BURNS McDONNELL

FREE STATE SOLAR PROJECT, LLC

SOIL SAMPLING PLAN

KANSAS SKY ENERGY CENTER (KSEC)

PROJECT NO. 147658

KDHE PROJECT CODES: C2-078-0058 & C2-078-70111

REVISION 0

AUGUST 11, 2023

CONTENTS

FIGURES

List of Abbreviations

Abbreviation	Term/Phrase/Name
CSECS	Commercial/Utility Scale Solar Energy Conversion System
CUP	Conditional Use Permit
EPA	U. S. Environmental Protection Agency
Free State	Free State Solar Project, LLC
GPS	Global Positioning Systems
KDHE	Kansas Department of Health and Environment
MS/MSD	Matrix spike/matrix spike duplicate
MW	Megawatt
Plan	Soil Sampling Plan
PLFA	phospholipid fatty acids
PPE	Personal Protective Equipment
Project	Kansas Sky Energy Center Project
Project Area	Project Development Area
PV	photovoltaic
QA/QC	Quality Assurance/Quality Control
Region	fenced PV array area(s)
SOP	Standard Operating Procedure
TIC	total organic carbon
TOC	total inorganic carbon

1.0 Introduction

1.1 Overview

Free State Solar Project, LLC (Free State), is proposing to construct a new utility scale photovoltaic (PV) solar generation facility in Douglas County, Kansas. The Kansas Sky Energy Center (Project) would have a nameplate capacity of 159 Megawatts (MW). The Project is located approximately 1 mile north of Lawrence, Kansas. The Project parcels are illustrated on Figures 1 and 2. The Project location was selected by Free State based on the area's strong solar resource, land use, and proximity to existing transmission infrastructure. The Project would include solar array blocks containing PV panels attached to a single-axis tracking system mounted to steel piles. The PV panels will track the sun during the day. Direct current electricity from the PV panels will be routed underground through collection wiring to Power Conversion Units located throughout the PV array areas. Each PV array area will be fenced and have gated access at the road entrances. One or more fenced PV array areas (Regions) are illustrated on Figures 3-1 through 3-7. Constructed access roads will be gravel and approximately 16 feet wide. Pending regulatory approval by the Kansas Department of Health and Environment (KDHE) and Douglas County, construction of the Project is anticipated to begin in 2024 and be completed in 2025.

This Soil Sampling Plan (Plan) has been prepared as a required component of the application submittal for the Conditional Use Permit (CUP) for a Commercial/Utility Scale Solar Energy Conversion System (CSECS). This Plan is in accordance with the Board of County Commissioners of Douglas County, Kansas Zoning Regulations Ordinance Resolution No. 22-16 under the Douglas County Code, Chapter 12: Zoning and Planning, Article 3 Zoning Regulations subsection 12-306-49 Limited Scale Solar Energy Conversion System and CSECS.

1.1.1 Area Description

The total Project study area is approximately 1,000 acres (Figure 2). For the purpose of this Soil Sampling Plan (Plan), Project Development Area will refer to only areas within the primary (631 acres) (Project Area).

Land use within the Project Area is primarily cultivated crops (95%), with interspersed pasture/hay, deciduous forest, wetlands, and developed areas (Figure 2). Much of the Project Area is comprised mostly of agricultural row crops including corn and soybeans.

1.1.2 Array Spacing/PV Panels

The typical minimum leading-edge height between the PV panels and the ground is approximately 18 inches. Post-to-post spacing between rows is approximately 21 feet. Final spacing within the arrays will be determined once equipment selection is finalized and the detailed engineering plan is complete. The installation of low-growing plant species and performance of vegetation management practices within the PV panel areas will be conducted to minimize vegetation touching or shading the PV panels.

1.2 Soil Sampling Plan Purpose and Intent

To support compliance with the Douglas County Code Zoning Regulations, this Plan outlines the methods and procedures to perform soil sample collection at designated sample locations within each Region to characterize and document the soil health and potential presence of heavy metals at the following project phases: before construction begins, when construction is complete, prior to renewing the CUP, prior to beginning decommissioning and reclamation, and following decommission/reclamation of the Project site. The Plan is designed to characterize and document the soil health and potential presence of contaminants in the upper 6-inches from sample collection areas established prior to construction that are representative of the vegetation and soil conditions for each fenced Region within the Project Area prior to construction and during the duration of the project. This Plan was prepared alongside several other plans relating to land and water management in the Project Area, including those addressing vegetation management, erosion and sediment control, stormwater management, perimeter landscaping, and decommissioning. This Plan may be updated as needed based on changing conditions, new methods, and/or Project needs. Standard Operating Procedures (SOPs) for activities that are anticipated for each soil sampling event are included in Appendix A. Prior to the start of work, the contractor collecting soil samples shall review and evaluate the procedures included in this Plan and the SOPs to determining if any modifications are necessary to promote the safe and proper collection of soil samples given site conditions at that time.

2.0 Soil Sampling Methods and Procedures

2.1 Health and Safety

A site-specific health and safety program will be prepared and implemented by the contractor performing soil sampling activities. The health and safety program will present procedures and protocols required to safely guide field activities, identify and describe hazards, outline required personnel protection equipment (PPE), and present contingency plans for site personnel to follow.

2.2 Pre-mobilization Activities

Prior to the start of any intrusive field activities, soil sampling locations will be marked in the field. Some soil sampling locations will likely be on private property and require access agreements and/or access coordination for soil sampling activities with private property owners. While not expected, utility locates (Kansas One-Call) and/or private utility locating services will be performed in the event field activities require excavation using mechanical means and methods (e.g. – excavator). Procedures for utility clearance are outlined in SOP 501, included in Appendix A.

2.3 Soil Sampling

Soil sampling events will be conducted to characterize and document the soil health and evaluate the potential presence of heavy metals at the following frequency:

- Before construction begins

- When construction is complete
- Prior to renewing the CUP
- Prior to beginning decommissioning and reclamation
- Following decommission/reclamation of the Project site

During each event soil samples will be collected from the 13 soil sampling locations illustrated on Figures 3-1 through 3-7. Soil sampling locations are located within the fenced proposed facilities area and seven Regions comprised of 12 fenced PV array areas. The soil sampling locations will be utilized for each scheduled sampling event.

Each soil sampling location consists of one 25-foot by 25-foot sampling area within each of the 13 fenced areas. One composite soil sample will be collected from each one of the sampling locations during each sampling event. A total of five discrete soil samples will be collected from the upper 6-inches of soil and homogenized to form a composite sample for each 25-foot by 25-foot sample area deemed to be representative of the vegetation and soil conditions for the fenced area. The location of each aliquot sample will be documented using a Global Positioning Systems (GPS) unit to confirm that it is collected from within the established 25-foot by 25-foot area. Prior to the initial sampling event, the 25-foot by 25-foot grids will be established and marked or documented so the extents are known for future sampling events. Procedures for collection of Geospatial Data Using GPS Technologies are outlined in SOP 503, included in Appendix A. Procedures for collecting composite surface soil sampling are outlined in SOP 102, included in Appendix A. Non-dedicated equipment/tools used in the collection of soil samples will be cleaned between sampling of each location. Procedures for decontamination are outlined in SOP 504, included in Appendix A.

