QUALITY ASSURANCE PROJECT PLAN (SHORT FORM)

ROYSTER GUANO REMOVAL
COLUMBIA, RICHLAND COUNTY, SOUTH CAROLINA

Revision 0

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 4
Atlanta, GA 30303

Contract No.	:	EP-W-05-054
TDD No.	:	TTEMI-05-001-0186
Date Prepared	:	October 26, 2012
EPA Task Monitor	:	Rick Jardine
Telephone No.	:	(404) 562-8764
Prepared by	:	Tetra Tech, Inc.
START III Site Manager	:	Brian Croft
Telephone No.	:	(678) 775-3113

Prepared by	Reviewed by	Approved by
Shanna Davis	Jessica A. Vickers	Andrew F. Johnson
START III Environmental Scientist	START III Technical Reviewer	START III Program Manager

CONTENTS

APPENDICES

QUALITY ASSURANCE PROJECT PLAN (SHORT FORM)

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 4 & TETRA TECH, INC.

SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM CONTRACT NO. EP-W-05-054

Site Name:	Royster Guano Removal	**City, County:** Columbia, Richland County	**State:** South Carolina
Prepared By:	Tetra Tech, Inc. (Tetra Tech)	**Date:** October 26, 2012	
Approved By:	Brian Croft **Date:** 10/26/12	**Signature:**	
Title:	Tetra Tech Project Manager		
Approved By:	Jessica Vickers **Date:** 10/26/12	**Signature:**	
Title:	Tetra Tech Quality Assurance (QA) Manager		
Approved By:	Andrew Johnson **Date:** 10/26/12	**Signature:**	
Title:	Tetra Tech Superfund Technical Assessment and Response Team (START III) Program Manager		
Approved By:	Rick Jardine **Date:**	**Signature:**	
Title:	U.S. Environmental Protection Agency (EPA) On-Scene Coordinator (OSC) and Project Task Monitor		

1.0 PROJECT INFORMATION

1.1 Distribution List:

EPA Region 4:

Rick Jardine, EPA OSC
Katrina Jones, EPA Project Officer

Tetra Tech:

Angel Reed, Tetra Tech Document Control Coordinator

1.2 Project/Task Organization

Rick Jardine will serve as the EPA OSC for the activities described in this quality assurance project plan (QAPP). Brian Croft of Tetra Tech will serve as the Tetra Tech site manager and is responsible for maintaining an approved version of this QAPP. Jessica Vickers of Tetra Tech will serve as the Tetra Tech QA manager and is responsible for providing Tetra Tech approval of this QAPP. Specific Tetra Tech field personnel will be selected before mobilization as defined under the START III Contract No. EP-W-05-054.

1.3 Problem Definition/Background:

The former F.S. Royster Guano Company (RGC) is located at 2095 Commerce Drive in Columbia, Richland County, South Carolina (see Figure 1 in Appendix A). The former RGC site consists of four parcels of land that covers about 2.9 acres, which are zoned M-1 (light industrial). According to documentation received from the South Carolina Department of Health and Environmental Control (SCDHEC), the site is also known by the names Seaco/Colprovia Asphalt, Petrolane Gas Service, Duane Gas Company, Tuller Oil, and Randolph Trucking. The former RGC property was a fertilizer plant in the early 1900s. During operations, a large pond was present north of the plant. The uses of the pond during fertilizer operations are not known. The pond was subsequently drained, backfilled, and redeveloped into residential properties. The approximate location of the former pond is the focus/study area of this removal investigation (see Figure 2 in Appendix A). Because the plant operated prior to environmental regulations and permitting, SCDHEC knows little about the former RGC plant, except that it made superphosphate fertilizer. Large tanks, which were located on the former RGC property, contained sulfuric acid that was mixed with phosphate ore to make the fertilizer. The sulfuric acid was produced in lead-lined chambers. The waste material from the fertilizer manufacturing process contained high levels of arsenic and lead. Three underground storage tanks were also present on site, two of which were removed and the third was abandoned in place. Several above ground storage tanks are located on the site, and are currently used for asphalt emulsion operations.

In May 2012, SCDHEC was notified that high concentrations of arsenic were discovered in soils and groundwater on a portion of the former RGC site following an investigation conducted during a pre-buy assessment in March 2012 for a portion of the former plant site and surrounding properties. Based on this information, on July 25, 2012, SCDHEC conducted additional soil sampling at 41 residences, six businesses, two parks, and seven public right-of-way areas. SCDHEC sampling efforts identified several locations with high levels of arsenic and lead. SCDHEC notified EPA of the contamination, which prompted an EPA site visit and review of sampling analytical results.

In August 2012, EPA conducted a removal investigation in the area of the former RGC property to characterize the extent and concentrations of contamination in surface and subsurface soil and determine the appropriateness of a removal action in accordance with 40 Code of Federal Regulations (CFR) 300.415. Removal investigation activities included the use of an X-ray fluorescence (XRF) instrument for soil screening and the collection of surface and subsurface soil samples for laboratory analysis. As illustrated on Figure 3 in Appendix A, XRF screening results and laboratory analytical results confirmed the presence of lead and arsenic at concentrations exceeding their respective EPA Removal Management Levels (RML) for residential soil. The EPA RML for arsenic is 39 milligrams per kilogram (mg/kg) and the EPA RML for lead is 400 mg/kg.

Based on previous investigations, EPA determined that a removal action is warranted at the site in accordance with 40 CFR 300.415.

1.4 Project/Task Description:

Tetra Tech START was tasked to conduct activities associated with a removal action at the RGC site. Thirteen residential properties contain arsenic and/or lead at concentrations exceeding their respective EPA RML. Specifically, of the thirteen properties, 3 front yards, 6 backyards, and 4 front and back yards will be excavated (see Figure 2 in Appendix A). The properties will be excavated by an EPA emergency and rapid response services (ERRS) contractor to a depth of 12 inches below ground surface.

