QUALITY ASSURANCE PROJECT PLAN
FOR A PRE-CERCLIS SCREENING AT THE
BRIDGETON MUNICIPAL ATHLETIC COMPLEX SITE
BRIDGETON, MISSOURI

Prepared By:

U.S. Environmental Protection Agency
Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219

May 13, 2014

APPROVED BY:

(EPA Management) Date 5/16/14

Todd Campbell, EPA On-Scene Coordinator, Superfund Division Date 5/16/14

Diane Harris, EPA Quality Assurance Manager Date 5/16/14

CONTENTS

CONTENTS (Continued)

APPENDICES

TABLES

1.0 PROJECT MANAGEMENT

1.1 DISTRIBUTION LIST

Region 7 EPA	Todd Campbell, On-Scene Coordinator Tom Mahler, Quality Assurance Planner Diane Harris, Quality Assurance Manager
Region 7 START	Colin Willits, Project Manager

1.2 PROJECT, TASK ORGANIZATION, AND SCOPE OF WORK

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 a Pre-CERCLIS Screening at the Bridgeton Municipal Athletic Complex (BMAC) site in Bridgeton, Missouri. Colin Willits of Tetra Tech will serve as the START Project Manager. He will be responsible for ensuring that sampling of environmental media is conducted 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. Todd Campbell will be the EPA On-Scene Coordinator for this activity.

Tetra Tech's tasks will include, but are not limited to: (1) collecting real-time gamma measurements of surface soils, (2) collecting discrete soil samples for analysis by a laboratory, and (3) creating figures depicting the surface soil gamma data and sample locations. 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.

1.3 PROBLEM DEFINITION, BACKGROUND, AND SITE DESCRIPTION

This QAPP was prepared by Tetra Tech START to investigate concerns regarding concentrations of radionuclides in soils at BMAC. The BMAC, at 13212 Ferguson Lane, Bridgeton, Missouri, encompasses approximately 70 acres including eleven baseball fields, tennis courts, two large parking

lots, and various structures (see figure 1 in Appendix A). The Global Positioning System (GPS) coordinates of the approximate center of the site are 38.779422° north latitude and -90.428224° west longitude. The EPA is conducting a Pre-CERCLIS screening of the facility to determine if further CERCLA investigation or response may be warranted. This screening activity is in response to a request by the Missouri Attorney General to the EPA Regional Administrator. A citizen utilizing his/her own field instrument collected a sample near the ball fields and alleged that it indicated radiation contamination is present. EPA has not been able to verify the quality of this data or that the proper methods were used. However, the information has been made public creating concern to the users of the athletic complex.

1.4 PROJECT AND TASK DESCRIPTION

The activities described in this QAPP will address the following:

- Real-time gamma measurement of surface soils at the BMAC and at reference areas
- Analyzing the data for areas of elevated gamma activity
- Collecting soil samples for laboratory analysis of radionuclides at representative on-site areas found to have elevated gamma measurements, representative areas indicating typical background activity, all locations that have been previously sampled by the public, and at off-site reference areas to establish background activities
- Assessing the investigation data, including comparing concentrations of naturally occurring radionuclides measured in BMAC soils to those measured in reference areas soils and to applicable health-based standards, to determine if further investigation under CERCLIS is warranted
- Documenting Pre-CERCLIS investigation activities

The following is the anticipated schedule of activities for the Pre-CERCLIS screening:

- May 19 - 23, 2014 – Conduct field survey and sampling activities
- June 6, 2014 – Submit interim report documenting real-time surface soil gamma survey
- June 20, 2014 – Submit final report documenting all Pre-CERCLIS screening activities (including the real-time surface soil gamma survey and discrete soil sampling with analytical results)

Relevant aspects of the project are described in the following sections of this QAPP.

1.5 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The QA objective for this project is to provide valid data of known and documented quality. Specific data quality objectives are discussed in terms of accuracy, precision, completeness, representativeness, and comparability.

