May 27, 2014

Mr. James Johnson
On-Scene Coordinator
U.S. Environmental Protection Agency, Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219

Subject: Quality Assurance Project Plan for Baseline Off-Site Air Monitoring and Sampling
West Lake Landfill Site, Bridgeton, Missouri
CERCLIS ID: MOD079900932
EPA Region 7, START 4, Contract No. EP-S7-13-06, Task Order No. 0058
Task Monitor: James Johnson, On-Scene Coordinator

Dear Mr. Johnson:

Tetra Tech, Inc. is submitting the attached Quality Assurance Project Plan regarding air monitoring and sampling at locations off-site of the West Lake Landfill Site (WLLS) in Bridgeton, Missouri. This monitoring will be conducted during a baseline period prior to start of construction of an isolation barrier at the WLLS. If you have any questions or comments, please contact me at (816) 412-1775.

Sincerely,

Dave Kinroth
START Project Manager

Ted Faile, PG, CHMM
START Program Manager

Enclosures

X9025.14.0058.000

QUALITY ASSURANCE PROJECT PLAN FOR BASELINE OFF-SITE AIR MONITORING

WEST LAKE LANDFILL SITE

Superfund Technical Assessment and Response Team (START) 4
Contract No. EP-S7-13-06, Task Order No. 0058

Prepared For:

U.S. Environmental Protection Agency
Region 7
Superfund Division
11201 Renner Blvd.
Lenexa, Kansas 66219

May 27, 2014

Prepared By:

Tetra Tech, Inc.
415 Oak Street
Kansas City, Missouri 64106
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Region 7 Superfund Program
Addendum for the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Activities (October 2012) for the West Lake Landfill Site

Project Information:

Site Name: West Lake Landfill Site			**City:** Bridgeton	**State:** Missouri
EPA Project Manager: James Johnson			START Project Manager: Dave Kinroth	
Approved By:			**Prepared For:** EPA Region 7 Superfund Division	
Title:	START Project Manager	Date:		
Approved By:				
Title:	START Program Manager	Date:		
Approved By:			**Prepared By:** Rob Monnig	
Title:	START QA Manager	Date:	**Date:** May 2014	
Approved By:				
Title:	EPA Project Manager	Date:	Tetra Tech START Project Number: X9025.14.0058.000	
Approved By:				
Title:	EPA Region 7 QA Manager	Date:		

1.0 Project Management:

1.1 Distribution List

EPA—Region 7: James Johnson, EPA On-Scene Coordinator
Diane Harris, Region 7 QA Manager

START: Dave Kinroth, Project Manager

1.2 Project/Task Organization

James Johnson, of the EPA Region 7 Superfund Division, will serve as the EPA Project Manager for the activities described in this QAPP. Dave Kinroth, of Seagull Environmental Technologies, Inc. (SETI), will serve as the START Project Manager.

1.3 Problem Definition/Background:

Description: This site-specific Quality Assurance Project Plan (QAPP) form is prepared as an addendum to the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012), and contains site-specific data quality objectives for the sampling activities described herein.

☒ Description attached.

☐ Description in referenced report: _ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
Title Date

1.4 Project/Task Description:

☐ CERCLA PA ☐ CERCLA SI ☐ Brownfields Assessment
☐ Other (description attached): ☐ Pre-CERCLIS Site Screening ☒ Removal Assessment (baseline sampling)

Schedule: Baseline sampling is anticipated from June 2014 through the start of isolation barrier construction. Pre-sampling activities occurred in April and May 2014.

☐ Description in referenced report: _ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____
Title Date

1.5 Quality Objectives and Criteria for Measurement Data:

Accuracy:	☒ Identified in attached table.
Precision:	☒ Identified in attached table.
Representativeness:	☒ Identified in attached table.
Completeness*:	☒ Identified in attached table.
Comparability:	☒ Identified in attached table.

Other Description:

*A completeness goal of 100 percent has been established for this project. However, if the completeness goal is not met, EPA may still be able to make site decisions based on any or all of the remaining validated data.