During the removal action, field screening of soil using an XRF will be performed to help guide excavation activities. In addition, confirmation soil samples will be collected for laboratory analysis to evaluate the concentrations of arsenic and lead and the effectiveness of excavation activities. Approximately 15 composite soil samples are proposed to be collected from a depth of 0 to 6 inches below the excavated areas. Specifically, one composite confirmation soil sample will be collected from each residential property and submitted to the laboratory for analysis of arsenic and lead concentrations. For the four residential properties where a front yard and back yard will be excavated, the composite soil sample will consist of aliquots from both the front and back yards. After a confirmation sample has been collected, the excavated area will be backfilled with clean soil. Quality control (QC) samples will also be collected. Pre- and post-excavation photographs will be taken to ensure that excavated properties will be returned to their pre-excavation conditions.

Tetra Tech will conduct air monitoring (for particulates) and sampling during removal activities, as well as provide written and photographic documentation. One dataRAM (or equivalent) will be stationed in the area of the excavation and one dataRAM will be stationed downwind of the area of excavation. Personal air pumps (monitoring for arsenic and lead) will be co-located with each dataRAM. The dataRAMs and personal air pumps will be repositioned after excavation activities at each residential property have been completed. One air sample per day of excavation activities will be submitted to the laboratory for analysis of arsenic and lead concentrations. The air sample to be submitted to the laboratory (area of excavation or downwind of excavation area) will be determined by the EPA OSC. EPA will provide a water truck for dust suppression during excavation activities.

Schedule: Field activities are expected to start during the week of October 29, 2012.

1.5 Quality Objectives and Criteria for Measurement Data:

Identification of the seven steps of the data quality objectives (DQO) process: DQOs were established for the Royster Guano Removal to define the quantity and quality of the data to be collected to support the objectives of the sampling event. DQOs were developed using the seven-step process outlined in the following guidance documents: "EPA Requirements for Quality Assurance Project Plans," EPA QA/R-5, March 2001; "Guidance for Quality Assurance Project Plans," EPA QA/G-5, December 2002; and "Guidance on Systematic Planning Using the Data Quality Objectives Process," EPA QA/G-4, February 2006.

Step 1: State the Problem	**Stakeholders:** EPA, SCDHEC, Randolph Trucking, Seaco, Inc., property owners, and the local community. **Site History/Conceptual Site Model:** The RGC site is located on several properties in a residential area in Columbia, Richland County, South Carolina. Thirteen residential properties contain lead and/or arsenic at concentrations above their respective EPA RMLs. EPA has determined that a removal action is warranted at the site in accordance with 40 CFR 300.415. For additional information see Section 1.3 of this QAPP. **Statement of Problem:** Field screening of soil using XRF, the collection of confirmation composite soil samples, and the collection of air samples for laboratory analysis of total lead and arsenic will be required to assist with the removal action. Sampling will be conducted to confirm the effectiveness of removal activities. ERRS will sample the excavated soil for disposal.
Step 2: Identify the Goals of the Study	**Study Questions:** Do confirmation soil samples reveal that the removal action is effective and that arsenic and lead concentrations are below RMLs? Have materials removed from the property been adequately characterized for proper disposal? Are particulates being dispersed to ambient air in the excavation areas and areas downwind of the removal? **Decision Statements:** Conduct XRF field screening and laboratory analysis of confirmation composite soil samples collected from excavated areas to determine concentrations of arsenic and lead. Air samples will also be collected in the area of the excavation as well as downwind of excavation activities to determine concentrations of lead and arsenic.
Step 3: Identify Information Inputs	**Inputs:** The RGC site history is contained in Section 1.3 of this QAPP.
Step 4: Define Study Boundaries	**Spatial Boundary:** The RGC site is located on several properties in a residential area along Easy and Howe Streets in Columbia, South Carolina. The RGC site is bounded by residential properties to the north; industrial businesses to the east and south; and a commercial business to the west (see Figures 1 and 2 in Appendix A). **Temporal Boundaries:** Removal action activities are anticipated to start during the week of October 29, 2012 and are expected to last for up to 8 weeks.

Step 5: Develop the Analytical Approach	**Analytical Methods:** Laboratory analysis of composite confirmation soil samples will include arsenic and lead by the EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) Method 6010C. Air samples will be analyzed for arsenic and lead using National Institute of Occupational Safety and Health (NIOSH) Method 7300. All analyses will be performed by subcontract laboratories procured by Tetra Tech. All requested analyses will be reported to meet the reporting limits specified in Table B-1 of Appendix B. **Comparison Criteria:** Analytical data results will be compared with the EPA RMLs, July 2012. **Decision Rules:** Analytical results will be compared to the criteria listed above. Decisions made regarding the results will be determined by EPA.
Step 6: Specify Performance or Acceptance Criteria	Air analytical results for initial acceptance will be assessed during validation performed by Tetra Tech that evaluates the usability of the data defined. Level IV data packages for soil and air samples will be requested from the laboratories procured by Tetra Tech. A Stage 4 validation of the Level IV data packages will be performed by Tetra Tech. Any rejected data and the reasons for rejection will be summarized in the data validation report.
Step 7: Develop the Plan for Obtaining Data	**Optimized Design:** Up to 15 composite confirmation soil samples are proposed for this event. The number of air samples will be determined by the length of the removal action. Sample nomenclature, locations, and rationales are described in Table B-2 of Appendix B.

