MEMORANDUM:

SUBJECT: Transmittal of SESD QAPP for Sonford Products, Flowood, Mississippi
SESD Project No. 08-0136

FROM: Brian Striggow, Superfund and Air Section

THRU: Danny France, Chief, Superfund and Air Section

TO: Keriema Newman, Superfund Division

During the week of February 4, 2008, Science and Ecosystem Support Division (SESD) personnel will travel to Flowood, MS to continue the Remedial Investigation of the Sonford Products Site. This investigation is a joint effort by SESD and Black & Veatch. A Remedial Investigation Quality Assurance Project Plan (QAPP) has been prepared by Black & Veatch and has been conveyed via other channels. The attached SESD QAPP relates to SESD procedures and methods to be used in the field execution of the Black & Veatch QAPP.

If you have any questions about this document, please contact me at (706) 355-8619 or at email striggow.brian@epamail.epa.gov

Attachment

cc: Reggie Dawkins, Black & Veatch
## SECTION A: Project Planning Elements

### A1. Title (Project Name):
Sonford Products Remedial Investigation

<table>
<thead>
<tr>
<th>Project Location:</th>
<th>151 Custom Drive, Flowood, MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Requestor, Position and Organization:</td>
<td>Keriema Newman, Remedial Project Manager (RPM), Superfund Division</td>
</tr>
<tr>
<td>Project Leader’s Name, Position, and Organization:</td>
<td>Brian Striggow, Engineer, Science and Ecosystem Support Division, Enforcement and Investigations Branch</td>
</tr>
<tr>
<td>Project Leader’s Signature:</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td>1-30-08</td>
</tr>
<tr>
<td>Technical Reviewer’s Name and Position:</td>
<td>Don Hunter, Environmental Scientist</td>
</tr>
<tr>
<td>Technical Reviewer’s Signature:</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td>2/01/08</td>
</tr>
<tr>
<td>Section Chief/DAO’s Name and Position:</td>
<td>Danny France, Chief, Superfund and Air Section</td>
</tr>
<tr>
<td>Section Chief/DAO’s Signature:</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td>1/31/08</td>
</tr>
</tbody>
</table>

### A2. Table of Contents
N/A

### A3. Distribution List
Keriema Newman, Superfund Division
Reggie Dawkins, Black & Veatch

### A4. Project Personnel (list below):

<table>
<thead>
<tr>
<th>Organization (list below):</th>
<th>Responsibilities (list below):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brian Striggow</td>
<td>Project Leader</td>
</tr>
<tr>
<td>Jon Vail</td>
<td>Site Safety Officer</td>
</tr>
<tr>
<td>Linda George</td>
<td>Sampler</td>
</tr>
<tr>
<td>Keriema Newman</td>
<td>RPM, sampler</td>
</tr>
<tr>
<td>Brian Hemdon</td>
<td>Sample Manager</td>
</tr>
<tr>
<td>Jerry Ackerman</td>
<td>DPT operator</td>
</tr>
<tr>
<td>Don Fortson</td>
<td>DPT tender</td>
</tr>
<tr>
<td>Rick Morocco</td>
<td>Sampler</td>
</tr>
<tr>
<td>Sara Waterson</td>
<td>Sampler</td>
</tr>
<tr>
<td>Reggie Dawkins</td>
<td>Geologist</td>
</tr>
<tr>
<td>Black &amp; Veatch</td>
<td></td>
</tr>
</tbody>
</table>

SESDFORM-010-R2
Quality Assurance Project Plan  
U.S. Environmental Protection Agency  
Science and Ecosystem Support Division  
980 College Station Road  
Athens, GA 30605

<table>
<thead>
<tr>
<th>A5. Problem Definition (Objectives) and Background:</th>
</tr>
</thead>
<tbody>
<tr>
<td>This site was occupied by a past formulator of wood treating solutions, primarily of pentachlorophenol products. Various releases have resulted in groundwater and soils contaminated with pentachlorophenol, dioxin, and other contaminants which are being investigated in an ongoing Remedial Investigation. In this mobilization, the following is to be investigated:</td>
</tr>
<tr>
<td>1. Determine areal and vertical extents of contamination in both the wetland area south of the site manufacturing area and along the western boundary of the site.</td>
</tr>
<tr>
<td>2. Determine if migration of contamination via groundwater is occurring in the previously determined direction of groundwater flow.</td>
</tr>
<tr>
<td>3. Determine if vertical migration has occurred at a previously identified contaminated area in the manufacturing area and determine if contamination extends horizontally from said area.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A6. Project Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>This SESD project executes a Remedial Investigation QAPP prepared by Black&amp;Veatch. Relevant portions of that document and a subsequent technical memorandum are attached. The goals described in the B&amp;V QAPP will be achieved in this study by the following general processes.</td>
</tr>
<tr>
<td>1. Full depth direct-push cores will be collected and sampled down to the Yazoo clay (est 22 ft depth) at the locations indicated in the attached Figure 2.</td>
</tr>
<tr>
<td>2. Direct-push screen point samplers will be used to establish temporary wells in the down-gradient direction from the site (northwest). These wells will be sampled and if time permits water levels will be recorded to refine the groundwater flow model.</td>
</tr>
<tr>
<td>3. A full depth direct-push core will be collected and sampled at location SB92 on the attached Figure 2. Surface and subsurface soil samples will be collected at locations radial to the SB92 point.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Decision(s) to be made based on data:</th>
</tr>
</thead>
<tbody>
<tr>
<td>This study is a part of a larger Remedial Investigation effort. The remedial decisions regarding risk to human health and the environment, as well as remedy selection will be based, in part, on data collected in this study.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Applicable regulatory information, action levels, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCLs, R9PRGs, Mississippi soil cleanup criteria, and other site-specific criteria will be used in evaluating the data.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field Study Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 05, 2008</td>
</tr>
</tbody>
</table>
A7. Quality Objectives and Criteria

This is a limited scope field investigation for which advanced sample plan and design criteria do not apply. All samples/sample locations meet the field investigation objectives and purposes summarized in Section A5 and A6 of this QAPP.

A8. Special Training/Certifications

N/A.

A9. Documents and Records

For this project, SESD will implement the following procedures pertaining to Documents and Records:

- SESD Operating Procedure for Logbooks, SESDPROC-010-R3.
- SESD Operating Procedure for Control of Records, SESDPROC-002-R3.

SECTION B: Data Generation and Acquisition

B1. Sampling Design

The following matrix lists the proposed numbers and types of samples to be collected. Sample locations are described in Section A6 of this QAPP.

<table>
<thead>
<tr>
<th>Media</th>
<th>Number of Samples:</th>
<th>Analyses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>95</td>
<td>Dioxin Screening by Immunooassay</td>
</tr>
<tr>
<td>Soil</td>
<td>95</td>
<td>Extractable Organics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pesticides, Metals</td>
</tr>
<tr>
<td>Soil</td>
<td>Estimated 50</td>
<td>Dioxin fixed laboratory analysis</td>
</tr>
<tr>
<td>Water</td>
<td>12</td>
<td>Volatile organics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extractable Organics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total Metals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dioxin</td>
</tr>
</tbody>
</table>
B2. Sampling Methods, General Procedures
The following SESD field measurement and sampling procedures will be followed during this field study, as applicable: (List Below)

<table>
<thead>
<tr>
<th>Field Measurement Procedures</th>
<th>SESDPROC-</th>
<th>Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field pH Measurement</td>
<td>100</td>
<td>R1</td>
</tr>
<tr>
<td>Field Specific Conductance Measurement</td>
<td>101</td>
<td>R1</td>
</tr>
<tr>
<td>Field Temperature Measurement</td>
<td>102</td>
<td>R1</td>
</tr>
<tr>
<td>Field Turbidity Measurement</td>
<td>103</td>
<td>R1</td>
</tr>
<tr>
<td>Groundwater Level and Well Depth Measurement</td>
<td>105</td>
<td>R1</td>
</tr>
<tr>
<td>Global Positioning System</td>
<td>110</td>
<td>R2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Field Sampling</th>
<th>SESDPROC-</th>
<th>Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management of Investigation Derived Waste</td>
<td>202</td>
<td>R1</td>
</tr>
<tr>
<td>Pump Operation</td>
<td>203</td>
<td>R1</td>
</tr>
<tr>
<td>Field Equipment Cleaning and Decontamination</td>
<td>205</td>
<td>R1</td>
</tr>
<tr>
<td>Soil Sampling</td>
<td>300</td>
<td>R1</td>
</tr>
<tr>
<td>Groundwater Sampling</td>
<td>301</td>
<td>R1</td>
</tr>
</tbody>
</table>

B3. Sampling Handling and Custody
All samples will be collected and handled according to the procedures listed in Section B2 of this QAPP. After collection, samples will managed according to the following:

*SESD Operating Procedure for Sample and Evidence Management, SESDPROC-005-R1.*
*SESD Operating Procedure for Packing, Labeling and Shipping of Environmental and Waste Samples SESDPROC-209-R1.*
B4. Analytical Methods
The following is a brief description of the analytical methods for this field investigation:

<table>
<thead>
<tr>
<th>SEDS:</th>
<th>Samples will be analyzed in accordance with the <em>SESD Laboratory Operations and Quality Assurance Manual, January 17, 2007.</em></th>
</tr>
</thead>
</table>
| CLP:  | **Multi-Media, Multi-Concentration Organic Analytical Service for Superfund (SOM01.1) (EPA, 2006c)** (volatile organics [groundwater only; trace water]; semivolatile organics [low water for surface water and groundwater and low soil for all soil]; and pesticides [low water for surface water and groundwater and low soil for all soil] found on the target compound list [TCL]);  
**Multi-Media, Multi-Concentration Inorganic Analysis, ILM05.3 (EPA, 2004d)** (ICP-AES for water and for soil for metals found on the target analyte list [TAL]).  
**Multi-Media, Multi-Concentration Dioxins and Furans Analysis, DLM02.0 (EPA, 2005b)** (dioxins and furans TCL for water and soil).  
*Modified EPA Method 4025 (immunoassay method reporting only the toxic equivalent concentration (TEQ))* |

B5. Quality Control
The following is a brief description of field and laboratory quality control measures to be implemented during this field investigation:

<table>
<thead>
<tr>
<th>Field:</th>
<th>Field quality control measure will be in accordance with the <em>SESD Operating Procedure for Field Sampling Quality Control, SESD PROC-011-R1.</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory:</td>
<td>Specific laboratory quality control measures are specified in the <em>SESD Laboratory Operations and Quality Assurance Manual, January 17, 2007.</em></td>
</tr>
</tbody>
</table>

B6. Instrument/Equipment Testing, Inspection and Maintenance
All field measurement instruments and equipment will be maintained in accordance with the *SESD Operating Procedure for Equipment Inventory and Management, SESDPROC-108-R2.*

B7. Instrument/Equipment Calibration and Frequency
All field measurement instruments and equipment are calibrated according to the *SESD Operating Procedure for Equipment Inventory and Management, SESDPROC-108-R2* and according to specific procedures included within the defined operating procedures for each instrument (see specific field measurement procedures in Section B2 of this QAPP).
B8. Inspection/Acceptance for Supplies and Consumables

All critical supplies and consumables for this field investigation are inspected and maintained in accordance with the following procedures:

*SESD Operating Procedure for Purchasing of Services and Supplies, SESDPROC-015-R2.*
*SESD Operating Procedure for Field Sampling Quality Control, SESDPROC-011-R1.*

The SESD Field Quality Manager and the Branch Quality Assurance Officers are responsible for ensuring that these requirements are met.

B9. Non-direct Measurements:

N/A for this category.

B10. Data Management

The field project leader will be responsible for ensuring that all requirements for data management are met. All data generated for this field investigation, whether hand-recorded or recorded and stored in an electronic data logger will be recorded, stored and managed according to the following procedures:

*SESD Operating Procedure for Control of Records, SESDPROC-002-R3.*
*SESD Operating Procedures for Logbooks, SESDPROC-010-R3.*

**Footnotes:** This Quality Assurance Project Plan (QAPP) has been prepared and approved according to the EPA Requirements for Quality Assurance Project Plans (EPA QA/R5 EPA/240/B-01/003), U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC, March 2001 (USEPA, 2001). This document will be used to ensure that the environmental data collected for this project are of the type and quality for the intended purposes.
1.0 Project Description

The Quality Assurance Project Plan (QAPP) was prepared in response to a request by EPA Region 4, under contract number 68-W-99-043, to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Sonford Products Site (the Site) in Flowood, Rankin County, Mississippi, issued to Black & Veatch Special Projects Corp. (Black & Veatch) on July 13, 2006, by the U.S. Environmental Protection Agency Region 4 (EPA) (EPA, 2006a). The QAPP is a critical planning document for the RI/FS environmental data collection activities to be performed at the Site. The QAPP was submitted on September 22, 2006.

Based upon sampling data collected to date, EPA determined that a screening method should be employed during future sample to aid in defining the extent of dioxins and furans in soil. The screening method to be used is a modified EPA Method 4025. This analytical method is to be used along with all other analytical methods described in Section 3.0 of the QAPP.

The QAPP Addendum 1 follows the same outline as the original QAPP, where applicable, and provides information on the use of the proposed screening method for dioxins and furans in soil. For identification purposes significant changes are presented in italics with this addendum.

2.0 Description of Current Conditions

Current conditions at the site remain as described in Section 2.0 of the QAPP
3.0 Project Management

3.4 Data Quality Objectives

3.4.3 DQO Step 3: Identify the Inputs to the Decision

The third step in the DQO process is to identify the information needed to support the decision (known as decision inputs), and specify which inputs require new environmental data. Action levels, applicable or relevant and appropriate requirements (ARARs), and preliminary remediation goals (PRGs) are examples of required inputs to the decision. The following activities will help identify required inputs to the decision:

- Identify the informational inputs needed to resolve the decision.
- Identify sources for each informational input and list those inputs that are obtained through environmental measurements.
- Determine the basis for establishing contaminant-specific action levels.
- Identify potential sampling techniques and appropriate analytical methods.

The following information is required to make the decision for the RI for the Site:

- The nature and extent of contamination present in surface soil, subsurface soil, groundwater, surface water, and sediment.
- Whether the contamination is attenuating and/or migrating and if so from which sources.
- The current and future risks to human health and ecological receptors associated with the contaminants present at the Site.