1.6 Special Training/Certification Requirements:

☒ OSHA 1910
☐ Special Equipment/Instrument Operator:
☐ Other (describe below):

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1.7 Documentation and Records:

☒ Field Sheets ☒ Site Log ☐ Trip Report ☒ Site Maps ☐ Video
☒ Chain of Custody ☒Health and Safety Plan ☒Letter Report ☒ Photos

☒ Sample documentation will follow EPA Region 7 SOP 2420.05.

☒ Other: Analytical information will be handled according to procedures identified in Table 2.

2.0 Measurement and Data Acquisition:

2.1 Sampling Process Design:

☐ Random Sampling ☐ Transect Sampling ☒ Biased/Judgmental Sampling ☐ Stratified Random Sampling
☐ Search Sampling ☐ Systematic Grid ☐ Systematic Random Sampling ☒ Definitive Sampling
☐ Screening w/o Definitive Confirmation ☒ Screening w/ Definitive Confirmation
☒ Sample Map Attached

The proposed sampling scheme will be biased/judgmental with definitive laboratory analysis, in accordance with procedures included in the *Guidance for Performing Site Inspections Under CERCLA*, Office of Solid Waste and Emergency Response (OSWER) Directive #9345.1-05, September 1992, and *Removal Program Representative Sampling Guidance, Volume 1: Soil*, OSWER Directive 9360.4-10, November 1991. Samples will be submitted for analysis by a START-contracted laboratory. See Appendices A and B for additional site-specific information.

Sample Summary Location	Matrix	# of Samples*	Analysis
Off-site Air Monitoring Stations (see Appendix B, Figure 1)	Air	Continuous/weekly/monthly monitoring and sampling (see Tables 1A & 1B)	Radionuclides, radon, gamma exposure rate, carbon monoxide, sulfur dioxide, hydrogen sulfide, volatile organic compounds, and particulates

*NOTE: Quality Control (QC) samples are not included with these totals. See Table 1 for a complete sample summary.

2.2 Sample Methods Requirements:

Matrix	Sampling Method	EPA SOP(s)/Methods
Air	various (see Tables 1A & 1B)	various (see Tables 1A & 1B)

2.3 Sample Handling and Custody Requirements:

☐ Samples will be packaged and preserved in accordance with procedures defined in Region 7 EPA SOP 2420.06.
☒ COC will be maintained as directed by Region 7 EPA SOP 2420.04.
☐ Samples will be accepted according to Region 7 EPA SOP 2420.01.

☒ Other (Describe): Samples will be packaged and accepted according to procedures established by the START-contracted laboratory.

2.4 Analytical Methods Requirements:

☒ Identified in attached table.
☒ Rationale: The requested analyses have been selected based on the historical information on the site and program experience with similar types of sites.
☐ Other (Describe):

2.5 Quality Control Requirements:

☐ Not Applicable
☒ Identified in attached table.
☒ In accordance with the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☒ Describe Field QC Samples: Field blanks, trip blanks, and field duplicate samples are specified in Tables 1A and 1B. Trip blanks will be used to evaluate contamination introduced during transportation of the containers/samples. Field blanks will be collected to evaluate contamination of sampling containers and to assess contamination potentially introduced during the sampling and laboratory procedure(s). Evaluation of blank samples depends on the levels of contamination found in environmental samples to determine whether the environmental samples are representative. Analytical results from blank samples will be evaluated qualitatively by the EPA Project Manager and EPA contractor(s) to determine a general indication of field-introduced and/or lab-introduced contamination. Field duplicate samples will be collected to evaluate sampling and laboratory precision.

☐ Other (Describe):

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

☐ Not Applicable
☒ In accordance with the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☒ Other (Describe): Testing, inspection, and maintenance of instrumentation will accord with the SOPs and/or manufacturers' recommendations referenced in Tables 1A and 1B.

