial sample analysis. There are also variables that may be present (e.g. sample homogeneity, analyte precipitation over time, etc.) that may affect the results of a reanalysis. Based on the above comments, the laboratory will reanalyze samples at a client's request with the following caveats. Client specific arrangements for reanalysis protocols can be established.

- Homogenous samples: If a reanalysis agrees with the original result to within the RPD limits for MS/MSD or Duplicate analyses, or within $\pm$ 1 reporting limit for samples $\leq$ 5x the reporting limit, the original analysis will be reported. At the client's request, both results may be reported on the same report but not on two separate reports.

- If the reanalysis does not agree (as defined above) with the original result, then the laboratory will investigate the discrepancy and reanalyze the sample a third time for confirmation if sufficient sample is available.

- Any potential charges related to reanalysis are discussed in the contract terms and conditions or discussed at the time of the request. The client will typically be charged for reanalysis unless it is determined that the lab was in error.

- Due to the potential for increased variability, reanalysis may not be applicable to Non-homogenous, Encore, and Sodium Bisulfate preserved samples. See the Department Manager or Laboratory Director if unsure.

26.9.2 Policy on Data Omissions or Reporting Limit Increases

Fundamentally, our policy is simply to not omit previously reported results (including data qualifiers) or to not raise reporting limits and report sample results as ND. This policy has few exceptions. Exceptions are:

- Laboratory error.
- Sample identification is indeterminate (confusion between COC and sample labels).
- An incorrect analysis (not analyte) was requested (e.g., COC lists 8315 but client wanted 8310). A written request for the change is required.
- Incorrect limits reported based on regulatory requirements.
- The requested change has absolutely *no possible* impact on the interpretation of the analytical results and there is *no possibility* of the change being interpreted as misrepresentation by anyone inside or outside of our company.

26.9.3 Multiple Reports

TestAmerica does not issue multiple reports for the same workorder where there is different information on each report (this does not refer to copies of the same report) unless required to meet regulatory needs and approved by QA.

Figure 26-1.

Read and Understand Memo for
Electronic Reporting and Electronic Signatures Policy

I have read and understand the TestAmerica Policy on Electronic Reporting and Electronic Signatures and agree to follow procedures stated in this document. Futhermore, I agree to maintain my password secure and confidential and will not divulge this password to anyone. I am aware that my electronic signature is as legally binding as that of my signature signed with a pen. I will not apply my signature until I have reviewed each page.

Employee: _____

Signature: _____

Date: _____

Return this signed form to HR within 5 days for filing in your Personnel File

Figure 26-2.

AGREEMENT FOR ELECTRONIC REPORTS

TestAmerica provides laboratory services and certified lab reports ("Reports") to the undersigned client ("Client"). Client desires to receive the Reports in both written hard copy and electronic format. Both TestAmerica and the Client desire to protect and preserve the integrity of the Reports.

TestAmerica agrees to provide Client with the Reports in both hard copy and electronic format. Client agrees to accept all responsibility for and indemnify and hold TestAmerica harmless from all claims or demands from third parties, including attorneys' fees and costs incurred by TestAmerica, due to alterations or deletions to the Reports by Client, or the use of incomplete Reports by Client.

Client agrees not to alter any Reports whether in the hard copy or electronic format and to use reasonable efforts to preserve the Reports in the form and substance originally provided by TestAmerica.

Date: _____Company Name: _____

Completed By: _____

Title/Position: _____

Client Signature: _____ _____

Date: _____Company Name: _____TestAmerica Edison

Received By: _____

Title/Position: _____

Signature: _____

Please sign and FAX to 732-549-3679

Appendix 1.

TESTAMERICA
ETHICS POLICY No. CA-L-P-001

Refer to CA-L-P-001 for complete policy.

TestAmerica
EMPLOYEE ETHICS STATEMENT

I understand that TestAmerica is committed to ensuring the highest standard of quality and integrity of the data and services provided to our clients. I have read the Ethics Policy of the Company.

- *With regard to the duties I perform and the data I report in connection with my employment at the Company, I agree that:*
- *I will not intentionally report data values that are inconsistent with the actual values observed or measured.*
- *I will not intentionally report the dates, times, sample or QC identifications, or method citations of data analyses that are not the actual dates, times, sample or QC identifications, or method citations.*
- *I will not intentionally misrepresent another individual's work as my own or represent my own work as someone else's.*
- *I will not intentionally misrepresent any data where data does not meet Method or QC requirements. If it is to be reported, I will report it with all appropriate notes and/or qualifiers; I shall not modify data (either sample or QC data) unless the modification can be technically justified through a measurable analytical process, such as one deemed acceptable to the laboratory's Standard Operating Procedures, Quality Assurance Manual or Technical Director. All such modifications must be clearly and thoroughly documented in the appropriate laboratory notebooks/worksheets and/or raw data and include my initials or signature and date.*
- *I shall not make false statements to, or seek to otherwise deceive, members of Management or their representatives, agents, or clients/customers. I will not, through acts of commission, omission, erasure, or destruction, improperly report measurement standards, quality control data, test results or conclusions.*
- *I shall not compare or disclose results for any Performance Testing (PT) sample, or other similar QA or QC requirements, with any employee of any other laboratory, including any other TestAmerica laboratory, prior to the required submission date of the results to the person, organization, or entity supplying the PT sample.*
- *I shall immediately inform my supervisor or other member of management regarding any intentional or unintentional reporting of my own inauthentic data. Such report shall be given both orally and in writing to the supervisor or other member of management contacted and to the local Quality Assurance Manager. The Quality Assurance Manager will initial and date the information and return a copy to me. I shall not condone any accidental or intentional reporting of inauthentic data by other employees and will immediately report its occurrence. If I have actual knowledge of such acts committed by any other employees, and I do not report such information to designated members of Management, it shall be considered as serious as if I personally committed the offense. Accordingly, in that event, I understand that I may be subject to immediate termination of employment.*
- *I understand that if any supervisor, manager, or representative of TestAmerica management instructs, requests, or directs me to perform any of the aforementioned improper laboratory practices, or if I am in doubt or uncertain as to whether or not such laboratory practices are proper, I will not*

comply. In fact, I must report such event to all appropriate members of Management including, but not limited to, the Lab Director, all supervisors and managers with direct line reporting relationship between me and the Lab Director, and the local Quality Assurance representative, excluding such individuals who participated in such perceived improper instruction, request, or directive. In addition, I may contact Corporate Quality Assurance / Ethics Compliance Officer(s) for assistance.

- *I understand the critical importance of accurately reporting data, measurements, and results, whether initially requested by a client, or retained by TestAmerica and submitted to a client at a later date, or retained by TestAmerica for subsequent internal use;*
- *I will not share the pricing or cost data of Vendors or Suppliers with anyone outside of the TestAmerica family of companies.*
- *I shall not accept gifts of a value that would adversely influence judgment.*
- *I shall avoid conflicts of interest and report any potential conflicts to the management (e.g. employment or consulting with competitors, clients, or vendors).*
- *I shall not participate in unfair competition practices (e.g. slandering competitors, collusion with other labs to restrict others from bidding on projects).*
- *I shall not misrepresent certifications and status of certifications to clients or regulators.*
- *I shall not intentionally discharge wastes illegally down the drain or onto the ground.*
- *I understand that any attempt by management or an employee to circumvent these policies will be subject to disciplinary action.*

As a TestAmerica employee, I understand that I have the responsibility to conduct myself with integrity in accordance with the ethical standards described in the Ethics Policy. I will also report any information relating to possible kickbacks or violations of the Procurement Integrity Act, or other questionable conduct in the course of sales or purchasing activities. I will not knowingly participate in any such activity and will report any actual or suspected violation of this policy to management.

I understand that if my job includes supervisory responsibilities, I shall not instruct, request, or direct any subordinate to perform any laboratory practice which is unethical or improper. Also, I shall not discourage, intimidate, or inhibit an employee who may choose to appropriately appeal my supervisory instruction, request, or directive which the employee perceives to be improper, nor retaliate against those who do.

The Ethics Policy has been explained to me by my supervisor or at a training session, and I have had the opportunity to ask questions if I did not understand any part of it. I understand that any violation of this policy subjects me to disciplinary action, which can include termination of my employment. In addition, I understand that any violation of this policy which relates to work under a government contract or subcontract could also subject me to the potential for prosecution under federal law.

EMPLOYEE SIGNATURE _____ Date _____

Supervisor/Trainer: _____ Date _____

Work Instruction No. CA-WI-005

TestAmerica

CONFIDENTIALITY AND PROPRIETARY INFORMATION AGREEMENT

TestAmerica and their predecessors, in their businesses, have developed and use commercially valuable technical and non-technical information and to guard the legitimate interests of TestAmerica and its clients, it is necessary to protect certain information as confidential and proprietary.

I, _____ , understand and acknowledge that during the term of my employment by TestAmerica, I will be privy to and entrusted with certain confidential information and trade secrets of TestAmerica and its clients.

Confidential information and trade secrets include, but are not limited to: customer and client lists; price lists; marketing and sales strategies and procedures; operational and equipment techniques; standard operating procedures; business plans and systems; quality control procedures and systems; special projects and technological research, including projects, research and reports for any government entity or client; client's plans and processes; client's manner of operation; the trade secrets of clients; client's data; vendor or supplier pricing; employee lists and personal information, and any other records, data, files, drawings, inventions, discoveries, applications, or processes which are not in the public domain.

I agree as follows:

1. I will not in any way, during the term of my employment, or at any time thereafter, except as authorized in writing by the Legal Department of TestAmerica or the client where client data is involved, disclose to others, use for my own benefit, remove from TestAmerica's premises (except to the extent off-site work is approved by my supervisor), copy or make notes of any confidential information and/or trade secrets of TestAmerica or its clients, excepting only that information which may be public knowledge. Technical and business information of any previous employer or other third party which I may disclose to TestAmerica shall be limited to that which was acquired legitimately and disclosed to me without restriction as to secrecy.

2. I agree that all inventions (whether or not patentable) conceived or made by me during the period of my employment by TestAmerica shall belong to TestAmerica, provided such inventions grow out of my work for TestAmerica and are related to the business of TestAmerica. I agree to disclose and assign such inventions to TestAmerica. In California, this provision shall not apply to any invention which qualifies fully under Section 2870 of the California Labor Code.

3. On termination of my employment from TestAmerica, I will deliver to TestAmerica all documents, records, notes, data, memoranda, files, manuals, equipment and things of any nature which relate in any way to confidential information and/or trade secrets of TestAmerica or its clients and which are in my possession or under my control.

4. I agree that during the period of my employment and for one (1) year from and after the termination (for any reason) of my employment with TestAmerica, I shall not directly or indirectly (without first obtaining the written permission of TestAmerica), recruit for employment, or induce to terminate his or her employment with TestAmerica, any person who is an active employee of TestAmerica on the last day of my employment with TestAmerica.

5. I acknowledge that if I were to breach any provision of this Confidentiality Agreement, money damages will be inadequate, and I hereby agree that TestAmerica shall be entitled, where appropriate, to specific performance and/or injunctive relief (i.e. to require me to comply with this Agreement). I further acknowledge that the willingness of TestAmerica to hire me or to continue my employment constitutes full and adequate consideration for the agreements, and obligations to which I have agreed as set forth in this document.

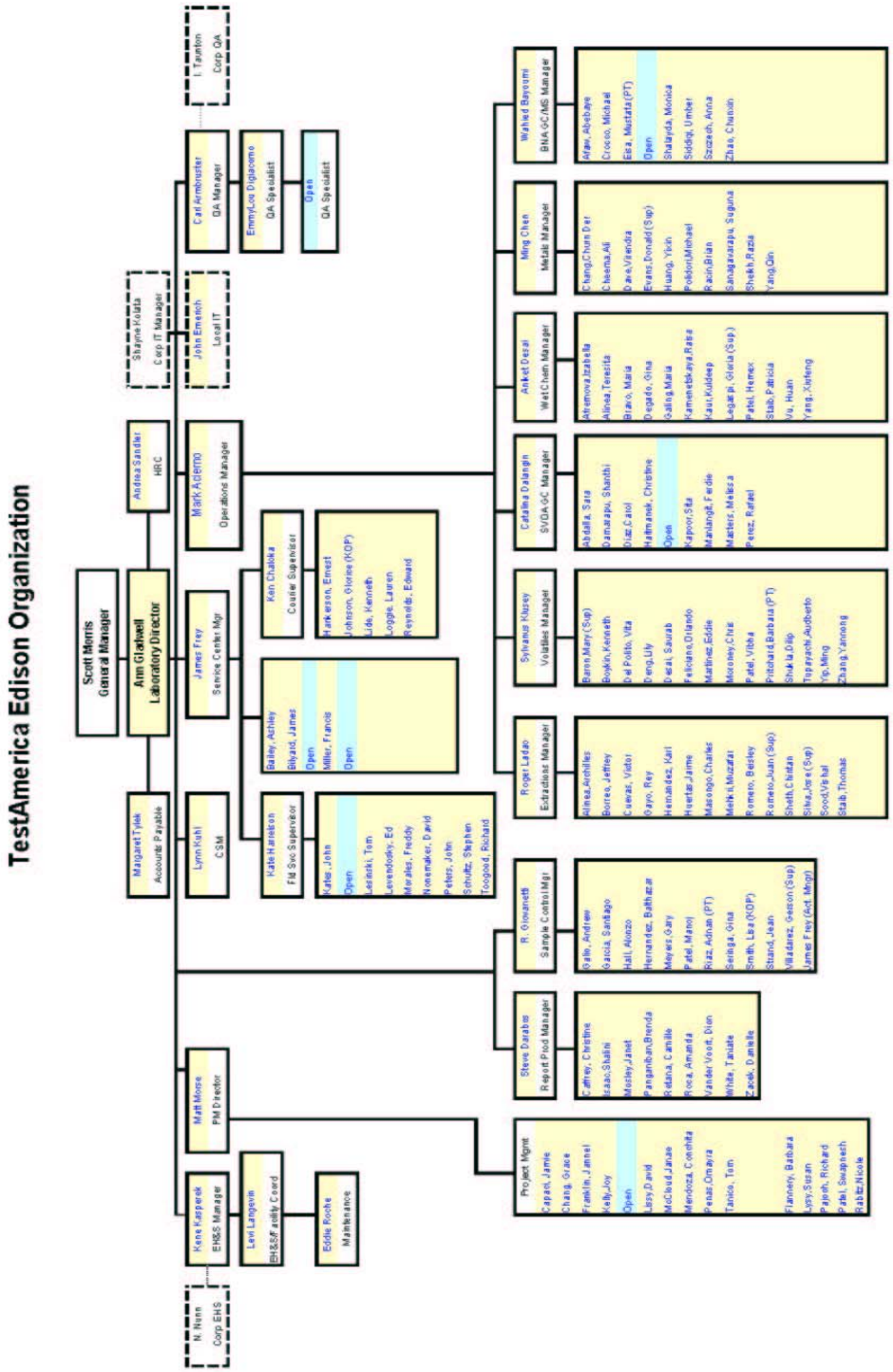
I have executed this Agreement, intending to be legally bound.