The following information includes the sources required to make the decision for the RI for the Site:

- Historical records of chemical and physical deposition.
- Environmental sampling data from surface and subsurface soil, groundwater, surface water, and sediments in conjunction with past environmental sampling data; the level of this data should be of sufficient quality to support an evaluation of alternatives, and engineering design.
- Potential human and environmental targets which may be affected by site contamination.

The criteria on which the decision will be made are as follows:
• The criteria for groundwater shall be the federal maximum contaminant levels (MCLs) (EPA, 2002b); EPA Region 9 PRGs for tap water (EPA, 2004a).

In the absence of these regulated concentrations, the criteria shall be two times the concentration identified in the background samples for inorganic compounds. In the absence of an adequate background samples, the criteria shall be the site-specific risk assessment.

In the case of organic compounds, the EPA will not compare the concentrations to background levels. Instead, the specific compounds will be carried through the baseline risk assessment and addressed in the “uncertainties” section of that risk assessment after necessary preliminary criteria are established so that the risk assessment may be used as a basis for risk characterization.

• The criteria for soil shall be the EPA Region 9 Soil PRGs for residential soil (surface soil) and industrial soil (subsurface soil) (EPA, 2004a) and EPA Region 4 ecological soil screening values (ESSVs) (surface soil) (EPA, 2004b).

In the absence of an EPA Region 9 PRG or EPA Region 4 SSV, the criteria shall be two times the concentration identified in the background sample for inorganic compounds. In the absence of an adequate background samples, the criteria shall be the site-specific risk assessment.

In the case of organic compounds, the EPA will not compare the concentrations to background levels. Instead, the specific compounds will be carried through the baseline risk assessment and addressed in the “uncertainties” section of that risk assessment after necessary preliminary criteria are established so that the risk assessment may be used as a basis for risk characterization.

• The criteria for sediment shall be the EPA Region 9 Soil PRGs for residential soil for dry sediment (EPA, 2004b) and EPA Region 4 sediment screening values (SeSVs) (EPA, 2004b).

In the absence of an EPA Region 4 SeSV, the criteria shall be two times the concentration identified in the background sample for inorganic compounds. In the absence of an adequate background samples, the criteria shall be the site-specific risk assessment.

In the case of organic compounds, the EPA will not compare the concentrations to background levels. Instead, the specific compounds will be carried through the baseline risk assessment and addressed in the “uncertainties” section of that risk assessment after necessary preliminary criteria are established so that the risk assessment may be used as a basis for risk characterization.
The criteria for surface water shall be the EPA Region 9 PRGs for tap water (EPA, 2004b), EPA Region 4 freshwater surface water screening values (FSWSVs) (EPA, 2004b); and EPA water+organics (WOs) (EPA, 2006b).

In the absence of these regulated concentrations, the criteria shall be two times the concentration identified in the background samples for inorganic compounds. In the absence of an adequate background samples, the criteria shall be the site-specific risk assessment.

In the case of organic compounds, the EPA will not compare the concentrations to background levels. Instead, the specific compounds will be carried through the baseline risk assessment and addressed in the "uncertainties" section of that risk assessment after necessary preliminary criteria are established so that the risk assessment may be used as a basis for risk characterization.

The sampling techniques and analytical procedures used and on which the decision will be made are as follows:

1. Groundwater, surface water, and sediment samples will be collected from background locations and contaminated soil, groundwater, and surface water/sediment areas as described in Section 3.0 of the FSP.

2. All soil, groundwater, surface water, and sediment samples collected and sent to a CLP or SESD laboratory for analysis will be analyzed by one or more of the following CLP established methods or other analytical methods as stated in the EPA CLP Statement of Work (SOW), Exhibit E for the following services:
   
   - Multi-Media, Multi-Concentration Organic Analytical Service for Superfund (SOM01.1) (EPA, 2006c) (volatile organics [groundwater only; trace water]; semivolatile organics [low water for surface water and groundwater and low soil for all soil]; and pesticides [low water for surface water and groundwater and low soil for all soil] found on the target compound list [TCL]);
   
   - Multi-Media, Multi-Concentration Inorganic Analysis, ILM05.3 (EPA, 2004d) (ICP-AES for water and for soil for metals found on the target analyte list [TAL]).
   
   - Multi-Media, Multi-Concentration Dioxins and Furans Analysis, DLM02.0 (EPA, 2005b) (dioxins and furans TCL for water and soil).
   
   - Field methods will be used for the analysis of pH, temperature, turbidity, conductivity, dissolved oxygen (DO), and oxidation/reduction potential for surface water and groundwater.
3. All soil samples collected and sent to a screening laboratory for dioxin and furan analysis will be analyzed by the following established methods or other analytical methods as stated in the EPA screening laboratory statement of work (SOW) for the following services:

   Modified EPA Method 4025 (immunoassay method which reports only the toxic equivalent concentration (TEQ)).

Table 3-1 in this QAPP Addendum I lists the analyses to be performed for each sample location. Sample locations are shown on figures in the FSP and FSP addendums.

### 3.4.5 DQO Step 5: Develop a Decision Rule

The fifth step in the DQO process is to develop a logical "if... then..." statement that defines the conditions that would cause the decision maker to choose among alternative actions. The purpose of this step is to clearly define objective criteria by which decisions can be made. Activities necessary for the development of a decision rule are:

- Specify the statistical parameter that characterizes the domain of interest. The statistical parameter is a descriptive measure such as mean, median, proportion, or maximum.

- Specify the action level for the decision. The action level is typically a contaminant concentration level that sets the limit at which further action is warranted.

- Combine actions from previous steps in the DQO process with those listed above to develop a decision rule.

With regard to the screening method to be used for dioxins and furans in soil, if the precision between the screening laboratory results and the CLP laboratory results do not fall within the range described in Section 3.4.8.1, then the CLP laboratory results will be used. If the results for the particular sample location. Furthermore, if the precision between splits or duplicate samples sent to the screening laboratory do not fall within the range described in Section 3.4.8.1, then the sample will be analyzed by the CLP laboratory and these results will be used for the particular sample location.

If the maximum concentration from any sample location exceeds the criteria listed in Section 3.4.3, then further assessment may be recommended. In addition, if the human health and ecological risk assessments warrant, and if the vertical and horizontal extent of contamination has been sufficiently defined, then the potential remedial options will be
recommended. If no contaminant concentrations exceed the criteria listed in Section 3.4.3, no further action will be recommended.

### 3.4.8.1 Precision

Precision is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions. Specifically, it is a quantitative measure of the degree of variability of a group of measurements compared to the average value. Standard deviation, coefficient of variation, range, and relative range are terms often used to express precision. Data precision will be evaluated through the collection of split and duplicate samples (field and in-house) at a rate of 5 to 10 percent of samples collected at each site. Precision is determined in the laboratory by assessing the relative percent difference for matrix spike duplicate analyses for organics and sample duplicates for inorganics. Relative percent difference (RPD) is expressed as follows:

\[
\text{RPD} = \frac{[V_1 - V_2]}{\left(\frac{[V_1 + V_2]}{2}\right)} \times 100
\]

where:
- \(\text{RPD}\) = relative percent difference
- \(V_1\) = primary sample value
- \(V_2\) = duplicate sample value.

Precision will also be measured when comparing data for dioxins in soil when using a screening laboratory and a fixed CLP laboratory. Data precision between the screening laboratory results and the CLP laboratory results will be evaluated through the collection of split samples at a rate of 10 percent of samples collected at each site. RPD values between positive and negative 25 percent will indicate good agreement between the laboratory results. When comparing the screening laboratory and the CLP laboratory, when RPD values are outside of this range the CLP laboratory results will serve as the default value.

When comparing split and duplicate samples sent to the screening laboratory as RPD value between positive and negative 25 percent will be acceptable. When the RPD value is outside of this range the sample will be analyzed by the CLP laboratory and these results will serve as the default value for the sample location.

### 4.0 Measurement Data Acquisition

### 4.4 Analytical Method Requirements

#### 4.4.1 Analytical Methods

Sediment, surface water, groundwater, and soil samples, including background samples,
will be collected during the investigation. These samples will be collected to further delineate the extent of contamination in soil, groundwater, surface water, and sediment and to establish the presence or absence of contamination in soil, surface water, and sediment. All of the Site groundwater, soil, sediment, and surface water samples collected will be collected and sent to a CLP or SESD laboratory for analysis using the methods present in Table 3-1A and similar tables included in all FSP addendums. QA/QC samples will include equipment blanks for field decontaminated equipment for each matrix (soil and water). A matrix duplicate will also be collected for every 20 samples and an additional duplicate for any remaining samples collected over a 20 sample increment in each matrix (soil/sediment and water).

4.4.2 Sample Preparation Procedures

The objective of the sampling and preservation procedures outlined in this document is to obtain samples which yield consistent quality. The use of proper sampling equipment, strict controls in the field, and appropriate chain-of-custody and analytical procedures will reduce the potential for sample misrepresentation and unreliable analytical data. Sample containers will be provided by SESD. Where appropriate, pre-preserved sample containers will be used.

A summary of the analytical and extraction methods, sample containers, method of preservation, holding time, and holding conditions is presented in Section 3.0 of the FSP and FSP addendums.

For soil samples being submitted to the screening laboratory for dioxin/furan screening a modified Method 3050B will be used. For the method, the sample extraction method conducted by the screening laboratory will consist of adding sodium metabisulfite to the sample followed by adding 1:1 toluene:acetone and then shaking for 2 to 3 hours (Cape Technologies, 2004).

4.4.3 Field Samples

During the Phase I field investigation for the RI/FS at the site, a total of 8 environmental samples were collected (excluding duplicate samples) in August 2006. All of the environmental samples were surface soil samples collected from onsite locations. During the Phase II field investigation, a total of 48 environmental samples will be collected and submitted to selected laboratories for analysis (excluding duplicate samples). Eight surface soil, 24 subsurface soil (4 hand auger; 20 DPT), 4 groundwater samples, 6 surface
water samples, and 6 sediment samples will be collected. A summary of the samples to be collected at the Site and the proposed analytical methods is presented in Table 3-1A and the locations are provided in the FSP and FSP addendums. Further details are provided in Sections 3.0 and 5.0 of the FSP and FSP addendums for later sampling.

4.5 Quality Control

4.5.1 Field and Laboratory Quality Control Samples

QC is defined as the "overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer." The CLP and screening laboratories have QC programs to assess the reliability and validity of the analyses being performed. In addition to field matrix samples, the field team may submit various QC samples which will include duplicate samples, trip blanks (TBs), spike samples, EBs, PBs, and FBs. QC samples are collected during the field investigation to isolate any site effects (control sample), define background conditions (background sample), and evaluate field and laboratory variability (spikes, blanks, splits, and duplicates). These sample types are described below (EPA, 2001b):

- Control sample - a sample collected to isolate a source of contamination; may require the collection of both an upgradient and downgradient sample.

- Background sample - a sample collected from an area suspected to be upgradient from the source and suspected to be free of any contamination.

- Split sample - a sample portioned into two or more containers from a single sample container or sample mixing container. The primary purpose of a split sample is to measure sample handling variability. When collecting soils samples to be screened for dioxins and furans using the modified Method 1025, a minimum of 10 percent of the samples will be split. This will aid in determining variability in sample mixing due to heterogeneities in the soil.

- Duplicate sample - two or more samples collected from a common source. The purpose of a duplicate sample is to estimate the variability of a given contaminant. Typically, one duplicate is collected for every set of 20 samples collected per media and/or partial set of 20 samples.

- Trip Blank - a sample of organic-free water or clean soil which is prepared prior to the sampling event in the actual container and is stored with the investigative samples. Trip blanks are packaged for shipment with the investigative samples and submitted for analysis. At no time after their preparation are trip blanks to
be opened prior to reaching the laboratory. Trip blanks are used to determine if samples were contaminated during storage and/or transportation to the laboratory. A water trip blank must accompany each shipment of water samples submitted for volatile organic analysis, and a soil trip blank must accompany each shipment of soil samples submitted for volatile organic analysis. A temperature blank must be placed within each cooler.

- **Spike samples** - a sample provided by EPA Region 4 and sent directly to the CLP lab. This sample has known concentrations of contaminants and is used to measure the negative bias due to sample handling or analytical procedures, or to assess the performance of a laboratory.

- **Equipment Blank** - a sample collected using organic-free water which has been run over/through decontaminated sample collection equipment. An equipment blank is used to determine if contaminants have been introduced by contact of the sample medium with sampling equipment.

- **Preservative Blank** - a sample prepared in the field used to determine any contamination of the preservatives during field operations. One preservative blank will be collected per bottle of preservative used during the investigation.

- **Field Blank** - a sample prepared in the field to evaluate the potential for contamination of a sample from a source not associated with the sample collected. Organic-free water is taken to the site and placed into the appropriate sample containers. Field blanks should be collected in dusty environments and/or from areas where volatile organic contamination is present in the atmosphere and originating from a source other than the source being sampled.

- **Material Blank** - a sample of sampling materials, construction materials, or reagents generated during field operations collected to measure any positive bias from sample handling variability.

- **Matrix spike/matrix spike duplicate** - samples generated to determine long-term precision and accuracy of the analytical method on various matrices and to demonstrate acceptable compound recovery by the laboratory at the time of sample analysis. Typically, one set of matrix spike/matrix spike duplicate samples is collected for every set of 20 samples collected per media and/or partial set of 20 samples.

As part of the sampling program, QC samples will be submitted to the laboratory with field investigative samples in order to evaluate the confirmatory sampling procedures and analytical methodologies. Approximately five percent of the field investigative samples will be collected in order to evaluate sample handling, shipment, and laboratory procedures. A summary of the QC samples, analyses, and containers is presented in the
FSP with subsequent QC samples, analyses, and containers to be presented in Section 3.0 of the FSP and in subsequent addendums.

All data from the CLP laboratories will undergo data validation by EPA SESD.

5.0 Assessment/Oversight
Assessment and oversight will be conducted as specified in Section 5.0 of the QAPP.

6.0 Data Validation and Usability
Data validation and usability will be conducted as specified in Section 6.0 of the QAPP.

7.0 References


EPA, 2006a. U.S. Environmental Protection Agency, Work Assignment 685-RICO-
04J5, Sonford Chemical Site, July 13, 2006.