2.7 Instrument Calibration and Frequency:

☐ Not Applicable
☒ Inspection/acceptance requirements accord with the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☒ Calibration of laboratory equipment will be performed as described in the SOPs and/or manufacturers' recommendations referenced in Tables 1A and 1B.
☒ Other (Describe): Calibration of field instruments will be performed as described in the SOPs and equipment operating guides referenced in Tables 1A and 1B.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables:

☐ Not Applicable
☒ In accordance with the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☐ All sample containers will meet EPA criteria for cleaning procedures for low-level chemical analysis. Sample containers will have Level II certifications provided by the manufacturer in accordance with pre-cleaning criteria established by EPA in *Specifications and Guidelines for Obtaining Contaminant-Free Containers.*
☒ Other (Describe): Air filter media will meet criteria in *Code of Federal Regulations* (CFR) Title 21, Part 177.2260. Summa canisters for VOC analysis will be certified clean by the START-contracted laboratory per the laboratory's SOP referenced in Table 1B.

2.9 Data Acquisition Requirements:

☐ Not Applicable
☒ In accordance with the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☐ Previous data/information pertaining to the site (including other analytical data, reports, photos, maps, etc., which are referenced in this QAPP) have been compiled by EPA and/or its contractor(s) from other sources. Some of that data has not been verified by EPA and/or its contractor(s); however, the information will not be used for decision-making purposes by EPA without verification by an independent professional qualified to verify such data/information.
☐ Other (Describe):

2.10 Data Management:

☐ All laboratory data acquired will be managed in accordance with Region 7 EPA SOP 2410.01.
☒ Other (Describe): All laboratory data acquired will be managed according to procedures established by the START-contracted laboratory.

3.0 Assessment and Oversight:

3.1 Assessment and Response Actions:

☒ Peer Review ☒ Management Review ☐ Field Audit ☐ Lab Audit

☐ Assessment and response actions pertaining to analytical phases of the project are addressed in Region 7 EPA SOPs 2430.06 and 2430.12.

☐ Other (Describe):

3.1A Corrective Action:

☒ Corrective actions will be taken at the discretion of the EPA Project Manager whenever there appear to be problems that could adversely affect data quality and/or resulting decisions affecting future response actions pertaining to the site.

☐ Other (Describe):

3.2 Reports to Management:

☐ Audit Report ☒ Data Validation Report ☐ Project Status Report ☐ None Required

☒ A letter report describing the sampling techniques, locations, problems encountered (with resolutions to those problems), and interpretation of analytical results will be prepared by Tetra Tech START and submitted to the EPA.
☒ Reports will be prepared in accordance with the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☐ Other (Describe):

4.0 Data Validation and Usability:

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4.1 Data Review, Validation, and Verification Requirements:

☐ Identified in attached table:
☒ Data review and verification will accord with the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Programs (updated October 2012).
☐ Data review and verification will be performed by a qualified analyst and the laboratory's section manager as described in Region 7 EPA SOPs 2430.06, 2410.10, and 2430.12.
☒ Other (Describe): The analytical data package from the START-contracted laboratory will be validated internally by the contracted laboratory in accordance with the laboratory's established SOPs. A START chemist will conduct an external verification and validation of the laboratory data package.

4.2 Validation and Verification Methods:

☐ Identified in attached table:
☐ The data will be validated in accordance with Region 7 EPA SOPs 2430.06, 2410.10, and 2430.12.
☒ Other (Describe): The data will be validated using methods consistent with a Stage 2B validation, as described in the EPA Contract Laboratory Program (CLP) *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 2009). A Stage 2B validation includes verification and validation based on a completeness and compliance check of sample receipt conditions and sample-related and instrument-related QC results. The EPA Project Manager will be responsible for overall validation and final approval of the data, in accordance with the projected use of the results.