_____	_____	_____
Printed Name	*Signature*	*Date*

Work Instruction No. CA-WI-006

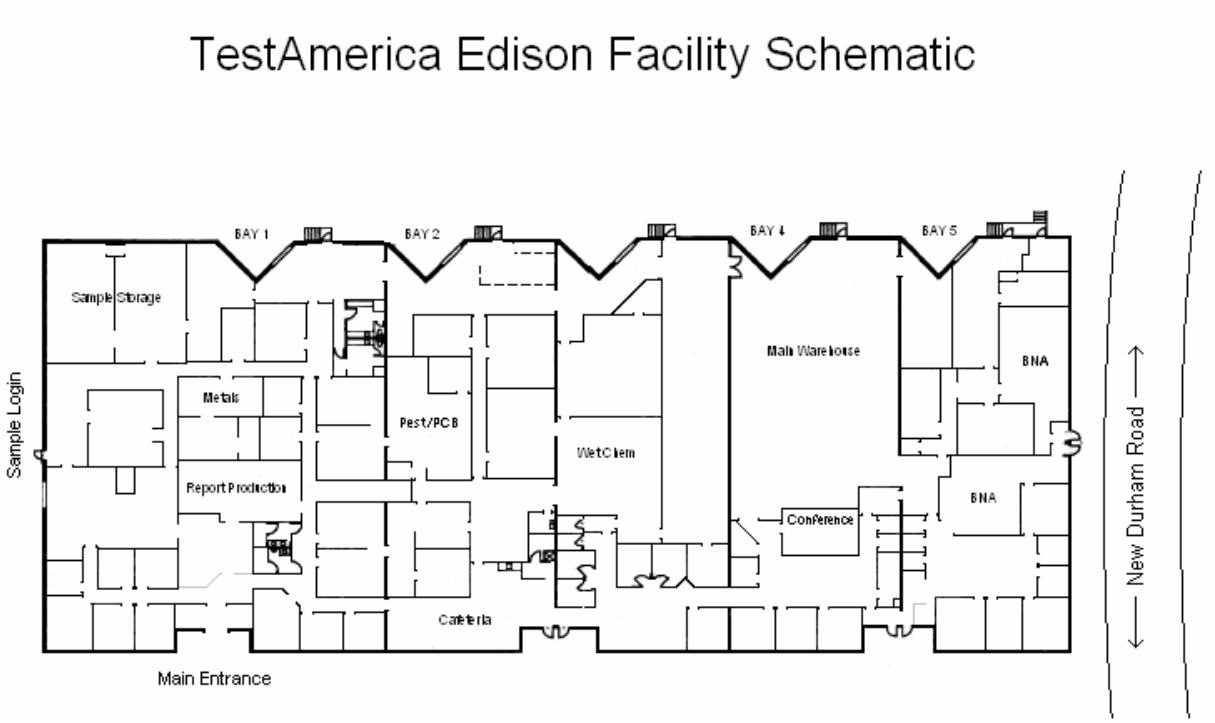
Appendix 2.

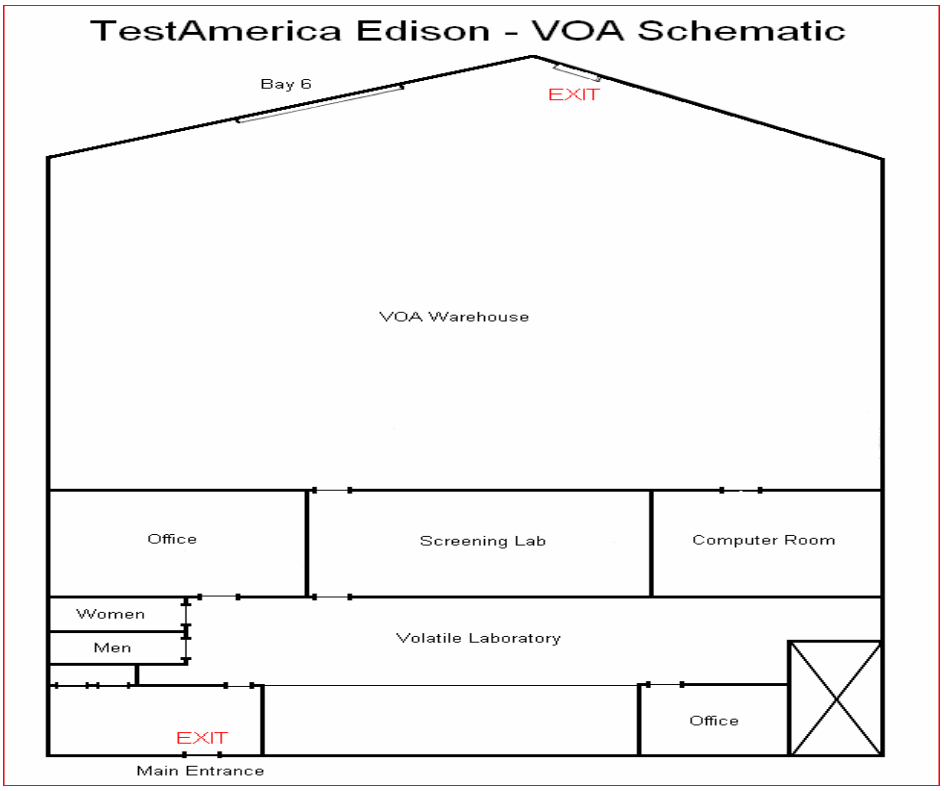
Laboratory Organization Chart



Appendix 3.

Laboratory Floor Plan





Appendix 4: RESERVED

Appendix 5. Glossary/Acronyms

Glossary:

Absorbance:
A measure of the decrease in incident light passing through a sample into the detector.

Acceptance Criteria:
Specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation:
The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one. (NELAC)

Accrediting Authority:
The Territorial, State, or Federal Agency having responsibility and accountability for environmental laboratory accreditation and which grants accreditation (NELAC) [1.5.2.3]

Accuracy:
The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Aliquot:
A measured portion of a sample, or solution, taken for sample preparation and/or analysis.

Ampule:
A fire-sealed glass vial, can contain a neat material or a stock standard.

Analysis Date/ Time:
The date and military time of the injection of the sample, standard, or blank into the analytical system.

Analyst:
The designated individual who performs the “hands-on” analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality. (NELAC)

Analyte:
The element or ion an analysis seeks to determine; the element of interest.

Analytical Sample:
Any solution or media introduced into an instrument on which an analysis is performed excluding instrument calibration, initial *calibration* verification, initial calibration blank, continuing calibration verification and continuing calibration blank. Note the following are all defined as analytical samples: undiluted and diluted samples (EPA and non-EPA), predigestion spike samples, duplicate samples, serial dilution samples, analytical spike samples, post-digestion

spike samples, interference check samples (ICS), CRDL standard for AA (CRA), CRDL standard for ICP (CRI), laboratory control sample (LCS), preparation blank (PS) and linear range analysis sample (LRS).

Analytical Spike:
The spike that is fortified just prior to analysis by adding a known quantity of the analyte to an aliquot of the prepared sample.

Assessor:
One who performs on-site assessments of accrediting authorities and laboratories' capability and capacity for meeting NELAC requirements by examining the records and other physical evidence for each one of the tests for which accreditation has been requested. (NELAC)

Assessment:
The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria (to the standards and requirements of NELAC). (NELAC)

Assessment Criteria:
The measures established by NELAC and applied in establishing the extent to which an applicant is in conformance with NELAC requirements. (NELAC)

Assessment Team:
The group of people authorized to perform the on-site inspection and proficiency testing data evaluation required to establish whether an applicant meets the criteria for NELAP accreditation. (NELAC)

Audit:
A systematic evaluation to determine the conformance to quantitative and qualitative specifications of some operational function or activity. (EPA-QAD)

Autozero:
Zeroing the instrument at the proper wavelength. It is equivalent to running a standard blank response set at zero.

Background Correction:
A technique to compensate for variable background contribution to the instrument signal -in the determination of trace elements.

Bar Graph Spectrum:
A plot of the mass-to-charge ratio (m/e) versus relative intensity of the ion current.

Batch:
Environmental samples which are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) and /or those samples not requiring preparation, which are analyzed together as a group using the same calibration curve or factor. An analytical batch can include

samples originating from various environmental matrices and can exceed 20 samples. (NELAC Quality Systems Committee)

Blank:
A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC)

Blind Sample:
A sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.

Breakdown:
A measure of the decomposition of certain analytes (e.g. DDT and Endrin) into by-products.

4-Bromofluorobenzene(BFB):
The compound chosen to establish mass spectral instrument performance for volatile (VOA) analyses. It is also used in the VOA fraction as a system monitoring compound (SMC).

Calibration:
To determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter, instrument, or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

Calibration Blank:
A volume of acidified deionized/distilled water.

Calibration Curve:
The graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (NELAC)

Calibration Factor(CF):
A measure of the response of a target analyte to the mass injected.

Calibration Method:
A defined technical procedure for performing a calibration. (NELAC)

Calibration Standard:
A substance or reference material used to calibrate an instrument (QAMS)

Certified Reference Material (CRM):
A reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. (ISO Guide 30–2.2)

Chain of Custody:
An unbroken trail of accountability that ensures the physical security of samples and includes the signatures of all who handle the samples. (NELAC) [5.12.4]

Clean Air Act:
The enabling legislation in 42 U>S>C> 7401 et seq., Public Law 91-604, 84 Stat. 1676 Pub. L. 95-95, 91 Stat., 685 and Pub. L. 95-190, 91 Stat., 1399, as amended, empowering EPA to promulgate air quality standards, monitor and enforce them. (NELAC)

Coefficient of Variation (CV):
The standard deviation as a percent of the arithmetic mean.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/SUPERFUND):
The enabling legislation in 42 U.S.C. 9601-9675 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. 9601 et seq., to eliminate the health and environmental threats posed by hazardous waste sites. (NELAC)

Compromised Samples:
Those samples which are improperly sampled, insufficiently documented (chain of custody and other sample records and/or labels), improperly preserved, collected in improper containers, or exceeding holding times when delivered to a laboratory. Under normal conditions, compromised samples are not analyzed. If emergency situation require analysis, the results must be appropriately qualified. (NELAC)

Concentration Level (low or medium):
Characterization of soil samples or sample fractions as low concentration or medium concentration is made on the basis of the laboratory's preliminary screen.

Confidential Business Information (CBI):
Information that an organization designates as having the potential of providing a competitor with inappropriate insight into its management, operation or products. NELAC and its representatives agree to safeguarding identified CBI and to maintain all information identified as such in full confidentiality.

Confirmation:
Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to: second column confirmation, alternate wavelength, derivatization, mass spectral interpretation, alternative detectors or additional cleanup procedures.
(NELAC)

Conformance:
An affirmative indication or judgement that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

Congener Number:
Throughout this method, individual PCBs are described with the number assigned by Ballschmiter and Zell. (This number is also used to describe PCB congeners in catalogs produced by Ultra Scientific, Hope, RI.)

Contamination:

A component of a sample or an extract that is not representative of the environmental source of the sample. Contamination may stem from other samples, sampling equipment, while in transit, from laboratory reagents, laboratory environment, or analytical instruments.

Continuing Calibration:
An analytical standard run at the method prescribed frequency to verify the initial calibration of the system.

Continuous Liquid-liquid Extraction:
Used herein synonymously with the terms continuous extraction, continuous liquid extraction, and liquid extraction. This extraction technique involves boiling the extraction solvent in a flask and condensing the solvent above the aqueous sample. The condensed solvent drips through the sample, extracting the compounds of interest from the aqueous phase.

Control Limits:
A range within which specified measurement results must fall to be compliant. Control limits may be mandatory, requiring corrective action if exceeded, or advisory, requiring that noncompliant data be flagged.

Contract Required Detection Limit (CRDL):
Minimum level of detection acceptable under the contract Statement of Work.

Corrective Action:
The action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Correlation Coefficient:
A number (r) which indicates the degree of dependence between two variables (concentration - absorbance). The more dependent they are the closer the value to one. Determined on the basis of the least squares line.

Data Audit:
A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data re of acceptable quality (i.e., that they meet specified acceptance criteria). (NELAC)

Data Reduction:
The process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form. (EPA-QAD)

Decafluorotriphenylphosphine (DFTPP):
Compound chosen to establish mass spectral instrument performance for semivolatile analysis.

Deficiency:
An unauthorized deviation from acceptable procedures or practices, or a defect in an item. (ASQC)

Demonstration of Capability (DOC):
Procedure to establish the ability to generate acceptable accuracy and precision.

Detection Limit:

The lowest concentration or amount of the target analyte that can be identified, measured, and reported with confidence that the analyte concentration is not a false positive value. See Method Detection Limit. (NELAC)

Dissolved Metals:
Analyte elements in an aqueous sample which will pass through a 0.45 µm filter.

Document Control:
The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly, and controlled to ensure use of the correct version at the location where the prescribed activity if performed. (ASQC)

Dry Weight:
The weight of a sample based on percent solids. The weight after drying in an oven.

Duplicate:
A second aliquot of a sample that is treated the same as the original sample in order to determine the precision of the method.

Duplicate Analyses:
The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory. (EPA-QAD)

Environmental Detection Limit (EDL):
The smallest level at which a radionuclide in an environmental medium can be unambiguously distinguished for a given confidence interval using a particular combination of sampling and measurement procedures, sample size, analytical detection limit, and processing procedure. The EDL shall be specified for the 0.95 or greater confidence interval. The EDL shall be established initially and verified annually for each test method and sample matrix. (NELAC Radioanalysis Subcommittee)

Equipment Blank:
Sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (NELAC)

External Standard Calibration:
Calibrations for methods that do not utilize internal standards to compensate for changes in instrument conditions.

Extractable:
A compound that can be partitioned into an organic solvent from the sample matrix and is amenable to gas chromatography. Extractables include semivolatile (BNA) and pesticide/Aroclor compounds.

Extracted Ion Current Profile (EICP):
A plot of ion abundance versus time (or scan number) for ion(s) of specified mass(es).

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA):

The enabling legislation under 7 U.S.C. 135 et seq., as amended, that empowers the EPA to register insecticides, fungicides, and rodenticides. (NELAC)

Federal Water Pollution Control Act (Clean Water Act, CWA):
The enabling legislation under 33 U.S.C. 1251 et seq., Public Law 92-50086 Stat 816, that empowers EPA to set discharge limitations, write discharge permits, monitor, and bring enforcement action for non-compliance. (NELAC)

Field Blank:
Blank prepared in the field by filing a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken (EPA OSWER)

Field Duplicate (FD):
Duplicate field-collected sample

Field Sample:
A portion of material received to be analyzed that is contained in single of multiple containers and identified by a unique

Field of Testing:
NELAC's approach to accrediting laboratories by program, method and analyte. Laboratories requesting accreditation for a program-method-analyte combination or for an up-dated/improved method are required to submit to only that portion of the accreditation process not previously addressed (see NELAC, section 1.9ff). (NELAC)

Finding:
An assessment conclusion that identifies a condition having a significant effect on an item or activity. As assessment finding is normally a deficiency and is normally accompanied by specific examples of the observed condition. (NELAC)

10% FREQUENCY:
A frequency specification during an analytical sequence allowing for no more than 10 analytical samples between required calibration verification measurements, as specified by the contract Statement of Work.

Gas Chromatograph (GC):
The instrument used to separate analytes on a stationary phase within a chromatographic column. The analytes are volatized directly from the sample (VOA water and low-soil), volatized from the sample extract (VOA medium soil), or injected as extracts (SVOA and PEST). In VOA and SVOA analysis, a Mass Spectrometer (MS) detects the compounds. In PEST analysis, an Electron Capture (EC) Detector detects the compounds. In the screening procedure (all fractions), the Flame Ionization Detector (FID) may be used as the detector.

Gel Permeation Chromatography (GPC):
A size-exclusion chromatographic technique that is used as a cleanup procedure for removing large organic molecules, particularly naturally occurring macro-molecules such as lipids, polymers, viruses, etc.

Graphite Furnace Atomic Absorption (GFAA):
Atomic absorption which utilizes a graphite cell for excitation.

Holding Times (Maximum Allowable Holding Times):
The maximum times that samples may be held prior to analyses and still be considered valid or not compromised. (40 CFR Part 136)

Independent Standard:
A Contractor-prepared standard solution that is composed of analytes from a different source than those used in the standards for the initial calibration.

Inductively Coupled Plasma(ICP):
A technique for the simultaneous or sequential multi-element determination of elements in solution. The basis of the method is the measurement of atomic emission by an optical spectroscopic technique. Characteristic atomic line emission spectra are produced by excitation of the sample in a radio frequency inductively coupled plasma.