<table>
<thead>
<tr>
<th>Longitude</th>
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<th>Description</th>
<th>Station ID</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Sonford Products</td>
<td>SB-92-A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Field sample, located at location of previous sample station SP45</td>
<td>SB-92-B</td>
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<td></td>
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<td>SB-92-C</td>
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<td>SB-92-D</td>
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<td>SB-92-E</td>
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<td></td>
<td>SB-92-F</td>
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<tr>
<td></td>
<td></td>
<td>Field sample, approximately 10 feet northeast of SP92</td>
<td>SB-93-A</td>
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<td></td>
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<td>SB-93-B</td>
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<td>SB-93-C</td>
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<td>SB-93-F</td>
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<tr>
<td></td>
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<td>Field sample, approximately 10 feet north-northwest of SP92</td>
<td>SB-94-A</td>
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<td>SB-94-B</td>
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<td>SB-95-F</td>
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<tr>
<td></td>
<td></td>
<td>Field sample, approximately 10 feet southwest of SP92</td>
<td>SB-96-A</td>
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<td>SB-96-F</td>
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<td></td>
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<td>Field sample, approximately 10 feet southeast of SP92</td>
<td>SB-97-A</td>
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<td>SB-97-F</td>
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<tr>
<td></td>
<td></td>
<td>Field sample, located on west central portion of site along boundary with</td>
<td>SB-98-A</td>
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<td></td>
<td></td>
<td>SB-98-B</td>
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Table 3-1A. Sonford Products Surface and Subsurface Soil Samples
(see FSP for locations)

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<th>Longitude</th>
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<th>Description</th>
<th>Station ID</th>
<th>SS</th>
<th>SB</th>
<th>Total Metals</th>
<th>Dioxins/ Furans</th>
<th>Field Param</th>
<th>VOC</th>
<th>SVOC</th>
<th>Pest</th>
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Table 4. Sonford Products Groundwater Samples  
(see Figure 2 for locations)

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<th>Longitude</th>
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<th>Description</th>
<th>Station ID</th>
<th>Sample ID</th>
<th>Total Metals</th>
<th>Dioxins/Furans</th>
<th>VOC</th>
<th>SVOC</th>
<th>Pest</th>
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<td><strong>Groundwater Samples</strong></td>
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<tr>
<td></td>
<td></td>
<td>Field sample, southwest side of site along rail line</td>
<td>SP100</td>
<td>GW-100</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td></td>
<td></td>
<td>Filed sample, approximately 50 feet east-northeast of SP100</td>
<td>SP101</td>
<td>GW-101</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td></td>
<td></td>
<td>Field sample, southwest side of site along rail line, approximately 50 feet</td>
<td>SP102</td>
<td>GW-102</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td></td>
<td></td>
<td>southwest of SP100</td>
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<td></td>
<td></td>
<td>Field sample, approximately 150 feet west of site on Dave Gardner property</td>
<td>SP103</td>
<td>GW-103</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td></td>
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<td>Field sample, approximately 200 feet west of site on W. Jones property</td>
<td>SP104</td>
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<td>Field sample, approximately 50 feet south of site on Wixson property</td>
<td>SP106</td>
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<td>Field sample, approximately 150 feet south of site on Wixson property</td>
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3.0 Project Management

The following project management elements address the procedural aspects of project development for the RI/FS at the Site. This section provides an overall approach to managing the project, including:

- Project organization, roles, and responsibilities.
- Problem definition and background.
- Project description and schedule.
- Quality objectives and criteria for measurement data.
- Special training requirements.
- Documentation and records management.

3.1 Project Organization

The purpose of the project organization is to provide the EPA with a clear understanding of the role of each participant in the RI/FS and to provide the lines of authority and reporting for the project. The following participants, including principal data users, decision makers, and project QA managers, are presented below:

- Decision Makers  EPA Remedial Project Manager (RPM)  Keriema Newman

- QA Managers  EPA QA Manager (QAM)  Marilyn Thornton  Virgil A. Paulson, P.E.
  Black & Veatch QAM

- Principal Data Users  Black & Veatch Project Manager  Carol King, P.E.
  Black & Veatch Project Staff  Reggy Dawkins, P.G.
  Gina Montgomery  Jim Eldridge  Jeff Flamini  To Be Determined

Additionally, comments and reviews will be provided by the MDEQ.

A project organization chart is presented on Figure 3-1. Black & Veatch in Alpharetta, Georgia, has overall responsibility for the RI/FS deliverables for the Site. The Black & Veatch Project Manager, Ms. Carol King, has primary responsibility for execution of the
work. The Project Manager will track performance of the work against schedule and budget constraints, will be involved in data review, and will oversee the preparation of technical reports. Ms. King will be the primary contact with the EPA RPM, Ms. Keriema Newman. Ms. King will also serve as the Project Review Team Leader and will ensure that valid data is collected and used in a technically correct manner. The Black & Veatch Project Manager, Ms. Carol King; the Project Geologist, Mr. Reggie Dawkins; Human Health Risk Assessor, Ms. Gina Montgomery; Ecological Risk Assessor, Mr. Jim Eldridge; and the Black & Veatch Data Manager, Mr. Jeff Flamini; will be responsible for implementation of the work plan, data evaluation, electronic deliverables, and ensuring that the data requirements of the project are met. Mr. Virgil Paulson serves a role independent of the project staff and is responsible for establishing, implementing, and overseeing compliance of Black & Veatch quality assurance procedures and preventing the release of documents not conforming with the quality assurance procedures until management has determined acceptable disposition.

The EPA Region 4 SESD oversees the Contract Laboratory Program (CLP) and maintains its own QA program under the direction of Ms. Marilyn Thornton. Ms. Thorton is responsible for ensuring that the analytical work contracted to CLP laboratories and the data qualification of the data by SESD personnel is conducted in accordance with the appropriate QA procedures (EPA, 2004c). The analytical work performed for this RI/FS will be conducted by both CLP and SESD laboratories. The Black & Veatch QA Manager, Mr. Virgil Paulson, has primary responsibility for the QA for the entire Black & Veatch Organization. Mr. Paulson is located at the Black & Veatch headquarters in Overland Park, Kansas.

3.2 Problem Definition and Background
Information on the location and the operational and regulatory history of the Site is presented in Section 1.0 of this document. The RI/FS is to determine the nature and extent of volatile, PCP, metal, pesticide, and dioxin contamination associated with the Site. Contamination will be defined in soil, groundwater, surface water, and sediment as those concentrations exceeding background and/or regulatory concentrations specified in Section 3.4.2.
3.3 Project Description and Schedule

3.3.1 RI/FS Description

An RI/FS is scoped for the Site under the Statement of Work (SOW) issued to Black & Veatch July 13, 2006 (EPA, 2006a). The objective of the RI/FS is to develop the minimum amount of data necessary to support the selection of an approach for site remediation and then use this data to develop a well-supported Record of Decision (ROD). The scope includes generating data to help in selecting a remedy to eliminate, reduce, or control risks to human health and the environment by characterizing the site via identifying the type and concentration of hazardous wastes or hazardous constituent releases, the rate and direction at which the releases are migrating, and the distance over which releases have migrated.

3.3.2 Description of the Work to be Performed

In order to address environmental concerns of the Site, proposed field activities include collecting surface and subsurface soil samples using hand auger and direct-push technology (DPT), groundwater samples, and collecting surface water and sediment samples, and disposal of investigation-derived waste (IDW) in a RI Phase II effort. The Phase I effort consisted of sampling surface soil locations and was conducted by SESD in August 2006 with assistance in the sample location selection by Black & Veatch. Data generated by the Phase I effort will be further used to determine Phase II sampling activities and locations. The proposed sample locations and activities for the Phase II effort are listed on Table 3-1 and presented on Figures 3-2 and 3-3 of this QAPP and in Section 3.0 of the Field Sampling Plan (FSP). Additional sampling will necessitate the submittal of FSP addendums and potentially QAPP addendums to address the specific needs of types and locations of samples as they are identified.

Upon completion of the Phase II initial site investigation activities and receipt of analytical data from the laboratory, a Data Evaluation Report (DER) will be submitted to EPA Region 4 for review that will include Phase I and II activities and will be prepared in accordance with the SOW issued July 13, 2006 (EPA, 2006a). Based on the results presented in the DER, EPA Region 4 and Black & Veatch will discuss data evaluation results, and EPA Region 4 will determine the need for a follow-up site investigation. If a follow-up site investigation is deemed necessary, then another DER will be submitted after receipt of analytical results for EPA Region 4 to determine if enough data is available.
to proceed with a draft RI report. If the amount of data is still not satisfactory, then the site investigation/DER process will be repeated until the amount of data is satisfactory. The RI report will be submitted to EPA Region 4 for review.

### 3.3.3 Proposed Project Schedule

The proposed schedule for completion of the RI/FS at the Site is to be presented in Section 5 of the RI/FS Work Plan to be submitted concurrently with this QAPP. The schedule will reflect the work assignment established review period lengths for EPA Region 4 review of each of the draft planning documents and the turnaround periods for preparation of final planning documents upon receipt of review comments from EPA.

### 3.4 Data Quality Objectives

Data quality objectives (DQOs) are qualitative and quantitative statements derived from the resultant of each step of a process that: 1) clarifies the study objective; 2) defines the most appropriate type of data to collect; 3) determines the most appropriate conditions from which to collect the data; and 4) specifies tolerable limits on decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decision. The DQO process for this project is described in the *Guidance for the Data Quality Objectives Process, EPA QA/G-4*, August 2000 (EPA, 2000a).

The DQO process is a strategic planning approach based on the scientific method designed to ensure that the type, quantity, and quality of environmental data used in decision making are appropriate for the intended application. By using the DQO process, a decision maker uses specific criteria for determining when data are sufficient for site decisions. This provides a mechanism for decision makers to determine when enough data has been collected. Because the DQO process is based on the scientific method, the legal defensibility of site decisions are improved by providing a complete record of the decision process and the criteria used for arriving at all conclusions.

The DQO process consists of seven steps; the output from each step influences the choices that will be made later in the process. Although it is a linear sequence of steps, the DQO process is iterative in practice; the outputs from one step may lead to reconsideration of prior steps. This iteration is encouraged in order to produce a more efficient data collection design. The seven steps of the DQO process are described below:
• Step 1: State the Problem - Concisely describe the problem to be studied. Review previous investigation reports and existing information in order to develop an understanding of how to define the problem. Other specific activities will include: 1) identifying members of the DQO planning team; 2) defining the conceptual site model; 3) defining exposure scenarios for human and ecological receptors; and 4) specifying available resources.

• Step 2: Identify the Decision - Identify the decision statement(s) for the site and define alternative actions that may be taken to solve the problem. Specific activities will include: 1) identifying the principal study questions; 2) defining the alternate actions that could result; 3) combining the study question and alternate actions into a decision document; and 4) where applicable, organize multiple decisions. The desired end product of this step is a decision statement that links the study question to possible actions that will resolve the problem.

• Step 3: Identify the Inputs to the Decision - Identify the information that needs to be obtained (analytical data results, field measurements) in order to resolve the decision statement. Specific activities include: 1) identifying the information that will be needed to resolve the decision statement; 2) determining the sources for this information; 3) determining what criteria will be used to establish an action level, and 4) confirming that measurement methods exist.

• Step 4: Define the Study Boundaries - Specify the time periods and spatial area to which decisions will apply. Determine when and where data will be collected.

• Step 5: Develop a Decision Rule - Define the statistical parameter of interest, specify the action level, and integrate the previous DQO outputs into a single statement that describes the logical basis for selecting alternative actions.

• Step 6: Specify Tolerable Limits on Decision Error - Define the decision maker's tolerable decision error rates based on a consideration of the consequences of making an incorrect decision.

• Step 7: Optimize the Design - Evaluate information from the previous steps and generate alternative data collection designs. Select the most resource-effective design that meets the DQOs.

3.4.1 DQO Step 1: State the Problem
The first step in the DQO process is to identify and clearly state the problem. For this work effort, the problem has been initially defined in the Weston HRS Documentation Record report (Weston, 2005b). The problem is the contamination of surface and
The analytical results of the 2003 and 2005 data indicated the following contamination (EPA, 2003b; EPA, 2005a).

Surface soil samples were compared to EPA Region 9 PRGs for residential soil (EPA, 2004a) and EPA Region 4 ESSVs (EPA, 2004b). Elevated levels of the following contaminants were detected in the surface soil samples collected.

- **Dioxins/Furans**: 2,3,7,8-TCDD and mammalian TEQ (Van den Berg, M. et al., 1998).

- **Semivolatiles**: benzo(a)pyrene; fluoroanthene; hexachlorobenzene; PCP; phenanthrene; phenol; and pyrene.

- **Pesticides/PCBs**: DDE; DDT; aldrin; alpha-BHC; beta-BHC; dieldrin; endrin; gamma-BHC; and toxaphene.

- **Metals**: aluminum; arsenic; barium; chromium; copper; iron; lead; manganese; mercury; vanadium; and zinc.

Subsurface soil samples were compared to EPA Region 9 PRGs for industrial soil (EPA, 2004a). Elevated levels of the following contaminants were detected in the subsurface soil samples collected.

- **Dioxins/Furans**: 2,3,7,8-TCDD and mammalian TEQ (Van den Berg, M. et al., 1998).

- **Semivolatiles**: 2,4,6-trichlorophenol and PCP.

- **Pesticides/PCBs**: alpha-BHC and gamma-BHC.

- **Metals**: arsenic.

Groundwater samples were compared to EPA Region 9 PRGs for tap water (EPA, 2004a) and EPA MCLs (EPA, 2002b). Elevated levels of the following contaminants were detected in the groundwater samples collected.

- **Dioxins/Furans**: 2,3,7,8-TCDD and TEQ mammalian (Van den Berg, M. et al., 1998).
Semivolatiles: 2,4,6-trichlorophenol; 3-nitroaniline; bis(2-ethylhexyl)phthalate; isophorone; naphthalene; and PCP.

Volatile: 1,2,4-trichlorobenzene; 1,4-dichlorobenzene; 4-methyl-2-pentanone; acetone; benzene; ethylbenzene; PCE; and trichloroethylene TCE.

Pesticides/PCBs: alpha-BHC; gamma-BHC; and heptachlor epoxide.

Metals: aluminum; arsenic; chromium; copper; iron; manganese; thallium; and vanadium.