For this project, accuracy is defined as the ratio, expressed as a percentage, of a measured value to a true or reference value. For radiological analyses by the laboratory, accuracy will be expressed as "total uncertainty" value which will be calculated and reported per the analytical method. The analytical component of accuracy will be expressed as percent recovery, based on the analysis of laboratory-prepared spike samples and performance evaluation audit samples.

Precision for this project is defined as a measure of agreement among individual measurements of laboratory-prepared duplicate samples. Because total method precision will not be determined for this project, no collocated samples will be collected.

Data completeness will be expressed as the percentage of data generated that are considered valid. A completeness goal of 100 percent will be applied to this project; however, if that goal is not met, site decisions may still be made based on the remaining data. No individual sample has been identified as a critical sample.

Representativeness of collected samples is facilitated by establishing and following criteria and procedures identified in this QAPP. Data comparability is achieved by requiring that all data generated for the project be reported in common units. Table 1 lists the various types of data that will be generated and specific reporting units.

TABLE 1

SPECIFIC DATA REPORTING UNITS

Parameter	Unit
Radionuclides in soil	picoCuries per gram (pCi/g)
Gross gamma activity	Counts per minute (cpm)
Time	Military time (00:01 - 24:00)

1.6 SPECIAL TRAINING REQUIREMENTS AND CERTIFICATION

All site personnel will be required to have completed a basic 40-hour health and safety (Hazardous Waste Operations and Emergency Response) training course and annual refreshers.

1.7 DOCUMENTATION AND RECORDS

Tetra Tech START personnel will maintain a field logbook to record all pertinent activities associated with the sampling events. Appropriate documentation pertaining to photographs taken by Tetra Tech START also will be recorded in the field logbook. Information pertaining to all samples collected for laboratory analysis during this event (such as sampling dates and times, locations, and so on) will be recorded in the field logbook. Labels generated by EPA will be affixed to the sample containers, identifying sample numbers, dates collected, and requested analyses. Chain-of-custody (COC) records will be completed and maintained for all samples from the time of their collection until they are submitted to the laboratory for analysis.

A health and safety plan (HASP) prepared by Tetra Tech START prior to field activities will address site-specific hazards. The HASP will be reviewed and signed by all field personnel prior to field work, indicating that they understand the plan and its requirements. Copies of the plan will be available to all personnel throughout sampling activities.

Tetra Tech START will distribute this QAPP to all personnel on site. The QAPP will be reviewed by all field personnel prior to field work to ensure that all measurements and samples collected are according to the methods described in this QAPP.

2.0 MEASUREMENT AND DATA ACQUISITION

The following sections address aspects of sampling and analysis.

2.1 SAMPLING PROCESS DESIGN

Under this task order, START will conduct real-time monitoring and soil sampling in the study and reference areas to investigate the presence of radionuclides in surface soils. The proposed sampling will be conducted in accordance with the *Removal Program Representative Sampling Guidance*, Volume 1: Soil, Office of Solid Waste and Emergency Response (OSWER) Directive 9360.4-10, November 1991. Soil samples collected will be submitted for laboratory radionuclide analysis. The samples results will be evaluated using Superfunds Soil Screening Guidance for Radionuclides (EPA/540-R-00-006).

Field procedures will follow standard operating procedures (SOP) outlined in the QAPP. Field activities will include real-time monitoring of surface soils and collection of soil samples for laboratory analysis. Descriptions of the sampling strategy and procedures are discussed below.