Initial Calibration:
Analysis of analytical standards for a series of different specified concentrations; used to define the linearity and dynamic range of the response of the analytcial instrument or procedure.

Inspection:
An activity such as measuring, examining, testing, or gauging one or more characteristics of an entity and comparing the results with specified requirements in order to establish whether conformance is achieved for each characteristic. (ANSI/ASQC E4-1994).

Internal Standard:
A known amount of standard added to a test portion of a sample and carried through the entire measurement process as a reference for evaluating and controlling the precision and bias of the applied analytical test method. (NELAC)

Internal Standard Calibration:
Calibrations for methods that utilize internal standards to compensate for changes in instrument conditions.

Instrument Blank:
A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Instrument Check Sample:
A solution containing both interfering and analyte elements of known concentration that can be used to verify background and interelement correction factors.

Instrument Check Standard:
A multi-element standard of known concentrations prepared by the analyst to monitor and verify instrument performance on a daily basis.

Instrument Response:
Instrument response is normally expressed as either peak area or peak height however it may also reflect a numerical representation of some type of count on a detector (e.g. Photomultiplier tube, or Diode array detector) and is used in this document to represent all types.

Instrument Detection Limit (IDL):

The minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific instrument. The IDL is associated with the instrumental portion of a specific method only, and sample preparation steps are not considered in its derivation. The IDL is a statistical estimation at a specified confidence interval of the concentration at which the relative uncertainty is +100%. The IDL represents a range where qualitative detection occurs on a specific instrument. Quantitative results are not produced in this range.

Injection:
Introduction of the analytical sample into the instrument analytical system for the purpose of measuring concentration of an analyte.

Insufficient Quantity:
When there is not enough volume (water sample) or weight (soil/sediment) to perform any of the required operations: sample analysis or extraction, percent moisture, MS/MSD, etc. Exhibit D provides guidance for addressing this situation.

Integration Scan Range:
The scan number of the scan at the beginning of the area of integration to the scan number at the end of the area of integration.

Integration Time Range:
The retention time at the beginning of the area of integration to the retention time at the end of the area of integration.

Interferents:
Substances which affect the analysis for the element of interest.

Internal Chain of Custody (COC):
An unbroken trail of accountability that ensures the physical security of samples, data and records. Internal COC refers to additional documentation procedures implemented within the laboratory that includes special sample storage requirements, and documentation of all signatures and/or initials, dates, and times of personnel handling specific samples or sample aliquots.

Laboratory:
A defined facility performing environmental analyses in a controlled and scientific manner. (NELAC)

Laboratory Duplicate:
Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently. (NELAC)

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample):
A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes, taken through all preparation and analysis steps. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process (such as Phosphorus), there is no LCS. It is generally used to establish intra-

laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

An LCS shall be prepared at a minimum of 1 per batch of 20 or less samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The results of these samples shall be used to determine batch acceptance.

Note: NELAC standards allow a matrix spike to be used in place of this control as long as the acceptance criteria are as stringent as for the LCS. (NELAC)

Laboratory Receipt Date:
The date on which a sample is received at the Contractor's facility, as recorded on the shipper's delivery receipt.

Least Squares Regression (1st Order Curve):
The least squares regression is a mathematical calculation of a straight line over two axes. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The regression calculation will generate a correlation coefficient (r) that is a measure of the "goodness of fit" of the regression line to the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r must be greater than or equal to 0.99 for organics and 0.995 for inorganics.

Linear Range, Linear Dynamic Range:
The concentration range over which the ICP analytical curve remains linear.

Limit of Detection (LOD):
An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory dependent. (Analytical Chemistry, 55, p.2217, December 1983, modified) See also Method Detection Limit.

Manager (however named):
The individual designed as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual. (NELAC)

Matrix:
The component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

Aqueous: Any aqueous sample excluded from the definition of Drinking Water matrix or

Saline/Estuarine source. Includes surface water, groundwater, effluents, and TCLP or other extracts.

Drinking Water: any aqueous sample that has been designated as a potable or potential potable water source.

Saline/Estuarine: any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.

Non-aqueous Liquid: any organic liquid with 15% settleable solids.

Biological Tissue: any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

Solids: includes soils, sediments, sludges, and other matrices with .15% settleable solids.

Chemical Waste: a product or by-product of an industrial process that results in a matrix not previously defined.

Air: whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device. (NELAC)

Matrix Duplicate (MD):
Duplicate aliquot of a sample processed and analyzed independently; under the same laboratory conditions; also referred to as Sample Duplicate; Laboratory Duplicate.

Matrix Spike (spiked sample or fortified sample):
Prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.
Matrix spikes shall be performed at a frequency of one in 20 samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as, total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in a matrix spike may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the spike. (QAMS)

Matrix Spike Duplicate (spiked sample or fortified sample duplicate):
A second replicate matrix spike is prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

Matrix spike duplicates or laboratory duplicates shall be analyzed at a minimum of 1 in 20 samples per matrix type per sample extraction or preparation method. The laboratory shall document their procedure to select the use of an appropriate type of duplicate. The selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in the duplicates may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the duplicate. (QAMS)

Matrix Effect:
In general, the effect of a particular matrix (water or soil/sediment) on the constituents with which it contacts. This is particularly pronounced for clay particles which may adsorb chemicals and catalyze reactions.

Matrix Modifier:
Salts used in AA to lessen the effects of chemical interferents, viscosity, and surface tension.

Megabore Capillary Column:
A gas chromatographic column with an internal diameter (ID) that is greater than or equal to 0.53 mm. Columns with lesser diameters are classified as narrow bore capillary columns.

Method Blank:
A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. (NELAC)

Method Detection Limit:
The minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136, Appendix B)

Method of Standard Additions (MSA):
The addition of 3 increments of a standard solution (spikes) to sample aliquots of the same size. Measurements are made on the original and after each addition. The slope, x-intercept and y-intercept are determined by least-square- analysis. The analyte concentration is determined by the absolute value of the x-intercept. Ideally, the spike volume is low relative to the sample volume (approximately 10% of the volume). Standard addition may counteract matrix effects; it will not counteract spectral effects. Also referred to as Standard Addition.

Multiphase Sample:
A non-homogenous sample containing portions that are physically distinct and are mechanically separable.

m/z:
Mass to charge ratio, synonymous with 'm/e".

National Environmental Laboratory Accreditation Conference (NELAC):
A voluntary organization of State and Federal environmental officials and interest groups purposed primarily to establish mutually acceptable standards for accrediting environmental laboratories. A subset of NELAP. (NELAC)

National Environmental Laboratory Accreditation Program (NELAP):
The overall National Environmental Laboratory Accreditation Program of which NELAC is a part. (NELAC)

Narrative (SDG Narrative):
Portion of the data package which includes laboratory, and sample number identification, and descriptive documentation of any problems encountered in processing the samples, along with corrective action taken and problem resolution.

Neat Material:
An element or compound in its pure form.

Negative Control:
Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results. (NELAC)

NELAC Standards:
The plan of procedures for consistently evaluating and documenting the ability of laboratories performing environmental measurements to meet nationally defined standards established by the National Environmental Laboratory Accreditation Conference. (NELAC)

Non- Conformance:
An indication, judgment, or state of not having met the requirements of the relevant specifications, contract, or regulation.

Percent Difference (%D):
To compare two values, the percent difference indicates both the direction and the magnitude of the comparison, i.e., the percent difference may be either negative, positive, or zero. (In contrast, see relative percent difference.)

Percent Moisture:
An approximation of the amount of water in a soil/sediment sample made by drying an aliquot of the sample at 105□C overnight 12-24 hrs. If the sample was dried for less than 12 hrs, it must be documented. The percent moisture determined in this manner also includes contributions from all compounds that may volatilize at or below 105□C including water. Percent moisture may be determined from decanted samples and from samples that are not decanted.

Performance Audit:
The routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory. (NELAC)

Performance Based Measurement System (PBMS):
A set of processes wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner. (NELAC)

Performance Evaluation Mixture:
A calibration solution of specific analytes used to evaluate both recovery and percent breakdown as measures of performance.

Performance Evaluation (PE) Sample:
A sample of known composition provided by a Third Party Contractor.

Positive Control:
Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects. (NELAC)

Post-Digestion Spike:
The addition of a known amount of standard after digestion.

Precision:
The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (NELAC)

Preparation Blank (reagent blank, method blank):
An analytical control that contains distilled, deionized water and reagents, which is carried through the entire analytical procedure (digested and analyzed). An aqueous method blank is treated with the same reagents as a sample with a water matrix; a solid method blank is treated with the same reagents as a soil sample.

Preservation:
Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample. (NELAC)

Proficiency Testing:
A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (NELAC) [2.1]

Proficiency Testing Program:
The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (NELAC)

Proficiency Test Sample (PT):
A sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria. (QAMS)

Proprietary:
Belonging to a private person or company

Precision:
An estimate of variability. It is an estimate of agreement among individual measurements of the same physical or chemical property, under prescribed similar conditions.

Preservation:
Refrigeration and/or reagents added at the time of sample collection to maintain the chemical, physical and/or biological integrity of the sample.

Primary Quantitaion Ion:
A contract specified ion used to quantitate a target analyte.

Protocol:
Describes the exact procedures to be followed with respect to sample receipt and handling, analytical method of data reporting and deliverables, and document control.

Purge and Trap (Device):
Analytical technique (device) used to isolate volatile (purgeable) organics by stripping the compounds from water or soil by a stream of inert gas, trapping the compounds on an adsorbent such as a porous polymer trap, and thermally desorbing the trapped compounds onto the gas chromatographic column.

Purgeables:

Volatile compounds.

Quality Assurance:
An integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence. (QAMS)

Quality Assurance [Project] Plan (QAPP):
A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EAP-QAD)

Quality Control:
The overall system of technical activities which purpose is to measure and control the quality of a product or service so that it meets the needs of users. (QAMS)

Quality Control Sample:
An uncontaminated sample matrix spiked with known amounts of analytes from a source independent from the calibration standards. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. (EPA-QAD)

Quality Manual:
A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (NELAC)

Quality Management Plan (QMP):
A formal document describing the management policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an agency, organization or laboratory to ensure the quality of its product and the utility of the product to its users.

Quality System:
A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC (ANSI/ASQC-E-41994)

Quantitation Limits:
The maximum or minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be quantified with the confidence level required by the data user. (NELAC)

Range:
The difference between the minimum and the maximum of a set of values. (EPA-QAD)

Raw Data:
Any original information from a measurement activity or study recorded in laboratory notebooks, worksheets, records, memoranda, notes, or exact copies thereof and that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic/optical media,

including dictated observations, and recorded data from automated instruments. Reports specifying inclusions of “raw data” do not need all of the above included, but sufficient information to create the reported data.

Reagent Blank (method reagent blank):
A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

Reagent Water:
Water in which an interferent is not observed at or above the minimum quantitation limit of the parameters of interest.

Reconstructed Ion Chromatogram-(RIC):
A mass spectral graphical representation of the separation achieved by a gas chromatograph; a plot of total ion current versus retention time.

Record Retention:
The systematic collection, indexing and storing of documented information under secure conditions.

Reference Material:
A material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (ISO Guide 30-2.1)

Reference Method:
A method of known and documented accuracy and precision issued by an organization recognized as competent to do so. (NELAC)

Reference Standard:
A standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived. (VIM-6.0-8)

Relative Percent Difference (RPD):
To compare two values, the relative percent difference is based on the mean of the two values, and is reported as an absolute value, i.e., always expressed as a positive number or zero.

Relative Response Factor (RRF):
A measure of the relative response of an analyte compared to its internal standard. Relative Response Factors are determined by analysis of standards and are used in the calculation of concentrations of analytes in samples.

Relative RetentionTime (RRT):
The ratio of the retention time of a compound to that of a standard (such as an internal standard).
Where,
RTc - Retention time for the target or surrogate compound in continuing calibration.
RTi.- Retention time for the internal standard in calibration standard or in a sample.

Replicate Analyses:

The measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval. (NELAC)

Reporting Limit (RL):
The level to which data is reported for a specific test method and/or sample. The RL is generally related to the QL. The RL must be minimally at or above the MDL.

Requirement:
Denotes a mandatory specification; often designated by the term “shall”. (NELAC)

Resource Conservation and Recovery Act (RCRA):
The enabling legislation under 42 USC 321 et seq. (1976), that gives EPA the authority to control hazardous waste from the “cradle-to-grave”, including its generation, transportation, treatment, storage, and disposal. (NELAC)

Resolution:
Also termed separation or percent resolution, the separation between peaks on a chromatagram, calculated by dividing the depth of the valley between peaks by the peak height of the smaller peak being resolved, multiplied by 100.

Resolution Check Mixture:
A solution of specific analytes used to determine resolution of adjacent peaks; used to assess instrumental performance

Response or Instrumental Response:
A measurement of the output of the detector (MS, EC, FID, etc.) in which the intensity of the signal is proportionate to the amount (or concentration) detected.

Retention Time (RT):
The time a target analyte is retained on a GC column before elution. The identification of a target analyte is dependent on a target compound's retention time falling within the specified retention time window established for that compound. Retention time is dependent on the nature of the column's stationary phase, column diameter, temperature, flow rate, and other parameters.

Safe Drinking Water Act (SDWA):
The enabling legislation, 42 USC 300f et seq. (1974), (Public Law 93-523), that requires the EPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations. (NELAC)

Sample:
A portion of material to be analyzed that is contained in single or multiple containers and identified by a unique sample number.

Sample Number:
A unique identification number designated to each sample.

Sampling and Analysis Plan (SAP):
A formal document describing the detailed sampling and analysis procedures for a specific project.

Sample Delivery Group (SDG):
A unit within a single Case that is used to identify a group of samples for delivery. An SDG is a group of 20 or fewer field samples within a Laboratory Job, received over a specified time frame.

Sample Duplicate:
Two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method including sampling and analysis. (EPA-QAD)

Second Order Polynomial Curve (Quadratic):
The 2nd order curves are a mathematical calculation of a slightly curved line over two axis. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The 2nd order regression will generate a coefficient of determination (COD or r^2) that is a measure of the "goodness of fit" of the quadratic curvature the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r^2 must be greater than or equal to 0.99.

Secondary Dilution Standard :
A dilution of a stock standard.

Secondary Quantitation Ion:
Specified ion(s) to be used in quantitation of target analytes when interferences prevent the use of the primary quantitation ion.

Selectivity:
(Analytical chemistry) the capability of a test method or instrument to respond to a target substance of constituent in the presence of non-target substances. (EPA-QAD)

Semivolative Compounds:
Compounds amenable to analysis by extraction of the sample with an organic solvent. Used synonymously with Base/Neutral/Acid (BNA) compounds.

Sensitivity:
The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (NELAC)

Serial-Dilution:
The dilution of a sample by factor of five. When corrected by the dilution factor, the diluted sample must agree with the original undiluted sample within specified limits. Serial dilution may reflect the influence of interferents.

Sonic Cell Disruptor (Sonicator):
A device that uses the energy from controlled ultrasound applications to mix, disperse, and dissolve organic materials from a given matrix.

Spike:
A known mass of target analyte added to a blank, sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, a representative number (at a minimum 10%) of the listed components may be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses permit specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.. (NELAC)

Standard:
The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of NELAC and meets the approval requirements of NELAC procedures and policies. (ASQC)

Standard Analysis:
An analytical determination made with known quantities of target compounds; used to determine response factors.

Standard Operating Procedures (SOPs):
A written document which details the method of an operation, analysis, or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. (QAMS)

Standardized Reference Material (SRM):
A certified reference material produced by the U.S. National Institute of Standards and Technology or other equivalent organization and characterized for absolute content, independent of analytical method. (EPA-QAD)

Stock Solution:
A standard solution which can be diluted to derive other standards.