Surface water were compared to EPA Region 9 PRGs for tap water (EPA, 2004a); EPA Region 4 FSWSVs (EPA, 2004b); and EPA WOs (EPA, 2006b). Elevated levels of the following contaminants were detected in the groundwater samples collected.

Dioxins/Furans: 2,3,7,8-TCDD.

Semivolatiles: bis(2-ethylhexyl)phthalate; and PCP.

Volatile: 1,4-dichlorobenzene.

Pesticides/PCBs: alpha-BHC; beta-BHC; delta-BHC; gamma-BHC; and heptachlor epoxide.

Metals: aluminum; cyanide; iron; lead; and manganese.

Sediment soil samples were compared to EPA Region 9 PRGs for residential soil (EPA, 2004a) and EPA SeSVs (EPA, 2004b). Elevated levels of the following contaminants were detected in the sediment collected.

Dioxins/Furans: 2,3,7,8-TCDD and mammalian TEQ (Van den Berg, M. et al., 1998).

Semivolatiles: benzo(a)pyrene; and PCP.

Pesticides/PCBs: 4,4-DDE; 4,4-DDT; and gamma-BHC.

Metals: arsenic; copper; iron; lead; manganese; and mercury.
The estimated aerial extent of contaminated soil is estimated to be the entire site or approximately 6 acres. Soil, groundwater, surface water, and sediment contamination is to be further delineated during the RI. The depth of contamination beneath the site will also be further delineated during the RI.

The RI/FS will be performed by Black & Veatch through RAC Contract No. 68-W-99-043 under contract Work Assignment No. 685-RICO-04J5 with EPA Region 4. EPA Region 4 will provide comments on the RI/FS Work Plan, the QAPP, the FSP, the Human Health Risk Assessment Work Plan, the Site Specific and Task Specific Health and Safety Plans (HASPs), and future investigation reports. The DQO planning team will consist of the following representatives:

- **Decision Maker**
  EPA RPM
  Keriema Newman

- **QA Managers**
  EPA QAM
  Black & Veatch QAM
  Marilyn Thornton
  Virgil A. Paulson, P.E.

- **Principal Data Users**
  Black & Veatch Project Manager
  Carol King, P.E.
  Black & Veatch Project Staff
  Reggy Dawkins
  Gina Montgomery
  Jim Eldridge
  Jeff Flamini

Comments and reviews will also be provided by the MDEQ. Available resources include representatives of EPA, MDEQ, and Black & Veatch.

A human health conceptual model of the site based on current information is presented on Figure 3-4. An ecological conceptual model and subsequent assessment will be completed at a later date with assistance by SESD. Available resources in developing the RI/FS include representatives of EPA, the State of Mississippi, and Black & Veatch. The goal is to complete and submit the final FS report by June 2008.

### 3.4.2 DQO Step 2: Identify the Decision

The second step in the DQO process is to identify the questions that the investigation will attempt to resolve, and identify the alternative actions that may be necessary based on the
outcome of the investigation. In the DQO process, the combination of these elements is called the decision.

Based on a review of the problem defined in Section 3.4.1, the following principal questions have been developed for this investigation:

- Is there surface soil, subsurface soil, groundwater, surface water, or sediment contamination significantly above background levels at the Site?
- Does surface soil, subsurface soil, groundwater, surface water, or sediment contamination exceed acceptable levels?
- Does surface soil, subsurface soil, groundwater, surface water, or sediment contamination pose a current or future human health or ecological risk?

Based on the results of the RI/FS at the Site, alternative actions may be necessary to solve the problem. The following are alternative actions that may be necessary to solve the aforementioned principal questions:

- Conduct additional testing to determine the level and extent of contamination at the Site.
- Monitor identified areas of contamination over time to confirm that contamination is decreasing through natural processes and not simply migrating to adjacent areas.
- Implement institutional controls to limit access to areas deemed pose a human health or ecological risk.
- Initiate a cleanup removal or treatment(s) to cleanup contaminated areas of concern.
- Take no action.

The principal questions and the alternative actions are combined into a decision statement that expresses a choice among alternative actions. The following decision statements have been drafted for this investigation:

- Do the contaminant concentrations present at the site present a risk to human health receptors which justifies remedial action?
• Do the contaminant concentrations present at the site present a risk to ecological receptors which justifies remedial action?

3.4.3 DQO Step 3: Identify the Inputs to the Decision
The third step in the DQO process is to identify the information needed to support the decision (known as decision inputs), and specify which inputs require new environmental data. Action levels, applicable or relevant and appropriate requirements (ARARs), and PRGs are examples of required inputs to the decision. The following activities will help identify required inputs to the decision:

• Identify the informational inputs needed to resolve the decision.

• Identify sources for each informational input and list those inputs that are obtained through environmental measurements.

• Determine the basis for establishing contaminant-specific action levels.

• Identify potential sampling techniques and appropriate analytical methods.

The following information is required to make the decision for the RI for the Site:

• The nature and extent of contamination present in surface soil, subsurface soil, groundwater, surface water, and sediment.

• Whether the contamination is attenuating and/or migrating and if so from which sources.

• The current and future risks to human health and ecological receptors associated with the contaminants present at the Site.

The following information includes the sources required to make the decision for the RI for the Site:

• Historical records of chemical and physical deposition.

• Environmental sampling data from surface and subsurface soil, groundwater, surface water, and sediments in conjunction with past environmental sampling data; the level of this data should be of sufficient quality to support an evaluation of alternatives, and engineering design.
• Potential human and environmental targets which may be affected by site contamination.

The criteria on which the decision will be made are as follows:

• The criteria for groundwater shall be the federal MCLs (EPA, 2002b); EPA Region 9 PRGs for tap water (EPA, 2004a).

In the absence of these regulated concentrations, the criteria shall be two times the concentration identified in the background samples for inorganic compounds. In the absence of an adequate background samples, the criteria shall be the site-specific risk assessment.

In the case of organic compounds, the EPA will not compare the concentrations to background levels. Instead, the specific compounds will be carried through the baseline risk assessment and addressed in the “uncertainties” section of that risk assessment after necessary preliminary criteria are established so that the risk assessment may be used as a basis for risk characterization.

• The criteria for soil shall be the EPA Region 9 Soil PRGs for residential soil (surface soil) and industrial soil (subsurface soil) (EPA, 2004a) and EPA Region 4 ESSVs (surface soil) (EPA, 2004b).

In the absence of an EPA Region 9 PRG or EPA Region 4 SSV, the criteria shall be two times the concentration identified in the background sample for inorganic compounds. In the absence of an adequate background samples, the criteria shall be the site-specific risk assessment.

In the case of organic compounds, the EPA will not compare the concentrations to background levels. Instead, the specific compounds will be carried through the baseline risk assessment and addressed in the “uncertainties” section of that risk assessment after necessary preliminary criteria are established so that the risk assessment may be used as a basis for risk characterization.

• The criteria for sediment shall be the EPA Region 9 Soil PRGs for residential soil for dry sediment (EPA, 2004b) and EPA Region 4 SeSVs (EPA, 2004b).

In the absence of an EPA Region 4 SeSV, the criteria shall be two times the concentration identified in the background sample for inorganic compounds. In the absence of an adequate background samples, the criteria shall be the site-specific risk assessment.
In the case of organic compounds, the EPA will not compare the concentrations to background levels. Instead, the specific compounds will be carried through the baseline risk assessment and addressed in the “uncertainties” section of that risk assessment after necessary preliminary criteria are established so that the risk assessment may be used as a basis for risk characterization.

- The criteria for surface water shall be the EPA Region 9 PRGs for tap water (EPA, 2004b), EPA Region 4 FSWSVs (EPA, 2004b); and EPA WOs (EPA, 2006b).

In the absence of these regulated concentrations, the criteria shall be two times the concentration identified in the background samples for inorganic compounds. In the absence of an adequate background samples, the criteria shall be the site-specific risk assessment.

In the case of organic compounds, the EPA will not compare the concentrations to background levels. Instead, the specific compounds will be carried through the baseline risk assessment and addressed in the “uncertainties” section of that risk assessment after necessary preliminary criteria are established so that the risk assessment may be used as a basis for risk characterization.

The sampling techniques and analytical procedures used and on which the decision will be made are as follows:

1. Groundwater, surface water, and sediment samples will be collected from background locations and contaminated soil, groundwater, and surface water/sediment areas as described in Section 3.0 of the FSP.

2. All soil, groundwater, surface water, and sediment samples collected and sent to a CLP or SESD laboratory for analysis will be analyzed by one or more of the following CLP established methods or other analytical methods as stated in the EPA CLP Statement of Work (SOW), Exhibit E for the following services:
   - Multi-Media, Multi-Concentration Organic Analytical Service for Superfund (SOM01.1) (EPA, 2006c) (volatile organics [groundwater only; trace water]; semivolatile organics [low water for surface water and groundwater and low soil for all soil]; and pesticides [low water for surface water and groundwater and low soil for all soil] found on the target compound list [TCL]);
   - Multi-Media, Multi-Concentration Inorganic Analysis, ILM05.3 (EPA, 2004d) (ICP-AES for water and for soil for metals found on the target analyte list [TAL]).
Multi-Media, Multi-Concentration Dioxins and Furans Analysis, DLM02.0 (EPA, 2005b) (dioxins and furans TCL for water and soil).

Field methods will be used for the analysis of pH, temperature, turbidity, conductivity, dissolved oxygen (DO), and oxidation/reduction potential for surface water and groundwater.

3. All soil samples collected and sent to a screening laboratory for dioxin and furan analysis will be analyzed by the following established methods or other analytical methods as stated in the EPA screening laboratory SOW for the following services:

Table 3-1 in this QAPP lists the analyses to be performed for each sample location, and Figures 3-2 and 3-3 indicate the locations to be sampled.

3.4.4 DQO Step 4: Define the Study Boundaries

The fourth step in the DQO process is to specify the spatial and temporal limits of the environmental media that the data must represent to support the decision. In order for environmental samples to be representative of the domain or area for which the decision will be made, the boundaries of the study must be precisely defined. The purpose of this step is to clearly define the set of circumstances (boundaries) which will be covered by the decision. These include:

- Spatial boundaries that define what should be investigated and where the samples should be collected; and

- Temporal boundaries that describe when samples should be collected and what time frame the study data should represent.

Practical constraints which could interfere with sampling are also identified within this step of the DQO process. A practical constraint is any hindrance or obstacle that may interfere with the full implementation of the study design.

3.4.4.1 Spatial Boundaries of the Study. Typically there are four actions which must be considered when establishing the spatial boundaries of the study. They are:
• Define the domain or geographic area within which all decisions must apply. The domain must be distinctively marked (i.e., volume, property boundaries, operable units).

• Specify the characteristics that define the domain of interest. These include contaminant type and media of concern. When defining the media of concern, it is useful to consider what medium was originally contaminated, and what inter-media transfer of contamination has likely occurred (i.e., leaching, transport, etc.).

• When appropriate, divide the domain into units which have relatively homogeneous characteristics. This is accomplished by using existing information. Units of the domain may include regions exhibiting similar concentrations, similar depth of contamination, similar process operations, or similar media structure (i.e., geologic strata).

• Define the scale of decision making. This is the smallest domain characteristic (such as area, volume, time frame, media, etc.) for which the project team wishes to control decision errors. The scale of decision making is generally based on: 1) the risk that exposure presents to targets; 2) technological considerations; and 3) other project specific considerations (i.e., historical use).

Surface and subsurface soil and groundwater will be sampled in areas of previously detected contamination to determine sources and the vertical and horizontal extent of downgradient contaminant migration. Surface water and sediment samples will be collected from the unnamed tributaries and wetland areas upgradient and downgradient of previous locations where contamination was detected to determine the horizontal extent and trends of site-associated contamination. The characteristic which defines the domain of interest is any contaminant concentration of site-related contaminants in any environmental media sample. The site shall be subdivided into surface water body units upon completion of the investigation, if necessary. The scale of decision making shall be the entire site and any detected plumes in the vicinity of the site that contain site-related contamination.

3.4.4.2 Temporal Boundaries of the Study. Typically there are two factors to consider when establishing the temporal boundaries of the study. These factors include:
• The time frame over which the data will apply. This is the most appropriate
time frame that the decision must reflect.

• When the data should be collected. Conditions which may affect this include
seasonal fluctuations and meteorological conditions.

Because the study is intended to provide the qualitative and quantitative human health and
ecological risk posed by the site, the time frame that the decision must reflect will be the
lifetime exposure to the constituents of potential concern. Because the major constituents
of concern have been previously identified at the Site, the RI sampling effort shall occur
as soon as feasible. Constituent concentrations may have varied between the time of the
previous investigations and the RI sampling effort; therefore, analytical results which will
be compared as a basis for constituent verification must be evaluated with this in
consideration. The potential variation of constituents with time is not significant in the
short duration to warrant an accelerated sampling effort. Seasonal fluctuations and
meteorological conditions should not hamper RI field activities but may impact how the
samples are evaluated. Previous surface water and sediment sampling locations were dry
during the site visit; therefore, the sediment samples must also be evaluated as surface
soils.

3.4.5 DQO Step 5: Develop a Decision Rule
The fifth step in the DQO process is to develop a logical "if... then..." statement that
defines the conditions that would cause the decision maker to choose among alternative
actions. The purpose of this step is to clearly define objective criteria by which decisions
can be made. Activities necessary for the development of a decision rule are:

• Specify the statistical parameter that characterizes the domain of interest. The
statistical parameter is a descriptive measure such as mean, median, proportion,
or maximum.

• Specify the action level for the decision. The action level is typically a
contaminant concentration level that sets the limit at which further action is
warranted.

• Combine actions from previous steps in the DQO process with those listed
above to develop a decision rule.
If the maximum concentration from any sample location exceeds the criteria listed in Section 3.4.3, then further assessment may be recommended. In addition, if the human health and ecological risk assessments warrant, and if the vertical and horizontal extent of contamination has been sufficiently defined, then the potential remedial options will be recommended. If no contaminant concentrations exceed the criteria listed in Section 3.4.3, no further action will be recommended.

3.4.6 DQO Step 6: Specify Tolerable Limits on Decision Errors

The purpose of this sixth step of the DQO process is to specify the decision maker’s acceptable limits on decision errors which are used to establish appropriate performance goals for limiting uncertainty in the data. Decision makers are intrinsically interested in the true status of some feature of a site. However, because measurement data can only estimate this status, decisions that are based on measurement data may possess some error (decision error). Therefore, the goal is to design a sampling plan that limits the probability of making a decision error to a level that is acceptable. In general, reducing decision errors increases costs. The decision maker must balance the desire to limit decision errors to acceptable levels with the cost of reducing decision errors.