Each soil sample will be collected and submitted to an off-site EPA-certified laboratory for analysis of total organic carbon (TOC) and total inorganic carbon (TIC) by Standard Method 5310C, cadmium, lead, and zinc by U. S. Environmental Protection Agency (EPA) Method 6020A, and phospholipid fatty acids (PLFA) by PLFA Method under standard turn-around time. EPA certification is not required for laboratories performing PLFA analysis. One duplicate soil sample will be collected per sampling event. One matrix spike/matrix spike duplicate (MS/MSD) and one equipment rinsate blank sample will be collected per event. Procedures for sample packaging and shipping are outlined in SOP 592, included in Appendix A.

2.4 Documentation

Field notes will be recorded in the field logbook and include field site soil sampling activities and pertinent information. Procedures for field documentation are outlined in SOP 701, included in Appendix A.

Photographic documentation of sample locations illustrating the location, vegetation, and soil conditions for the fenced area will be included in Appendix B once the contractor performing the soil sampling activities is determined.

2.5 Additional Soil Sampling

Additional soil sampling may be required by Douglas County or KDHE to evaluate potential impacts to soil in the event damaged panels are not removed within 30 days of initial damage or a damaged panel is suspected of leaching materials to the soil. The location of additional soil sampling, an account of soil sampling activities, and analytical results will be documented in a report that will be provided to the Douglas County Zoning and Codes office.

2.6 Sample Handing and Analysis

Analytical methods and sample storage procedures for soil samples are outlined below. Additional information regarding sample packaging and shipping is outlined in SOP 592, included in Appendix A.

Sample Media	Analyses/Method	Container/Storage	Preservation	Holding Time
Soil	TOC – SM 5310C	4 oz. glass soil jar / cooled to 4°C	None	28 days
Soil	TIC – SM 5310C	4 oz. glass soil jar / cooled to 4°C	None	28 days
Soil	Cadmium – 6020A	4 oz. glass soil jar / cooled to 4°C	None	6 months
Soil	Lead – 6020A	4 oz. glass soil jar / cooled to 4°C	None	6 months
Soil	Zinc – 6020A	4 oz. glass soil jar / cooled to 4°C	None	6 months
Soil	PLFA	8 oz. glass soil jar / cooled to 4°C	None	24-48 hours
Rinsate Blank Water	TOC – SM 5310B	3 x 40 mL vials / cooled to 4°C	Sulfuric Acid	28 days
Rinsate Blank Water	TIC – SM 5310B	3 x 40 mL vials / cooled to 4°C	Sulfuric Acid	28 days
Rinsate Blank Water	Cadmium – 6010D or 6020B	250 mL plastic bottle / cooled to 4°C	Nitric Acid	6 months
Rinsate Blank Water	Lead – 6010D or 6020B	250 mL plastic bottle / cooled to 4°C	Nitric Acid	6 months

2.7 Sampling Equipment Decontamination

Clean nitrile gloves will be worn when collecting and handling soil samples and changed between sampling locations to minimize potential for cross contamination between sampling points. All reusable sampling equipment will be decontaminated between each sample collection using non-phosphate detergent solution (e.g. - Liquinox®), potable water rinse, and drying by use of disposable paper towels or air drying. Sample collection equipment and PPE

generated during the sampling event will be disposed of as municipal solid waste. Decontamination procedures are outlined in SOP 504, included in Appendix A.

2.8 Soil Remediation

A soil remediation plan will be prepared and submitted to the Douglas Counting Zoning and Codes office for review if soil testing results indicate contamination or soil degradation has occurred from Project activities. In the event soil remediation is required, remediation measures will be implemented in accordance with a KDHE-approved soil remediation plan.

3.0 Quality Assurance/Quality Control

The Quality Assurance/Quality Control section of this Plan presents the objectives and specific quality assurance (QA) and quality control (QC) activities designed to achieve data quality goals. QA/QC samples and procedures will be implemented to achieve acquisition of valid data. QA/QC sampling protocol and procedures are presented below.

A EPA-certified laboratory will perform analytical testing, with the exception of PLFA analytical testing. Laboratory analytical testing for soil samples will be in accordance with EPA methodologies when applicable. The laboratory will be responsible for all chemical sample analyses, data validation, and data verification. Soil samples will be analyzed for TOC and TIC by Standard Method 5310C, cadmium, lead, and zinc by EPA Method 6020A, and PLFA by PLFA Method under standard turn-around time. Duplicate samples will be collected at a frequency of one per event. One MS/MSD and one equipment rinsate blank sample will be collected per event.

Precision is expressed in terms of standard deviation or relative percent difference and is assessed by evaluating duplicate sample results. Method blanks and calibration standards will be used to determine calibration stability and analytical method accuracy of the laboratory analysis. Field duplicates will be collected to evaluate the overall precision of field sampling, field screening methods, and laboratory analytical methods.

Accuracy is expressed in terms of percent recovery and measures the degree of agreement between a measurement and its true value. Accuracy is assessed by evaluating spike sample recoveries (i.e., surrogate and matrix spike samples) and blank results (i.e., laboratory, rinsate, and MS/MSD).

Analytical laboratory data obtained during the course of this project will be validated for completeness and accuracy by the contractor performing the soil sampling activities through an internal data validation process in accordance with EPA National Functional Guidelines.

4.0 Reporting

Upon completion of each soil sampling event, a Soil Sampling Report will be submitted to Free State, KDHE, and Douglas County. The letter report will include a summary of the completed field activities, compilation of laboratory analytical data, site excavation figures, and appendices that will include a copy of field log notes and field photographs.

FIGURES

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Service Layer Credits: USGSTopo: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset

Proposed Project Fence Boundary

NORTH

1 0.5 0 1
Miles

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Figure 1
General Location Map
Kansas Sky Energy Center
Free State Solar Project, LLC
Douglas County, Kansas