Storage Blank:
A blank matrix stored (2-weeks) with field samples of a similar matrix (volatiles only) that measures storage contribution to any source of contamination. OR A blank matrix stored with field samples of a similar matrix.

Subsampling:
The process of obtaining a representative aliquot of a sample for analysis.

Supervisor (however named):
The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties, and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses. (NELAC)

Surrogate:
A substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes.

Surrogate compounds must be added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. Poor surrogate recovery may indicate a problem with sample composition and shall be reported to the client whose sample produced poor recovery. (QAMS)

Sulfur Blank:
A modified method blank that is prepared only when some, of the samples in a batch are subjected to sulfur cleanup. It is used to determine the level of contamination associated with the sulfur cleanup-procedure. When all of the samples are subjected to sulfur cleanup, then the method blank serves this purpose. When none of the samples are subjected to sulfur cleanup, no sulfur blank is required.

Suspended:
Those elements which are retained by a 0.45 um membrane filter.

Systems Audit (also Technical Systems Audit):
A thorough, systematic, qualitative on-site assessment of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system. (EPA-QAD)

System Monitoring Compounds:
Compounds added to every blank, sample, matrix spike, matrix spike duplicate, and standard for volatile analysis, and used to evaluate the performance of the entire purge and trap-gas chromatograph-mass spectrometer system. These compounds are brominated or deuterated compounds not expected to be detected in environmental media.

Target Compound List (TCL):
A list of compounds designated by the Statement of Work (Exhibit C) for analysis.

Technical Director:
Individuals(s) who has overall responsibility for the technical operation of the environmental testing laboratory. (NELAC)

Tentatively Identified Compounds (TIC):
Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates. Those greater than 10% of the peak areas or heights of nearest internal standard are subjected to mass spectral library searches for tentative identification.

Test:
A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process, or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate. (ISO/IEC Guide 2-12.1, amended)

Test Method:
An adoption of a scientific technique for a specific measurement problem, as documented in a laboratory SOP. (NELAC)

Toxic Substances Control Act (TSCA):

The enabling legislation in 15 USC 2601 et seq., (1976) that provides for testing, regulating, and screening all chemicals produced or imported into the United States for possible toxic effects prior to commercial manufacture. (NELAC)

Total Metals:
Analyte elements which have been digested prior to analysis.

Traceability:
The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons. (VIM-6.12)

Trip Blank:
A blank matrix placed in a sealed container at the laboratory that is shipped, held unopened in the field, and returned to the laboratory in the shipping container with the field samples.

Twelve-hour Time Period:
The twelve (12) hour time period for GC/MS system instrument performance check, standards calibration (initial or continuing calibration), and method blank analysis begins at the moment of injection of the DFTPP or BFB analysis that the laboratory submits as documentation of instrument performance. The time period ends after 12 hours have elapsed according to the system clock. For pesticide/Aroclor analyses performed by GC/EC, the twelve hour time period in the analytical seclience begins at the moment of injection of the instrument blank that precedes sample analyses, and ends after twelve hours have elapsed according to the system clock.

Uncertainty:
A parameter associated with the result of a measurement that characterizes the dispersion of the value that could reasonably be attributed to the measured value.

United States Environmental Protection Agency (EPA):
The Federal governmental agency with responsibility for protecting public health and safeguarding and improving the natural environment (i.e., the air, water, and land) upon which human life depends. (US-EPA)

Validated Time of Sample Receipt (VTSR):
The date on which a sample is received at the facility, as recorded on the shipper's delivery receipt (chain of custody).

Validation:
The process of substantiating specified performance criteria. (EPA-QAD)

Verification:
Confirmation by examination and provision of evidence that specified requirements have been met. (NELAC). NOTE: In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment.

The result of verification leads to a decision either to restore in service, to perform adjustment, to repair, to downgrade, or to declare obsolete. In all cases, it is required that a written trace of the verification performed shall be kept on the measuring instrument's individual record.

Volatile Compounds:
Compounds amenable to analysis by the purge and trap technique. Used synonymously with purgeable compounds.

Wide Bore Capillary Column:
A gas chromatographic column with an internal diameter (ID) that is greater than or equal to 0.53 mm. Columns with lesser diameters are classified as narrow bore capillary columns.

Wet Weight:
The weight of a sample aliquot including moisture (undried).

Working Standard:
Standards in daily use such as: calibration solution, internal standard spiking solution, surrogate standard spiking solution, initial and/or continuing calibration verification, or matrix spike/laboratory control sample (LCS) spike solution .

Work Cell:
A well-defined group of analysts that together perform the method analysis. The members of the group and their specific functions within the work cell must be fully documented. (NELAC).

Acronyms:

BS – Blank Spike
BSD – Blank Spike Duplicate
CAR – Corrective Action Report
CCV – Calibration Verification
CF – Calibration Factor
CFR – Code of Federal Regulations
COC – Chain of Custody
CRS – Change Request Form
DOC – Demonstration of Capability
DQO – Data Quality Objectives
DU – Duplicate
DUP - Duplicate
EHS – Environment, Health and Safety
EPA – Environmental Protection Agency
GC - Gas Chromatography
GC/MS - Gas Chromatography/Mass Spectrometry
HPLC - High Performance Liquid Chromatography
ICP - Inductively Coupled Plasma Atomic Emission Spectroscopy
ICV – Initial Calibration Verification
IDL – Instrument Detection Limit
IH – Industrial Hygiene
IS – Internal Standard
LCS – Laboratory Control Sample
LCSD – Laboratory Control Sample Duplicate
LIMS – Laboratory Information Management System
MDL – Method Detection Limit
MS – Matrix Spike
MSD – Matrix Spike Duplicate
MSDS - Material Safety Data Sheet
NELAC - National Environmental Laboratory Accreditation Conference
NELAP - National Environmental Laboratory Accreditation Program
PT – Performance Testing
QAM – Quality Assurance Manual
QA/QC – Quality Assurance / Quality Control
QAPP – Quality Assurance Project Plan
RF – Response Factor
RPD – Relative Percent Difference
RSD – Relative Standard Deviation
SD – Standard Deviation
SOP: Standard Operating Procedure
TAT – Turn-Around-Time
VOA – Volatiles
VOC – Volatile Organic Compound

Appendix 6.

Laboratory Certifications, Accreditations, Validations

TestAmerica Edison maintains certifications, accreditations, certifications, and validations with numerous state and national entities. Programs vary but may include on-site audits, reciprocal agreements with another entity, performance testing evaluations, review of the QA Manual, Standard Operating Procedures, Method Detection Limits, training records, etc. At the time of this QA Manual revision, the laboratory has accreditation/certification/licensing with the following organizations:

Organization	Certificate/Lab ID Number
New Jersey DEP	12028
Pennsylvania DEP	68-00522
Connecticut DPH	PH-2022
New York DOH	11452
Rhode Island DOH	LAO00132
Delaware DNRC	n/a
USDA Foreign Soils Permit	S-76543

The certificates and parameter lists (which may differ) for each organization may be found on the corporate web site and the laboratory's public server.

Appendix 7. Data Qualifiers

Organic Data Reporting Qualifiers

ND - The compound was not detected at the indicated concentration.

J - Mass spectral data indicates the presence of a compound that meets the identification criteria. The result is less than the specified quantitation limit but greater than or equal to the method detection limit. The concentration given is an estimated value.

B - The analyte was found in the laboratory blank as well as the sample. This indicates possible laboratory contamination of the environmental sample.

P - For dual column analysis, the percent difference between the quantitated concentrations on the two columns is greater than 40%.

* - For dual column analysis, the lowest quantitated concentration is being reported due to coeluting interference.

E – Result exceeded calibration range, secondary dilution required.

U – Compound analyzed for but not detected.

D – Surrogate or matrix spike recoveries not obtained because the extract was diluted.

Inorganic Data Reporting Qualifiers

ND/U - The compound was not detected at the indicated concentration.

B - Reported value is less than the Practical Quantitation Limit but greater than or equal to the Instrument Detection Limit.

E - The reported value is estimated because of the presence of interference. See explanatory note in the Nonconformance Summary if the problem applies to all of the samples or on the individual Inorganic Analysis Data Sheet if the problem is isolated.

M - Duplicate injection precision not met on the Furnace Atomic Absorption analysis.

N - The spiked sample recovery is not within control limits

S - The reported value was determined by the Method of Standard Additions (MSA).

* - Duplicate Analysis is not within control limits.

W - Post digestion spike for Furnace Atomic Absorption analysis is out of control.

+ - Correlation coefficient for MSA is less than 0.995.

< - The compound was not detected at the indicated concentration

> - The compound exceeded the indicated concentration

** Not included in the initial calibration

E - Estimated concentration for the compound

ATTACHMENT 4

List of Anticipated Permits for Hatco Remediation

- Soil Erosion and Sediment Control Plan – Weston has obtained approval from Freehold Soil Conservation District for the soil and sediment remediation and reuse.
- State Wetlands General Permit # 4 - This certificate also serves as the 401 Water Quality Certificate required under the Federal Act at 33 U.S.C. §1341 [as indicated in NJAC 7:7A-2.1(d)].
- Local Site Plan Approval – waived by Woodbridge Township
- Flood Hazard Area Permit
- Middlesex County Utilities Authority (MCUA) approval is required for discharge of treated dewatering fluids to the publicly-owned treatment works (covered under the IRM RAWP)
- Temporary storage of recovered LNAPL may be subject to NJ Hazardous Waste and TSCA regulations for storage and treatment (no additional permit required)
- Air permit as appropriate under N.J.A.C. 7:27-8 or N.J.A.C. 7:27-22 if needed for dewatering fluids treatment (covered under the IRM RAWP)

ATTACHMENT 5

Attachment 5 –

Hatco Air Monitoring and Odor Control Program

Weston's air monitoring program for all intrusive or earth-moving activities, including excavation, post-excavation sample collection, staging and loading, includes the use of both perimeter dust monitoring and worker breathing zone dust monitoring. Data will be collected by up to five DataRams set to continuously log particulate data each work day (including one upgradient location, one worker breathing zone location, and up to three downgradient locations). Additionally, a photo ionization detector (PID) will be utilized to monitor potential VOC concentrations in the worker breathing zone during all excavation and sampling activities.

The DataRams will be set up each morning and monitored throughout the day by a site safety representative. PID monitoring will also be performed continuously. At the end of each workday, the logged information will be downloaded and evaluated by the site safety representative. Each DataRam will be equipped with an audible alarm which will engage when the site-specific action level is exceeded; if such an exceedence occurs, a water truck or other suitable localized method of dust control shall be utilized. All work activities will be performed in a manner to limit the generation of visible dust, and a water source will be available at all times during excavation and staging/loading activities to ensure that dust potential is minimized.

Based upon a review of historical site data, **Weston recommends an action level of 1000 ug/m^3 (1.0 mg/m^3)** in all areas where LNAPL is present or PCB concentrations are determined to exceed 100 mg/kg. When utilizing the highest historic site PCB concentration of 12,000 mg/kg, the OSHA exposure limit of 0.5 mg/m^3 and a safety factor of 4, the most conservative action level calculated for the site is 10.42 mg/m^3.

$$\text{Action Level} = \frac{\text{exposure limit } (0.5\ \text{mg/m}^3) \times 1{,}000{,}000}{\text{maximum soil conc. } (12{,}000\ \text{mg/kg}) \times \text{safety factor } (4)} = 10.42\ \text{mg/m}^3$$

Since the majority of soil PCB concentrations at the site are considerably lower than 12,000 mg/kg, Weston's proposed action level of 1.0 mg/m^3 is both conservative and protective of worker health, while also providing the Hatco facility workers and off-site properties sufficient protection. A less stringent action level of 2.5 mg/m^3 will be utilized in work areas where PCB concentrations have documented concentrations less than 100 mg/kg. This alternate action level is considerably more protective than required for PCB concentrations less than 100 mg/kg, calculated to be 50.0 mg/m^3.

$$\text{Action Level} = \frac{\text{exposure limit } (0.5\ \text{mg/m}^3) \times 1{,}000{,}000}{\text{soil conc. } (100\ \text{mg/kg}) \times \text{safety factor } (4)} = 50.0\ \text{mg/m}^3$$

For potential VOC concentrations in the worker breathing zone, Weston's standard health and safety protocol will apply. For sustained PID readings of 5 to 25 units, workers will be required to utilize Level C respiratory protection. Due to the presence of benzene at the, colorimetric tubes will also be utilized for benzene detection whenever a work area has a sustained PID reading of 1 unit or greater in the breathing zone. For reference, the Weston SOP for benzene is included as Attachment A of this Program.

Foam will be utilized as a method of odor control during excavation activities to prevent nuisance odors from impacting Hatco operations or neighboring properties. Foam will be kept on standby at a nearby location by Weston's excavation contractor to be brought to site as necessary.

FLD 54 BENZENE EXPOSURE CONTROL PLAN

This Exposure Control Plan will be reviewed annually and updated as appropriate to reflect any changes that may impact WESTON's compliance status.

RELATED PROGRAMS

Personal Protective Equipment Program
Respiratory Protection Program

EXPOSURE MONITORING

General Monitoring Requirements

WESTON will perform exposure monitoring for benzene at any workplace or work operation at a client's location that is covered by OSHA standard 29 CFR 1910.1028. The exposure evaluation will be performed at the earliest possible time when beginning activities at a site or during an operation to ensure the safety of personnel and confirm that effective controls are used.

- Determinations of employee exposure will be made from breathing zone air samples that reflect the monitored employee's regular, daily 8-hour time-weighted average (TWA) exposure to benzene. WESTON will determine if any employee may be exposed to benzene at or above the action level (AL) or the 8-hour TWA.
- 8-hour TWA exposures will be determined for each employee on the basis of one or more personal breathing zone air samples reflecting full shift exposure on each shift, for each job classification in each work area. Where employees perform the same job tasks, in the same job classification, on the same shift, in the same work area, and the length, duration, and level of benzene exposures are similar, WESTON may choose to sample a representative fraction of the employees instead of collecting samples on all employees in order to meet this requirement. When this representative sampling is performed, WESTON will sample the employee(s) expected to have the highest benzene exposures.
- Determinations to evaluate exposures with respect to the short-term exposure limit (STEL) shall be made from 15 minute employee breathing zone samples measured at operations where there is reason to believe exposures are high, such as where tanks are opened, filled, unloaded or gauged; where containers or process equipment are opened. Objective data, such as instantaneous measurements or from short periods, may be used to determine where STEL monitoring is needed.

Initial Monitoring

Initial monitoring will be performed in compliance with the following:

- Except as provided for in the following two paragraphs, WESTON will monitor employee exposures and will base initial determinations concerning controls, personal protective equipment (PPE) and the need for additional monitoring on the initial results. The results will also trigger requirements for re-sampling as defined by OSHA.
- Where WESTON has monitored under conditions that in all important aspects closely resemble those currently prevailing and where that monitoring satisfies all other requirements of this section, including the accuracy and confidence levels of subsection 6 of this section, WESTON

may rely on such earlier monitoring results to satisfy the requirements of potential exposure determination. Data used in this determination must be collected in the previous 12 months.

- Where WESTON has objective data demonstrating that employee exposure to benzene will not exceed the AL or STEL under the expected conditions of processing, use, or handling, WESTON may rely upon such data instead of implementing initial monitoring.
- The review of sampling results and the decision to use objective data will be made by the Division Environmental, Health, and Safety Manager (DEHSM), a Certified Industrial Hygienist, or the Corporate Environmental Health and Safety Director.

Monitoring Frequency (Periodic Monitoring)

- If the initial monitoring or periodic monitoring reveals employee exposures to be at or above the AL but at or below the TWA, WESTON will monitor at least every year.
- If the initial monitoring or periodic monitoring reveals employee exposures to be above the TWA, WESTON will monitor at least every 6 months.
- If the initial monitoring or the periodic monitoring indicates that employee exposures are below the AL and that result is confirmed by the results of another monitoring taken at least 7 days later, WESTON may discontinue the monitoring for those employees whose exposures are represented by such monitoring.
- Monitoring to evaluate the exposures with respect to the STEL will be completed as necessary.