There are two reasons why the decision maker cannot know the true value of a domain parameter, including:

- The domain or population of interest almost always varies over time and space. Limited sampling will miss some features of this natural variation because it is usually impossible or impractical to measure every point or to measure over all time frames. Sampling error occurs when sampling is unable to capture the complete scope of natural variability that exists in the true state of the environment.

- A combination of random and systematic errors inevitably arise during the various steps of the measurement process, such as sample collection, sample handling, sample preparation, sample analysis, data reduction, and data handling. These errors are called measurement errors because they are introduced during measurement process activities.

The combination of sampling error and measurement error is called total study error, which is directly related to decision error. Because it is impossible to eliminate error in-
measurement data, basing decisions on measurement data will lead to the possibility of making a decision error.

The probability of making decision errors can be controlled by adopting a scientific approach. The scientific method employs a system of decision making that controls decision errors through the use of hypothesis testing. In hypothesis testing, the data are used to select between one condition of the environment (the baseline condition or null hypothesis, $H_0$) and the alternative condition (the alternative hypothesis, $H_a$). For example, the decision maker may decide that a site is contaminated (the baseline condition) in the absence of strong evidence (study data) that indicates that the site is clean (alternative hypothesis). Hypothesis testing places the greater weight of evidence on disproving the null hypothesis or baseline condition. Therefore, the decision maker can guard against making the decision error that has the greatest undesirable consequence by setting the null hypothesis equal to the condition that, if true, has the greatest consequence of decision error.

False Positive Error - A false positive error occurs when sampling data mislead the decision maker into believing that the burden of proof has been satisfied and that the null hypothesis ($H_o$ or baseline condition) should be rejected. Consider an example where the decision maker presumes that concentrations of contaminants of concern exceed the action level (i.e., the baseline condition or null hypothesis is: concentrations of contaminants of concern exceed the action level). If the sampling data lead the decision maker to incorrectly conclude that the concentrations of contaminants of concern do not exceed the action level when they actually do exceed the action level, then the decision maker would be making a false positive error.

False Negative Error - A false negative error occurs when the data mislead the decision maker into wrongly concluding that the burden of proof has not been satisfied so that the null hypothesis ($H_o$) is not rejected when it should be. A false negative error in the previous example occurs when the data lead the decision maker to wrongly conclude that the site is contaminated when it truly is not.

The first step in establishing limits on decision errors is to determine the possible range of the parameter of interest. The possible range of the parameter of interest should be established by estimating its upper and lower bounds. This means defining the lowest
(typically zero in environmental studies) and highest concentrations at which the contaminant(s) is expected to exist at the site. This will help focus the remaining activities of this step on only the relevant values of the parameter. Historical data, including analytical data, should be used to define contaminant concentrations if available.

The second step in establishing decision error limits is to define both types of decision errors and identify the potential consequences of each. The action level specified in Section 3.4, should be used to designate the areas above and below the action level as the range where the two types of decision errors could occur. The process of defining the decision errors has four steps:

- Define both types of decision errors and establish which decision error has more severe consequences near the action level. For instance, the threat of health effects from a contaminated hazardous waste site may be considered more serious than spending extra resources to remediate the site. Therefore, a decision maker may judge that the consequences of incorrectly concluding that the concentrations of site-related contaminants do not exceed the action level are more severe than the consequences of incorrectly concluding that the concentrations of site-related contaminants exceed the action level.

- Establish the true state of nature for each decision error. In the example above, from the decision maker's perspective, the true state of the site for the more severe decision error will be that the concentrations of site-related contaminants exceed the action level. The true state of nature for the less severe decision error is that the concentrations of site-related contaminants do not exceed the action level.

- Define the true state of nature for the more severe decision error as the baseline condition or null hypothesis ($H_0$ = the site is contaminated), and define the true state of nature for the less severe decision error as the alternative hypothesis ($H_a$ = the site is not contaminated). Since the burden of proof rests on the alternative hypothesis, the data must demonstrate enough information to authoritatively reject the null hypothesis and conclude the alternative. Therefore by setting the null hypothesis equal to the true condition that exists when the more severe decision error occurs, the decision maker is guarding against making the more severe decision error.

- Assign the terms "false positive" and "false negative" to the proper decision errors. A false positive decision error corresponds to the more severe decision error and a false negative decision error corresponds to the less severe decision error.
The potential consequences of decision errors at several points within the false positive and false negative ranges should be defined and evaluated. For example, the consequences of a false positive decision error when the true parameter value is merely 10 percent above the action level may be minimal because it would cause only a moderate increase in the risk to human health. On the other hand, the consequences of a false positive error when the true parameter is ten times the action level may be severe because it could greatly increase the exposure risk to humans as well as cause severe damage to a local ecosystem. In this case, decision makers would want to have less control (tolerate higher probabilities) of decision errors of relatively small magnitudes and would want to have more control (tolerate small probabilities) of decision errors of relatively large magnitudes.

The third step in developing decision error rates is to specify a range of possible parameter values where the consequences of decision errors are relatively minor. The acceptable decision error region is a range of points (bounded on one side by the action level) where the consequences of a false negative decision error are relatively minor. It is not generally feasible or reasonable to control the false negative decision error rate to low levels because the resources that would be required would exceed the expected costs of the consequences of making that decision error. In order to determine with confidence whether the true value of the parameter is above or below the action level (depending on the more severe decision error), the site manager would need to collect a large amount of data, increase the precision of the measurements, or both.

The fourth step in establishing decision error limits is to assign probability values to points above and below the action level that reflect the acceptable probability for the occurrence of decision errors. The most stringent limits on decision errors that are typically encountered for environmental data are 0.01 (one percent) for both the false positive and false negative decision errors. The most frequent reasons for setting limits greater than 0.01 are that the consequences of the decision errors may not be severe enough to warrant setting decision error rates that are this stringent. If the decision is made to relax the decision error rates from 0.01 for false positive and false negative decision errors, the scoping team should document the rationale for setting the decision error rate. This rationale may include potential impacts on cost, human health, and ecological conditions.
The last step in establishing decision error limits is to check the limits on decision errors to ensure that they accurately reflect the decision maker's concerns about the relative consequences for each type of decision error. The acceptable limits on decision errors should be smallest (i.e., have the lowest probability of error) for cases where the decision maker has greatest concern for decision errors. This means that if one type of error is more serious than another, then its acceptable limits should be smaller (more restrictive). In addition, the limits on decision errors are usually largest (high probability of error can be tolerated) near the action level, since the consequences of decision errors are generally less severe as the action level is approached.

### 3.4.6.1 The First Decision for the Sonford Products Site

Based on previous investigation reports, the possible range of site-related contaminants expected to be found at the Site is between 0 and 48,000 $\mu$g/kg.

Null Hypothesis ($H_0$) = One or more site contaminant concentrations are greater than or equal to the criteria listed in Section 3.4.3.

Alternate Hypothesis ($H_a$) = All site contaminant concentrations are below the criteria listed in Section 3.4.3.

The false positive decision error will occur if the decision maker decides, based on sampling data, that the site is not contaminated, when in truth, some portion of the site contains concentrations which exceed the criteria specified in Section 3.4.3.

The false negative decision error will occur if the decision maker decides, based on sampling data, that some portion of the site is contaminated above the criteria specified in Section 3.4.3, when in truth, all concentrations are below the specified criteria.

### Allowable Decision Error Rates

<table>
<thead>
<tr>
<th>True Concentration &quot;C&quot; as a Percentage of Criteria Specified in Section 3.4.3.</th>
<th>Acceptable Probability of Recommending Additional Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 70%$</td>
<td>$\leq 20%$ (false negatives)</td>
</tr>
<tr>
<td>$70% &lt; C \leq 100%$</td>
<td>$\leq 30%$ (false negatives)</td>
</tr>
<tr>
<td>$&gt; 100%$</td>
<td>$\geq 90%$ ($\leq 10%$ false positives)</td>
</tr>
</tbody>
</table>
3.4.6.2 The Second Decision for the Sonford Products Site. Based on available previous investigation reports, the possible range of PCE/TCE/daughter product contaminants expected to be found in soil at the Site, is between 0 and 48,000 μg/kg.

The Null Hypothesis \((H_0)\) = The site is sufficiently characterized.

Alternate Hypothesis \((H_a)\) = The site is not sufficiently characterized.

The false positive decision error will occur if the decision maker decides that the site is not sufficiently characterized, when in truth, sufficient data has been collected from the site.

The false negative decision error will occur if the decision maker decides that the site is sufficiently characterized, when in truth, sufficient data has not been collected from the site. The acceptable decision error for the second decision will provide less than 20 percent false positive or false negative errors.

3.4.7 DQO Step 7: Optimize the Design

The purpose of this final step in the DQO process is to identify the most resource-effective sampling and analysis design for generating data during the RI/FS that are expected to satisfy the DQOs. To achieve this goal, it may be necessary to work through this step more than once after revisiting previous steps of the DQO process. The following activities are required to optimize the design:

- Review the results from the previous DQO process steps as well as existing information.
- Develop general sampling and analysis design alternatives.
- Verify that each design alternative satisfies the DQOs.
- Select the most resource-effective design which achieves all DQOs.
- Document the operational details and theoretical assumptions of the selected sampling and analysis design.

Further modifications of the DQO decision error limits may be proposed pending the review of additional information as it is made available. Such a change would necessitate
corresponding changes in the FSP and in this document to accommodate the required additional environmental data collection.

3.4.8 Measurement Performance Criteria
The measurement performance criteria are checked on several levels:

- Built-in QC standards
- Senior review
- Management controls

The analytical data is given specific QC standards by which it must abide. If these standards are not met, the data is suitably qualified. The bench chemist and the laboratory's QA manager check the analytical data and QC results.

All documents that pertain to the quality standards of the project are drafted by and reviewed internally by Black & Veatch staff with relevant technical experience. While performing field sampling activities, the field site supervisor and the site QA officer will supervise activities to assess if standard operating procedures (SOPs) are being followed.

Data quality indicators (DQIs) are qualitative and quantitative descriptors used to interpret the degree of acceptability or utility of data. The principal DQIs are precision, accuracy (or bias), representativeness, comparability, and completeness (PARCC). Of the five DQIs, precision and accuracy are the quantitative measures, representativeness and comparability are the qualitative measures, and completeness is a combination of quantitative and qualitative measures.

3.4.8.1 Precision. Precision is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions. Specifically, it is a quantitative measure of the degree of variability of a group of measurements compared to the average value. Standard deviation, coefficient of variation, range, and relative range are terms often used to express precision. Data precision will be evaluated through the collection of split and duplicate samples (field and in-house) at a rate of 5 to 10 percent of samples collected at each site. Precision is determined in the laboratory by assessing the relative percent difference for matrix spike duplicate analyses for organics and sample duplicates for inorganics. Relative percent difference (RPD) is expressed as follows:
Precision will also be measured when comparing data for dioxin in soil when using a screening laboratory and a fixed CLP laboratory. Data precision between the screening laboratory results and the CLP laboratory results will be evaluated through the collection of split samples at a rate of 10 percent of samples collected at each site. RPD values between positive and negative 25% will indicate good agreement between the laboratory results when comparing the screening laboratory and the CLP laboratory. When RPD values are outside of this range the CLP laboratory results will serve as the default value.

### 3.4.8.2 Accuracy

Accuracy measures the bias of a measurement system. Sources of error introduced into the measurement system may be accounted for by using field/trip blanks, spike samples, and analysis by two different laboratories. Accuracy is assessed by measuring the percent recoveries of surrogate spikes for organic analyses and by spike sample percent recoveries for inorganic analyses. For a spike sample, known amounts of standard compounds are added to the sample. Spike recoveries are calculated as follows:

\[
\text{Spike Recovery} (\%) = \left(\frac{\text{SSR} - \text{SR}}{\text{SA}}\right) \times 100
\]

where:
- SSR = spike sample results
- SR = unspiked sample results
- SA = spike added from spiking mix.

The spike sample results are used to evaluate matrix effects and the accuracy of the samples analyzed. Sources of error include the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analytical techniques. Field accuracy cannot be determined for the project. However, it is more important that the criteria outlined in the sections of the work plan concerning QA/QC sample descriptions, sampling and decontamination procedures, and field documentation be followed so that the project objectives and DQOs are met.
3.4.8.3 **Representativeness.** Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population parameter at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative term that is evaluated to determine whether in situ and other field measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the media and phenomenon measured or studied.

3.4.8.4 **Comparability.** Comparability is a parameter used to express the confidence with which one set of data may be compared with another. In order to achieve comparability in data sets, it is important that standard techniques are used to collect and analyze representative samples and to report analytical results. The presence of the following items enhances the comparability of data sets:

- Two data sets should contain the same set of variables of interest.
- Units in which these variables were measured should be convertible to a common metric.
- Similar analytical and quality assurance procedures.
- Similar time of measurements.
- Similar measuring devices.
- Rules for excluding certain types of observations from both samples.

3.4.8.5 **Completeness.** Completeness is a measure of the relative number of analytical data points that meet all the acceptance criteria for accuracy, precision, and additional criterion required by the specific analytical methods used. The goal for essentially all data uses is that sufficient amounts of valid data will be generated. Onsite measurement techniques can provide a high degree of completeness because invalid measurements can normally be repeated relatively quickly and easily.

3.4.8.6 **Sensitivity.** Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest. Sensitivity can be determined by the minimum concentration that can be measured by a method (or method detection limit), by an instrument (instrument detection limit), or laboratory (quantitation limit).
3.5 Special Training Requirements and Certification

The purpose of this section is to ensure that any specialized training or certification requirements necessary to the project are known and that the procedures are described in sufficient detail to ensure that specific training skills and certifications can be verified, documented, and updated. This section will summarize training requirements for Black & Veatch personnel and their subcontractors, more specifically, health and safety training requirements. A Site-Specific HASP and one Task-Specific HASP for each field effort will be submitted to EPA Region 4 to meet planning document requirements specified in the SOW for the Site RI/FS.