Source: ESRI and Burns & McDonnell

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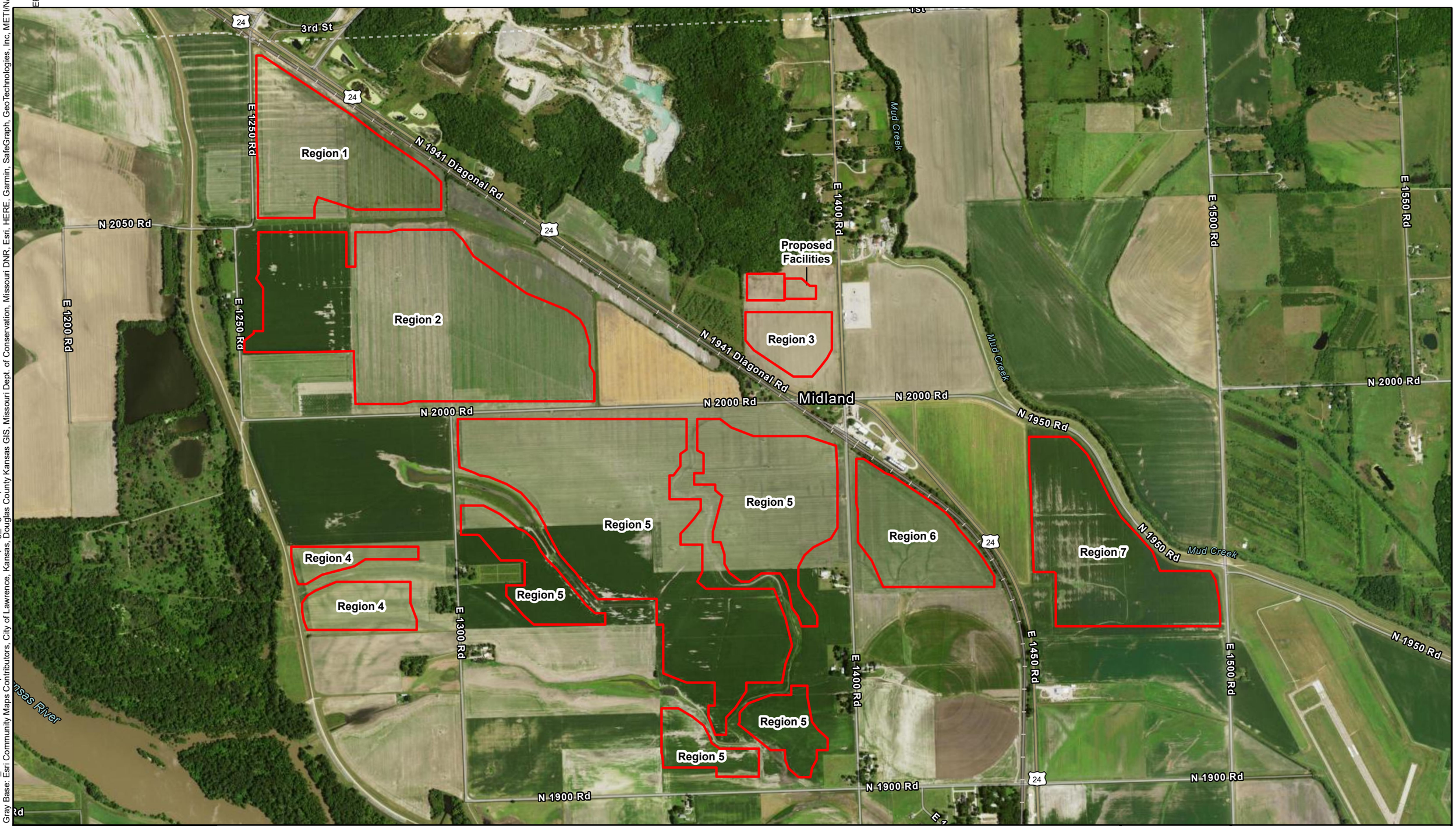

Proposed Project Fence Boundary

NORTH

1,200 600 0 1,200

Scale in Feet

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Figure 2
Site Vicinity Map
Kansas Sky Energy Center
Free State Solar Project, LLC
Douglas County, Kansas

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Source: ESRI and Burns & McDonnell

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Source: ESRI and Burns & McDonnell

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Figure 3-2
Soil Sampling Site Location Map
Kansas Sky Energy Center
Free State Solar Project, LLC
Douglas County, Kansas
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Source: ESRI and Burns & McDonnell

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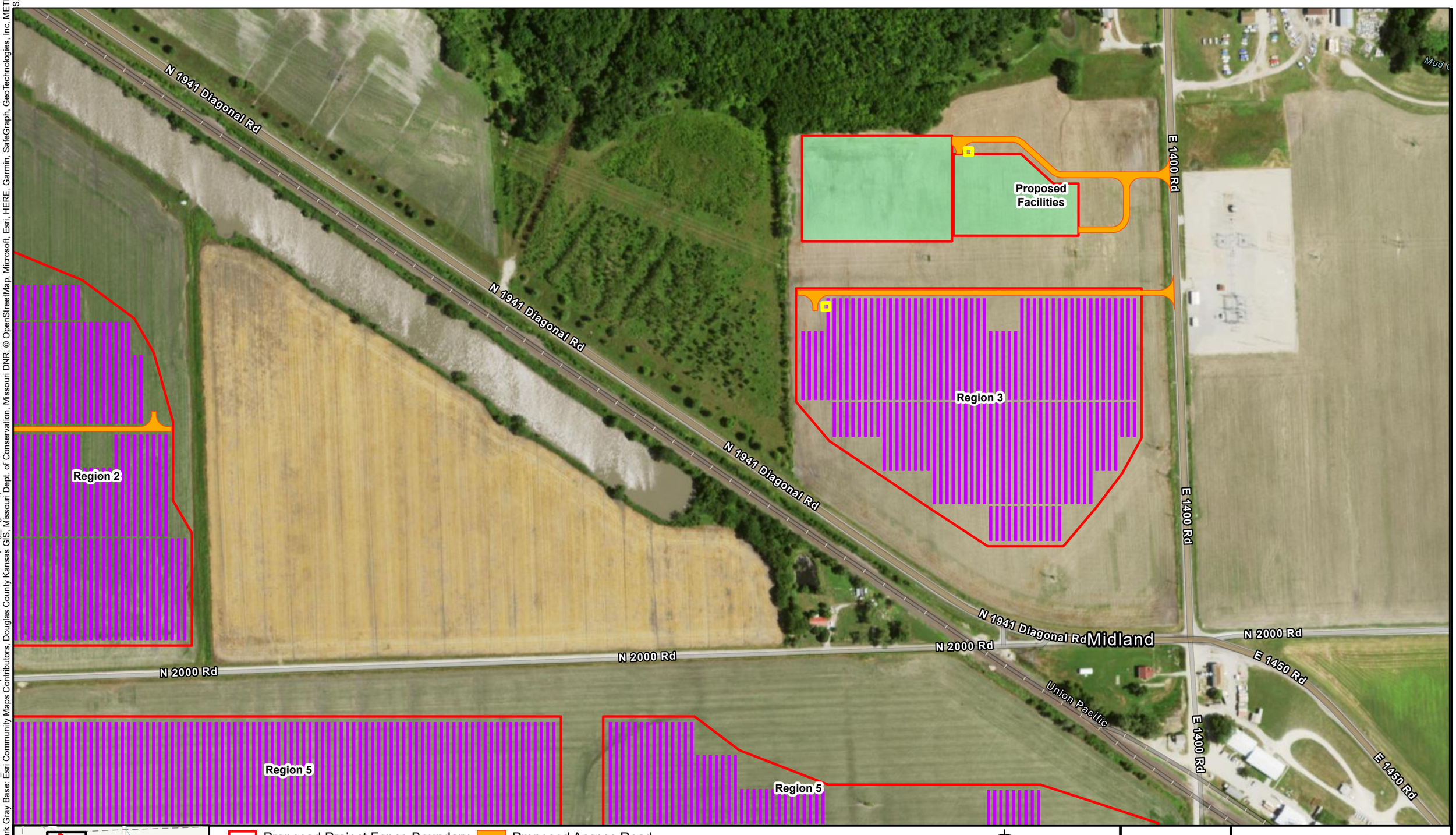
N 1941 Diagonal Rd
N 1941 Diagonal Rd
N 1941 Diagonal Rd
N 1941 Diagonal Rd
E 1400 Rd
Proposed
Facilities
Region 3
Region 2
Region 5
Region 5
N 2000 Rd
N 2000 Rd
N 2000 Rd
N 2000 Rd
Midland
Union Pacific
E 1400 Rd
E 1450 Rd
E 1450 Rd
Mud
1
2
3
4
5
6
7
Midland
Proposed Project Fence Boundary
Soil Sampling Site
Proposed Facilities
Proposed Access Road
Proposed Solar Array
NORTH
300 150 0 300
Scale in Feet
BURNS McDONNELL
Figure 3-3
Soil Sampling Site Location Map
Kansas Sky Energy Center
Free State Solar Project, LLC
Douglas County, Kansas
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Source: ESRI and Burns & McDonnell
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Region 4