1.6 Special Training/Certification Requirements:

☒ OSHA 29 CFR 1910.120 ☐ Special Equipment/Instrument Operator (describe below): ☐ Other (describe below):

Special Requirements:

1.7 Documentation and Records:

The most current version of this QAPP will be distributed to the entire distribution list presented in Section 1.1. The Tetra Tech PM will be responsible for maintaining the most current revision of this QAPP and for distributing it to all personnel and parties involved in the field effort. Field records that may be generated include the following:

- ☒ Chains-of-Custody Forms
- ☒ Field Instrument Calibration Logs
- ☒ Field Monitoring and Screening Results
- ☒ Tailgate Sign-In Sheet
- ☒ Health and Safety Plan (HASP)
- ☒ Photographic log
- ☒ Site Logbook
- ☒ Site Maps and Drawings

Field documentation and records will be generated and maintained in accordance with the requirements presented in the EPA Region 4 Science and Ecosystem Support Division (SESD) Field Branches Quality System and Technical Procedures (FBQSTP) guidance document for *Logbooks* (SESDPROC-010-R4), October 2010. This document can be found at the following web address: http://www.epa.gov/region4/sesd/fbqstp/index.html. All field-generated data will also be maintained in the project file and included, as appropriate, in project deliverables in final form after all reviews and applicable corrective actions.

Laboratory analytical data will be generated and maintained in accordance with the EPA Contract Laboratory Program (CLP) National Functional Guidelines (NFG) for Inorganic Superfund Data Review, USEPA-540-R-10-11, January 2010; NIOSH Method 7300; and SW-846, Fourth Edition, Including Updated, I through IVB, February 2007 (which can be found at: http://www.epalgov/SW-846/main.htm). A turnaround time of 5 business days for preliminary results and 15 business days for final data packages for soil and air sample analyses will be requested from the Tetra Tech-procured subcontract laboratories. However, turnaround time may be modified in the field at the discretion of the EPA OSC.

The formal deliverables for EPA associated with this project are specified in the EPA technical direction document. Draft and final reports will be prepared to summarize field activities and findings and present laboratory analytical results. All project records under Tetra Tech's control will be maintained and retained in accordance with the requirements of EPA START III Contract No. EP-W-05-054.

2.0 DATA GENERATION AND ACQUISITION

2.1 Sampling Process Design:

Tables B-2 through B-5 of Appendix B present details on the types and numbers of samples to be collected, sample locations, sample matrices, and laboratory analytical methods. The rationale for this sampling process design is based on the DQO process discussed in Section 1.5 of this QAPP. Samples will be submitted to the subcontract laboratories procured by Tetra Tech and will be analyzed for arsenic and lead.

2.2 Sample Methods Requirements:

Matrix	Sampling Method	EPA and Tetra Tech Standard Operating Procedures and Guidance
Soil	Refer to Tables B-2 through B-5 for more details, including requested laboratory analyses and methods.	Refer to the EPA SW-846 Method 6010C; and the Region 4, SESD FBQSTP for *Soil Sampling* (SESDPROC-300-R2), December 2011. Also refer to Section 2.2, page 19 of the Tetra Tech START Program Level QAPP, May 2012. A list of applicable Safe Work Practices is included in the HASP, which will be available on site.
Air		Refer to the NIOSH Method 7300 for air samples; and the Region 4, SESD FBQSTP for *Ambient Air Sampling* (SESDPROC-303-R4), January 2011. Also refer to Section 2.2, page 19 of the Tetra Tech START Program Level QAPP, May 2012. A list of applicable Safe Work Practices is included in the HASP, which will be available on site.

Other Sample Method Requirements: The Tetra Tech site manager, in coordination with the EPA OSC, will be responsible for identifying failures in sampling and field measurement systems, overseeing any corrective actions, ensuring that the corrective actions are documented in site logbooks and other appropriate records, and assessing the effectiveness of corrective actions. Field decontamination, if necessary, will be conducted in accordance with the procedures provided in the EPA Region 4, SESD FBQSTP *Field Equipment Cleaning and Decontamination* (SESDPROC-205-R2), December 2011, available at the following web address: http://www.epa.gov/region4/sesd/fbqstp/index.html. Equipment required for this sampling event includes sample jars; sample packaging materials such as coolers and suitable packing material; stainless steel bowls, and spoons; and personal protective equipment (PPE) identified in the HASP (including disposable nitrile gloves and boot covers). Also see Table B-6 of this QAPP for a list of field equipment and supplies.

2.3 Sample Handling and Custody Requirements:

Sample handling and chain-of-custody record keeping will be conducted in accordance with EPA Region 4, SESD FBQSTP *Packing, Marking, Labeling, and Shipping of Environmental and Waste Samples* (SESDPROC-209-R2), April 2011, available at the following web address: http://www.epa.gov/region4/sesd/fbqstp/index.html. Once they have been collected, soil samples will be placed on ice and kept in a custody-sealed cooler in a secure location. The Tetra Tech site manager will ensure that custody of samples is maintained until they are shipped to the laboratories. Chain-of-custody records will be used to document the samples collected and delivered to the laboratories. Also refer to Section 2.3, page 27 of the Tetra Tech START Program Level QAPP, May 2012.

2.4 Analytical Method Requirements:

The analytical parameters and associated laboratory analytical methods that will be used for this project are listed in Tables B-4 and B-5 of this QAPP.

A turnaround time of 5 business days for preliminary results and 15 business days for final data packages for soil and air samples will be requested for arsenic and lead from the Tetra Tech-procured subcontract laboratories. Analytical results for initial acceptance will be assessed during validation performed by Tetra Tech that evaluates the usability of the data defined. Level IV data packages for soil and air samples will be requested from the laboratories procured by Tetra Tech. A turnaround time of 15 business days will be requested for the Level IV data package for air and soil. A Stage 4 validation of the Level IV data packages will be performed by Tetra Tech. Any rejected data and the reasons for rejection will be summarized in the data validation report. See Table B-5 in Appendix B of this QAPP.