2.1.1 Real-time Monitoring for Surface Soil Gamma Activity

START will use a Ludlum Model 2221 ratemeter with a Ludlum Model 40-20 sodium iodide (NaI) scintillation detectors, Trimble GPS units, and RATS/FAST software to perform a scan of surface soils at the BMAC. This survey will be conducted over the entire property, excluding any on-site buildings, as well as off-site reference areas to establish a normal background response level (see Figure 1 in Appendix A). For survey purposes, the site has three general types of soil use areas: eleven baseball fields, several acres of grass covered soils (general use), and on-site drainage ditches. One reference area of each type will be selected off of the site that closely resembles the conditions of on-site soils. The background reference area is anticipated to be Koch Park, located about 4.0 miles northeast of the site, in Florissant, MO (see Figure 2 in appendix A). The park includes baseball fields, general use areas, and drainage areas. A survey of each of the reference areas will be used to establish three normal/background response levels in the field by averaging the data collected in each survey. The detector will be held approximately 6 inches above the ground surface while the surveyor moves the detector at approximately 1 to 2 feet per second. The RATS/FAST system will collect and log detector readings and GPS locations, and will display the survey data in real time over aerial imagery. The resulting graphical illustration will be used to evaluate the distribution of gross gamma activity from surface soils throughout the area of investigation. These scanning measurements will be compared to normal background response levels established at the background reference areas described above. If the results of the survey include data that is greater than the mean of the background reference area plus three standard deviations, the location will be flagged for additional investigation and a representative number of these flagged locations will be sampled for laboratory analysis. Priority will be given to the areas with the highest measurements; but samples will also be taken from locations with normal background measurements to confirm the accuracy of the survey.

2.1.2 Soil Sampling

Soil samples will be collected from each of the three different soil use areas (ball fields, general use areas and drainage areas) from the BMAC site and from the background location (Koch Park). Soil samples will also be collected from the on-site locations previously sampled by the general public. After the conclusion of the RAT/FAST survey, a representative subset of areas found to have elevated gross

gamma activity (if any), as well as areas found to have normal background gross gamma activity will be sampled. The samples collected from the areas that coincide with background will be used to verify the accuracy of the survey method. Section 2.2 describes in further detail the method for selecting sampling locations and the total number of soil samples. Each of the samples will be collected from 0 to 2 inches below ground surface (bgs) using a disposable stainless-steel spoon, homogenized in a disposable aluminum pie pan, and placed in clean plastic containers or re-sealable plastic bags sufficient to hold at least 500 grams which is the minimum laboratory sample mass needed.

2.2 ANTICIPATED SAMPLE SUMMARY

It is anticipated that the site will be divided into the following three categories: all eleven baseball fields, all on-site drainage ditches, and the remaining grass-covered (general use) areas. Three corresponding off-site reference areas (located in Koch Park) will be selected to meet the requirements in section 2.1.1 of this document. Based on statistical approaches used at similar sites of this size, a maximum number of 123 samples could be collected from the BMAC property, with a maximum of 41 samples collected from each of the three site surface soil categories. The locations of the on-site samples will include the 9 locations sampled by the public, a representative number of the locations found with elevated gross gamma activity (if any), and a representative number of locations found to correspond with background levels established at the reference areas. Off site, within the three reference areas established at Koch Park, a maximum of 6 samples could be collected from each reference area for a total of 18 background samples. Based on the results of the real-time gamma survey, it is possible that a fewer number of on-site and/or background samples could be collected. The actual number of samples will depend upon the range and spatial distribution of readings across the site, as determined during the survey. Table 2 summarizes the type and maximum number of samples that will be collected during this investigation.

TABLE 2

ANTICIPATED SAMPLE SUMMARY

Matrix	Number of Surface Soil Samples	Laboratory Analyses
Surface soil (BMAC area)	102	Radionuclides, including U-238, Th-230 and Ra-226
Surface soil (reference areas)	15	Radionuclides, including U-238, Th-230 and Ra-226

Notes:
See Section 2.4 for details pertaining to laboratory analyses.
Ra-226 Radium-226
Th-230 Thorium-230
U-238 Uranium-238

2.3 SAMPLING METHODS REQUIREMENTS

Table 3 references EPA Region 7 SOPs that will be followed during sample collection.