Additional Monitoring

WESTON also will institute the exposure monitoring required in the Initial Monitoring and the Monitoring Frequency sections when there is a change in the production, process, control equipment, personnel or work practices which may result in new or additional exposure to benzene, or when WESTON has any reason to suspect a change which may result in new or additional exposures.

Employee Notification of Monitoring Results

Within 15 working days after the receipt of the results of any monitoring performed under this section, WESTON will notify each affected employee individually in writing of the results. In addition, within the same time period WESTON will post the results of the exposure monitoring at an appropriate location that is accessible to all affected employees.

Wherever monitoring results indicate an employee exposure exceeds the permissible exposure limit (PEL), WESTON will include in the written notice a description of the corrective action being taken by WESTON to reduce employee exposure to or below the PEL.

Accuracy of Measurement

WESTON will use a method of monitoring and analysis with a confidence level of 95% and an accuracy of plus or minus 25%, for airborne concentrations of benzene. OSHA Method 12 is identified in the OSHA standard for air sampling. WESTON will consult a qualified analytical laboratory to confirm the sampling method.

Establishment

WESTON will establish a regulated area at a Client's work site when an employee's exposure to airborne concentrations of benzene exceeds or can reasonably be expected to exceed the PELs, either the 8-hour TWA exposure of 1 ppm or the STEL of 5 ppm for 15 minutes.

Demarcation

Regulated areas will be demarcated from the rest of the workplace in any manner that adequately establishes and alerts employees of the boundaries of the regulated area.

Access

Access to regulated areas will be limited to authorized persons.

Provision of Respirators

Each person entering a regulated area will be supplied with and required to use a respirator, selected in accordance with 29 CFR 1910.134(b) through (d) (except (d)(1)(iii), (d)(3)(iii)(B)(1) and (2), and (f) through (m) and compliant with WESTON's Respiratory Protection Program.

Prohibited Activities

WESTON will ensure that employees do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas, carry the products associated with these activities into regulated areas, or store such products in those areas.

METHODS OF COMPLIANCE

Compliance Hierarchy

WESTON will implement engineering and work practice controls to reduce and maintain employee exposure to benzene at or below the PEL, except to the extent that WESTON can demonstrate that such controls are not feasible.

Wherever engineering and work-practice controls are required and are not sufficient to reduce employee exposure to or below the PEL, WESTON will implement such controls to reduce exposures to the lowest levels achievable. WESTON will supplement such controls with respiratory protection that complies with the requirements of the PEL.

WESTON will not use employee rotation as a method of compliance.

Compliance Program

Where the PEL is exceeded, WESTON will establish and implement a written site-specific compliance program within its Health and Safety Plan (HASP) to reduce employee exposure to or below the PEL by means of engineering and work practice controls, as required by the previous subsection. To the extent that engineering and work-practice controls cannot reduce exposures to or below the PEL, WESTON will include in the written compliance program the use of appropriate respiratory protection to achieve compliance with the PEL.

Written site-specific compliance programs will include at least the following:

- A description of each operation in which benzene is emitted; e.g., machinery used, material processed, controls in place, crew size, employee job responsibilities, operating procedures, and maintenance practices;
- A description of the specific means that will be employed to achieve compliance, including engineering plans and studies to determine the methods to control exposure to benzene, and, where necessary, the use of appropriate respiratory protection to achieve the PEL;
- A report of the technology considered to control exposures below the PEL;
- Air monitoring data that document the sources of benzene emissions;
- A detailed schedule for implementing the program, including documentation such as copies of purchase orders for equipment, construction contracts, etc.;
- A work practice program;
- A written plan for emergency situations; and
- Other relevant information.

The written compliance program will be reviewed and updated at least annually, if the project site duration makes this requirement necessary, or more often, if necessary, to reflect significant changes in WESTON's compliance status.

The written compliance program will be provided upon request for examination and copying to the OSHA Assistant Secretary and/or Director, affected employees, and designated employee representatives.

Respiratory Protection

WESTON maintains a Respiratory Protection Program as required by 29 CFR 1910.134 and substance-specific standards. For employees who use respirators required by this section, WESTON will provide respirators that comply with the requirements of this subsection. Respirators must be used during:

- Periods necessary to install or implement feasible engineering and work-practice controls.
- Maintenance and repair activities, and brief or intermittent operations, where employee exposures exceed the PEL or STEL, and engineering and work-practice controls are not feasible;
- Activities in regulated areas;
- Work operations for which WESTON or the Client has implemented all feasible engineering and work-practice controls and such controls are not sufficient to reduce employee exposures to or below the PEL;
- Work operations for which an employee is exposed to benzene at or above the AL, and the employee requests a respirator;
- Work operations for which an employee is exposed above the PEL and engineering controls are not required by exemption; and
- Emergencies.

No employee will be permitted to use a respirator if, based on their recent medical examination, the examining physician determines that they will be unable to continue to function normally while using a respirator. If the physician determines that the employee must be limited in, or removed from, their

current job because of their inability to use a respirator, the limitation or removal will be in accordance with WESTON's Human Resources policies and practices.

Respirator Selection

WESTON will use the assigned protection factors (APFs) listed in Table 1 to select a respirator that meets or exceeds the required level of employee protection. When using a combination respirator (e.g., airline respirators with an air-purifying filter), WESTON will ensure that the APF is appropriate to the mode of operation in which the respirator is being used. WESTON will select the appropriate respirator from Table 1.

Table 1. -- Assigned Protection Factors[5]

Type of respirator[1], [2]	Quarter mask	Half mask	Full facepiece	Helmet/ hood	Loose-fitting facepiece
1. Air-Purifying Respirator	5	[3]10	50	.....	.....
2. Powered Air-Purifying Respirator (PAPR)	.....	50	1,000	[4]25/1,000	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					
• Demand mode	.....	10	50	.....	.....
• Continuous flow mode	.....	50	1,000	[4]25/1,000	25
• Pressure-demand or other positive-pressure mode	.....	50	1,000	.....	.....
4. Self-Contained Breathing Apparatus (SCBA)					
• Demand mode	.....	10	50	50	.....
• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)	.....	.....	10,000	10,000	.....

Notes:

[1]Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.

[2]The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.

[3]This APF category includes filtering facepieces, and half masks with elastomeric facepieces.

[4]The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.

[5]These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to the appropriate substance-specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 CFR 1910.134 (d)(2)(ii).

Emergency Situations

WESTON will develop and implement a written plan for dealing with emergency situations involving substantial releases of benzene on a site-specific, as-needed basis. The plan will include provisions for the use of appropriate respirators and PPE. In addition, employees not essential to correcting the emergency situation will be restricted from the area and normal operations halted in that area until the emergency is abated.

Protective Work Clothing and Equipment

Personal protective clothing and equipment shall be worn to prevent eye contact and limit dermal exposure to liquid benzene. Protective clothing and equipment shall be impermeable to liquid benzene and will be provided by WESTON at no cost to the employee. Eye and face protection shall meet the requirements of 29 CFR 1910.133. Protective work clothing and equipment includes, but is not limited to:

- Benzene resistant coveralls or similar full-body work clothing;
- Benzene resistant gloves, head coverings, and boots or foot coverings; and
- Face shields, vented goggles, or other appropriate protective equipment.

Employees shall remove all protective clothing and equipment worn for protection from benzene at the completion of the work shift at identified change areas.

In the event that protective clothing or PPE becomes wetted with benzene or when rips or tears are detected while an employee is working, the protective clothing or equipment will be replaced as soon as possible.

WESTON will arrange for the laundering or disposal of protective clothing and equipment. Employees will not take off the site, protective clothing or equipment contaminated with benzene. WESTON will ensure that the disposal or cleaning of contaminated protective clothing and equipment is done in a manner that prevents the release of airborne benzene in excess of the PEL.

Hygiene Areas and Practices

WESTON will provide hand-washing facilities, showers for personnel to use when leaving the work area and before eating, drinking, smoking, chewing tobacco or gum, or applying cosmetics.

Housekeeping

All spills and sudden releases of material containing benzene will be cleaned up as soon as possible.

Waste, scrap, debris, bags, containers, PPE, and clothing contaminated with benzene and consigned for disposal must be collected and disposed of in sealed impermeable bags or other closed, impermeable containers. These bags and containers will be labeled appropriately.

MEDICAL SURVEILLANCE

WESTON maintains a medical surveillance program for:

- All employees who are or may be exposed to benzene at or above the AL unless WESTON demonstrates that the employee is not, and will not be, exposed at or above the AL 30 or more days per year (12 consecutive months); and
- Employees who might previously have been exposed to benzene at or above the AL while employed by WESTON, unless WESTON demonstrates that the employee did not work for WESTON in jobs with exposure to benzene.

To determine an employee's fitness to use a respirator, WESTON will provide the medical examination to obtain a physician's certification that includes a cardiopulmonary evaluation and a pulmonary function test.

All medical examinations and procedures required by this standard will be performed by or under the supervision of a licensed physician, who has read and is familiar with the health effects of benzene and the requirements detailed in 29 CFR 1910.1028. All laboratory tests will be conducted by an accredited laboratory. These examinations and procedures will be provided without cost to the employee and at a time and place that is reasonable and convenient to employees.

Initial Examination

WESTON will provide an initial (pre-placement) examination to all employees who are or may be exposed to benzene at or above the AL 30 or more days per year, for employees who are or may be exposed to benzene at or above the PELs 10 or more days per year, for employees who have been exposed to more that 10 ppm of benzene for 30 or more days in a year prior to the effective date of the standard when employed by WESTON. The initial (pre-placement) medical examination will include:

- A detailed medical and occupational work history, with emphasis on exposure to benzene or any other hematological toxins;
- A family history of blood dyscrasias including hematological neoplasms;
- A history of blood dyscrasias including genetic hemoglobin abnormalities, bleeding abnormalities, abnormal function of formed blood elements;
- A history of renal or liver dysfunction;
- A history of medicinal drugs routinely taken;
- A history of previous exposure to ionizing radiation;
- Exposure to marrow toxins outside the current work situation;
- A complete physical examination; and
- Laboratory tests as required by the OSHA Standard.

Recent Examination: An initial examination is not required to be provided if adequate records show that the employee has been examined in accordance with the requirements of this subsection within the past twelve months. In that case, such records will be maintained as part of the employee's medical record and the prior exam will be treated as if it were an initial examination for the purposes of the following 2 subsections, "Actions Triggered by Initial Biological Monitoring" and "Periodic Medical Surveillance".

Actions Triggered by Initial Biological Monitoring

If the results of the initial and periodic examination indicate any of the following abnormal conditions exist, then the blood count shall be repeated within 2 weeks.

- The hemoglobin level or the hematocrit falls below the normal limit (outside the 95% confidence interval [C.I.]) as determined by the laboratory for the particular geographic area and/or these indices show a persistent downward trend from the individual pre-exposure norms; provided these findings cannot be explained by other medical reasons.
- The thrombocyte (platelet) count varies more than 20 percent below the employee's most recent values or falls outside the normal limit (95% C.I.) as determined by the laboratory.
- The leukocyte count is below 4,000 per mm^3 or there is an abnormal differential count.

If the abnormality persists, the examining physician shall refer the employee to a hematologist or an internist for further evaluation unless the physician has good reason to believe such referral is unnecessary. If the hematologist's or internist's evaluation determines the need for additional tests, WESTON shall ensure that these tests are provided.

Periodic Medical Surveillance

For each employee who is covered under "Medical Surveillance" subsection, WESTON will provide at least the minimum level of periodic medical surveillance, which consists of periodic medical examinations and periodic biological monitoring. A periodic medical examination will be provided within one year after the initial examination required by the Initial Examination subsection and thereafter at least yearly. Biological sampling will be provided at least annually, either as part of a periodic medical examination or separately as periodic biological monitoring.

The periodic medical examination will include:

- A brief history regarding any new exposure to potential marrow toxins, changes in medical drug use; and the appearance of physical signs relating to blood disorders.
- A complete blood count including a leukocyte count with differential, quantitative thrombocyte count, hemoglobin, hematocrit, erythrocyte count and erythrocyte indices (mean corpuscular volume [MCV], mean corpuscular hemoglobin [MCH], mean corpuscular hemoglobin concentration [MCHC]); and
- Appropriate additional tests as necessary, in the opinion of the examining physician, in consequence of alterations in the components of the blood or other signs which may be related to benzene exposure.

Where the employees develops signs and symptoms commonly associated with toxic exposure to benzene, WESTON shall provide the employee with an additional medical examination which shall include those elements considered appropriate by the examining physician.

For persons required to use respirators for at least 30 days a year, a pulmonary function test shall be performed every 3 years. A specific evaluation of the cardiopulmonary system shall be made at the time of the pulmonary function test.

Emergency Examinations

In addition to the medical surveillance required in this Medical Surveillance section, WESTON will provide a medical examination as soon as possible to any employee who may have been acutely exposed to benzene because of an emergency.

The examination will be coordinated through the WESTON medical provider. At a minimum the test will involve having the employee provide a urine sample at the end of the employee's shift and having a urinary phenol test performed within 72 hours. Based on the results for this sample, the medical provider will determine the need for additional testing, for example a complete blood count including an erythrocyte count, leukocyte count with differential and thrombocyte count at monthly intervals for a 3-month duration following the emergency.

Information Provided to the Physician

WESTON will provide the following information to any examining physician, including hematologists or internists:

- A copy of OSHA's Benzene Standard (29 CFR 1910.1028) and appendices;
- A description of the affected employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to benzene;
- The employee's former, current, and anticipated future levels of occupational exposure to benzene;
- Relevant results of previous biological monitoring and medical examinations.

Physician's Written Medical Opinion

WESTON will promptly obtain a written, signed medical opinion from the examining physician and provide a copy of the document to the employee within 15 days of the examination. This written opinion will contain:

- The physician's diagnosis based on occupationally pertinent results of the medical examination and tests;
- The physician's opinion as to whether the employee has any detected medical condition(s) that would place the employee at increased risk of material impairment to health from further exposure to benzene;
- Any recommended limitations on the activities or duties of the employee and exposure to benzene or on the employee's use of PPE, clothing, and respirators;
- A statement that the physician has clearly and carefully explained to the employee the results of the medical examination, including all biological monitoring results, and any medical conditions related to benzene exposure that require further evaluation or treatment.

WESTON will instruct the physician not to reveal orally or in the written medical opinion given to WESTON specific findings or diagnoses unrelated to occupational exposure to benzene.

Medical Removal Plan

WESTON will temporarily remove an employee from work where there is excess exposure to benzene on each occasion that medical removal is required, such as when a physician makes a referral to a hematologist/internist, and until the physician determines the employee can safely return to work.

Following the examination and evaluation by the hematologist/internist, a decision to remove an employee from areas where benzene exposure is above the AL or to allow the employee to return to areas where benzene exposure is above the AL shall be made by the physician in consultation with the hematologist/internist. The physician will communicate the decision in writing to WESTON and the employee. In the case of removal, the physician shall state the required probable duration of removal from occupational exposure to benzene above the AL and the requirements for future medical examinations to review the decision.

When an employee is medically removed, WESTON shall provide a follow-up examination. The physician, in consultation with the hematologist/internist, shall make a decision within 6 months of the

date the employee was removed concerning whether the employee shall be returned to the usual job or whether the employee should be removed permanently.

Whenever an employee is medically removed under this subsection, WESTON will transfer the removed employee to a job where the exposure to benzene is less than the AL and will meet the OSHA requirements with respect to medical removal protection benefits.

Reporting

In addition to other medical events that are required to be reported on the OSHA Form No. 300, WESTON will report any abnormal condition or disorder caused by occupational exposure to benzene associated with employment.