All personnel (Black & Veatch and their subcontractors) who will engage in hazardous waste operations at the Site must present to the Black & Veatch Site Safety Coordinator (SSC) a certificate of completion for an initial 40-hour hazardous waste operations training course or the most recent certificate of completion for an 8-hour refresher course. The course must have been completed within the 12 months of the individual being on site performing hazardous waste operations. The training must comply with Occupational Safety and Health Administration (OSHA) regulations found in 29 Code of Federal Regulations (CFR) 1910.120(e). The certification must be presented to the SSC before site activities begin. All personnel must complete a minimum of three days of on-the-job training under the direct supervision of a qualified SSC or site supervisor before they are qualified to work at a hazardous waste site unsupervised.

Consistent with 29 CFR 1910.120 paragraph (e)(4), individuals serving in a supervisory role, such as the field team leader or SSC, require an additional 8 hours of training. Black & Veatch individuals functioning in a SSC capacity shall also have at least 6 days of experience at the level of protection planned for in the HASP. A SSC qualified at a given level of protection is also qualified as a SSC at a lower level of protection.

At least two people onsite will be trained and currently certified in first aid and adult cardiopulmonary resuscitation (CPR). First aid and CPR records for all anticipated onsite workers are to be included in the Site-Specific HASP.
Personnel who use air supplied respirators must provide the Black & Veatch Director of Health and Safety (DHS) written certification that they have been trained in the proper use, inspection, emergency use, and limitations of the equipment by a competent person. The training must be current within 12 months prior to the use of the equipment. Personnel who participate in permitted confined space entry, radiation work, asbestos work, lead awareness work, or work involving lockout/tagout of energy sources, if applicable, must provide the Black & Veatch DHS written certification that they have been trained in accordance with the applicable OSHA regulations before performing such work.

Personnel who use health and safety monitoring equipment other than that provided by the Black & Veatch equipment center must provide written certification to the Black & Veatch DHS that they have been trained in the use, maintenance, calibration, and operation of the equipment by a competent person before using the equipment.

All Black & Veatch personnel who engage in hazardous waste operations must present, to the Black & Veatch SSC, certification of completion, within the 24 months prior to the beginning of site activities, a comprehensive medical monitoring examination. All Black & Veatch subcontractor personnel who engage in hazardous waste operations must present, to the Black & Veatch SSC, certification of completion, within the 12 months prior to the beginning of site activities, a comprehensive medical monitoring examination. The examination must comply with OSHA regulation found at 29CFR 1910.120 et. seq. The certification must be signed by a medical doctor and indicate any work limitations placed on the individual. The certification also must specify that the individual is capable of working while wearing respiratory protective equipment. The certification must be presented before Black & Veatch activities begin.

3.6 Documentation and Records
This section defines the records which are critical to the project and what information needs to be included in the reports, as well as the data reporting format and the document control procedures to be used. Specification of the proper reporting format, compatible with data validation, will facilitate clear and direct communication of the investigation.
3.5.7 Field Operation Records

The field operating records to be used in this investigation will document field procedures and any measurements performed during the sampling effort. Examples of Boring Logs, Well Development Logs, and Well Sampling Logs are shown in Figure 3-5, 3-6, and 3-7. Chain-of-custody records will also be used to document the progression of field samples and QC samples; chain-of-custody records are discussed in further detail in Section 4.3.4.

A bound field logbook will be maintained by the Black & Veatch sampling team to provide a daily record of significant events, observations, and measurements taken during the field investigation. All entries into the field logbook will be made with indelible ink. Field personnel will sign each page of their field-note book, and mark through any mistakes with a single line. The field logbooks are intended to provide sufficient data and observations to enable the field team to reconstruct events that occur during the project. The field logbooks will contain the following as a minimum:

- Name of the sample collector.
- Date and military time of collection
- Weather conditions, including temperature.
- The site number and name.
- Location of sampling point.
- Sample identification number.
- Type of sample.
- Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment.
- Any field measurements taken [i.e, organic vapor analyzer (OVA), groundwater levels and depths, etc.]
- Field observations, especially any notice of stained soil, stressed or absent vegetation, and whether located in a drainage area.
- References, such as maps or photographs of the sampling site.
- Any procedural steps taken that deviate from those presented in this QAPP.

3.6.2 Laboratory Records

CLP laboratory records that are to be sent electronically to SESD within 21 calendar days of receipt of the samples for data qualification are described in Exhibit H of the CLP SOWs for organic, inorganic, and dioxin and furan analysis (EPA, 2006c; EPA, 2004d; EPA, 2005b). SESD typically has another 21 calendar days to submit the qualified data
electronically to Black & Veatch followed by hard copies. SESD laboratory records are typically submitted electronically to Black & Veatch within 35 calendar days of receipt of the samples followed by hard copies.

3.6.3 Document Control

Document control is defined as the maintenance of investigation project files. All official and original documents relating to the investigation must be placed in the official project files. All evidence file documentation will be maintained by Black & Veatch under the document control system. Upon termination of the project, all records (field records, laboratory records) will be archived and submitted to EPA Region 4. Black & Veatch will maintain backup files for the project for a period of 10 years beyond the completion of the RAC No. 68-W-99-043 (expires June 2009) that EPA has with Black & Veatch.

3.6.4 Project Record Maintenance and Storage

Project records will be stored and maintained in a secure manner by Black & Veatch until the end of the project. Each project team member is responsible for filing all project information or providing it to the administrative assistant familiar with the project filing system. Individual team members may maintain separate files or notebooks for individual tasks but must provide such files to the project file room upon completion of each task.

The general project file categories are as follows:
- correspondence
- non-laboratory project invoices and approvals by vendor
- original unbound reports
- non-laboratory requests for proposals, bids, contracts, SOWs
- field data
- data evaluation and calculations
- site reports from others
- photographs
- insurance documentation
- laboratory analytical data and associated documents/memos
- regulatory submittals, licensing, and permitting applications
- site and reference material
- Health and Safety Plans
- figures and drawings
A project-specific index of file contents is kept with the project files at all times. Upon termination of the project, all records (field records, laboratory records, etc.) will be archive and submitted to EPA Region 4. Black & Veatch will maintain backup files for the project for a period of 10 years beyond the completion of the RAC No. 68-W-99-043 (expires June 2009) that EPA Region 4 has with Black & Veatch.
4.0 Measurement Data Acquisition

4.1 Sampling Process Design
The purpose of the sampling process design is to describe all relevant components of the investigation design; define the key parameters to be investigated; indicate the number and type of samples to be collected; and describe where, when, and how the samples are to be collected.

4.1.1 Sample Collection Schedule
The anticipated schedule for sample collection activities at the Site will be presented in the FSP and in Section 5.0 of the RI/FS Work Plan.

4.1.2 Sampling Design Rationale
The objective of the Phase II and any subsequent field investigations at the Site is to develop the minimum amount of data necessary better define the extent of surface soil, subsurface soil, groundwater, surface water, and sediment contamination requiring remediation to support the selection of an approach for site remediation to support a ROD, and to gain further understanding of the flow characteristics on site. In order to achieve this objective, samples must be collected from surface soil, subsurface soil, groundwater, surface water, and sediment at the Site. Rationale for sample locations proposed for this Phase II RI/FS field investigation are presented with sample locations in Table 3-1 and in Section 3.0 of the RI/FS FSP and any subsequent addendums.

4.1.3 Sampling Design Assumptions
This section presents assumptions made to establish the effectiveness and representativeness of the data obtained from samples collected at the Site. These assumptions include:

- Homogeneity of the surface and subsurface soil and sediment samples.
- Independence in the collection of individual samples (no aliquot samples will be collected; individual samples will be collected from each sampling location).
4.1.4 Procedures for Selecting Locations for Environmental Samples

The number of samples to be collected during this investigation and a description of these samples are presented with sample locations in Section 3.0 of the FSP and any subsequent addendums.

4.1.5 Classification of Critical Samples

Critical samples are those for which valid data must be obtained in order to satisfy the objectives of the sampling and analysis task; noncritical samples are those for informational purposes only or needed to provide background information. An example of a critical data point is a sediment sample collected near the boundary of the estimated extent of sediment contamination. All samples which are submitted for quantitative chemical analyses during the investigations are considered critical samples. An example of critical samples for each sampling medium at the Site is presented below:

- **Groundwater** - groundwater samples collected to establish background conditions and vertical and horizontal migration of contaminants adjacent to areas where contamination was found previously.

- **Soil** - potentially surface soils to establish source areas and spatial distribution of contamination, and subsurface soils to establish source areas and to delineate vertical and horizontal extent of contamination and evaluate soil to groundwater, soil to surface water, and soil to sediment transport potential.

- **Surface water** - surface water samples collected upstream, downstream, and at locations of unnamed tributaries where contamination was detected previously.

- **Sediment** - sediment samples collected from the same locations as surface water samples.

4.2 Sampling Methods Requirements

The objective of the sampling and preservation procedures outlined in this section is to obtain samples which yield consistently high quality. The use of proper sampling equipment, strict controls in the field, and appropriate chain-of-custody and analytical procedures will reduce the potential for sample misrepresentation and unreliable analytical data. All sampling activities will be performed in accordance with the EPA Region IV Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, Revised 2001 (EISOPQAM) (EPA, 2001b).
Initially, surface and subsurface soil, and groundwater samples will be collected within and adjacent to the study area property as presented in Section 3.0 of the RI/FS FSP. Sediment and surface water samples will be collected from locations in the wetlands and unnamed tributaries as described in Sections 3.0 and 5.0 of the RI/FS FSP.

All surface soil, subsurface soil, surface water, and sediment samples collected will be sent to a CLP or SESD laboratory for analysis using the methods presented in Table 3-1.

The EISOPQAM will serve as the primary document from which all field procedures will be developed. Container, preservation, and holding time requirements must also meet the requirements of the EISOPQAM (EPA, 2001b). The analytical methods selected and/or modified will have detection limits that are less than, or equal to, federal regulatory levels. All contractor personnel conducting sampling will be experienced in implementing the sampling procedures as outlined herein.

Modifications and/or changes to the procedures described in the EISOPQAM will not be implemented without the prior approval of the EPA RPM or designated representative and will be documented in field logbooks. A field change request form will be completed which details the conditions that necessitated the change and indicate the date approval of the change was received from EPA. An example of the form is presented on Figure 4-1.

Details that pertain to the soils, groundwater, surface water, and sediment investigation and decontamination procedures are presented in the FSP, Section 3.0 of the FSP, and any addendums. Details that pertain to the management of IDW are presented in Section 7.0 of the FSP.

### 4.3 Sample Handling and Custody Requirements

The primary objective of sample custody procedures is to create an accurate written record which can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. All procedures for sample labeling, handling, and reporting will comply with EPA-approved sample control procedures, field recording procedures, and document control (EPA, 2001b).

#### 4.3.1 Sample Preservation and Holding Time

A summary of analytical methods, containers, preservatives, holding time requirements, and the number of field and QC samples is presented Section 6.0 of the FSP. Sample
containers for chemical analysis will be certified by the generator/vendor as precleaned. Where possible, pre-preserved sample containers will be utilized. Otherwise, preservatives will be prepared using reagent-grade chemicals and added to the sample bottles by the laboratory prior to shipment to the field site. Samples will be stored on ice to 4 degrees Celsius (°C) for preservation.

4.3.2 Sample Numbering

A sample numbering system will be used to identify each sample for analysis. The purpose of this numbering system is to provide a tracking system for retrieval of data on each sample. The sample numbers will include the groundwater, surface soil, subsurface soil, surface water, or sediment sample location (groundwater-MW [monitoring well]; groundwater-### [municipal well]; surface soil-SS; subsurface soil-SB; surface water-SW; sediment-SD). Soil, sediment, and direct push samples will also include a strata designation preceded by the sample location number. Examples of sample numbers are given below:

A surface soil sample collected from the Site over a depth of approximately 0 to 1 foot bls.

SS-50

A subsurface soil sample collected from the Site over a depth of approximately 2 to 4 feet bls.

SB-50-A

A groundwater sample collected from the Site monitoring wells.

MW-50

A groundwater sample collected from the Site municipal wells.

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A surface water sample collected from a Site water body.

SW-50
A sediment sample collected from 0 to 1 foot below the water body.

SD-50

Sample identification for QA/QC samples must begin with "QA". A water trip blank is designated as QA-TW, a soil trip blank is designated QA-TS. QA/QC equipment field blanks (QA-EB), field blanks (QA-FL), material blanks (QA-BK), and preservative blanks (QA-PB) will be designated in a similar fashion.

Duplicate samples will be identified with a "9" positioned between the sample type and the location number.

SD-950 is a duplicate sample of SD-50.

All sample identification numbers will be entered onto the appropriate EPA FORMS II LITE Organic or Inorganic Traffic Report or Generic Traffic Report for other than CLP laboratories by the field team representative, including date and time of sample collection, specified analytical methods, and sample label number, if appropriate. The sample identification numbers, including sample codes allocated for this sampling effort, will be used on sample label, chain-of-custody records, and all other applicable documentation used during the sampling activity.

4.3.3 Sample Identification
Samples to be analyzed by a CLP laboratory for routine analysis are identified by a sample label with adhesive on it which is attached to the sample container. The labels include information regarding the site location, analysis, the project number assigned by SESD, time collected in military time, collector, and sequential number for each container.

4.3.4 Chain-of-Custody Procedures
Chain-of-custody procedures are comprised of maintaining sample custody and documentation of samples for evidence. To document chain-of-custody, an accurate record of samples must be maintained in order to trace the possession of each sample from the time of collection to its introduction to the laboratory. A label should be
completed for each sample as specified in Section 4.3.3. After the sample label is affixed to the sample container, a Black & Veatch or SESD custody seal is placed over the container lid such that the container cannot be opened without breaking the seal. An example of a custody seal is presented on Figure 4-2. The custody seal provides the following information.

- Date of seal.
- Name, title, and signature of person affixing the seal.

After the sample labels and custody seals are affixed to sample containers, all samples will be secured in a resealable plastic bag (Zip-Loc®). Glass sample containers will be shipped in containers filled with vermiculite.

Sample custody is maintained by an EPA Organic or Inorganic Traffic Report & Chain-of-Custody Record for routine analysis or a Generic Traffic Report & Chain-of-Custody Record for special analysis or for analyses to be conducted by an other than CLP laboratory. These records document the transfer of sample custody from the sample custodian to another person or the laboratory. All Chain-of-Custody Records will be generated by FORMS II LITE. An example of an Organic Traffic Report & Chain of Custody Record generated for samples at the Site is presented on Figure 4-3.