TABLE 3

SUMMARY OF SAMPLING METHODS

Matrix	Sample Description	EPA Region 7 SOP Numbers
Soil	Surface soil collected for laboratory analysis	4231.2012
Soil	Surface soil screening for field analysis	EOG for Ludlum Scaler/Ratemeter—Model 2221; EOG for Trimble Global Positioning System (GPS) & Rapid Assessment Tool (RAT) Software

Notes:
EOG Equipment Operating Guide
EPA U.S. Environmental Protection Agency
SOP Standard Operating Procedure

Tetra Tech START will address disposal of investigation-derived waste (IDW) and procedures for equipment and personal decontamination in a separate, site-specific HASP. Most IDW will consist of disposable sampling supplies (gloves, paper towels, etc.) that will be screened, and if clean, disposed of off of the site as uncontaminated debris.

2.4 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

Soil samples collected for radionuclide analysis will be placed in coolers for secure transport (holding samples on ice is not required for radionuclide analyses). Tetra Tech START will complete the necessary paperwork for all samples, including chain-of-custody (COC) records, which will accompany the coolers during delivery to the laboratory. If shipment of samples is required by commercial service, each cooler lid will be securely taped shut, and two custody seals will be signed, dated, and placed across the lid opening.

2.5 ANALYTICAL METHODS REQUIREMENTS

Samples will be analyzed by a START-contracted laboratory, according to the analytical methods listed in Table 4. START will verify that the contracted laboratory will be able to achieve the project quantitation goals listed in Table 4. Turnaround time for laboratory analysis of all samples will be approximately 20 calendar days . Tetra Tech will be responsible for any corrective action required on the

part of the START-subcontracted laboratory. Corrective action will proceed in accordance with the subcontracted laboratory's SOP for non-conformance and corrective action processes.

TABLE 4

ANALYTICAL METHODS

Analytical Parameter	Project Quantitation Goal	Analytical Method
Isotopic uranium (including U-238)	1 pCi/g for U-238	DOE EML Procedures Manual HASL-300 A-01-R
Isotopic thorium (including Th-230)	1 pCi/g for Th-230	DOE EML Procedures Manual HASL-300 A-01-R
Radionuclides in soil by gamma spectrometry scan (including Ra-226)	1 pCi/g for Ra-226	21 day in-growth for Ra-226 daughters followed by DOE EML Procedures Manual HASL-300 Ga-01-R

Notes:

DOE EML	U.S. Department of Energy Environmental Measurements Laboratory
pCi/g	picoCuries per gram
Ra-226	Radium-226
Th-230	Thorium-230
U-238	Uranium-238

2.6 QUALITY CONTROL REQUIREMENTS

Field sampling and laboratory analysis will accord with their associated SOPs and methods. For this investigation, no field QC samples will be required to obtain valid data for the screening.

2.7 INSTRUMENT, EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

Tetra Tech START personnel will test, inspect, and maintain all sampling equipment and supplies, along with field screening instrumentation, prior to deployment for field activities. Testing, inspection and maintenance requirements are detailed in the Equipment Operating Guides (EOG) listed in Table 3 and in the equipment user's manuals. Testing, inspection, and maintenance of analytical instrumentation will proceed in accordance with the START-subcontracted laboratory's SOPs and manufacturers' recommendations.

2.8 INSTRUMENT CALIBRATION AND FREQUENCY

Calibration of the laboratory analytical instrumentation will conform to the START-contracted laboratory's SOPs and manufacturers' recommendations. Radiological field instruments will be calibrated with National Institute of Standards and Technology (NIST) traceable sources to radiation

emission types and energies that provide detection capabilities similar to the isotopes of concern. Instrumentation, provided by EPA, will be calibrated in accordance with manufacturer specifications and ANSI N323A guidance prior to delivery to the field. Certifications of calibration will be provided. Calibrations are typically performed once per year (or as specified by the manufacturer). Daily response checks (as detailed in Section 2.9) are conducted to assure that the equipment is maintaining calibration.