COMMUNICATION OF BENZENE HAZARDS TO EMPLOYEES

As required by OSHA, WESTON's Hazard Communication Program transmits information on the hazards of chemicals to employees. The Hazard Communication Program has been established as part of the Corporate EHS Program available on-line or as hard copy to all WESTON employees. Additionally, WESTON transmits the following communications specific to benzene.

Warning Signs

Warning signs will be provided and displayed in regulated areas and at all approaches to regulated areas. Where warning signs are posted, employees must take necessary protective steps before entering the area. The warning signs will include the following information:

DANGER
BENZENE
CANCER HAZARD
FLAMMABLE – NO SMOKING
AUTHORIZED PERSONNEL ONLY
RESPIRATOR REQUIRED

WESTON will ensure that signs required by this subsection are illuminated, cleaned, and maintained as necessary so that the legend is readily visible.

Warning Labels

Warning labels or other appropriate forms of warning will be provided for containers of benzene within the workplace. There is no requirement to label pipes. The label shall comply with the requirements of 29 CFR 1900.1200(f) and in addition shall include the following information:

DANGER
CONTAINS BENZENE
CANCER HAZARD

WESTON will ensure that labels required by this subsection are cleaned and maintained as necessary so that the labels are readable.

Employee Information and Training

WESTON will provide employees with information and training at the time of initial assignment to a work area where benzene is present, and will provide training at least annually thereafter if exposures are above the AL. WESTON will ensure employee participation in the program and maintain a record of the contents of such program.

The training shall be in accordance with the requirements of the Hazard Communication Standard [29 CFR 1910.1200(h)(1) and (2)] and will include:

- Reviewing benzene material safety data sheets;
- Providing the employees with an explanation of the contents of 29 CFR 1910.1028 and a description of the medical surveillance program requirements. The following appendices of 29 CFR 1910.1028 will also be provided and requirements explained:
  - Appendix A – Benzene Substance Safety Data Sheet (reprinted as part of this FLD)
  - Appendix B – Benzene Substance Technical Guidelines (reprinted as part of this FLD)
  - Appendix C – Medical Surveillance Guidelines for Benzene
- Informing personnel where the standard and appendices can be found.

RECORDKEEPING

Exposure Monitoring Records

WESTON will establish and keep an accurate record of all air monitoring for benzene in the workplace. WESTON will maintain this record for at least 30 years, in accordance with OSHA requirements. This record will include at least the following information:

- The monitoring date, number, duration, and results for each sample taken, including a description of the procedures used to determine representative employee exposures;
- The name, social security number, and job classification of the employees monitored and of all other employees whose exposures the monitoring is intended to represent;
- A description of the sampling and analytical methods used and evidence of their accuracy;
- The type of respiratory protective device, if any, worn by the monitored employee;
- A notation of any other conditions that might have affected the monitoring results.

Medical Surveillance Records

WESTON will establish and maintain an accurate record for each employee covered by medical surveillance. WESTON will ensure that this record is maintained for the duration of employment plus 30 years. The record will include at least the following information about the employee:

- Name, social security number, and description of the duties;
- A copy of the physician's written opinions on the initial, periodic, and special examinations including results of medical examinations and all tests, opinions, and recommendations.
- Any employee medical complaints related to exposure to benzene;

- A copy of the medical and work history related to benzene exposure or any other hematologic toxins; and
- A copy of the information provided to the physician.

Availability

WESTON will ensure that all required records are maintained in accordance with current OSHA requirements and made available upon request to the Assistant Secretary and the Director for examination and copying.

WESTON will provide required employee exposure monitoring records upon request for examination and copying to employees, employee representatives, and the Assistant Secretary.

WESTON will provide required employee medical records upon request for examination and copying to the subject employee and anyone having specific written consent of the subject employee, and the Assistant Secretary.

Transfer of Records

If WESTON ceases to do business and there is no successor employer to receive and retain records, WESTON will notify the Director at least 3 months prior to disposal and will transmit them to the Director if required by the Director, within that period.

OBSERVATION OF MONITORING

Employee Observation

WESTON will provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to benzene.

Observation Procedures

When observation or monitoring requires entry into an area where the use of protective clothing or equipment is required, WESTON will provide the observer with that clothing and equipment and will ensure that the observer uses such clothing and equipment and complies with all other applicable safety and health procedures.

DEFINITIONS

Action level (AL): An airborne concentration of benzene of 0.5 parts per million (ppm) calculated as an 8-hour time-weighted average (TWA).

Assistant Secretary: The Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Authorized Person: Any person specifically authorized by the employer whose duties require the person to enter a regulated area, or any person entering such an area as designated representative of employee for the purpose of exercising the right to observe monitoring.

Benzene (CAS Registry No 71-43-2): Liquefied or gaseous benzene. It includes benzene contained in liquid mixture and the benzene vapors released by these liquids. It does not include trace amount of unreacted benzene contained in solid materials.

Container: Any barrel, bottle, can, cylinder, drum, reaction vessel, storage tank, or the like, but does not include piping system.

Day: Any part of the calendar day.

Emergency: Any occurrence such as, but not limited to, equipment failure, rupture of containers, or failures of control equipment which may or does result in an unexpected significant release of benzene.

Employee exposure: Exposure to airborne benzene which would occur if the employee were not using respiratory protective equipment.

Final medical determination: The written medical opinion of the employee's health status by the examining physician.

High-efficiency particulate air (HEPA) filter: A filter capable of trapping and retaining at least 99.97% of mono-dispersed particles of 0.3 micrometers in diameter.

Permissible exposure limit (PEL): The OSHA regulatory limit as a TWA limit is one part of benzene per million parts of air (1 ppm). WESTON will ensure that no employee is exposed to an airborne concentration of benzene in excess of 1 ppm as an 8-hour TWA.

Regulated area: Any area where airborne concentrations of benzene exceed or can reasonably be expected to exceed the PELs, either the 8-hour TWA exposure of 1 ppm or the short-term exposure limit of 5 ppm for 15 minutes.

Short-term exposure limit (STEL): The OSHA regulatory limit over a 15-minute period is 5 ppm. WESTON will ensure that no employee is exposed to an airborne concentration of benzene in excess of 5 ppm as averaged over any 15-minute period.

Vapor control system: Any equipment used for containing the total vapors displaced during the loading of gasoline, motor fuel, or other fuel tank trucks and the displacing of these vapors through a vapor processing system or balancing the vapor with the storage tank.

29 CFR 1910.1028, Appendix A
Substance Safety Data Sheet
(Verified against Standard January 2008)

I. Substance Identification

A. Substance: Benzene.

B. Permissible Exposure: Except as to the use of gasoline, motor fuels and other fuels subsequent to discharge from bulk terminals and other exemptions specified in 1910.1028(a)(2):

1. Airborne: The maximum time-weighted average (TWA) exposure limit is 1 part of benzene vapor per million parts of air (1 ppm) for an 8-hour workday and the maximum short-term exposure limit (STEL) is 5 ppm for any 15-minute period.

2. Dermal: Eye contact shall be prevented and skin contact with liquid benzene shall be limited.

C. Appearance and odor: Benzene is a clear, colorless liquid with a pleasant, sweet odor. The odor of benzene does not provide adequate warning of its hazard.

II. Health Hazard Data

A. Ways in which benzene affects your health. Benzene can affect your health if you inhale it, or if it comes in contact with your skin or eyes. Benzene is also harmful if you happen to swallow it.

B. Effects of overexposure. 1. Short-term (acute) overexposure: If you are overexposed to high concentrations of benzene, well above the levels where its odor is first recognizable, you may feel breathless, irritable, euphoric, or giddy; you may experience irritation in eyes, nose, and respiratory tract. You may develop a headache, feel dizzy, nauseated, or intoxicated. Severe exposures may lead to convulsions and loss of consciousness.

2. Long-term (chronic) exposure. Repeated or prolonged exposure to benzene, even at relatively low concentrations, may result in various blood disorders, ranging from anemia to leukemia, an irreversible, fatal disease. Many blood disorders associated with benzene exposure may occur without symptoms.

III. Protective Clothing and Equipment

A. Respirators. Respirators are required for those operations in which engineering controls or work practice controls are not feasible to reduce exposure to the permissible level. However, where employers can document that benzene is present in the workplace less than 30 days a year, respirators may be used in lieu of engineering controls. If respirators are worn, they must have joint Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (NIOSH) seal of approval, and cartridge or canisters must be replaced before the end of their service life, or the end of the shift, whichever occurs first. If you experience difficulty

breathing while wearing a respirator, you may request a positive pressure respirator from your employer. You must be thoroughly trained to use the assigned respirator, and the training will be provided by your employer.

B. Protective Clothing. You must wear appropriate protective clothing (such as boots, gloves, sleeves, aprons, etc.) over any parts of your body that could be exposed to liquid benzene.

C. Eye and Face Protection. You must wear splash-proof safety goggles if it is possible that benzene may get into your eyes. In addition, you must wear a face shield if your face could be splashed with benzene liquid.

IV. Emergency and First Aid Procedures

A. Eye and face exposure. If benzene is splashed in your eyes, wash it out immediately with large amounts of water. If irritation persists or vision appears to be affected see a doctor as soon as possible.

B. Skin exposure. If benzene is spilled on your clothing or skin, remove the contaminated clothing and wash the exposed skin with large amounts of water and soap immediately. Wash contaminated clothing before you wear it again.

C. Breathing. If you or any other person breathes in large amounts of benzene, get the exposed person to fresh air at once. Apply artificial respiration if breathing has stopped. Call for medical assistance or a doctor as soon as possible. Never enter any vessel or confined space where the benzene concentration might be high without proper safety equipment and at least one other person present who will stay outside. A life line should be used.

D. Swallowing. If benzene has been swallowed and the patient is conscious, do not induce vomiting. Call for medical assistance or a doctor immediately.

V. Medical Requirements

If you are exposed to benzene at a concentration at or above 0.5 ppm as an 8-hour time-weighted average, or have been exposed at or above 10 ppm in the past while employed by your current employer, your employer is required to provide a medical examination and history and laboratory tests within 60 days of the effective date of this standard and annually thereafter. These tests shall be provided without cost to you. In addition, if you are accidentally exposed to benzene (either by ingestion, inhalation, or skin/eye contact) under emergency conditions known or suspected to constitute toxic exposure to benzene, your employer is required to make special laboratory tests available to you.

VI. Observation of Monitoring

Your employer is required to perform measurements that are representative of your exposure to benzene and you or your designated representative are entitled to observe the monitoring procedure. You are entitled to observe the steps taken in the measurement procedure, and to

record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, you or your representative must also be provided with, and must wear the protective clothing and equipment.

VII. Access to Records

You or your representative are entitled to see the records of measurements of your exposure to benzene upon written request to your employer. Your medical examination records can be furnished to yourself, your physician or designated representative upon request by you to your employer.

VIII. Precautions for Safe Use, Handling and Storage

Benzene liquid is highly flammable. It should be stored in tightly closed containers in a cool, well ventilated area. Benzene vapor may form explosive mixtures in air. All sources of ignition must be controlled. Use non-sparking tools when opening or closing benzene containers. Fire extinguishers, where provided, must be readily available. Know where they are located and how to operate them. Smoking is prohibited in areas where benzene is used or stored. Ask your supervisor where benzene is used in your area and for additional plant safety rules.

29 CFR 1910.1028, Appendix B
Substance Technical Guidelines for Benzene
(Verified against Standard January 2008)

I. Physical and Chemical Data

A. Substance identification.

1. Synonyms: Benzol, benzole, coal naphtha, cyclohexatriene, phene, phenyl hydride, pyrobenzol. (Benzin, petroleum benzin and Benzine do not contain benzene).

2. Formula: C(6)H(6) (CAS Registry Number: 71-43-2)

B. Physical data.

1. Boiling Point (760 mm Hg); 80.1 deg. C (176 deg. F)

2. Specific Gravity (water = 1): 0.879

3. Vapor Density (air = 1): 2.7

4. Melting Point: 5.5 deg. C (42 deg. F)

5. Vapor Pressure at 20 deg. C (68 deg. F): 75 mm Hg

6. Solubility in Water: .06%

7. Evaporation Rate (ether = 1): 2.8

8. Appearance and Odor: Clear, colorless liquid with a distinctive sweet odor.

II. Fire, Explosion, and Reactivity Hazard Data

A. Fire.

1. Flash Point (closed cup): - 11 deg. C (12 deg. F)

2. Autoignition Temperature: 580 deg. C (1076 deg. F)

3. Flammable limits in Air. % by Volume: Lower: 1.3%, Upper: 7.5%

4. Extinguishing Media: Carbon dioxide, dry chemical, or foam.

5. Special Fire-Fighting procedures: Do not use solid stream of water, since stream will scatter and spread fire. Fine water spray can be used to keep fire-exposed containers cool.

6. Unusual fire and explosion hazards: Benzene is a flammable liquid. Its vapors can form explosive mixtures. All ignition sources must be controlled when benzene is used, handled, or stored. Where liquid or vapor may be released, such areas shall be considered as hazardous locations. Benzene vapors are heavier than air; thus the vapors may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which benzene is handled.

7. Benzene is classified as a 1 B flammable liquid for the purpose of conforming to the requirements of 29 CFR 1910.106. A concentration exceeding 3,250 ppm is considered a potential fire explosion hazard. Locations where benzene may be present in quantities sufficient to produce explosive or ignitable mixtures are considered Class I Group D for the purposes of conforming to the requirements of 29 CFR 1910.309.

B. Reactivity.

1. Conditions contributing to instability: Heat.

2. Incompatibility: Heat and oxidizing materials.

3. Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide).

III. Spill and Leak Procedures

A. Steps to be taken if the material is released or spilled. As much benzene as possible should be absorbed with suitable materials, such as dry sand or earth. That remaining must be flushed with large amounts of water. Do not flush benzene into a confined space, such as a sewer, because of explosion danger. Remove all ignition sources. Ventilate enclosed places.

B. Waste disposal method. Disposal methods must conform to other jurisdictional regulations. If allowed, benzene may be disposed of: (a) By absorbing it in dry sand or earth and disposing in a sanitary landfill; (b) if small quantities, by removing it to a safe location from buildings or other combustible sources, pouring it in dry sand or earth and cautiously igniting it; and (c) if large quantities, by atomizing it in a suitable combustion chamber.

IV. Miscellaneous Precautions

A. High exposure to benzene can occur when transferring the liquid from one container to another. Such operations should be well ventilated and good work practices must be established to avoid spills.

B. Use non-sparking tools to open benzene containers which are effectively grounded and bonded prior to opening and pouring.

C. Employers must advise employees of all plant areas and operations where exposure to benzene could occur. Common operations in which high exposures to benzene may be encountered are: the primary production and utilization of benzene, and transfer of benzene.

ATTACHMENT 6

Attachment 6

Soil Reuse Proposal

TABLE OF CONTENTS

Section **Title** **Page**

1.0 INTRODUCTION **1**

2.0 WASTE CLASSIFICATION **1**

3.0 PROPOSED REUSE **1**

3.1 Location *1*
3.2 Soil Volume *2*
3.3 Reuse Area *2*

3.4 RELIABILITY AND EFFECTIVENESS OF REUSE **2**

3.5 OTHER APPLICABLE DATA **3**

3.5.1 Permits *3*
3.5.2 Design *3*
3.5.3 Controls *4*
3.5.4 Health and Safety *4*
3.5.5 Site Restoration *4*
3.5.6 Dismantling *5*

1.0 INTRODUCTION

This Soil Reuse Proposal has been prepared in connection with the approved Consolidated Remedial Action Workplan (RAWP) and Addendum No. 3 for the Hatco facility, located in Fords, New Jersey (Site) and in accordance with the New Jersey Department of Environmental Protection's (NJDEP) Technical Requirements for Site Remediation. The Site is currently owned and operated by Hatco. Details concerning site location, history and background are provided in Section 2 of the approved Consolidated RAWP.