Region 4

Region 5

Region 5

E 1300 Rd

E 1300 Rd

1
2
3
Aydlett
4
5
6
7

Proposed Project Fence Boundary
Soil Sampling Site
Proposed Facilities
Proposed Access Road
Proposed Solar Array

NORTH

300 150 0 300

Scale in Feet

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Figure 3-4
Soil Sampling Site Location Map
Kansas Sky Energy Center
Free State Solar Project, LLC
Douglas County, Kansas
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Source: ESRI and Burns & McDonnell

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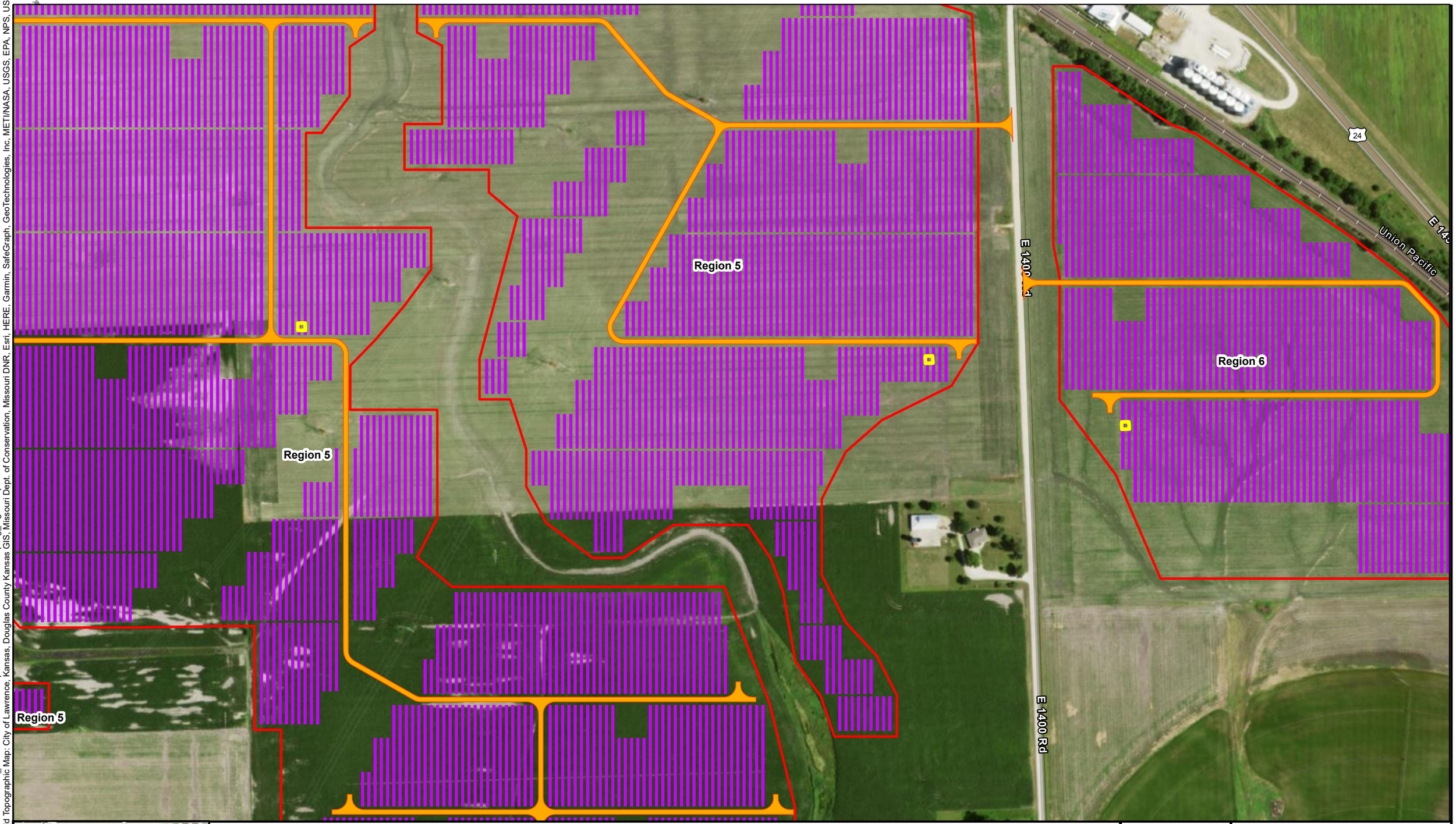

Figure 3-5
Soil Sampling Site Location Map
Kansas Sky Energy Center
Free State Solar Project, LLC
Douglas County, Kansas
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Source: ESRI and Burns & McDonnell

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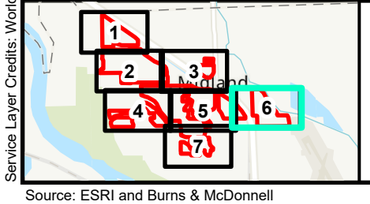
Region 6
Region 7
E 1450 Rd
N 1950 Rd
E 1500 Rd
Union Pacific
Mud Creek
24



Proposed Project Fence Boundary
Soil Sampling Site
Proposed Facilities
Proposed Access Road
Proposed Solar Array