2.9 DAILY RESPONSE CHECKS

Radiological field instruments will be response tested prior to daily use. Background and source measurements will be taken as part of the instrument check and compared with the acceptance range for the instrument and site conditions. These response checks will be performed by EPA or START personnel familiar with the equipment. These response checks are conducted against sources that emit radiation comparable to the isotopes that the equipment is intended to detect in the field. If response checks indicate the instrument is "drifting" out of calibration, the unit will be removed from service and a replacement obtained. To assure proper instrument function, twice-daily (beginning and end of daily activities) source checks are performed using a field check source. Tetra Tech START will document these checks in the site log book.

2.10 INSPECTION AND ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

Soil samples collected for radionuclide analysis will be collected into new food-grade plastic containers or new Ziploc®, or similar, bags. The containers will be verified to be in good condition by Tetra Tech START prior to their use.

2.11 DATA ACQUISITION REQUIREMENTS

Previous data and information pertaining to the site (such as other analytical data, reports, photographs, and maps) will not be used for decision-making purposes without verification of its authenticity and usability.

2.12 DATA MANAGEMENT

All laboratory data acquired will be managed according to procedures established by the START-contracted laboratory. Prior to mobilization, chain-of-custody forms will be provided by the START-subcontracted laboratory for use by field sampling personnel.

3.0 ASSESSMENT AND OVERSIGHT

The following sections address aspects of assessment, oversight, and reporting.

3.1 ASSESSMENTS AND RESPONSE ACTIONS

Assessment and response actions pertaining to analytical phases of the project will proceed in accordance with the START-subcontracted laboratory's SOP for non-conformance and corrective action processes Corrective action will be taken at the discretion of the EPA Project Manager, and in turn as directed by the Tetra Tech START Project Manager, whenever problems appear that could adversely affect data quality or resulting decisions affecting future response actions pertaining to the site.

3.2 REPORTS TO MANAGEMENT

Within 14 days of completing the field activities, START will submit an interim report documenting and presenting data from the real-time surface soil gamma survey. This report will include a description of how the real-time survey data was generated and figures depicting the results. A final report will be submitted within 14 days of receipt of laboratory analytical data and will include information from the interim report in addition documenting the discrete soil sampling and laboratory analytical data. The final report will also include sampling techniques, locations, and problems encountered (with resolutions to those problems); interpretation of analytical results following completion of the field activities described herein; and validation of any data generated by START-contracted laboratories.

4.0 DATA VALIDATION AND USABILITY

The following sections address aspects of data review, validation, verification, and usability.

4.1 DATA REVIEW, VALIDATION, AND VERIFICATION REQUIREMENTS

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 Tetra Tech chemist will conduct an external verification and validation of the laboratory data package using a method 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.

4.2 VALIDATION AND VERIFICATION METHODS

The data will be validated in accordance with the laboratory's established SOPs. Laboratory personnel will perform QC spot checks, as needed. The EPA Project Manager will inspect the data to provide a final review and will ensure that any anomalies in the data are documented appropriately.

4.3 RECONCILIATION WITH USER REQUIREMENTS

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 may be required.