This Soil Reuse Proposal has been prepared to address the excavation of several areas of contaminated soils and sediment (both on- and off-site) and the reuse of these materials as backfill in excavations under the proposed cap. The areas from which soil and sediment will be excavated are shown on Figures 1 and 2 of Addendum 3 to the Consolidated RAWP. Additional soil and sediment from Channels A, B, C, and D as well as soil excavations to refine the perimeter of the engineered cap [with PCBs less than 500 milligrams per kilogram (mg/kg) dry weight and greater than either 2 mg/kg for on site, 0.49 mg/kg for off site soils and 1 mg/kg for off site sediment] will also be used as backfill for excavations under the proposed cap. A small percentage of these soils and sediments designated for re-use also contain low levels of bis(2-ethylhexyl)phthalate, as discussed in Addendum 3. Estimated volumes of these materials designated for re-useare provided below.

However, it should be noted that this Re-Use Proposal only applies to backfilling of areas under the engineered cap which are not currently designated wetlands. All excavations performed within the boundaries of the wetlands will be backfilled with certified clean fill and restored as a wetland. No soils designated for re-use will be emplaced in wetland areas. This is further discussed below.

2.0 WASTE CLASSIFICATION

The nature and extent of contaminated soils at the Site are well defined as described in the approved Consolidated RAWP and Weston's *2007 Data Progress Report*. Over 2,000 soil samples have been collected and analyzed throughout the Site as part of the various site and remedial investigations. The results from the analysis of samples collected in the areas from which soil and sediment for reuse will be derived are summarized in the tables provided in the 2007 Data Progress Report. Sample locations are shown on the figures included in the 2007 Progress Report. Based on the levels of constituents detected in these soils and sediments, and based on generator knowledge, these soils and sediments are not classified as hazardous waste as per N.J.A.C. 7:26G-5.1.

3.0 PROPOSED REUSE

3.1 Location

The proposed reuse area is located in Woodbridge Township, Middlesex County, New Jersey, in the town of Fords, Block 67, Lot 100-A.

3.2 Soil Volume

Soil and sediment volume estimates for each of the respective areas identified in Figures 3 of Addendum 3 are outlined below. The soil and sediment from these areas have PCB concentrations less than 500 mg/kg dry weight and no visible LNAPL.

Area	Approx. Volume (in-place cubic yards)
Main LNAPL Excavation Overburden	12,577
Soil Excavations to Define the Cap Perimeter	6,700
Channels A, B, C, and Pond (Off Site)	700
Channel D (Off Site)	2,900
Total	**22,877**

3.3 Reuse Area

The areas to receive the soil and sediment to be reused will be the southeastern portion of the LNAPL excavation area and the remediated former lagoons as shown on Figure 1 of Addendum 3. The LNAPL excavation area will be produced as a result of removal of soil with PCBs greater than 500 mg/kg and visible LNAPL. A portion of this excavation will extend below the groundwater table.

The southwestern portion of the LNAPL excavation will be backfilled with certified clean fill as part of the wetland restoration remedy. This Variance addresses the southeastern portion of the LNAPL plume, which will be backfilled through use of reused soils. The total volume of fill required for the eastern portion of the LNAPL excavation area is approximately 11,986 in-place cubic yards. The remaining 10,800 cubic yards of excavated soils will be placed under an engineered cap within the former lagoons along the southern border of the Hatco property.

Following backfilling of the eastern LNAPL excavation with the soil reuse materials as described above, these areas will be placed under an engineered cap and deed notice. The cap will be designed and emplaced as outlined in the USEPA's March 30, 2005 approval letter for risk-based PCB disposal. The cap design will ensure that backfilled materials are capped with a geotextile liner of no less than 50 millimeters in thickness, with a permeability of no less than 10E-7 centimeters per second, per the requirements of the USEPA. Weston will submit a certification by a New Jersey-licensed professional engineer to the USEPA within 30 days of cap placement.

3.4 Reliability and Effectiveness of Reuse

The proposed remedy for the southeastern portion of the LNAPL area is excavation, off-site disposal of waste exceeding 500 mg/kg PCB, and placement of an engineered cap and deed notice. This is reliable and uses fully demonstrated technologies. The long-term effectiveness of this remedy requires long-term maintenance. With such maintenance, this remedy will be effective in the long term with minimal residual risk. Performance of this remedy is easily monitored. The long-term maintenance and effectiveness will be evaluated consistent with NJDEP's requirement for a biannual certification.

The proposed remedy for the southwestern portion of the LNAPL area includes excavation, backfilling with certified clean fill, and wetland restoration. No materials will be reused in this area.

The proposed remedy will be effective in preventing contact by human and ecological receptors with soils to be reused. The proposed soil reuse will not affect the performance, reliability or effectiveness of any of the on-site remediation remedies.

3.5 Other Applicable Data

3.5.1 Permits

The following permits will, or are likely to be, required to implement the proposed soil reuse.

- Soil Erosion and Sediment Control Plan – Weston has obtained approval from Freehold Soil Conservation District for the soil and sediment remediation and reuse.
- Wetland Permit - Weston has submitted this permit application to NJDEP. This certificate also serves as the 401 Water Quality Certificate required under the Federal Act at 33 U.S.C. §1341 [as indicated in NJAC 7:7A-2.1(d)].
- Stream Encroachment Permit – Weston has submitted this permit application to NJDEP.
- Local Site Plan Approval – waived by Woodbridge Township

3.5.2 Design

Sediments to be reused will be stabilized or dewatered, as necessary, to improve their structural characteristics prior to placement under the on-site cap. The need for stabilizing sediments will be determined in the field. If the sediments are too wet and soft to allow for grading and cap placement, addition of granular material (e.g., sand or gravel) or absorbents (e.g., fly ash) will be considered to improve the structural properties of the sediments. Where standing water is present in an excavation at the time of backfilling, structural fill such as stone or dense graded aggregate (DGA), and a geotextile sheet shall be placed forming a bridge lift prior to the placement of soil.

The contaminated soil under the cap will be demarcated through the use of physical and administrative controls including on-site deed restrictions.

Maintenance of the cap will be required in accordance with N.J.A.C. 7:26E-6.4(g) with a biannual certification being submitted to NJDEP. The cap will be soil cover in the non-traffic portions of the Site and asphalt in the traffic portions. Routine maintenance of the soil cover will be performed to maintain an effective grass/vegetation cover. Periodic mowing will be conducted to prevent growth of trees or shrubs that could penetrate the cover layer. Reseeding will be performed as necessary to prevent bare areas that could allow erosion of the cover. Routine maintenance of the asphalt cap will be performed to maintain an effective cover. Periodic patching and re-surfacing will be conducted as needed. The cap will be evaluated and maintained as outlined in the USEPA's March 30, 2005 approval letter for risk-based PCB disposal.

Annual inspections will be performed to ensure that the cap is in good condition. Appropriate corrective action will be implemented if evidence of erosion or degradation of the cap is observed.

3.5.3 Controls

Measures to control soil erosion and dust are prescribed in the Soil Erosion and Sediment Control Plan, approved by Freehold Soil Conservation District.

3.5.4 Health and Safety

A site-specific HASP to address all remediation activities at the Site has been prepared to implement the RA. The HASP was prepared in accordance with all applicable federal, state and local requirements including, but not limited to, Occupational Safety and Health Administration Regulations 29 CFR Part 1910 (Occupational Safety and Health Standards) and 29 CFR Part 1926 (Safety and Health Regulations for Construction) and N.J.A.C. 7:26E-1.9. The HASP outlines the health and safety procedures and equipment required for activities to minimize the potential for exposure to site workers, including construction workers. The HASP will be submitted to the NJDEP after retention of the Remediation Contractor and prior to implementation of the RA at the Site.

3.5.5 Site Restoration

Areas of the site from which soil and sediment will be removed for reuse will be restored. Soil and sediment excavation areas will be restored to original grade by placing certified clean fill and topsoil. The fill will be seeded and mulched to prevent erosion. Streambeds where sediments are removed for reuse will be backfilled with gravel to restore the drainage channel, and will be allowed to naturally re-vegetate.

3.5.6 Dismantling

No dismantling of structures will be required to implement the reuse plan.

SOIL REUSE SAMPLING FREQUENCY VARIANCE REQUEST

Weston Solutions, Inc. (Weston®) is requesting a reduction in the sample collection frequency required per the *Technical Requirements for Site Remediation* (N.J.A.C. 7:26E-6.4(d)) for the portion of soils that will be removed during excavations and then reused as backfill in accordance with the New Jersey Department of Environmental Protection (NJDEP) approved August 18, 2005 Consolidated Remedial Action Work Plan (RAWP) for the Hatco facility. Weston is providing the required information for this variance request in the order identified in N.J.A.C. 7:26E-1.6(d)1 – documenting compliance with the technical requirements.

N.J.A.C. 7:26E-1.6(d)1: *To petition for a variance from a requirements in N.J.A.C. 7:26E-2 through 6, the petitioner shall submit the following information…*

N.J.A.C. 7:26E-1.6(d)1.i*: The name and address of the person submitting the petition.*

The name and address of the person submitting the petition is:

Weston Solutions, Inc.
205 Campus Drive
Edison, New Jersey 08837
Daniel R. Kopcow, P.E., PMP, Project Manager

N.J.A.C. 7:26E-1.6(d)1.ii*: The name and address of the person conducting the remediation.*

The name and address of the person conducting the remediation is:

Weston Solutions, Inc.
205 Campus Drive
Edison, New Jersey 08837
Daniel R. Kopcow, P.E., PMP, Project Manager

N.J.A.C. 7:26E-1.6(d)1.iii: *The names and addresses of the owner(s) and occupant(s) of the site which is the subject of the variance.*

The name and address of the owner and occupant of the subject facility is:

Hatco Corporation / Chemtura
1020 King Georges Post Road
Fords, NJ 08863
Susan Castles, Environmental Health and Safety Manager

N.J.A.C. 7:26E-1.6(d)1.iv: *The street address and all tax block and lot numbers of the site which is the subject of the variance.*

The facility is found at Block 60 Lot 1.B1 and Block 67 Lot 100.A of the Tax Maps of Fords Township. The facility street address is 1020 King Georges Post Road.

N.J.A.C. 7:26E-1.6(d)1.v: *A description of the proposed alternate approach and applicable N.J.A.C. citation.*

Weston is requesting an alternate soil sample collection frequency other than that specified in N.J.A.C. 7:26E-6.4(d)1.ii for reuse of soils generated from the excavations associated with the soil remediation. Per N.J.A.C. 7:26E-6.4(d)1.ii, if soils will be reused at the site, they are to be sampled at a frequency of one sample per 20 cubic yards for the first 100 cubic yards, with one additional sample per each additional 100 cubic yards. However, N.J.A.C. 7:26E-6.4(d)1.iii allows for a reduced sampling frequency for quantities of soils greater than 1,000 cubic yards.

Weston is proposing a reduction in frequency for the soils to be excavated during the remedial work. At this time, Weston estimates that approximately 22,877 cubic yards of soil and sediment with PCBs less than 500 mg/kg dry weight, the site PCB cleanup standard, will be excavated and reused on site. If acceptable to NJDEP, this soil and sediment will be sampled at a frequency of one discrete sample collected and analyzed for PCBs per 1,000 cubic yards of excavated material to be reused as backfill.

The soil and sediment material to be reused will be excavated and stockpiled on site, and samples will be collected from the piles at the frequency requested above. Analysis of the stockpile samples will be limited to PCBs which is the primary site contaminant of concern. If the analytical results indicate that PCBs are present at concentrations less than or equal to 500 mg/kg dry weight, soils will be reused in the LNAPL excavation area within the limits of the proposed cap and deed notice.

Weston has already collected over 2000 samples of the material to be excavated and reused in order to fully characterize the nature and extent of contamination in the reuse material.

N.J.A.C. 7:26E-1.6(d)1.vi: *A description of the specific conditions applicable to the variance.*

All soils and sediment proposed for reuse will be generated from the excavation work associated with the soil remediation. Based on the historic data summarized in the consolidated RAWP and the results of Weston's 2007 investigation, the soil and sediment proposed for reuse has shown levels of PCBs below the site-specific soil criterion of 500 mg/kg dry weight.

However, in order to excavate the contaminated interval associated with the LNAPL plume, the overburden material must be removed and stockpiled separately for eventual reuse.

N.J.A.C. 7:26E-1.6(d)1.vii: *The technical basis for the variance pursuant to [N.J.A.C. 7:26E-1.6(c)].*

The basis for this variance request is two-fold. First, the approved RAWP and the USEPA 30 March 2005 approval letter state that any soil with concentrations of PCBs at or below the site-specific soil criterion of 500 mg/kg dry weight is considered acceptable to remain on site and could be used as fill in areas under deed restriction and/or an engineered cap. This would include

soils contained in the smaller excavations around the perimeter of the cap, as well as the overburden material atop the LNAPL excavation.

The second basis for this variance request is that several feet of soil (overburden) must be removed in order to gain access to the LNAPL-impacted soil that exceeds the cleanup goal. It is logical that this overburden soil can be placed back into the excavation once the soils exceeding the cleanup goal have been removed. The area that is backfilled with re-used soil will be covered by an engineered cap, and a Deed Notice will be implemented for the site.

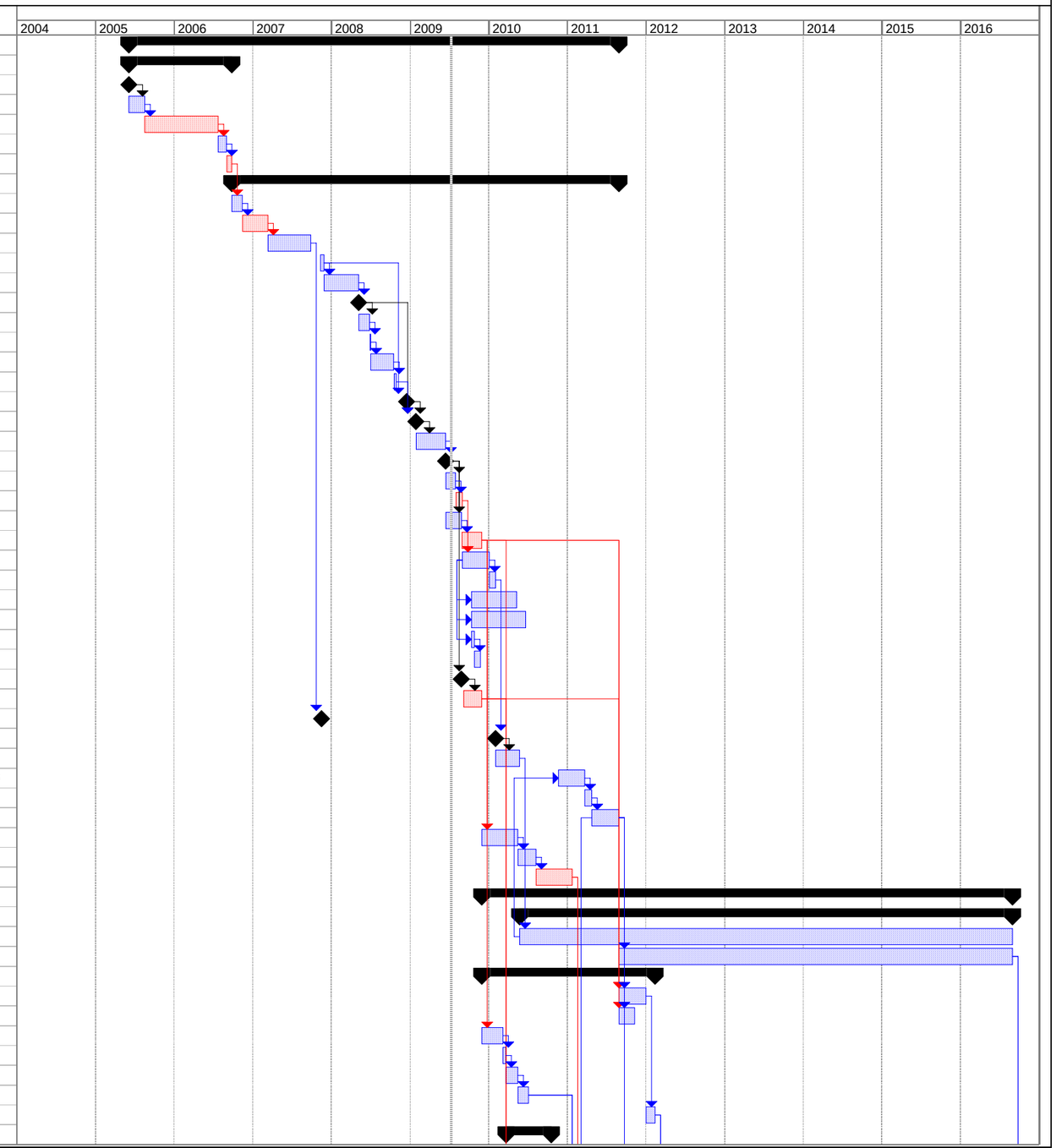
N.J.A.C. 7:26E-1.6(d) 1.viii: *Any other information or data the Department requests to thoroughly evaluate the petition.*

In March 2006, NJDEP and Weston conducted a meeting to discuss the RAWP. During the meeting, Weston explained that we would be submitting this request for variance for the soil remediation.