In order to simplify sample custody procedures, as few people as possible should have custody of the samples during the investigation. Once this record is completed, it becomes an accountable document and must be maintained in the project file. The following information must be supplied in Chain of Custody forms, and the FORMS II LITE program in detail.

- The project and case number.
- The project name.
- The signature of all samplers.
- The sampling station number.
- The date and time of sample collection.
- Grab or composite sample designation.
The sample matrix/media.
The total number of sample containers.
Any necessary remarks.
Documented transfer of the samples.
Remarks, including air bill numbers or registered or certified mail serial numbers.

The original signature copy and an additional copy of the Chain-of-Custody Record is enclosed in a plastic bag and secured to the inside of the cooler lid. A copy is retained in the project file.

4.3.5 Field Custody Procedures
The following custody procedures will be followed:

- Only the minimum number of samples that provide a good representation of the media being sampled will be collected. As few people as possible will handle the samples during the investigation, sample custodians are presented in Section 4.3.8.

- Sample labels, supplied by Black & Veatch or SESD, will be completed for each sample, using FORMS II LITE.

- All samples will be sealed immediately upon collection utilizing Black & Veatch's or SESD's custody seal. The field investigator shall write the date and his signature on the seal.

- All sample locations and times will be documented in bound field logbooks.

- All samples will be kept within sight of the sampling team in a secured location until they are properly and formally transferred to another person or facility.

- A Chain-of-Custody Record will be completed for all samples collected.
• Custody seals can be used to maintain custody on numerous items when necessary by utilizing similar procedures as those outlined previously in this section.

All measurements made and samples collected will be recorded in the field logbook. If an incorrect entry is made, regardless of the type of data document, the incorrect data will be crossed out with a single strike mark, the correct information entered either above or adjacent to the error, and the correction initialed and dated by the person making the correction.

4.3.6 Sample Packaging and Shipping

Samples collected during environmental field investigations must be classified prior to shipment, either as environmental samples or hazardous waste samples. In general, most groundwater, soil, surface water and sediment samples will be classified as environmental samples. The shipment of environmental samples is based on protocol developed jointly by the EPA, U.S. Department of Transportation (DOT), and OSHA in the "Final National Package for Compliance with Department of Transportation Regulations in the Shipment of Environmental Laboratory Samples" (OSHA, 1981).

When samples are shipped by common carrier or the United States mail, DOT Hazardous Materials Regulations (49 CFR 172) must be followed. The shipment of preserved samples is not regulated; however, the amount of preservative used must not exceed the concentrations provided in 40 CFR 136.3. The proper preservation of environmental samples should not exceed these concentrations.

Samples will be shipped to the laboratory at proper temperatures to ensure sample preservation. Ice will be included in all coolers and will be placed around all four sides of the sample containers due to sample preservation requirements which dictate maintaining the samples at 4 °C. The following sample packaging requirements will be followed:
• Allow sufficient headspace in all sample containers (except for volatile organic containers with a septum seal) to compensate for any pressure or temperature change (approximately 10 percent of the container volume).

• Sample bottle lids are never to be mixed. All sample lids must stay with the original containers. Ensure that sample container lids are tight to prevent leakage.

• Sample bottles will be placed in individual plastic Zip-loc® type bags and sealed with tape. Glass containers will be shipped in vermiculite.

• Select a sturdy cooler and secure and tape shut the drain plug. Line the cooler with a large heavy duty plastic bag.

• Place two to four inches of vermiculite in the bottom of the cooler in the plastic bag. Place sample bottles in the cooler in such a way that they do not touch one another.

• Ice that has been double bagged will be placed on top of and/or between the samples. Fill all remaining space between the samples with vermiculite.

• A temperature blank will be placed in each cooler.

• A copy of the custody record must be placed in a plastic bag and taped to the inside of the cooler lid.

• Custody seals will be secured across opposite edges of the shipping container lid; two seals will be used per shipping container. Nylon strapping tape will be wrapped around the package in at least two locations. The seal will be signed before the sample(s) is shipped and will be covered with clear tape.

• "This End Up" labels will be placed on all four sides of the shipping container. "Fragile" labels will be placed on at least two sides of the cooler.

• Shipping containers will have a clearly visible return address.
4.3.7 Transfer of Custody Procedures

All samples will be accompanied by a Chain-of-Custody Record. When transferring the possession of samples, the individuals receiving the samples shall sign, date, and note the time that they received the samples on the form. In instances where samples are split with a facility, state regulatory agency, or other government agency, the facility, state regulatory agency, or other government agency representative will sign a Receipt For Samples Form instead of the Chain-of-Custody Record.

Samples will be properly packaged for shipment to the laboratory for analyses. Shipping containers shall be secured by using nylon strapping tape and custody seals.

The original and one copy of the Chain-of-Custody Record will be placed in a plastic bag and taped inside the secured shipping container if samples are shipped. One copy of the record will be retained by the Black & Veatch sample custodian. The original record will be transmitted to the Black & Veatch Project Manager after samples are accepted by the laboratory. This copy will become a part of the project file.

If sent by mail, the package will be registered with return receipt requested. If sent by common carrier, an airbill will be used. Receipts from post offices and airbills will be retained as part of the documentation of the chain-of-custody. The airbill number will be recorded in the remarks section at the bottom of the Chain-of-Custody Record.

The receiving laboratory will complete a cooler receipt form noting any problems with the incoming samples.

4.3.8 Sample Custodians

In order to ensure the security of the samples collected during the RI investigation, it is important to limit the number of persons that handle the samples from the time of sample collection to receipt at the laboratory.

Sample collection will be performed by Black & Veatch or SESD field personnel. The Black & Veatch field team leader or other designated personnel will be responsible for the preparation of sample labels, custody seals, and chain-of-custody records for each
sample and for the proper shipment of sample coolers to the laboratory. Upon receipt of the sample coolers at the laboratory, sample custody will be retained by the laboratory's Custody Technician. The laboratory's procedures for sample custody are presented in the EPA Contract Laboratory Program SOW Exhibit H for organic, inorganic, and dioxin and furan analysis (EPA, 2006c; EPA, 2004d; EPA, 2005b).

### 4.4 Analytical Method Requirements

#### 4.4.1 Analytical Methods

Sediment, surface water, groundwater, and soil samples, including background samples, will be collected during the investigation. These samples will be collected to further delineate the extent of contamination in soil, groundwater, surface water, and sediment and to establish the presence or absence of contamination in soil, surface water, and sediment. All of the Site groundwater, soil, sediment, and surface water samples collected will be collected and sent to a CLP or SESD laboratory for analysis using the methods present in Table 3-1 and similar tables included in all FSP addendums. QA/QC samples will include equipment blanks for field decontaminated equipment for each matrix (soil and water). A matrix duplicate will also be collected for every 20 samples and an additional duplicate for any remaining samples collected over a 20 sample increment in each matrix (soil/sediment and water).

#### 4.4.2 Sample Preparation Procedures

The objective of the sampling and preservation procedures outlined in this document is to obtain samples which yield consistent quality. The use of proper sampling equipment, strict controls in the field, and appropriate chain-of-custody and analytical procedures will reduce the potential for sample misrepresentation and unreliable analytical data. Sample containers will be provided by SESD. Where appropriate, pre-preserved sample containers will be used.

A summary of the analytical and extraction methods, sample containers, method of preservation, holding time, and holding conditions is presented in Section 3.0 of the FSP and FSP addendums.
For soil samples being submitted to the screening laboratory for dioxin/furan screening a modified Method 4025 will be used. For this method, the sample extraction method conducted by the screening laboratory will consist of adding sodium sulfate to the sample followed by adding 1:1 hexane:acetone and then shaking for 2 to 4 hours.

4.4.3 Field Samples
During the Phase I field investigation for the RI/FS at the site, a total of 8 environmental samples were collected (excluding duplicate samples) in August 2006. All of the environmental samples were surface soil samples collected from onsite locations. During the Phase II field investigation, a total of 48 environmental samples will be collected and submitted to selected laboratories for analysis (excluding duplicate samples). Eight surface soil, 24 subsurface soil (4 hand auger; 20 DPT), 4 groundwater samples, 6 surface water samples, and 6 sediment samples will be collected. A summary of the samples to be collected at the Site and the proposed analytical methods is presented in Table 3-1 and the locations are provided on Figures 3-2 and 3-3. Further details are provided in Sections 3.0 and 5.0 of the FSP and FSP addendums for later sampling.

4.5 Quality Control
4.5.1 Field and Laboratory Quality Control Samples
QC is defined as the "overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer." The CLP and screening laboratories have QC programs to assess the reliability and validity of the analyses being performed. In addition to field matrix samples, the field team may submit various QC samples which will include duplicate samples, trip blanks (TBs), spike samples, EBs, PBs, and FBs. QC samples are collected during the field investigation to isolate any site effects (control sample), define background conditions (background sample), and evaluate field and laboratory variability (spikes, blanks, splits, and duplicates). These sample types are described below (EPA, 2001b):

- Control sample - a sample collected to isolate a source of contamination; may require the collection of both an upgradient and downgradient sample.
- Background sample - a sample collected from an area suspected to be upgradient from the source and suspected to be free of any contamination.
• Split sample - a sample portioned into two or more containers from a single sample container or sample mixing container. The primary purpose of a split sample is to measure sample handling variability.

• Duplicate sample - two or more samples collected from a common source. The purpose of a duplicate sample is to estimate the variability of a given contaminant. Typically, one duplicate is collected for every set of 20 samples collected per media and/or partial set of 20 samples.

• Trip Blank - a sample of organic-free water or clean soil which is prepared prior to the sampling event in the actual container and is stored with the investigative samples. Trip blanks are packaged for shipment with the investigative samples and submitted for analysis. At no time after their preparation are trip blanks to be opened prior to reaching the laboratory. Trip blanks are used to determine if samples were contaminated during storage and/or transportation to the laboratory. A water trip blank must accompany each shipment of water samples submitted for volatile organic analysis, and a soil trip blank must accompany each shipment of soil samples submitted for volatile organic analysis. A temperature blank must be placed within each cooler.

• Spike samples - a sample provided by EPA Region 4 and sent directly to the CLP lab. This sample has known concentrations of contaminants and is used to measure the negative bias due to sample handling or analytical procedures, or to assess the performance of a laboratory.

• Equipment Blank - a sample collected using organic-free water which has been run over/through decontaminated sample collection equipment. An equipment blank is used to determine if contaminants have been introduced by contact of the sample medium with sampling equipment.

• Preservative Blank - a sample prepared in the field used to determine any contamination of the preservatives during field operations. One preservative blank will be collected per bottle of preservative used during the investigation.

• Field Blank - a sample prepared in the field to evaluate the potential for contamination of a sample from a source not associated with the sample collected. Organic-free water is taken to the site and placed into the appropriate sample containers: Field blanks should be collected in dusty environments and/or from areas where volatile organic contamination is present in the atmosphere and originating from a source other than the source being sampled.
- Material Blank - a sample of sampling materials, construction materials, or reagents generated during field operations collected to measure any positive bias from sample handling variability.

- Matrix spike/matrix spike duplicate - samples generated to determine long-term precision and accuracy of the analytical method on various matrices and to demonstrate acceptable compound recovery by the laboratory at the time of sample analysis. Typically, one set of matrix spike/matrix spike duplicate samples is collected for every set of 20 samples collected per media and/or partial set of 20 samples.

As part of the sampling program, QC samples will be submitted to the laboratory with field investigative samples in order to evaluate the confirmatory sampling procedures and analytical methodologies. Approximately five percent of the field investigative samples will be collected in order to evaluate sample handling, shipment, and laboratory procedures. A summary of the QC samples, analyses, and containers is presented in the FSP with subsequent QC samples, analyses, and containers to be presented in Section 3.0 of the FSP and in subsequent addendums.

All data from the CLP laboratories will undergo data validation by EPA SESD.

4.5.2 Corrective Action

Any project team member may initiate a field corrective action process. The corrective action process consists of identifying a problem, acting to eliminate the problem, monitoring the effectiveness of the corrective action, verifying that the problem has been eliminated, and documenting the corrective action.

The initial responsibility for monitoring QC activities in the field is that of the Field Team Leader (FTL). The FTL is responsible for verifying that all QC procedures are followed. This requires that the FTL assess the correctness of the field methods, determine the ability to meet QA/QC objectives, and evaluate the impact a procedure has upon field objectives and the resulting data quality. In the event that a problem arises which may jeopardize the ability to meet QA/QC objectives, the FTL will contact the EPA RPM and the Black & Veatch Project Manager to inform them of the situation, if appropriate. Corrective action measures will be determined and implemented, with the
approval of the EPA RPM, if necessary. In addition, auditors from the MDEQ may assess and require that corrective action be taken, with the concurrence of the project manager, FTL, or field QAM. The problem, the corrective action be taken, and the results of that action will be recorded in the field logbook by the FTL.

In the event that one of the CLP laboratories is unable to meet QA/QC objectives, appropriate corrective action measures will be initiated by informing SESD who will inform the laboratory's QA officer. The Black & Veatch Project Manager and the project team will maintain daily contact with both the FTL and the SESD liaison with the CLP laboratory, as required. In the event that the subcontract laboratory is unable to meet QA/QC objectives, appropriate corrective action measures will be initiated by informing the Black & Veatch Project Manager. In the event of laboratory problems requiring additional field work (e.g., resampling, etc.), or field problems requiring laboratory action (mislabeling, etc.), the Black & Veatch project team, in conjunction with the EPA RPM, will decide on the appropriate corrective action.

### 4.6 Field Instrument Requirements

The analytical and health and safety screening instruments that may be used in the field during the RI/FS investigation are listed below:

- OVA Flame Ionization Detection Meter (FID)
- Water Temperature, pH, and Conductivity Meter
- Water Turbidity meter
- Water Level Indicator
- Salinity, Conductivity, DO, and Temperature Meter
- Redox Meter

The instruments will be calibrated according to manufacturers' specifications before and after each field use, and as otherwise deemed necessary. Manufacturers' specifications will be available onsite. Instruments will be calibrated, at minimum, each day prior to field use. Daily calibration procedures will be recorded in the field logbook, including the following information:

- Instrument name and serial number.
• Date and time of calibration.
• Responses to battery check, alarm, and instrument use.
• Calibration gas used and concentration.
• Initials of person performing calibration.