4.3 Reconciliation with User Requirements:

☐ Identified in attached table:
☒ If data quality indicators do not meet the project's requirements as outlined in this QAPP, the data may be discarded and re-sampling or re-analysis of the subject samples may be required by the EPA Project Manager.
☐ Other (Describe):

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Region 7 Superfund Program
Addendum for the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Activities (October 2012) for the West Lake Landfill Site

Table 1A: Sample Summary – Radiological Parameters

Site Name: West Lake Landfill Site				**Location:** Bridgeton, Missouri		
START Project Manager: Dave Kinroth				**Activity/ASR #:** NA	**Date:** May 2014	
No. of Samples	**Matrix**	**Location**	**Purpose**	**Requested Analysis**	**Sampling Method**	**Analytical Method/SOP**
Samples Submitted for Laboratory Analysis						
1 sample per station per week	Radionuclides in airborne particulates	5 off-site monitoring stations	Assess concentrations of radionuclides present on airborne particulates	Isotopic Th (including Th-230)	EPA NCRFO SOP RPR-250: Operation of Air Samplers without Flow Measurement Capability	Alpha spec. per lab SOP[1]
				Total alpha-emitting Ra		EPA 903.0 & SW-846 9315 as modified by lab SOP[1]
				Isotopic U		Alpha spec. per lab SOP[1]
				Gross alpha/beta		Low background GFPC per lab SOP[1]
				Gamma spectroscopy		Gamma spec. per lab SOP[1]
				Ra-226[2]		EPA 903.0 & SW-846 9315 as modified by lab SOP[1] preceded by 21-day in-growth of Ra-226 progeny
3 badges per station, submitted monthly	Gamma exposure rate by environmental TLD	5 off-site monitoring stations	Assess gamma exposure rates	Gamma exposure rate	Per vendor-provided instructions and Service Guide[4]	NRC Regulatory Guide 4.13
Field Measurements						
3 E-Perms per station, read weekly	Radon in ambient air	5 off-site monitoring stations	Assess concentrations of radon in air	Radon	EPA Region 7 E-PERM Radon Detection System Equipment Guide	NA *(field measurement only)*
1 continuous instrument per station	Gamma exposure rate by Saphymo GammaTRACER (G-M tube)	5 off-site monitoring stations	Assess gamma exposure rates	Gamma exposure rate	Per EPA ERT procedures	NA *(field measurement only)*
1 continuous sensor per station	Gamma exposure rate by RAE Systems AreaRAE sensor	5 off-site monitoring stations	Assess gamma exposure rates	Gamma exposure rate	EPA Region 7 AreaRAE EOG	NA *(field measurement only)*
QC Samples/Measurements						
1 per weekly field blank submittal	Radionuclides on filter media	Field blank	Assess contamination of the filter from field handling	Same as the requested analyses for filter samples	Filter will be handled in the field[2]	Same as the analyses for filter samples
1 each per batch of TLDs	Gamma exposure rate by environmental TLD	Transit/control badge	Assess contributions to gamma exposure rates related to background and badge transit	Gamma exposure rate	Per vendor-provided instructions and Service Guide[4]	NRC Regulatory Guide 4.13
2 replicates per station[5]	Radon in ambient air	5 off-site monitoring stations	Assess total method precision	Radon	EPA Region 7 E-PERM EOG	NA *(field measurement only)*
2 replicates[5]	Gamma exposure rate by environmental TLD	5 off-site monitoring stations	Assess total method precision	Gamma exposure rate	Per vendor-provided instructions and Service Guide	NRC Regulatory Guide 4.13

Alpha spec. = alpha spectroscopy; EPA = U.S. Environmental Protection Agency; EOG = Equipment Operating Guide; ERT = Environmental Response Team; gamma spec. = gamma spectroscopy; GFPC = gas flow proportional counting; G-M = Geiger-Mueller; NA = not applicable; lab = laboratory; NCRFO = National Center for Radiation Field Operations; NRC = U.S. Nuclear Regulatory Commission; Ra = radium; SOP = Standard Operating Procedure; TLD = thermoluminescence dosimeters; Th = thorium; U = uranium

Notes:
[1] See Appendix C
[2] Analyzed only if total alpha-emitting radium is greater than 5 picoCuries/filter
[3] A filter will be handled in the field in a manner similar to that for the primary filter samples, except no sampling onto the filter will occur
[4] See http://www.landauer.com/uploadedFiles/About_Us/LDR%20Service%20Guide%20-%20012013.pdf
[5] These replicates are included in the per station number of samples