ATTACHMENT 7

Project Implementation Schedule
Hatco Site - Fords, NJ
Figure 7

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Pre-Remediation**	**1627 days**	**Mon 6/6/05**	**Mon 8/29/11**	
2	**ACO**	**342 days**	**Mon 6/6/05**	**Tue 9/26/06**	
3	ACO Effective Date	0 days	Mon 6/6/05	Mon 6/6/05	
4	Consolidated RAWP Preparation & NJDEP Submittal	54 days	Mon 6/6/05	Thu 8/18/05	3
5	NJDEP Review	243 days	Fri 8/19/05	Tue 7/25/06	4
6	Consolidated RAWP Addendum Nos. 1 & 2 Preparation	28 days	Wed 7/26/06	Fri 9/1/06	5
7	NJDEP Review & Approval of Consolidated RAWP	17 days	Mon 9/4/06	Tue 9/26/06	6
8	**FIELD VERIFICATION AND PILOT STUDIES**	**1285 days**	**Wed 9/27/06**	**Mon 8/29/11**	
9	Sampling & Analysis Plan Preparation	35 days	Wed 9/27/06	Tue 11/14/06	7
10	NJDEP Review	84 days	Thu 11/16/06	Tue 3/13/07	9
11	Verification Sampling and Analysis	143 days	Wed 3/14/07	Fri 9/28/07	10
12	Excavation Pilot Study Implementation	13 days	Tue 11/13/07	Wed 11/28/07	
13	Excavation Pilot Study Data Evaluation	115 days	Thu 11/29/07	Wed 5/7/08	12
14	Excavation Pilot Study Progress Report Submittal	0 days	Thu 5/8/08	Thu 5/8/08	13
15	LNAPL Pilot Study Preparation	36 days	Fri 5/9/08	Fri 6/27/08	14
16	LNAPL Pilot Study Implementation	3 days	Mon 6/30/08	Wed 7/2/08	15
17	LNAPL Pilot Study Data Evaluation & Modeling	77 days	Thu 7/3/08	Fri 10/17/08	16
18	LNAPL Pilot Study Progress Report Submittal	8 days	Mon 10/20/08	Wed 10/29/08	17
19	2007 Data Progress Report Submittal	0 days	Wed 12/17/08	Wed 12/17/08	12
20	Meeting with NJDEP & USEPA	0 days	Thu 1/29/09	Thu 1/29/09	14,18,19
21	Await NJDEP/USEPA Response on Remediation Approach	97 days	Fri 1/30/09	Mon 6/15/09	20
22	Meet with NJDEP & USEPA	0 days	Tue 6/16/09	Tue 6/16/09	21
23	IRM RAWP Preparation and Submittal	33 days	Wed 6/17/09	Fri 7/31/09	22
24	NJDEP & USEPA Review & Approval of IRM RAWP	22 days	Mon 8/3/09	Tue 9/1/09	23
25	RAWP Addendum No. 3 Preparation	53 days	Wed 6/17/09	Fri 8/28/09	22
26	NJDEP & USEPA Review & Approval of RAWP Addendum 3	66 days	Mon 8/31/09	Mon 11/30/09	25
27	Design Phase I Active LNAPL Recovery System	89 days	Wed 9/2/09	Mon 1/4/10	24
28	Procure Phase I Active LNAPL Recovery System	21 days	Tue 1/5/10	Tue 2/2/10	27
29	NJDEP Air Permit	150 days	Wed 10/14/09	Tue 5/11/10	27SS+30 days
30	NJDEP Water Diversion Permit	180 days	Wed 10/14/09	Tue 6/22/10	27SS+30 days
31	MCUA Discharge Permit Preparation	10 days	Wed 10/14/09	Tue 10/27/09	27SS+30 days
32	MCUA Review and Issuance of Discharge Permit	20 days	Wed 10/28/09	Tue 11/24/09	31
33	Wetlands GP #4 and Flood Hazard Area Permit Applications Submittal	0 days	Fri 8/28/09	Fri 8/28/09	22
34	NJDEP Review & Issuance of Wetlands GP #4 and Flood Hazard Area Permits	60 days	Tue 9/8/09	Mon 11/30/09	33
35	Feehold Soil Cons. Dist. Approve SESC	0 days	Sun 11/18/07	Sun 11/18/07	11
36	Mobilize On Site	0 days	Tue 2/2/10	Tue 2/2/10	28
37	Install & Startup Phase I Active LNAPL Recovery System	80 days	Wed 2/3/10	Tue 5/25/10	36
38	Design Phase II Active LNAPL Recovery System	88 days	Mon 11/22/10	Wed 3/23/11	46SS+128 days
39	Procure Phase II Active LNAPL Recovery System	23 days	Thu 3/24/11	Mon 4/25/11	38
40	Install & Startup Phase II Active LNAPL Recovery System	90 days	Tue 4/26/11	Mon 8/29/11	39
41	Final Grade & Stormwater Design Plan	120 days	Tue 12/1/09	Mon 5/17/10	26
42	RAWP Addendum No. 4 Preparation & Submittal	60 days	Tue 5/18/10	Mon 8/9/10	41
43	NJDEP, USEPA, Woodbridge Twp & Freehold SCD Review & Approval of RAWP Addendum No. 4	120 days	Tue 8/10/10	Mon 1/24/11	42
44	**Remediation**	**1761 days**	**Tue 12/1/09**	**Tue 8/30/16**	
45	**LNAPL Recovery**	**1635 days**	**Wed 5/26/10**	**Tue 8/30/16**	
46	Operate Phase I Active LNAPL Recovery System	1635 days	Wed 5/26/10	Tue 8/30/16	37
47	Operate Phase II Active LNAPL Recovery System	1306 days	Tue 8/30/11	Tue 8/30/16	40
48	**ON-SITE SOILS**	**575 days**	**Tue 12/1/09**	**Mon 2/13/12**	
49	Soil Excavation in Wetlands	90 days	Tue 8/30/11	Mon 1/2/12	26,34,40
50	Soil with PCBs > 500 ppm Excavation in LNAPL Plume	53 days	Tue 8/30/11	Thu 11/10/11	40,26
51	Soil with PCBs > 500 ppm Excavation Hot Spots	70 days	Tue 12/1/09	Mon 3/8/10	26
52	Scrape Areas A, B, C, D Excavation	10 days	Tue 3/9/10	Mon 3/22/10	51
53	Cap Area Hot Spot Excavation	40 days	Tue 3/23/10	Mon 5/17/10	52
54	Reuse of Overburden	35 days	Tue 5/18/10	Mon 7/5/10	53
55	Wetland Restoration	30 days	Tue 1/3/12	Mon 2/13/12	49
56	**OFF-SITE SOILS**	**150 days**	**Wed 3/24/10**	**Tue 10/19/10**	

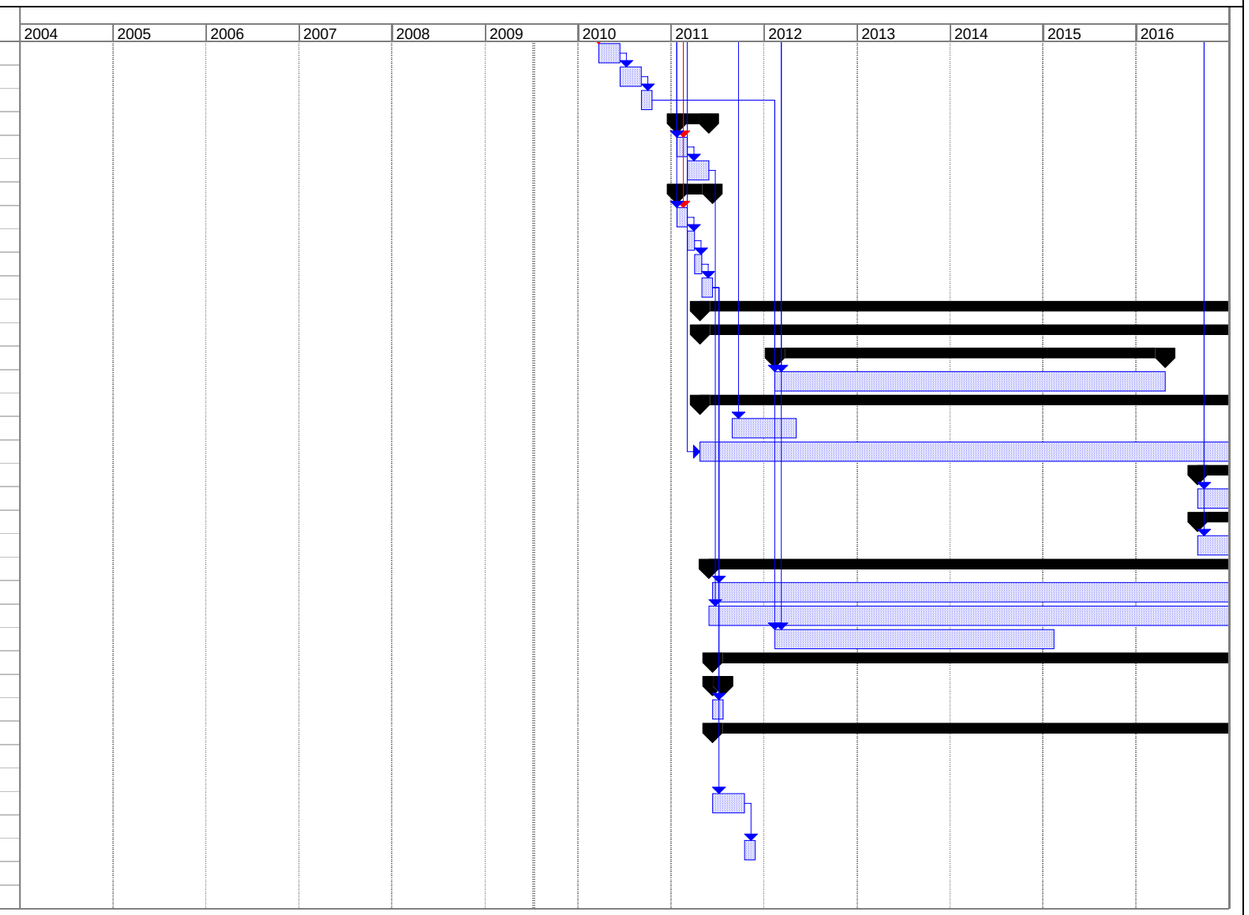


Project: HatcoProject
Date: Thu 7/9/09

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Project Implementation Schedule
Hatco Site - Fords, NJ
Figure 7

ID	Task Name	Duration	Start	Finish	Predecessors
57	Channels A, B, and C Excavation & Restoration	60 days	Wed 3/24/10	Tue 6/15/10	26,34
58	Channel D Excavation & Restoration	60 days	Wed 6/16/10	Tue 9/7/10	57
59	Welands Restoration	30 days	Wed 9/8/10	Tue 10/19/10	58
60	**SOIL CAP**	**90 days**	**Tue 1/25/11**	**Mon 5/30/11**	
61	Regrade Soil Cap Area	30 days	Tue 1/25/11	Mon 3/7/11	54,43
62	Soil Cap Placement	60 days	Tue 3/8/11	Mon 5/30/11	61
63	**ASPHALT CAP**	**100 days**	**Tue 1/25/11**	**Mon 6/13/11**	
64	Regrade Asphalt Cap Area	30 days	Tue 1/25/11	Mon 3/7/11	54,43
65	Asphalt - Over Existing Pavement	20 days	Tue 3/8/11	Mon 4/4/11	64
66	Asphalt - Over Gravel	20 days	Tue 4/5/11	Mon 5/2/11	65
67	Asphalt - Over Soil	30 days	Tue 5/3/11	Mon 6/13/11	66
68	**Post-Remediation**	**2730 days**	**Tue 4/26/11**	**Mon 10/11/21**	
69	**O&M**	**2645 days**	**Tue 4/26/11**	**Mon 6/14/21**	
70	**WETLANDS RESTORATION**	**1095 days**	**Tue 2/14/12**	**Mon 4/25/16**	
71	Wetlands Restoration Monitoring (3 years)	1095 days	Tue 2/14/12	Mon 4/25/16	59,55
72	**LNAPL RECOVERY**	**2610 days**	**Tue 4/26/11**	**Mon 4/26/21**	
73	Post-Recovery LNAPL Sampling	180 days	Tue 8/30/11	Mon 5/7/12	40
74	Passive LNAPL Trenching (10 years)	2610 days	Tue 4/26/11	Mon 4/26/21	40SS
75	**SHALLOW WELL MONITORING MNA**	**523 days**	**Wed 8/31/16**	**Fri 8/31/18**	
76	Shallow Well Monitoring/MNA (2 years)	523 days	Wed 8/31/16	Fri 8/31/18	47
77	**DEEP WELL MONITORING**	**523 days**	**Wed 8/31/16**	**Fri 8/31/18**	
78	Deep Well Groundwater MNA (2 years)	523 days	Wed 8/31/16	Fri 8/31/18	47
79	**ASHPHALT/SOIL CAP**	**2620 days**	**Tue 5/31/11**	**Mon 6/14/21**	
80	Asphalt Cap O&M (10 years)	2610 days	Tue 6/14/11	Mon 6/14/21	67
81	Soil Cap O&M (10 years)	2610 days	Tue 5/31/11	Mon 5/31/21	62
82	Sediment Monitoring (3 years)	784 days	Tue 2/14/12	Fri 2/13/15	59,55
83	**Final Reports**	**2695 days**	**Tue 6/14/11**	**Mon 10/11/21**	
84	**DEMOBILIZATION**	**30 days**	**Tue 6/14/11**	**Mon 7/25/11**	
85	Demobilization	30 days	Tue 6/14/11	Mon 7/25/11	67
86	**FINAL REPORTS**	**2695 days**	**Tue 6/14/11**	**Mon 10/11/21**	
87	Final LNAPL RA Report Prep & Approval	90 days	Tue 4/27/21	Mon 8/30/21	74
88	Receive LNAPL NFA	30 days	Tue 8/31/21	Mon 10/11/21	87
89	Final Soil & Sediment RA Report Prep & Approval	90 days	Tue 6/14/11	Mon 10/17/11	67
90	Final GW RA Report	90 days	Mon 9/3/18	Fri 1/4/19	78,76
91	Receive Soil & Sediment NFA	30 days	Tue 10/18/11	Mon 11/28/11	89
92	CEA Removal & Receipt of GW NFA	30 days	Mon 1/7/19	Fri 2/15/19	90
93	NJDEP Release from ACO	30 days	Mon 2/18/19	Fri 3/29/19	92



Project: HatcoProject
Date: Thu 7/9/09

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

ATTACHMENT 8