The following section presents a description of commonly used field screening equipment, procedures for use, calibration procedures and frequency, and any applicable inspection and maintenance procedures to be conducted by field personnel.

4.6.1 OVA Flame Ionization Detection Meter (FID)

The Foxboro/OVA 128 is a type of FID. The OVA is a general screening instrument used to detect the presence of most organic vapors. The OVA measures gases and vapors by responding to an unknown sample correlated to a gas of known composition to which the instrument is calibrated.

The Foxboro OVA Model 128 is calibrated in the following manner:

• Inspect the instrument for cracks, and check calibration.
• Connect the probe/readout assembly to the unit.
• Connect the probe extension to the probe assembly; check for tight seal.
• Place INSTR/BATT switch to "test" position; verify that the battery is charged.
• Place INSTR/BATT switch to the "on" position; allow warm-up of five minutes.
• Turn the PUMP SWITCH on.
• Place CALIBRATE SWITCH to "x10" mode.
• Connect gas regulator to a cylinder of 95 parts per million (ppm) methane-in-air calibration gas and observe that the pressure is above 50 per square inch gauge (psig).
• Attach tubing with tee to gas regulator and to end of close area sample.
Open gas regulator valve fully. Observe meter reading after approximately 1 to 2 minutes. If the reading is 95 ppm, close the regulator valve, disconnect the tubing, from the gas regulator and close area sampler, and remove the regulator from the gas cylinder. If the reading is not 95 ppm, adjust the potentiometer labeled R32 (located within the instrument housing in the gray circuit block on back of the unit) to obtain 95 ppm.

Close the H2 SUPPLY VALVE, move PUMP SWITCH to off, and adjust CALIBRATE ADJUST knob to 4 ppm.

Move the calibrate switch to x1 and observe meter. If the meter moves to 4 ppm, move the calibrate switch to x10 and adjust meter needle to 4 ppm. If the meter does not move to 4 ppm, adjust potentiometer labeled R31 to obtain a reading of 4 ppm.

Move calibrate switch to x100 and observe meter. If needle moves to 40 ppm, then instrument is ready for use. If needle does not move to 40 ppm, adjust potentiometer labeled R33 to obtain reading of 40 ppm.

The Foxboro OVA Model 128 is operated in the following manner:

- Open hydrogen TANK VALVE (observe pressure of approximately 150 psi for each hour of intended operation).

- Open hydrogen SUPPLY VALVE (observe pressure of 8 to 12 psi).

- Wait approximately one-minute; depress IGNITE BUTTON for a few seconds (and no more than five-seconds) until flame ignites; observe "kick" of meter needle; the instrument is now readily for use.

- Measure a volume of air for volatile organic vapors by placing the probe for about three to six seconds in the volume that is to be sampled.

Shutdown procedure of the OVA is:

- Close the hydrogen TANK VALVE.

- Close the hydrogen SUPPLY VALVE.

- Place INSTR switch to "off".

- Wait five-seconds, so that lines bleed; place PUMP switch to "off".
• The instrument may remain connected temporarily or be disconnected for packing and shipment.

Preventive maintenance of the Foxboro OVA is conducted by the manufacturer at six to nine month intervals. Other preventive maintenance measures include battery charging, cleaning of the instrument, and factory servicing.

4.6.2 Water Temperature, pH, and Conductivity Meter

It is anticipated that a HyDAC/Cambridge Model 910 brand conductance, pH, and temperature meter will be utilized during well development and surface water and well sampling activities. Each unit will be checked before each day's activities for mechanical or electrical failures, weak batteries, fouled or cracked electrodes, and dirty conductivity cells.

4.6.2.1 Temperature. The HyDAC instrument will be field-checked and calibrated daily for temperature against a glass thermometer which has been initially calibrated against a National Bureau of Standards (NBS) certified thermometer or one traceable to NBS certification. All temperature data will be recorded to the nearest 1 degree Fahrenheit (°F). Cross-checks and duplicate field analyses should agree within plus or minus 1°F. The HyDAC instrument has an accuracy rating of plus or minus 2°F.

To obtain a temperature reading, fill the instrument cup with aqueous sample. Depress the reading button and record the stabilized temperature. If the temperature does not stabilize, rinse the cup with the aqueous sample until the temperature stabilizes.

4.6.2.2 Specific Conductance. Before use in the field, the following procedures will be used to calibrate conductance on the HyDAC instrument:

• Remove the black plug on the bottom-right of the instrument revealing the adjustment potentiometer screw.

• Add standard conductance solution (provided by manufacturer) to the cup, discard, and refill. Repeat until the digital readout repeats the same reading twice in a row.
### Adjust the potentiometer until the digital display indicates the known value of conductance. Turning the screw clockwise decreases the reading and counterclockwise increases the reading.

Specific conductance results will be expressed in microhms per centimeter (μmhos/cm). Results will be reported to the nearest ten units for readings under 1,000 μmhos/cm and the nearest 100 units for readings over 1,000 μmhos/cm. Duplicate field analyses should agree within plus or minus 10 percent. The HyDAC instrument has an accuracy rating of plus or minus 2 percent full scale at 77°F.

To obtain a specific conductance reading, adjust the conductance-temperature dial to the recorded temperature. Depress the reading button and record the specific conductance in μmhos/cm.

#### 4.6.2.3 pH.

While in the field, the HyDAC instrument will be calibrated for pH daily before use with two buffers bracketing the expected sample pH. The following procedures will be used to calibrate pH:

- Place the pH electrode in the 7.0 buffer solution; adjust the ZERO potentiometer on the face of the instrument so that the digital display indicates 7.0.
- Rinse the electrode and place in the 4.0 or 10.0 buffer solution; adjust the SLOPE potentiometer on the face of the instrument so that the digital display indicated the value of the buffer chosen.

In case of an apparent pH misrepresentation, the electrode will be checked with pH 7.0 buffer and re-calibrated to the closest reference buffer. Then the sample will be re-tested. Duplicate tests should agree within 0.1 standard unit. Temperature resistant, combination electrodes will be employed in conjunction with the meters. Litmus paper will be used only for determining pH ranges, for determining approximate pH values, or for determining the pH of concentrated hazardous waste samples which may damage the instrument. Readings will be reported to the nearest 0.01 standard unit. The HyDAC instrument has an accuracy rating of plus or minus 0.1 standard unit at 77°F.

To obtain a pH value, insert the electrode into the aqueous sample, depress the reading button, and record the pH value.
4.6.3 Water Turbidity
It is anticipated that an HF Scientific Turbidity Meter will be utilized during field activities. The accuracy rating of the turbidimeter is typically plus or minus 2 percent of the reading plus stray light from 0 to 1000 Nephelometric Turbidity Units (NTUs). Instrument calibration will be conducted by the equipment provider, and will be checked in the field before each use against a known standard. Reported readings will be to the nearest NTU.

To field screen aqueous samples for turbidity, the meter is inspected and allowed to equilibrate to ambient temperatures. The instrument is calibrated, and the sample cell is rinsed with deionized water. The following procedure is used for collecting turbidity data:

- Rinse sample cell with deionized water, follow by rinsing with several volumes of sample water.
- Fill cell with sample water, activate testing switch, and obtain reading, switching to proper scale.
- Record sample reading and calibration readings in log book.

4.6.4 Water Level Indicator
It is anticipated that a Solinst water level will be used to measure water levels in the monitoring wells. This instrument consists of a spool of dual conductor wire with a probe at one end and an indicator light at the spool end. The following procedures are used for collected water level data:

- Lower the probe into the well until it makes contact with the water; the circuit will close upon water contact and the indicator light/buzzer attached to the spool will signal the contact.
- Measure by placing the tape at the reference point on the well.
- Record the measurement to the nearest 0.01 foot.

4.6.5 Salinity, Conductivity, Dissolved Oxygen, and Temperature Meter
It is anticipated that a YSI Model 85 salinity, conductivity, dissolved oxygen, and temperature meter will be used to measure DO levels in aqueous samples. The following procedure is used for collecting DO data:
• Turn on the meter with the probe in the calibration chamber on the side of the meter. The instrument will activated all segments of the display for a few seconds, then go through a self-test procedure that will last a few more seconds. A number will be displayed, along with the letters “CEL”. That number should be between 4.8 - 5.2. If not, call an equipment specialist.

• If the unit displays “Err” at this point, try turning the unit off and back on again. If it displays “LO BAT”, replace the batteries and discard the old ones. If it displays other error messages, contact an equipment specialist. If it displays number readings “rcl” or “ErAs”, the meter is functioning properly.

• Remove the probe from the calibration chamber. Shake any water off as you would a mercury thermometer. If the sponge inside looks dry, add a few drops of water, let soak, and pour off the excess. Examine the probe to be sure all holes are clean of debris with a shiny gold cathode on the end. The plastic membrane over the cathode should not be loose, wrinkled, damaged, or dirty, with no bubbles larger than 1/8 inch under the membrane. Rinse, if needed with organic free water. If problems persist continue as best you can with the procedure and document problems. Replace the probe in the calibration chamber, inserting it all the way.

• Remove the probe from the calibration chamber, rinse with organic free water, and lower it into the flow through apparatus. DO levels will decrease; record the lowest observed DO level and the corresponding temperature and salinity level.

4.6.6 Redox Meter
It is anticipated that an Orion 920A meter will be used to measure the redox potential in aqueous samples. This meter is calibrated by the manufacturer; however, a self-test must be run on the meter each time the meter is used. The following procedure is used for collecting redox potential data:

• Lower the redox probe into the well below the water surface. The redox potential will decrease rapidly; when the value begins to stabilize, record this value.

4.7 Inspection/Acceptance Requirements for Supplies and Consumables
All supplies and consumables that may directly or indirectly affect the quality of the project must be clearly identified and documented by field personnel. Acceptance criteria is based on the individual characteristics of the supply or consumable to be used, and is described in detail in Sections 3.0 and 5.0 of the FSP. Typical examples of supplies and consumables include sample bottles, calibration gases, tubing, materials for decontamination activities, deionized water, and potable water. For each item identified, field personnel shall document the inspection, acceptance testing requirements, or specifications (i.e., concentration, purity, source of procurement) in addition to any requirements for certificates of purity or analysis. All acceptance certificates will be retained on file.

Acceptance criteria must be consistent with overall project technical and quality criteria. If special requirements are needed for particular supplies or consumables, a clear agreement should be established with the supplier (i.e., particular concentration of calibration gas).

Upon inspection, all supplies will be documented in a field log book by field personnel. This logbook will contain the following information for each supply/consumable:

- Description of supply or consumable.
- Date received.
- Name/address of manufacturer or supplier.
- Attached documentation (yes/no and description) (i.e., calibration checks; concentration verification for calibration gases).
- Expiration date (if applicable).
- Special precautions (if applicable).
- Meets acceptance criteria (yes/no).
- Comments (i.e., chain of custody seal on box of sample containers).
- Name of responsible field personnel.

The Field Team Leader is responsible for insuring that consumables are properly inspected and that the documentation procedures stated above have been accomplished.

4.8 Non-Direct Measurements
This element addresses data obtained from existing data sources and not directly measured or generated during this project. Data that will be used during the RI/FS for the Site include existing site reports (i.e., Weston Letter Report). These data are deemed acceptable since existing site reports were submitted to EPA by Weston for background information. These data are intended to provide background information and the basis for any EPA RI/FS work.

4.9 Data Management

Data management is a process in which to track the data from its generation in the field and/or laboratory to their final use and storage. An overview of how data will be managed is described in the following sections. The Data Management Plan is presented as Appendix C.

4.9.1 Data Recording

The field operating records to be used in this investigation will document field procedures and any measurements performed during the sampling effort; a discussion of field operating records is presented in Section 3.6.1 of this QAPP.

Laboratory records that will be generated by EPA SESD, are discussed in the EPA Contract Laboratory Program Statement of Work, Exhibits A-D for organic, inorganic, and dioxin and furan analysis (EPA, 2006c; EPA, 2004d; EPA, 2005b).

4.9.2 Data Validation

A data quality evaluation of the laboratory results and field data will be performed prior to their use for conducting the evaluation of site contaminant distributions and magnitudes. All data from the CLP laboratories will undergo data validation by EPA SESD. All data received from the BOA laboratories will undergo data validation by the Black & Veatch chemist. Data quality evaluations will be performed in accordance with the procedures outlined in the EPA CLP National Functional Guidelines for Low Concentration Organic Data Review (EPA-540-R-00-006, dated June 2001) (EPA, 2001c), National Functional Guidelines for Organic Data Review (EPA-540/R-99-008, October 1999) (EPA, 1999), and the National-Functional Guidelines for Inorganic Data Review (EPA 540-R-04-004, October 2004) (EPA, 2004e). Field data log books and chain-of-custody forms will be cross checked against each other and against the
laboratory results to assess conformity of sample identification numbers. Laboratory data will typically be reviewed for data qualifier flags and anomalous data values. This information will be compared to results of duplicate and blank samples, and to information on field conditions at the time of sample collection to qualify the sample analytical results.

4.9.3 Data Transmittal
Data will be transmitted from the laboratory to SESD to Black & Veatch via paper-copy data packages and electronic files, followed by data validation, reduction, analysis, and report preparation.

4.9.4 Data Transformation and Reduction
Data received from the laboratory on electronic files will be used to create a database for the project. This database will be used to extract data according to method and sample identifications in order to produce data summary tables that will be presented in the RI/FS DER reports.

4.9.5 Data Analysis
Groundwater, soil, and surface water will be compared to the applicable state and federal regulations as presented in Section 3.4.3 of this QAPP.

4.9.6 Data Tracking
Data tracking will be performed by the Black & Veatch Project Manager, Project Geologist, or Project Engineer. Data will be tracked using a database which will include the date of collection, date of transmittal to laboratory, and date of analysis. It is important that these dates are tracked to ensure that sample holding times are not exceeded. Upon receipt of the data packages and electronic data files from the laboratory, data will be maintained in a database where additional tracking information can be added if needed.

4.9.7 Data Storage and Retrieval
Field data (logbooks, well development forms, groundwater sample collection forms) and laboratory data packages will be stored in hard copy in the Black & Veatch file storage room, as part of the project file. In addition, laboratory data will be stored in a
database format. This information will be retained in the project file for at least three years following project completion and closeout.