NORTH
300 150 0 300
Scale in Feet

BURNS McDONNELL

Figure 3-6
Soil Sampling Site Location Map
Kansas Sky Energy Center
Free State Solar Project, LLC
Douglas County, Kansas
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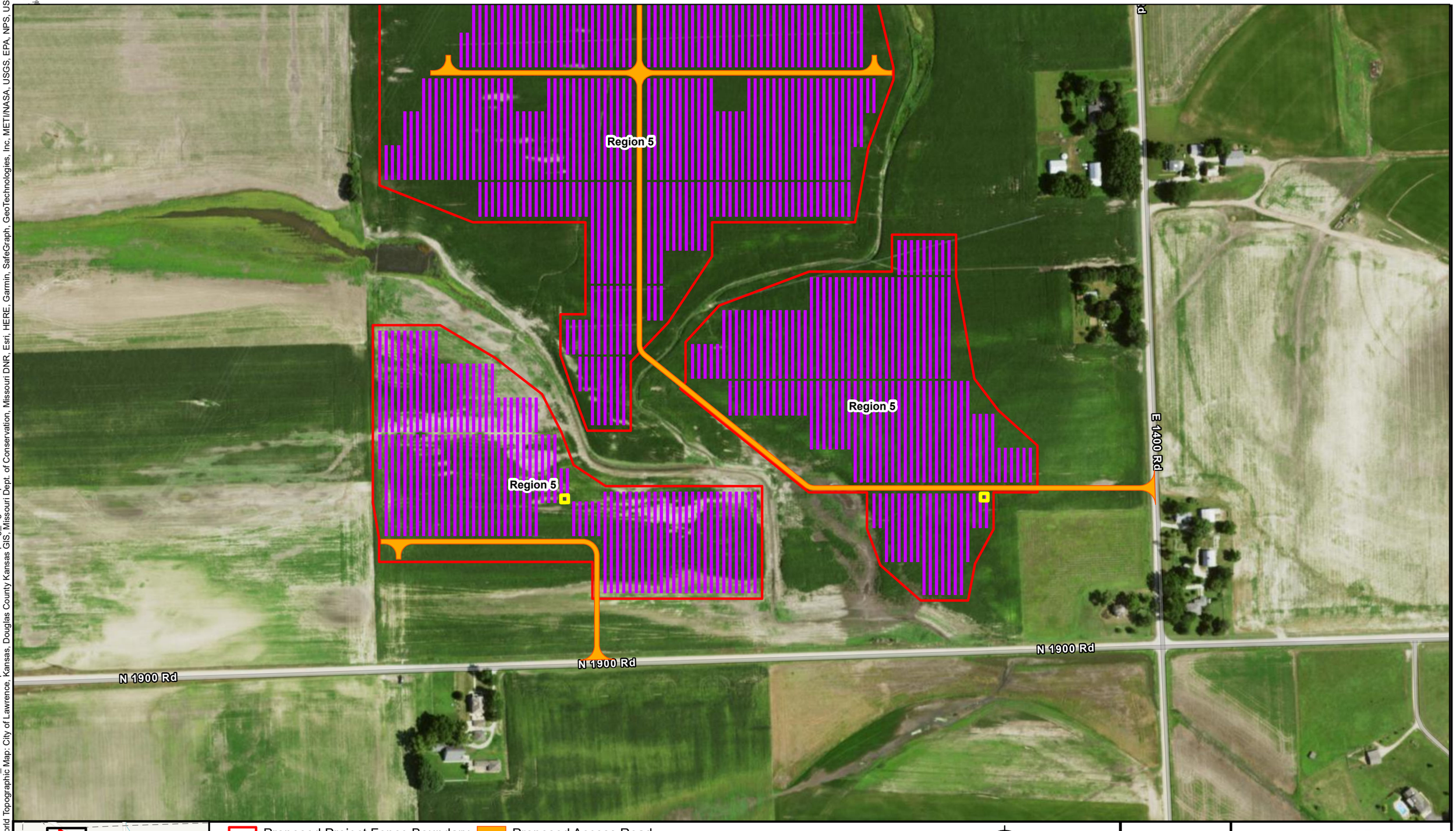
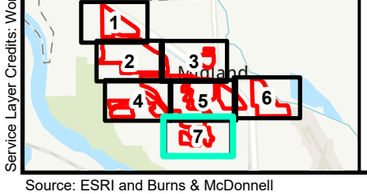
Source: ESRI and Burns & McDonnell





Proposed Project Fence Boundary
Soil Sampling Site
Proposed Facilities
Proposed Access Road
Proposed Solar Array

NORTH

300 150 0 300

Scale in Feet

BURNS McDONNELL

Figure 3-7
Soil Sampling Site Location Map
Kansas Sky Energy Center
Free State Solar Project, LLC
Douglas County, Kansas
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Source: ESRI and Burns & McDonnell

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APPENDIX A – STANDARD OPERATING PROCEDURES

SOP 102 – Surface Soil Sampling Composite

SOP 501 – Utility Clearance

SOP 503 – Global Positioning System (GPS)

SOP 504 – Decontamination

SOP 592 – Sample Packing and Shipping

SOP 701 – Field Documentation

SOP 102
Collection of Composite Surface Soil Samples

Revision 01
04/06/2018

Approved by:

04/02/2018

Martha Hildebrandt, PG, Associate Geologist,
Environmental Services Division

Date

04/02/2018

Reynold Tomes, PG, Senior Geologist,
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Date

04/06/2018

John Hesemann, PE,
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Environmental Services Division

Date

Biennial Review:

Revision/Review	Date	Responsible Party	Description of Change
Revision 01	04/02/2018	Hildebrandt, Martha	Minor grammar and reference updates

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1.0 PURPOSE AND APPLICABILITY

The purpose of *Standard Operating Procedure (SOP) 102 Collection of Composite Surface Soil Samples* is to establish a uniform procedure for the collection of composite surface soil samples. This SOP covers the *process* for the collection and field compositing of surface soil samples; sample rationale and scope including locations, depths, required sample amounts, sample preservatives, etc., are detailed in the Project-Specific Work Plan(s). *SOP 102 Collection of Composite Surface Soil Samples* has been prepared in accordance with the *Guidance for the Preparing of Standard Operating Procedures* (USEPA, 2007) and the Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) *Policy Manual* (Burns & McDonnell, 2018).

2.0 SUMMARY OF METHOD

Composite soil sampling is a technique that combines a number of discrete soil samples (i.e. aliquots) into a single homogenized sample for the purpose of analysis. The objective of composite surface soil sampling is to represent the average conditions in a specified area of surface soil. Composite soil samples will be collected from specific locations and depths per the Project-Specific Work Plan. Composite soil sampling consists of collecting multiple aliquots from a given area, homogenizing the aliquots by mixing, then filling the sample containers with the homogenized soil. Soil can be collected using a variety of techniques including shovels, spoons, or probes. The specific tools to be used will be detailed in the Project-Specific Plan. Composite soil samples are typically not collected for volatile organic compound (VOC) analysis. Composited samples are placed into the sample container from the mixing container.

3.0 DEFINITIONS

- **Composite soil sample** – A soil sample comprised of a number of discrete soil samples which are combined into a single sample designed to be representative of an area.

- **Discrete soil sample** – A single soil sample from a specific location and depth interval. Discrete soil samples are also referred to as aliquots or subsamples when they are to be composited into a single composite soil sample.

- **Homogenization** – Combining and mixing of discrete soil samples to produce a uniform distribution of soil particles and other constituents throughout a composite soil.