2.5 Quality Control Requirements:

QC requirements for field monitoring are provided in the EPA Region 4, SESD FBQSTP *Field Measurement Uncertainty* (SESDPROC-014-R1), April 2012, and QC requirements for field sampling are provided in the EPA Region 4, SESD FBQSTP *Field Sampling Quality Control* (SESDPROC-011-R3), October 2010. Both are available at the following web address: http://www.epa.gov/region4/sesd/fbqstp/index.html. Also refer to Section 2.5.1, page 33 of the Tetra Tech START Program Level QAPP, May 2012.

QC requirements for analytical methods are presented in the EPA CLP NFG for Inorganic Superfund Data Review, USEPA-540-R-10-11, January 2010; NIOSH Method 7300; and SW-846, Fourth Edition, Including Updated, I through IVB, February 2007 (which can be found at: http://www.epalgov/SW-846/main.htm), as well as in Section 2.5.2, page 34 of the Tetra Tech START Program Level QAPP, May 2012.

Laboratory QC samples will include one matrix spike and matrix spike duplicate (MS/MSD) from sample sets collected at a frequency of one MS/MSD set for every 20 samples per medium collected. Field QC samples will include field duplicate samples collected at a frequency of one field duplicate sample for every 20 samples per medium collected and one media blank for air samples. All QC samples will be submitted for analyses of parameters listed in Tables B-4 and B-5 of this QAPP.

2.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements:

For instrument testing, inspection, and maintenance requirements for field monitoring, refer to the EPA Region 4, SESD FBQSTP *Equipment Inventory and Management* (SESDPROC-108-R3), April 2009, available at the following web address: http://www.epa.gov/region4/sesd/fbqstp/index.html. Also refer to the manufacturer's operating manual for further instructions on field instrument testing, inspection, and maintenance, as well as to Section 2.6.2, page 40 of the Tetra Tech START Program Level QAPP, May 2012. Table B-6 of this QAPP contains a list of field equipment that will be used during this sampling event.

Laboratory instrument testing, inspection, and maintenance requirements are contained in SW-846 and NIOSH methods, as well as in the associated manufacturer's operating manuals and Section 2.6.3, page 40 of the Tetra Tech START Program Level QAPP, May 2012.

2.7 Instrument Calibration and Frequency:

For instrument calibration and frequency requirements for field monitoring, refer to the EPA Region 4, SESD FBQSTP *Equipment Inventory and Management* (SESDPROC-108-R3), April 2009, available at the following web address: http://www.epa.gov/region4/sesd/fbqstp/index.html. Also refer to the manufacturer's operating manual for further instructions on calibration, as well as to Section 2.7.1, page 41 of the Tetra Tech START Program Level QAPP, May 2012.

Instrument calibration and frequency requirements for analytical methods are specified in the SW-846 and NIOSH methods, as well as in the associated manufacturer's operating manuals, the laboratory QA manual, and in Section 2.7.2, page 41 of the Tetra Tech START Program Level QAPP, May 2012.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables:

Supplies and consumables required for this sampling event will be inspected and accepted by the Tetra Tech site manager or designated field team member, and include sample jars, sampling implements, sample packaging materials, and PPE identified in the HASP (including disposable nitrile gloves and boot covers). All sample containers will meet EPA criteria for cleaning procedures for low-level chemical analysis. Certifications will be provided by the manufacturer for sample containers in accordance with pre-cleaning criteria established by EPA. See Section 2.8, page 43 of the Tetra Tech START Program Level QAPP, May 2012. See Table B-6 in this QAPP for a list of supplies and consumables that will be used during this sampling event.

2.9 Non-Direct Measurement Requirements:

Information pertaining to the site (including photographs, maps, and so forth) has been compiled from file information obtained from EPA. The extent to which these data and information, if any, are used to achieve the objectives of this project will be determined by Tetra Tech in cooperation with the EPA OSC. Any justifications and qualifications required for the use of these data and information will be provided in the reports generated for this project. Refer to Section 2.9, page 43 of the Tetra Tech START Program Level QAPP, May 2012.

2.10 Data Management:

All reference materials generated during this investigation and included in the final reports will be submitted to the EPA OSC in portable document format. All field-generated data will be managed as part of the permanent field record for the project. All laboratory analytical data will be managed in accordance with the requirements specified in the EPA CLP NFG for Inorganic Superfund Data Review, USEPA-540-R-10-11, January 2010; NIOSH Method 7300; and SW-846, Fourth Edition, Including Updated, I through IVB, February 2007 (which can be found at: http://www.epalgov/SW-846/main.htm), as well as the laboratory QA manual, and in Section 2.10, page 44 of the Tetra Tech START Program Level QAPP, May 2012. Finally, all field-generated data and other records generated or obtained during this project will be managed according to the requirements of EPA START III Contract No. EP-W-05-054, as well as to Section 2.10, page 44 of the Tetra Tech START Program Level QAPP, May 2012.

3.0 ASSESSMENT AND OVERSIGHT

3.1 Assessment and Response Actions:

Field and laboratory audits will not be conducted for this project. All deliverables to which Tetra Tech contributes in whole or in part, including the final reports, will be subject to a corporate two- or three-tiered review process, which includes a technical review, a QC review, and (for the three-tiered review only) an editorial review. Each reviewer will sign off on a QC review sheet when any issues or revisions have been addressed. These reviews will be performed by qualified individuals in accordance with the requirements of EPA START III Contract No. EP-W-05-054 and with Section 3.1, page 45 of the Tetra Tech START Program Level QAPP, May 2012.

3.2 Corrective Action:

The Tetra Tech site manager, in coordination with the EPA OSC, will be responsible for identifying failures in sampling and field measurement systems, overseeing any corrective actions, ensuring that the corrective actions are documented in site logbooks and other appropriate records, and assessing the effectiveness of corrective actions. Corrective action requirements for EPA and NIOSH analytical methods are presented in Section 3.1.2, page 47 of the Tetra Tech START Program Level QAPP, May 2012.