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Region 7 Superfund Program Addendum for the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Activities (October 2012) for the West Lake Landfill Site						
Table 1B: Sample Summary – Chemical and Particulate Parameters						
Site Name: West Lake Landfill Site				**Location:** Bridgeton, Missouri		
START Project Manager: Dave Kinroth				**Activity/ASR #:** NA	**Date:** May 2014	
No. of Samples	**Matrix**	**Location**	**Purpose**	**Requested Analysis**	**Sampling Method**	**Analytical Method/SOP**
Samples Submitted for Laboratory Analysis						
1 sample per station per week	Outdoor air	5 off-site monitoring stations	Assess VOCs	VOCs	EPA ERT SOP 4231.1704 and EPA Region 7 SOP 2313.04	EPA Method T0-15 and lab SOP[1]
Field Measurements						
1 continuous sensor per station	Outdoor air	5 off-site monitoring stations	Assess for typical landfill gasses of concern	CO, SO_2, H_2S, VOCs[2]	EPA Region 7 AreaRAE EOG	NA *(field measurement only)*
1 continuous sensor per station	Outdoor air	5 off-site monitoring stations	Assess for airborne particulate concentrations	$PM_{2.5}$ and PM_{10}	EPA Region 7 DataRAM EOG	NA *(field measurement only)*
QC Samples						
1 per week	Outdoor air	Trip blank	Assess contamination of the Summa canister from field handling	VOCs	Trip blank will be handled in the field[3]	EPA Method T0-15 and lab SOP[1]
1 per week	Outdoor air	Field duplicate	Assess total method precision	VOCs	Field duplicate will be co-located with a primary Summa canister and will be sampled concurrent with the primary Summa canister	EPA Method T0-15 and lab SOP[1]

CO = carbon monoxide; EPA = U.S. Environmental Protection Agency; EOG = Equipment Operating Guide; ERT = Environmental Response Team; H_2S = hydrogen sulfide; NA = not applicable; lab = laboratory; $PM_{2.5}$ = particulates less than 2.5 micrometers in diameter; PM_{10} = particulates less than 10 micrometers in diameter; SOP = Standard Operating Procedure; VOC = volatile organic compound

Notes:
[1] See Appendix C
[2] Measures VOCs as a relative instrument response to a 10.6 electron volt lamp calibrated to isobutylene
[3] A Summa canister will be handled in the field in a manner similar to that for the sampled Summa canisters, except no sampling with the trip blank canister will occur

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Region 7 Superfund Program Addendum for the Generic QAPP for Superfund Site Assessment and Targeted Brownfields Assessment Activities (October 2012) for the West Lake Landfill Site								
Table 2: Data Quality Objective Summary								
Site Name: West Lake Landfill Site				**Location:** Bridgeton, Missouri				
START Project Manager: Dave Kinroth				**Activity/ASR #:** N/A (START-contracted laboratory)			**Date:** May 2014	
Analysis	**Analytical Method**	**Data Quality Measurements**					**Sample Handling Procedures**	**Data Management Procedures**
		Accuracy	**Precision**	**Representativeness**	**Completeness**	**Comparability**		
Radionuclides in airborne particulates collected on filters	see Table 1A	per analytical method	per analytical method	Biased/judgmental sampling based on professional judgment of the sampling team	The completeness goal is 100%; however, no individual samples have been identified as critical samples.	Standardized procedures for sample collection and analysis will be used.	See Section 2.3 of QAPP form.	See Section 2.10 of QAPP form.
Gamma exposure rate by environmental TLD	see Table 1A	per analytical method	per analytical method	Biased/judgmental sampling based on professional judgment of the sampling team	The completeness goal is 100%; however, no individual samples have been identified as critical samples.	Standardized procedures for sample collection and analysis will be used.	See Section 2.3 of QAPP form.	See Section 2.10 of QAPP form.
VOCs by EPA Method TO-15	see Table 1B	per analytical method	per analytical method	Biased/judgmental sampling based on professional judgment of the sampling team	The completeness goal is 100%; however, no individual samples have been identified as critical samples.	Standardized procedures for sample collection and analysis will be used.	See Section 2.3 of QAPP form.	See Section 2.10 of QAPP form.