- **Project-Specific Accident Prevention Plan/Site Safety and Health Plan** (Project-Specific APP/SSHP) – A plan or plans that address occupational safety and health hazards associated with site operations.

- **Project-Specific Work Plan** – The plan that details the rationale, scope, and techniques to be used at the site to achieve the project objectives. Project-Specific Work Plans can include work plans, field sampling plans, quality assurance project plans, technical memorandums, and other documentation of proposed work.

- **Surface soil** – Soil near the ground surface. Surface soil in environmental work is typically considered to extend from the ground surface to 1.5 – 2.0 feet deep unless a different depth range is stated the Project-Specific Work Plan.

4.0 SAFETY AND HEALTH

Field activities as detailed in this SOP will be performed in accordance with applicable safety related documents/requirements which may include but are not limited to: Project-Specific APP/SSHP, the Burns & McDonnell *Safety and Health Program* (Burns & McDonnell, 2017), and site / client-specific requirements. Prior to any field work involving intrusive activities, utility clearance will be required per *SOP 501 Utility Clearance*. Personal protective equipment (PPE) including safety glasses and gloves should be worn as appropriate and as detailed in the Project-Specific APP/SSHP. PPE requirements should be assessed daily and on a per task basis.

5.0 CAUTIONS

Composite samples should not be homogenized if the sample is to be analyzed for a constituent that is easily volatilized. Dependent upon required analysis, soil type, and required precision, compositing may be better done within a laboratory setting than the field. Care should be taken to limit the amount of non-soil components (rocks, sticks, roots) within the sample. If sampling for munition constituents, any projectiles or munition debris found should be removed from the sample. The description and amount of any non-soil components that are removed should be noted in the field logbook. Depths should be measured from the original surface.

6.0 PERSONNEL QUALIFICATIONS

Burns & McDonnell personnel conducting on-site environmental activities will have completed the 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and

Emergency Response (HAZWOPER) course and annual 8-hour HAZWOPER refresher courses. At a minimum, one person on site will be certified in first aid and cardiopulmonary resuscitation (CPR) and, if multiple people are on site, at least one person will have completed the 8-hour HAZWOPER Supervisor Training course. If Burns & McDonnell subcontractors are on site then, at a minimum, one Burns & McDonnell person will have completed the OSHA 30-hour Construction Industry Outreach Training.

7.0 EQUIPMENT AND SUPPLIES

Equipment to be used during composite surface soil sampling may include:

- Sampling tool(s) as prescribed in the Project-Specific Plan such as direct push sampling tools equipped with liners, core sampler, shovel, auger, spoon, etc.
- Mixing bowl(s) and spoon(s)
- Disposable gloves
- Tape measure
- Laths, survey stakes, or pin flags
- Ribbon/string
- Sample containers and sample preservatives per Project-Specific Work Plan
- Personal protective equipment (PPE) and safety equipment per the Project-Specific APP/SSHP

Equipment and utensils that will be in direct contact with the sample material should be constructed of non-reactive materials and free of coatings or platings. Equipment to be used for location, logging/characterization, decontamination, and sample labeling, packing and shipping can be found in the SOPs for those activities.

Prior to the start of field activities, the Field Site Manager and/or the Project Manager should determine that 1) necessary permits, right of entries, and utilities clearances have been obtained; 2) the Project-Specific APP/SSHP has been reviewed by Burns & McDonnell personnel participating in the work and subcontractors who will be on site; 3) appropriate PPE has been obtained for Burns & McDonnell personnel and will be available on site; 4) equipment and meters are available, in working order, and complete with needed components; 5) applicable safety data sheets are on site and available to the field team; and 6) sample containers provided by the laboratory are the correct size and type, are preserved, if required, per the Project-Specific Work Plan, and are sufficient in number for the planned field activities.

8.0 PROCEDURES

Composite surface soil samples will be collected following the following steps:

1. Survey in the corners of the area over which the composite sample is to be collected using a GPS per *SOP 503 GPS* or mark the corners of the area by measuring from known, fixed locations.

2. Divide the area into uniform grid cells to achieve the number of subsamples detailed in the Project-Specific Work Plan. Mark the subsample locations with flags or survey stakes.

3. For each subsample location:

    a. Clear the area to be sampled of surface debris and vegetation using equipment that will not be used for sample collection.

    b. Collect discrete soil subsamples (aliquots) using the method specified in the Project-Specific Work Plan. Transfer the soil directly to a sample bowl for later homogenization. Subsamples should be uniform in volume

    c. Fill in the sample hole and restore the area to match the original conditions.

4. Describe the lithology of the composited sample in accordance with *SOP 521 Field Classification and Description of Soil and Bedrock* as required by the Project-Specific Work Plan. Record this information in the field logbook.

5. Remove any sticks, grass, or rocks from the sample. Note the removed materials in the field logbook.

6. Thoroughly homogenize the soil by mixing in the sample bowl with a spoon or by hand, while wearing clean, new gloves. Clean, disposable gloves will be worn and changed after the collection of each composite sample.

7. Place the composited surface soil in appropriate sample containers, label the containers, and place immediately in a cooler with ice. In general, sample containers will be filled in from most volatile to least volatile. Specific sample order, sample containers, and sample preservatives will be detailed in the Project-Specific Work Plan.

8. Decontaminate non-disposable sampling equipment prior to the start of the sampling event and between samples as specified in *SOP 504 Decontamination*.

9. Enter the appropriate information on the chain of custody (COC) and in the field logbook in accordance with *SOP 701 Field Documentation.*

10. Pack the samples for shipping as specified in the Project-Specific Work Plan and *SOP 592 Sample Packaging and Shipping.*

9.0 DATA AND RECORDS MANAGEMENT

Environmental field activities will be documented as detailed in *SOP 701 Field Documentation*. Field documentation will be completed as activities are conducted and will be relayed to the Field Site Manager or Project Manager at a minimum weekly or on a more frequent basis if so stated in the Project-Specific Work Plan.

10.0 QUALITY ASSURANCE/QUALITY CONTROL

Prior to the start of any field activity, Burns & McDonnell personnel will have read and understood the Project-Specific Plans as well as this SOP. Field personnel will be trained for a minimum of 40 hours prior to their working solo on environmental field activities.

Quality control (QC) samples will be collected in the field to aid in the determination of the validity of the analytical results. The type, number, and location of QC samples to be collected will be detailed in the Project-Specific Plans. Typical field QC samples for surface soil samples include:

- Field duplicates
- Matrix spike/matrix spike duplicates (MS/MSDs)
- Equipment rinsate blanks (ERBs)
- Temperature blanks

10.1 Field Duplicate Samples

Field duplicate samples will be obtained at the same time and analyzed for the same set of parameters as the investigative sample they are intended to replicate. Field duplicates are used to assess precision, including variability associated with both the laboratory analysis and the sample collection process. For soil samples that are homogenized, the sample within the bowl will be halved and the original sample will be collected from one half and the duplicate from the other half. The original and duplicate samples will be placed in separate, but identical containers and preserved in the same manner. Both the original and the duplicate will be sent to the primary laboratory or on-site laboratory, as applicable, and analyzed for the

same analytical parameters. Field samples will be identified with unique sample identification numbers. Field duplicates will be numbered so to be blind to the laboratory. Sample locations where field duplicate samples are collected will be documented in the field logbook. Field duplicates are typically taken on 10 percent of the original samples collected.