3.3 Reports to Management:

Tetra Tech is responsible for notifying the EPA OSC if any circumstances arise during the field investigation that may impair the quality of the data collected. All formal deliverables to EPA associated with this project will be prepared, reviewed, and distributed in accordance with the requirements of the EPA START III Contract No. EP-W-05-054, Section 3.2, page 49 of the Tetra Tech START Program Level QAPP, May 2012, and under the supervision of the Tetra Tech QA manager, Jessica Vickers or appropriate designee.

4.0 DATA VALIDATION AND USABILITY

4.1 Data Review, Verification, and Validation Requirements:

All field-generated data and records (such as XRF screening results, field sampling sheets, global positioning system coordinates of sample and other locations, and field logbook notes) will be reviewed for completeness and accuracy by the Tetra Tech project manager, site manager, and appropriate designees. Field data and records will be reviewed at the end of each day or as soon as possible so that corrective actions, if necessary, can be made before field crews demobilize from the site.

Analytical results for initial acceptance will be assessed during validation performed by Tetra Tech that evaluates the usability of the data defined. A Stage 4 validation of the Level IV data package for air and soil samples will be performed in accordance with the EPA CLP NFG for Inorganic Superfund Data Review, USEPA-540-R-10-11, January 2010; NIOSH Method 7300; SW-846, Fourth Edition, Including Updated, I through IVB, February 2007 (which can be found at: http://www.epalgov/SW-846/main.htm); and Section 4.2.2, page 51 of the Tetra Tech START Program Level QAPP, May 2012. Any rejected data and the reasons for rejection will be summarized in the data validation report.

4.2 Verification and Validation Methods:

All field-generated data will be maintained in the project file and included (as appropriate) in project deliverables in final form after all reviews and associated corrective actions. The laboratory analytical data will be validated as discussed in Section 4.1 above. The data validation reports will contain a summary of all data qualifier flags and their explanations. Also see Section 4.2, page 51 of the Tetra Tech START Program Level QAPP, May 2012.

4.3 Reconciliation of the Data to the Project-Specific DQOs:

The Tetra Tech project manager, in cooperation with the EPA OSC and Tetra Tech QA Manager, will be responsible for reconciling the data and other project results with the requirements specified in this QAPP and by the data users and decision makers. Ultimate acceptance of the data is at the discretion of the EPA OSC. Depending on how specific data quality indicators do not meet the project's requirements, the data may be discarded, and resampling and reanalysis of the subject samples may be required. Resampling, reanalysis, or other out-of-scope actions identified to address data quality deficiencies and data gaps will require approval by the EPA OSC, EPA Project Officer, and EPA Contracting Officer.

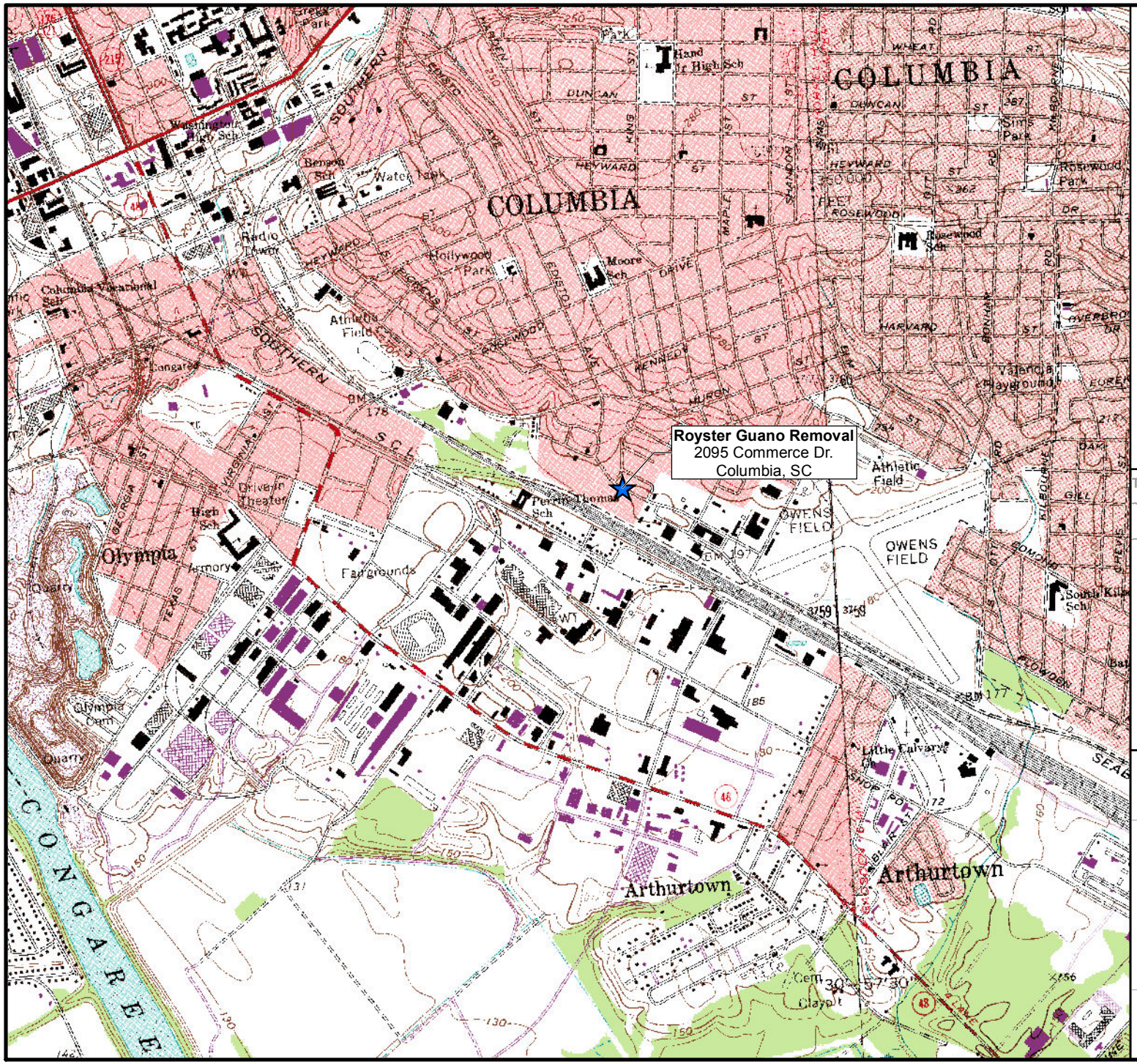
Limitations of the data and data rejection and qualification will be identified during the validation process conducted by Tetra Tech. The data will be reviewed to determine whether any data are rejected and whether any data qualifiers or limitations assigned during the validation process affect the usability of the data, as defined in Section 1.5 of this QAPP. Tetra Tech will review all final laboratory data packages to evaluate whether the site-specific DQOs, as defined in Section 1.5 of this QAPP, are met. The data will be reconciled with the project-specific DQOs also in accordance with EPA guidance documents, including "Guidance on Systematic Planning Using the Data Quality Objectives Process," EPA QA/G-4, February 2006. Also see Section 4.3, page 53 of the Tetra Tech START Contract-Level QAPP, May 2012.