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APPENDIX A

SITE-SPECIFIC INFORMATION REGARDING BASELINE OFF-SITE AIR MONITORING AND SAMPLING AT LOCATIONS AROUND THE WEST LAKE LANDFILL SITE IN BRIDGETON, MISSOURI

INTRODUCTION

The Tetra Tech, Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) has been tasked by the U.S. Environmental Protection Agency (EPA) to assist with baseline monitoring at off-site locations around the West Lake Landfill site (WLSS) in Bridgeton, Missouri. Dave Kinroth of Seagull Environmental Technologies, Inc. (SETI) will serve as the START Project Manager. He will be responsible for ensuring that air monitoring and sampling proceeds as described in this Quality Assurance Project Plan (QAPP), and for providing periodic updates to the client concerning the status of the project, as needed. James Johnson will be the EPA Project Manager for this activity.

START's tasks will include, but are not limited to: (1) assembling and maintaining a network of off-site air monitoring stations with instrumentation and sampling devices to measure radiological and chemical parameters of potential concern, (2) collecting samples and coordinating laboratory analysis, (3) assisting EPA with data acquisition and management, and (4) documenting the off-site air monitoring efforts. The Tetra Tech START quality assurance (QA) manager will provide technical assistance, as needed, to ensure that necessary QA issues are adequately addressed.

START will adhere to this QAPP as much as possible, but may alter proposed activities in the field if warranted by site-specific conditions and unforeseen hindrances that prevent implementation of any aspect of this QAPP in a feasible manner. Such deviations will be recorded in the site logbook, as necessary. This QAPP will be available to the field team at all times during sampling activities to serve as a key reference for the proposed activities described herein.

PROBLEM DEFINITION, BACKGROUND, AND SITE DESCRIPTION

This QAPP was prepared by Tetra Tech START to support the off-site air monitoring program during a baseline monitoring period prior to initiation of construction of a planned isolation barrier at WLLS. Air monitoring will be conducted during the baseline period to provide data that will be used to (1) evaluate pre-construction concentrations of chemical and radiological parameters of potential concern in outdoor air, and (2) provide data that will be used to optimize the sampling and monitoring plan for the off-site air monitoring to occur during construction of the isolation barrier.

West Lake Landfill is an approximately 200-acre property that includes several closed solid waste landfill units that accepted wastes for landfilling from the 1940s or 1950s through 2004, plus a solid waste transfer station, a concrete plant, and an asphalt batch plant. The WLLS is at 13570 St. Charles Rock Road in Bridgeton, St. Louis County, Missouri, approximately 1 mile north of the intersection of

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Interstate 70 and Interstate 270 (see Appendix B, Figure 1). The WLLS was used for limestone quarrying and crushing operations from 1939 through 1988. Beginning in the late 1940s or early 1950s, portions of the quarried areas and adjacent areas were used for landfilling municipal refuse, industrial solid wastes, and construction/demolition debris. In 1973, approximately 8,700 tons of leached barium sulfate residues (a remnant from the Manhattan Engineer District/Atomic Energy Commission project) were reportedly mixed with approximately 39,000 tons of soil from the 9200 Latty Avenue site in Hazelwood, Missouri, transported to the WLLS, and used as daily or intermediate cover material. In December 2004, the Bridgeton Sanitary Landfill—the last landfill unit to receive solid waste—stopped receiving waste pursuant to an agreement with the City of St. Louis to reduce potential for birds to interfere with Lambert Field International Airport operations. In December 2010, Bridgeton Landfill detected changes—elevated temperatures and elevated carbon monoxide levels—in its landfill gas extraction system in use at the South Quarry of the Bridgeton Sanitary Landfill portion of the Site (a landfill portion not associated with known radiologically-impacted materials (RIM)). Further investigation indicated that the South Quarry Pit landfill was undergoing an exothermic subsurface smoldering event (SSE). In 2013, potentially responsible parties committed to constructing an isolation barrier that would separate the Bridgeton Landfill undergoing the SSE from the RIM-containing WLLS (EPA 2014).