10.2 MS/MSDs

MS/MSDs will be analyzed for the same constituents as the actual sample. MS/MSD samples provide information on matrix interference encountered during extraction, digestion, and analysis (i.e., suppression or enhancement of instrument signals). MS samples are principally used to evaluate accuracy by measuring recovery of the spiked compounds. When the MS sample is used together with an associated MSD sample, information is obtained on analytical precision. Soil samples will be collected in triplicate volume at certain locations unless previous arrangements have been made with the analytical laboratory regarding sample volume requirements. The samples will be identified as the original, MS, and MSD and will be collected in the same manner as duplicate samples. The COC will be completed to notify the laboratory that a MS/MSD should be completed in addition to the original sample.

MS/MSDs are typically taken on 5 percent of the original samples collected; however, some projects may require a site-specific MS/MSD for each batch analyzed at the laboratory. For analytical methods with short holding times (i.e., less than 7 days), it may be necessary to collect MS/MSDs at a frequency greater than 5 percent. The analytical laboratory should be consulted regarding their MS/MSD batching needs when requesting sample analysis for short holding time methods.

10.3 ERBs

ERBs will be prepared for non-dedicated sampling equipment used to collect soil samples for chemical analyses. ERBs are used to evaluate potential cross-contamination between samples caused by residual contamination on the sampling equipment. To prepare an ERB, the portion of the equipment that could potentially touch a sample will be decontaminated per *SOP 504 Decontamination* and then rinsed with analyte-free water. The water from the post-decontamination rinse (i.e. rinsate) will be placed directly into specified aqueous sample containers, labeled as the ERB, placed into a cooler with ice, and analyzed for the same parameters as the primary soil sample. The type of water and batch number, if using laboratory grade water, used to prepare the ERB will be noted in the field logbook. ERBs are typically not required for disposable equipment that is not reused. ERBs are typically taken a minimum of once per sample type per sample event.

10.4 Temperature Blanks

Temperature blanks consist of small containers filled with water that are included in each cooler. The temperature of each blank will be measured by laboratory personnel upon arrival at the laboratory to determine if method-specific preservative requirements (i.e., ≤ 4ºC) were met. Temperature blanks are often prepared by the laboratory and included with the sample container order shipment to Burns & McDonnell.

11.0 REFERENCES

Burns & McDonnell Engineering, Co, Inc. (Burns & McDonnell), 2018. *Policy Manual*,

- Chapter 8, Employee Safety & Health Program, April 2017.
- Chapter 10, Quality Control Manual, January 2017.

United States Environmental Protection Agency (USEPA), 2007. *Guidance for Preparing Standard Operating Procedures*. EPA/600/B-07/001. April

12.0 ATTACHMENTS

None.

SOP 501
Utility Clearance

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Approved by:

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Date

04/06/2018

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Date

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1.0 PURPOSE AND APPLICABILITY

The purpose of *Standard Operating Procedure (SOP) 501 Utility Clearance* is to establish a uniform procedure for field personnel to use for utility clearance prior to intrusive work at an environmental site. This SOP covers the ***process*** for the utility clearance; specifics of the utility clearance including property ownership and potential utilities are detailed in the Project-Specific Work Plan and the Project-Specific Accident Prevention Plan/Site Safety and Health Plan (Project-Specific APP/SSHP). *SOP 501 Utility Clearance* has been prepared in accordance with the *Guidance for the Preparing of Standard Operating Procedures* (USEPA, 2007) and the Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) *Policy Manual* (Burns & McDonnell, 2017).

2.0 SUMMARY OF METHOD

Prior to any field work involving intrusive activities, utility clearance will be required. Subcontractor or Burns & McDonnell personnel will locate utilities with the aid of state-mandated utility location services, private utility location services, as-built drawings, client personnel, and/or individual property owners. Typically, utility locates are the responsibility of the subcontractor conducting the intrusive activities; however, in some cases, such as hand augering, the intrusive activities are being conducted by Burns & McDonnell, in which case, Burns & McDonnell is responsible for the utility clearance prior to the start of the intrusive activities.

3.0 DEFINITIONS

- **Project-Specific Accident Prevention Plan/Site Safety and Health Plan** (Project-Specific APP/SSHP) – A plan or plans that address occupational safety and health hazards associated with site operations.
- **Project-Specific Work Plan** – The plan that details the rationale, scope, and techniques to be used at the site to achieve the project objectives. Project-Specific Work Plans can include work plans, field sampling plans, quality assurance project plans, technical memorandums, and other documentation of proposed work.

4.0 SAFETY AND HEALTH

Utility clearance is required prior to conducting any intrusive activity at a site. Hitting a utility can result in property destruction, injury, or even death. Work may be stopped at ***any*** time by ***any*** team personnel due to utility concerns. At some locations, client requirements will include additional precautions for utility clearance such as using an air knife, hydro vacuum, and/or soil vacuum.

Field activities as detailed in this SOP will be performed in accordance with applicable safety related documents/requirements which may include but are not limited to: Project-Specific APP/SSHP, the Burns & McDonnell *Safety and Health Program* (Burns & McDonnell 2017), and site / client-specific requirements. Personal protective equipment (PPE) should be worn as appropriate and as detailed in the Project-Specific APP/SSHP. PPE requirements should be assessed daily and on a per task basis.

5.0 CAUTIONS

See Section 4.0

6.0 PERSONNEL QUALIFICATIONS

Burns & McDonnell personnel conducting on-site environmental activities will have completed the 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) course and annual 8-hour HAZWOPER refresher courses. At a minimum, one person on site will be certified in first aid and cardiopulmonary resuscitation (CPR) and, if multiple people are on site, at least one person will have completed the 8-hour HAZWOPER Supervisor Training course. If Burns & McDonnell subcontractors are on site then, at a minimum, one Burns & McDonnell person will have completed the OSHA 30-hour Construction Industry Outreach Training.

7.0 EQUIPMENT AND SUPPLIES

Equipment and supplies are the responsibility of the subcontractor or utility location service.

8.0 PROCEDURES

Utility clearance activities start during the project planning process. Information on the location of utilities should be requested from the client and locations and potential locations of utilities should be avoided when planning sample locations. A minimum of two full business days' notification is required for most state one-calls prior to commencing intrusive activities. Utility clearance activities, including the ticket number, request date and end date, utilities notified, and the names and companies of persons granting utility clearance will be documented on the ticket and in the field logbook. If a subcontractor is performing the utility clearance, a copy of the utility clearance ticket will be requested for documentation purposes. The Field Site Manager should track the effective date of the utility clearance and check that the utility clearance has been renewed prior to the ticket expiring.