APPENDIX A

FIGURES

(Three Pages)

Figure



Legend

Site Location

N
W E
S

0 1,000 2,000

Feet

Map Source:
USGS 7.5 Minute Topographic Quadrangle Maps:
SW Columbia, 1994 and Ft Jackson South, 1987.

United States Environmental Protection Agency Region 4

FIGURE 1

Site Location

TDD Name: Royster Guano Removal

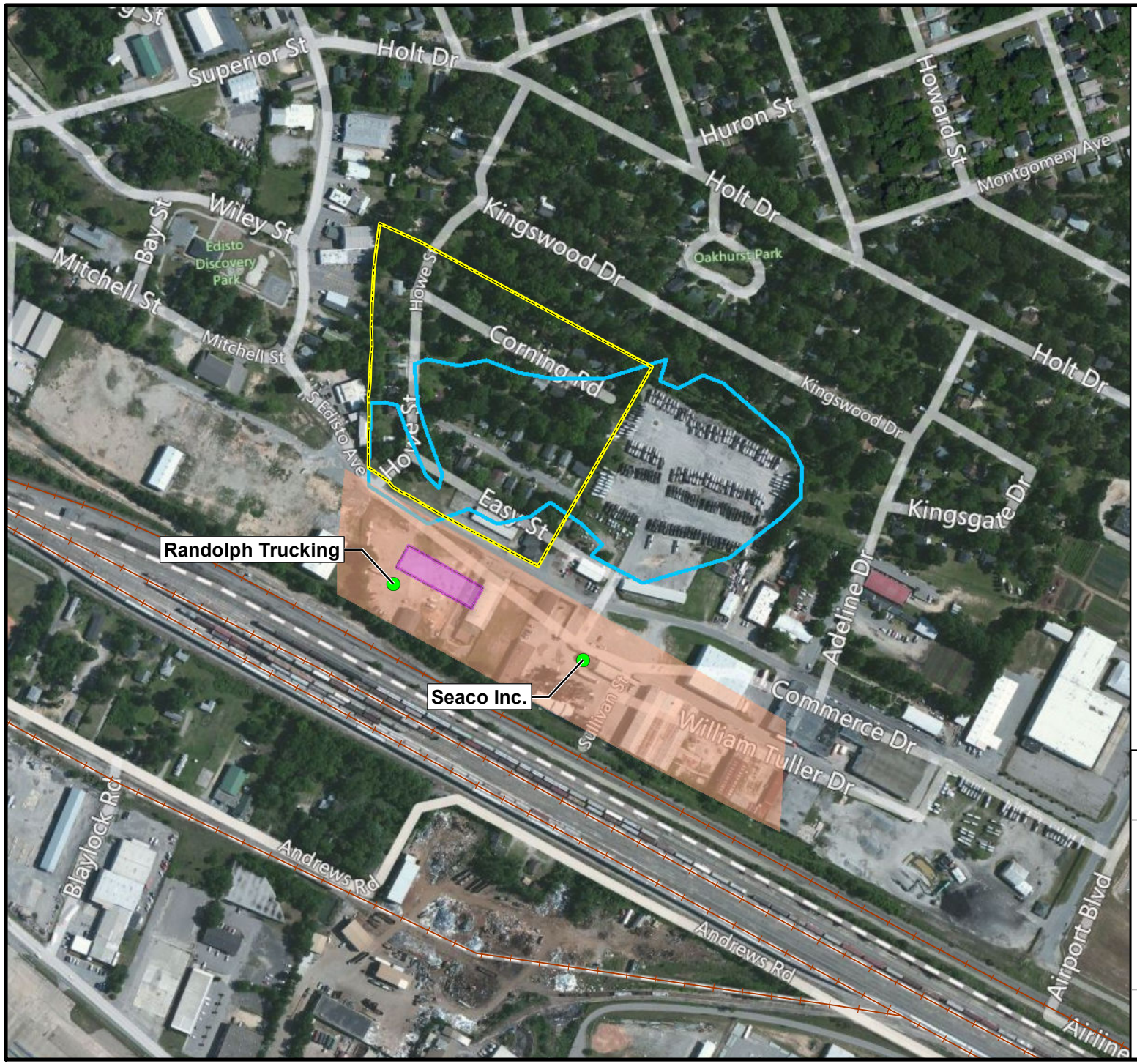
TDD No.: TTEMI-05-001-0186

City:	County:	State:
Columbia	Richland	South Carolina

TETRA TECH

Date: 10/26/2012
Analyst: ingrid.tobar

File: C:\X\TTEMI-05-001-0186_Royster_Guano_Removal\GIS\MXDs\Fig1_SiteLocation.mxd



Legend

- Railroad
- Study Area
- Acid Chamber
- Former Royster Guano Company Footprint
- Approximate Extent of Former Pond

N
W E
S

0 200 400
Feet

Map Source:
Bing Maps Hybrid, 2012; HSIP Gold, 2011.