Before construction of the isolation barrier and during construction activities, START will assist EPA with air monitoring at locations off-site of the WLLS to characterize current ambient air conditions. Monitoring will be conducted for radiological parameters (including alpha-, beta-, and gamma-emitting radionuclides on particulates; radon; and external gamma exposure), as well as typical solid waste landfill gases (including sulfur dioxide [SO_2], hydrogen sulfide [H_2S], carbon monoxide [CO], and volatile organic compounds [VOC]) and particulate matter.

EPA has arranged for placement of the air monitoring stations at the following locations (see Appendix B, Figure 1):

Station 1 – Robertson Fire Protection District Station 2, 3820 Taussig Rd., Bridgeton, Missouri

Station 2 – Pattonville Fire Department District, 13900 St Charles Rock Rd., Bridgeton, Missouri

Station 3 – Pattonville Fire Department District Station 2, 3365 McKelvey Rd., Bridgeton, Missouri

Station 4 – Spanish Village Park, 12827 Spanish Village Dr., Bridgeton, Missouri

Station 5 – St. Charles Fire Department Station #2, 1550 S. Main St., St. Charles, Missouri.

These locations were selected to ensure coverage around the perimeter of the WLLS and are

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placed in areas near residential populations.

SAMPLING STRATEGY AND METHODOLOGY

EPA and START began initial evaluation of the five off-site monitoring stations in April 2014; these activities included installation of electrical service, instrument weather housings, monitoring and sampling devices (including particulate air samplers, RAE Systems AreaRAEs, Saphymo GammaTRACERs, E-Perm radon detectors, and thermoluminescence dosimeters), and a continuous remote monitoring network. The baseline sampling period is anticipated to begin in early June 2014, and will end prior to initiation of the isolation barrier construction, when a second phase of air monitoring and sampling will begin.

Baseline period off-site air monitoring and sampling will proceed according to the following sampling process design, including selection of parameters of interest and associated sampling procedures:

Parameters of Interest

The following radiological and chemical parameters of potential concern were identified based on historical information regarding the site and program experience with similar types of sites:

Radiological Parameters of Potential Concern

Presence of naturally occurring alpha-, beta-, and gamma-emitting radionuclides on airborne particulates will be assessed. The radionuclides of potential concern based on the characteristics of the West Lake RIM that will be assessed are thorium-230, radium-226, and radon. Gross gamma activity at each of the monitoring stations will also be assessed.

Chemical Parameters of Potential Concern

Chemical parameters of potential concern selected for assessment include CO, H_2S, SO_2, and VOCs.

Airborne Particulate Matter

Because the isolation barrier construction activities could release airborne particulate matter, $PM_{2.5}$ and PM_{10} (particulates less than 2.5 and 10 micrometers in diameter, respectively) are also being assessed.

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Sampling Procedures

Samples will be collected in a manner consistent with EPA methods and standard operating procedures (SOP). The following are summaries of the project-specific sampling methods. Tables 1A and 1B summarize the sampling method requirements.

Radionuclides in Airborne Particulates

To determine airborne concentrations of radionuclides transported via airborne particulates, airborne particulates will be collected onto borosilicate glass fiber filter media using high-volume air samplers. One air sampler will be operated at each off-site monitoring station and will collect airborne particulates continuously onto the filter media for durations of 7 days. At the end of the sampling period, the sampled filter will be submitted for laboratory analysis, a new filter will be installed, and a new 7-day sampling period will begin. The air samplers will be operated at a flow rate of at least 2.0 cubic feet per minute to yield a minimum air sample volume of 20,160 cubic feet (571 cubic meters [m^3]). With an anticipated laboratory detection limit of 1 picoCurie (pCi) per filter for thorium-230 and radium-226, this sample volume corresponds to a detection limit, in terms of an air concentration, of 1.75E-2 pCi/m^3 for those radionuclides. Calibration and operation of the high-volume air samplers will accord with the EPA National Center for Radiation Field Operations (NCRFO) SOP RPR-250: *Operation of Air Samplers without Flow Measurement Capability*.