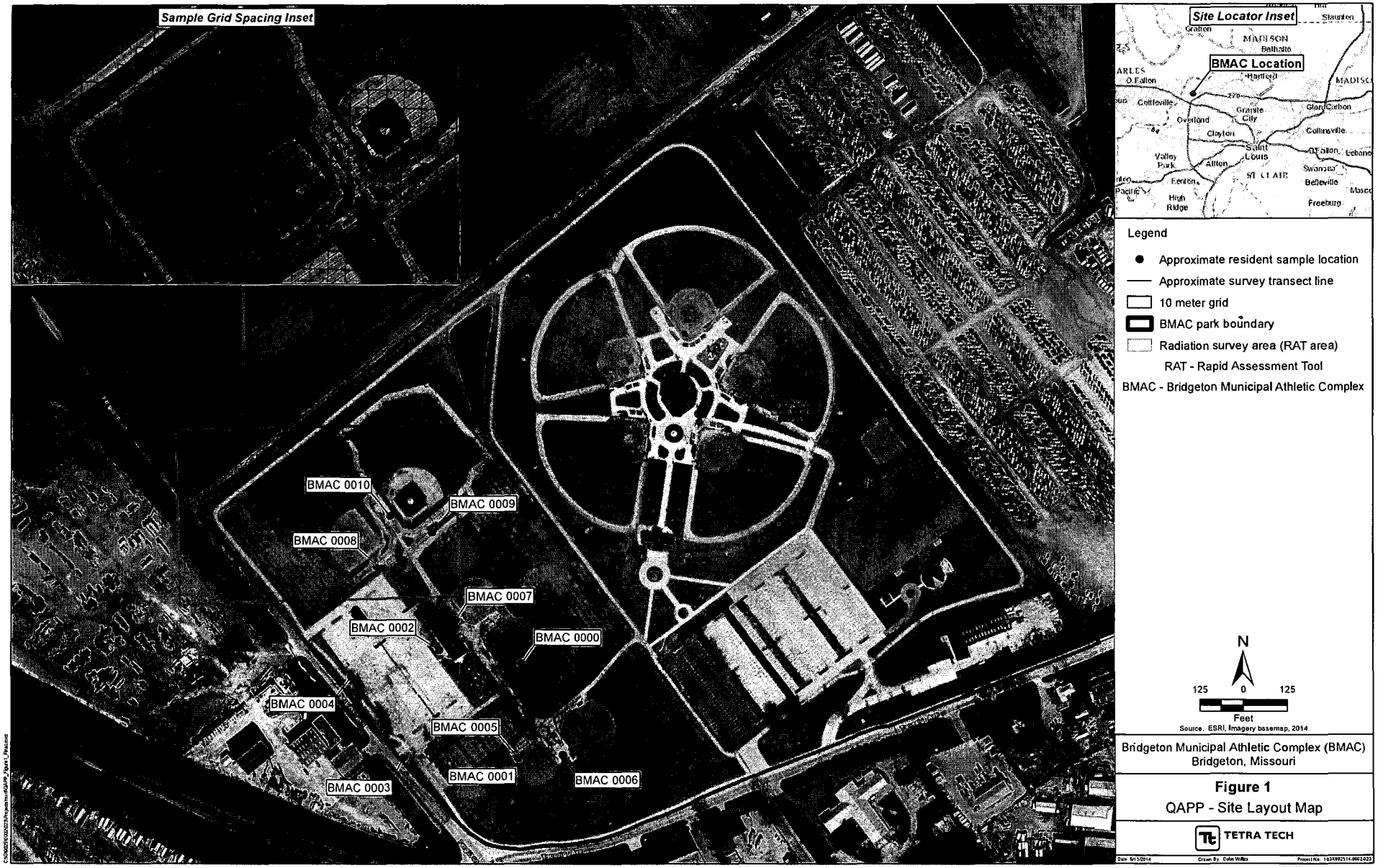
5.0 REFERENCES

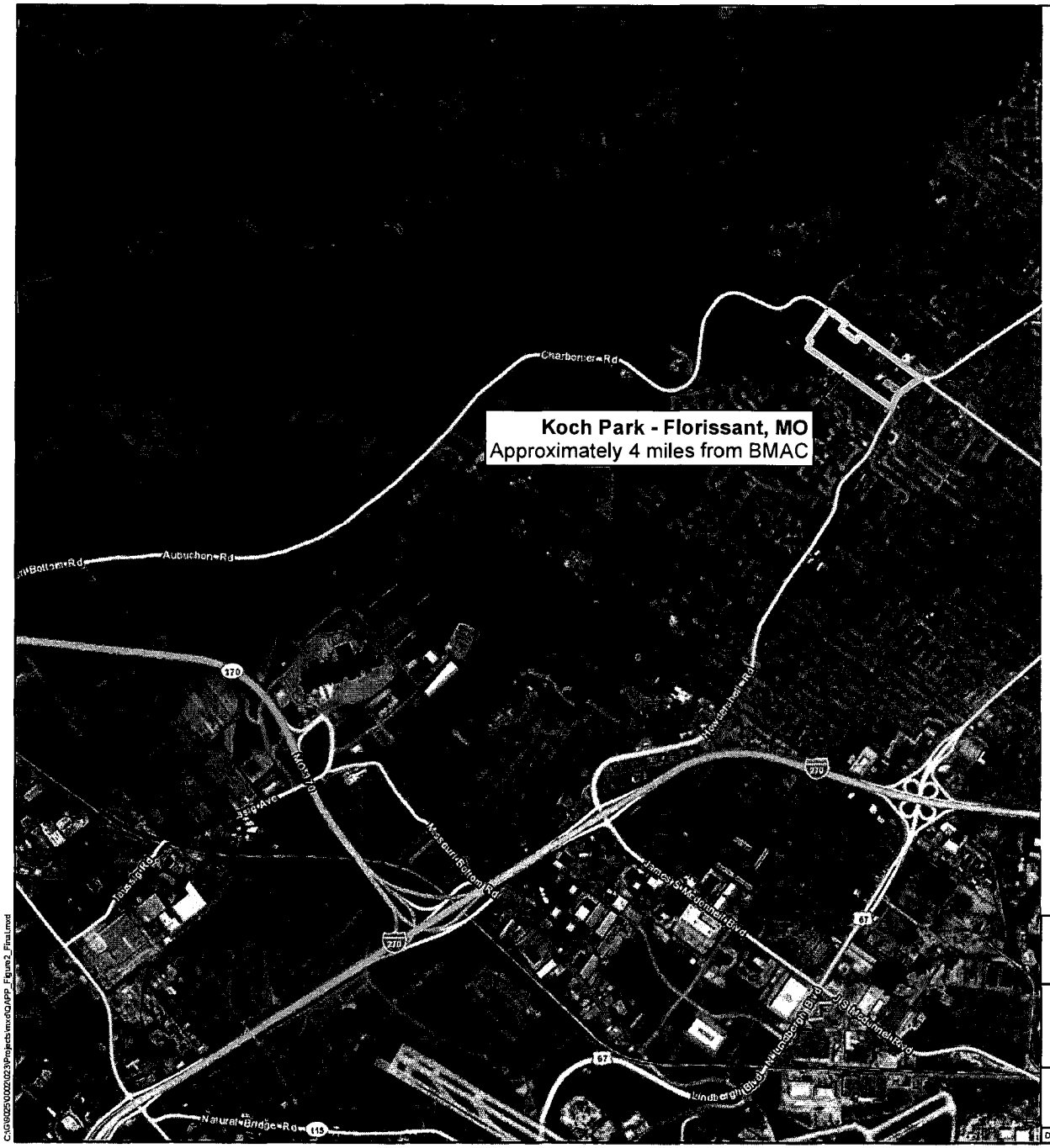
United State Army Corps of Engineers (USACE). 2005. Record of Decision for the North St. Louis County Sites, St. Louis, Missouri. St. Louis District Office, Formerly Utilized Sites Remedial Action Program. September 2.

United States Environmental protection Agency (USEPA). 2009. *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use*. EPA 540-R-08-005. January.

APPENDIX A

FIGURES





Legend

- BMAC park boundary
- Koch Park boundary / reference area

N

2,000 0 2,000

Feet

Source: ESRI, Imagery basemap, 2014

Bridgeton Municipal Athletic Complex (BMAC)
Bridgeton, Missouri

Figure 2

QAPP - Reference Area Location Map

TETRA TECH

Date: 5/13/2014 Drawn By: Colin Willis Project No: 103X902514.0002.023

C:\GIS\902514\0002\023\Projects\mxd\QAPP_Figure2_Final.mxd