United States Environmental Protection Agency Region 4

FIGURE 2

Site Layout

TDD Name: Royster Guano Removal

TDD No.: TTEMI-05-001-0186

City:	County:	State:
Columbia	Richland	South Carolina

TETRA TECH

Date: 10/26/2012
Analyst: ingrid.tobar

File: C:\X\TTEMI-05-001-0186_Royster_Guano_Removal\GIS\MXDs\Fig2_SiteLayout.mxd

Legend

Grab sample location
(Various depths)

- Arsenic and lead results above RMLs
- Arsenic and lead results below RMLs
- Approximate Extent of Former Pond

Impacted areas by depth

0 - 3 inches
- Arsenic and lead above RMLs
- Arsenic or lead above RML

9 - 12 inches
- Arsenic and lead above RMLs
- Only lead above RML

21 - 24 inches
- Arsenic and lead above RMLs
- Only arsenic above RML
- Arsenic or lead result below RMLs

- Parcel boundary (with address number)

Notes:

Arsenic RML: 39 mg/kg

Lead RML: 400 mg/kg

mg/kg	Milligrams per kilogram
RML	EPA Removal Management Level

N
W E
S

0 50 100
Feet

Map Source:
Bing Maps Aerial, 2012.

United States Environmental Protection Agency Region 4

FIGURE 3

Arsenic and Lead
Impacted Areas by Depth

TDD Name: Royster Guano Removal

TDD No.: TTEMI-05-001-0186

City:	County:	State:
Columbia	Richland	South Carolina

TETRA TECH

Date: 10/26/2012

Analyst: ingrid.tobar

File: C:\X\TTEMI-05-001-0186_Royster_Guano_Removal\GIS\MXDs\Fig3_PropertiesImpacted.mxd

APPENDIX B

TABLES

(Six Pages)

Table

TABLE B-1
ROYSTER GUANO REMOVAL
REQUESTED REPORTING LIMITS

Analyte	CAS Number	Soil Reporting Limit	Residential Soil Comparison Criteria
			RML
Metals (mg/kg)			
Arsenic	7440-38-2	1.0	39
Lead	7439-92-1	1.0	400

Analyte	CAS Number	Air Reporting Limit	Air Comparison Criteria
			RML
Metals (µg/m^3)			
Arsenic	7440-38-2	0.05	0.05
Lead	7439-92-1	0.15	0.15

Notes:

CAS	Chemical abstract number
µg/m^3	Micrograms per cubic meter
mg/kg	Milligrams per kilogram
RML	Removal management level

TABLE B-2
ROYSTER GUANO REMOVAL
SAMPLING LOCATIONS AND RATIONALE

Sample ID	Depth (in bes)	Sample Type	Sample Location	Rationale
RG-EASY66-CS-FYC-DATE	0 to 6	Composite Soil	66 Easy Street	Determine the presence or absence of contamination
RG-EASY67-CS-FYC-DATE	0 to 6	Composite Soil	67 Easy Street	Determine the presence or absence of contamination
RG-EASY68-CS-FYC-DATE	0 to 6	Composite Soil	68 Easy Street	Determine the presence or absence of contamination
RG-EASY79-CS-BYC-DATE	0 to 6	Composite Soil	79 Easy Street	Determine the presence or absence of contamination
RG-EASY80-CS-BYC-DATE	0 to 6	Composite Soil	80 Easy Street	Determine the presence or absence of contamination
RG-EASY81-CS-BYC-DATE	0 to 6	Composite Soil	81 Easy Street	Determine the presence or absence of contamination
RG-EASY82-CS-FYBYC-DATE	0 to 6	Composite Soil	82 Easy Street	Determine the presence or absence of contamination
RG-EASY83-CS-BYC-DATE	0 to 6	Composite Soil	83 Easy Street	Determine the presence or absence of contamination
RG-EASY84-CS-FYBYC-DATE	0 to 6	Composite Soil	84 Easy Street	Determine the presence or absence of contamination
RG-EASY85-CS-BYC-DATE	0 to 6	Composite Soil	85 Easy Street	Determine the presence or absence of contamination
RG-HOWE1029-CS-BYC-DATE	0 to 6	Composite Soil	1029 Howe Street	Determine the presence or absence of contamination
RG-HOWE1045-CS-FYBYC-DATE	0 to 6	Composite Soil	1045 Howe Street	Determine the presence or absence of contamination
RG-HOWE1049-CS-FYBYC-DATE	0 to 6	Composite Soil	1049 Howe Street	Determine the presence or absence of contamination
RG-AE-01-DATE to RG-AE-##-DATE*	NA	Air	Excavation area	Determine the presence or absence of contamination
RG-AD-01-DATE to RG-AD-##-DATE*	NA	Air	Downwind of excavation area	Determine the presence or absence of contamination

Notes:

*	One air sample will be submitted for laboratory analysis each day during excavation activities. The location of the air sample (excavation area or downwind of excavation area) will be determined in the field by the EPA OSC.
##	Station ID to be determined during sampling activities
AD	Air sample collected downwind of excavation area
AE	Air sample collected in excavation area
BYC	Backyard composite
CS	Confirmation soil sample
DATE	Date on which sampling occurred in the form of month, day, and year (MMDDYY
FYC	Frontyard composite
FYBYC	Frontyard and backyard composite
ID	Identification
in bes	Inches below excavation surface
RG	Royster Guano Company