Radon

Electret ion chamber radon detectors (E-PERM®) equipped with a high-volume chamber ("H-chamber") short-term ("ST") electrets will be used to assess radon levels at each off-site monitoring station. E-PERM® measurements are performed by use of an Electret Voltage Reader to measure a beginning and final electrical charge on the electret that is exposed for a specified time period. The E-PERM® will be read weekly to yield a radon measurement that is continuously integrated (averaged) over the week-long exposure duration. Three E-PERMs® will be deployed per off-site monitoring station to provide redundant measurements in case of a device failure, and to provide an indication of total method precision.

Gross Gamma Activity

Continuous gross gamma activity at each off-site monitoring station will be assessed using Saphymo GammaTRACER and RAE Systems AreaRAE instruments. The continuous gross gamma measurements

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from these instruments will be remotely transmitted via Safe Environment Engineering's Lifeline remote telemetry system and logged by EPA's Viper data management software.

Thermoluminescence dosimeters (TLD) will also record gross gamma activity at the off-site monitoring stations. TLDs are passive detection devices that require analysis by the dosimeter provider. The TLDs will be deployed for continuous periods of approximately 30 days. Three TLDs will be deployed per off-site monitoring station to provide redundant measurements allowing determination of total method precision.

Continuous Monitoring for CO, H_2S, SO_2, and VOCs

RAE Systems AreaRAEs equipped with CO, H_2S, SO_2, and photo-ionization (for VOC detection) sensors will be deployed at each off-site air monitoring station for continuous air monitoring. These AreaRAE measurements will be remotely transmitted via Safe Environment Engineering's Lifeline remote telemetry system and logged by EPA's Viper data management software. Typical AreaRAE response parameters for the gases listed above are as follows:

Gaseous Parameter Measured	AreaRAE Detection Range	AreaRAE Resolution
Carbon Monoxide (CO)	0-500 PPM	± 1 PPM
Hydrogen Sulfide (H_2S)	0-11 PPM	± 1 PPM
Sulfur Dioxide (SO_2)	0-20 PPM	± 0.1 PPM
Volatile Organic Compounds (VOC)	0-199 PPM	± 0.1 PPM

Air Sampling for VOCs

Sampling for VOCs via Summa® canisters will occur each week at the air monitoring stations. The Summa® canister will be fitted with a passive flow regulator to enable collection of an air sample for a continuous 24-hour period. The sampled Summa canisters will be submitted to a START-contracted laboratory for VOC analysis. All Summa® sampling will accord with EPA Environmental Response Team SOP 4231.1704 – Summa® Canister Sampling, and with EPA Region 7 SOP 2313.04 – Air

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Sampling with Stainless Steel Canisters. During the weekly sampling, a field duplicate sample will be collected at one of the off-site air monitoring stations. In addition, an un-sampled Summa canister will be handled in the field and will be submitted as a trip blank.

Airborne Particulate Matter

A DataRAM air particulate monitor will be deployed at each off-site air monitoring station to continuously monitor concentrations and median particle sizes. The DataRAM instruments will be equipped with particle discriminators to yield measurements correlated with $PM_{2.5}$ and PM_{10}. The continuous DataRAM measurements will be remotely transmitted via Safe Environment Engineering's Lifeline remote telemetry system and logged by EPA's Viper data management software.

Quality Control Samples

To evaluate sample quality control (QC), field blank, trip blank, and field duplicate samples will be collected, as specified in Section 2.5 of the QAPP form.

ANALYTICAL METHODS

All samples will be submitted to a START-contracted laboratory for analysis. All samples will be analyzed according to SOPs and methods referenced on the QAPP Form.

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REFERENCES

U.S. Environmental Protection Agency (EPA). 2014. Administrative Settlement Agreement and Order on A Consent For Removal Action – Preconstruction Work. EPA Docket No. CERCLA-07-2014-0002. April 20.

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APPENDIX B

FIGURE

APPENDIX C

ANALYTICAL LABORATORY STANDARD OPERATING PROCEDURES