TABLE B-3
ROYSTER GUANO REMOVAL
QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Sample ID	Sample Type	Rationale
RG-StreetAddress-CS-FYBYC-DATE	MS/MSD	Provide information about the effect of each sample matrix on the sample preparation procedures and measurement methodology. One MS/MSD sample will be designated for every 20 soil samples collected per matrix.
RG-StreetAddress-CS-FYBYC-DATE-DUP	Field duplicate	Measure both field and laboratory precision. One duplicate sample will be collected for every 20 soil samples collected per matrix.
RG-AIR-MB-01	Media Blank	Determine whether the sample-collection media are being contaminated through field handling (but not including collecting air samples) and shipping of the media, thus affecting the analytical results for air samples. One media blank will be collected per 20 samples and per lot of cassettes.

Notes: Also refer to Section 2.5 of this QAPP.

##	Station ID to be assigned during sampling activities
CS	Confirmation soil sample
DATE	Date on which sampling occurred in the form of month, day, and year (MMDDYY)
DUP	Duplicate
FYBYC	Frontyard and backyard composite
ID	Identification
MB	Media blank
MS/MSD	Matrix spike/matrix spike duplicate
RG	Royster Guano Company

TABLE B-4
ROYSTER GUANO REMOVAL
ANALYTICAL METHODS, REQUIRED SAMPLE CONTAINERS, AND PRESERVATIVES

ANALYTICAL PARAMETER	PARAMETER TO BE NOTED ON CHAIN-OF-CUSTODY RECORDS	MATRIX	ANALYTICAL METHOD[1]	NUMBER[3] AND TYPE OF SAMPLE CONTAINER	PRESERVATION METHOD	SAMPLE HOLDING TIME
SOIL SAMPLES						
Total Arsenic (As) and Lead (Pb)	As and Pb	Soil	SW-846 Method 6010C[1]	One 4-ounce glass jar with Teflon-lined lid	Cool to 4 °C	6 months
AIR SAMPLES						
Total Arsenic and Lead	As and Pb	Air	NIOSH Method 7300[2]	PVC Filter	None	6 months

Notes:

[1] U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), available at the following web address: http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm.

[2] U.S. Centers for Disease Control, National Institute for Occupational Safety and Health (NIOSH) Method, available at the following web address: http://www.cdc.gov/niosh/docs/2003-154/pdfs/7300.pdf .

[3] For soil samples designated for MS/MSD analysis, double sample volume is required. MS/MSD analysis is not required for air samples.

°C Degrees Celsius

PVC Polyvinyl chloride

TABLE B-5
ROYSTER GUANO REMOVAL
PERFORMANCE OR ACCEPTANCE CRITERIA

SOIL, AIR, AND FIELD QUALITY CONTROL SAMPLES	
Analysis	**Analytical Method**
Total Arsenic and Lead	SW-846 Method 6010C, NIOSH Method 7300
DATA QUALITY MEASUREMENTS	
Accuracy	Refer to EPA Region 4, SESD FBQSTP for *Soil Sampling* (SESDPROC-300-R2), December 2011; *Ambient Air Sampling* (SESDPROC-303-R4), January 2011; the SW-846 methods listed above; and the data validation guidance documents discussed in Sections 4.1 and 4.2 of this QAPP.
Precision	Refer to EPA Region 4, SESD FBQSTP for *Soil Sampling* (SESDPROC-300-R2), December 2011; *Ambient Air Sampling* (SESDPROC-303-R4), January 2011; NIOSH Method 7300; the SW-846 methods listed above; and the data validation guidance documents discussed in Sections 4.1 and 4.2 of this QAPP.
Representativeness	Sample representativeness will be achieved by following the EPA Region 4, SESD FBQSTP for *Soil Sampling* (SESDPROC-300-R2), December 2011; and *Ambient Air Sampling* (SESDPROC-303-R4), January 2011.
Completeness	The scope of work is currently confined to the 13 residenital properties containing arsenic and/or lead at concentrations exceeding their respective EPA RMLs. The properties are listed in Table B-2.
Comparability	Sample and data comparability is expected to be achieved by conducting all field and laboratory work using the same, well-documented, uniform procedures.

Notes:

EPA	Environmental Protection Agency
FBQSTP	Field Branches Quality System and Technical Procedures
NIOSH	U.S. Centers for Disease Control National Instutute for Occupational Safety and Health, available at the following web address: http://www.cdc.gov/niosh/docs/2003-154/pdfs/7300.pdf .
RML	Removal management level
SESD	Science and Ecosystem Division
SW-846	U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), available at the following web address: http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm.

TABLE B-6
ROYSTER GUANO REMOVAL
EQUIPMENT AND SUPPLIES

FIELD INSTRUMENTS	SAMPLE CONTAINERS	EQUIPMENT AND SUPPLIES	SAMPLE PROCESSING SUPPLIES	DECONTAMINATION SUPPLIES	MISCELLANEOUS SUPPLIES
Trimble GPS unit	4-oz glass jars	Disposable plastic scoops	plastic baggies		permanent markers
XRF Unit*	Air sample cassettes	Aluminum pans	coolers		logbooks
DataRAMor equivalent*		Nitrile gloves	custody seals		garbage bags
Camera		Visqueen	labels		first aid kit
Personal air pumps		Tubing	laptop		eyewash
		Tripod	printer		camera
			paper		
DryCal DC-Lite			FedEx labels		
			duct tape		
			strapping tape		
			paper towels		

Notes:

*	To be provided by EPA
GPS	Global positioning system
oz	Ounce