Specific utility clearance procedures will be detailed in the Project-Specific Work Plan and the Project-Specific APP/SSHP. At a minimum, drilling rigs/equipment will be positioned such that they are no closer than the lesser of the height of the mast/tallest part of the equipment or 20 feet of overhead lines with voltages 0-50 kV; for other voltages refer to 29 CFR 1926.550 (a) (15) and 29 CFR 1910.333 (i) (1). Other vehicles will remain a minimum lateral distance of 30 feet from overhead utilities to reduce the possibility of arcing. Intrusive activities will be no closer than 10 feet from buried utilities. Specific procedures for any activities that are closer than 10 feet will be detailed in the Project-Specific Work Plan and in the Project-Specific APP/SSHP.

Due to the presence of underground or overhead utilities, it may be necessary to offset boring locations. This will be done with the approval of the Field Site Manager and documented in the field logbook. Notification of the relocation of boring locations due to utility or other interference will be reported to the Project Manager by the Field Site Manager immediately.

9.0 DATA AND RECORDS MANAGEMENT

A copy of the utility clearance ticket number will be kept in the project file and notes regarding utility location activities will be maintained in the field logbook as described in *SOP 701 Field Documentation*. Field documentation will be completed as activities are conducted and will be relayed to the Field Site Manager or Project Manager at a minimum weekly or on a more frequent basis if so stated in the Project-Specific Work Plan. The client will be notified if data collected in the field screening indicates unmarked or unknown underground lines are present so that they can update their records.

10.0 QUALITY ASSURANCE/QUALITY CONTROL

Prior to the start of any field activity, Burns & McDonnell personnel will have read and understood the Project-Specific Work Plan as well as this SOP. Field personnel will be trained for a minimum of 40 hours prior to their working solo on environmental field activities.

11.0 REFERENCES

Burns & McDonnell Engineering, Co, Inc. (Burns & McDonnell), 2018. *Policy Manual*,

- Chapter 8, Employee Safety & Health, April 2017.
- Chapter 10, Quality Control Manual, January 2017.

United States Environmental Protection Agency (USEPA), 2007. *Guidance for Preparing Standard Operating Procedures*. EPA/600/B-07/001. April

12.0 ATTACHMENTS

None.

SOP 503
Collection of Geospatial Data Using Global Positioning Systems (GPS) Technologies

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Approved by:

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1.0 PURPOSE AND APPLICABILITY

The purpose of *Standard Operating Procedure (SOP) 503 Collection of Geospatial Data Using Global System Positioning Systems (GPS) Technologies* is to establish a uniform procedure for collecting Global Positioning System (GPS) field data. This SOP is designed to provide a framework to promote the collection of consistent and accurate geospatial positioning data (e.g. - latitude and longitude coordinates) when utilizing hand-held GPS systems. This SOP covers the ***process*** for the collecting GPS data; specific details such as make and model of GPS unit to be used or the precision and accuracy required are detailed in the Project-Specific Work Plan. *SOP 503 Collection of Geospatial Data Using Global System Positioning Systems (GPS) Technologies* has been prepared in accordance with the *Guidance for the Preparing of Standard Operating Procedures* (USEPA, 2007) and the Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) *Policy Manual* (Burns & McDonnell, 2018).

2.0 SUMMARY OF METHOD

GPS technologies are used to collect spatial data including latitude, longitude, and elevation. The data collected in the field may be post-processed or verified by project staff to assess accuracy as required by Project-Specific Work Plan. Once the data is deemed acceptable for its intended end-use, it is managed in accordance with the Project-Specific Work Plan.

3.0 DEFINITIONS

- **Project-Specific Accident Prevention Plan/Site Safety and Health Plan** (Project-Specific APP/SSHP) – A plan or plans that address occupational safety and health hazards associated with site operations.

- **Project-Specific Work Plan** – The plan that details the rationale, scope, and techniques to be used at the Site to achieve the project objectives. Project-Specific Work Plans can include work plans, field sampling plans, quality assurance project plans, technical memorandums, and other documentation of proposed work.

4.0 SAFETY AND HEALTH

Field activities as detailed in this SOP will be performed in accordance with applicable safety related documents/requirements which may include but are not limited to: Project-Specific APP/SSHP, the Burns & McDonnell *Safety and Health Program* (Burns & McDonnell, 2017), and site / client-specific

requirements. Personal protective equipment (PPE) should be worn as appropriate and as detailed in the Project-Specific APP/SSHP. PPE requirements should be assessed daily and on a per task basis.

5.0 CAUTIONS

The make and model of the GPS unit used to collect geospatial data will influence the accuracy of the data collected. It is important that field staff is familiar with the project-data requirements and the GPS unit's capabilities prior to collecting data. Furthermore, GPS data can be influenced by a number of environmental factors such as dense trees, steep hillsides, or tall buildings. These factors can reduce a GPS unit's accuracy by limiting the number of satellites a GPS unit communicates with while in use. Field personnel should monitor the number of satellites in communication with the GPS unit throughout its use and take corrective action in the event the number of satellites decreases significantly in certain portions of the site.

6.0 PERSONNEL QUALIFICATIONS

There are no general qualifications (e.g. – classes or certifications) required for using basic, GPS-enabled devices for the collection of field data; however, project-specific requirements may exist. Burns & McDonnell personnel conducting on-site environmental activities will have completed the 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) course and annual 8-hour HAZWOPER refresher courses. At a minimum, one person on site will be certified in first aid and cardiopulmonary resuscitation (CPR) and, if multiple people are on site, at least one person will have completed the 8-hour HAZWOPER Supervisor Training course. If Burns & McDonnell subcontractors are on site then, at a minimum, one Burns & McDonnell person will have completed the OSHA 30-hour Construction Industry Outreach Training course.

7.0 EQUIPMENT AND SUPPLIES

The GPS model and specifications selected for use should meet the data accuracy specifications presented in the Project-Specific Work Plan. In the event no accuracy requirements are available, the project staff will select a unit that provides reasonable accuracy for the intended end-use of the data being collected.

Prior to the start of field activities, the Field Site Manager and/or the Project Manager should determine that 1) necessary permits, and right of entries have been obtained; 2) the Project-Specific APP/SSHP has been reviewed by Burns & McDonnell personnel participating in the work and subcontractors who will be on site; 3) appropriate PPE has been obtained for Burns & McDonnell personnel and will be available on

site; 4) equipment and meters are available, in working order, and complete with needed components; and 5) applicable safety data sheets are on site and available to the field team.

8.0 PROCEDURES

8.1 Points

Point features will be collected using GPS instruments to provide x, y, and/or z data necessary for the documentation of a specific location (e.g. -sample locations, corner of a building, etc.). Operation of the GPS unit selected for the project will be conducted in accordance with the unit-specific operator's manual (provided by the manufacturer). The following general procedure will be used for collecting point features:

1. Prior to collecting data, compare the selected GPS unit's accuracy to the project requirements. Information on the GPS unit including make and model should be entered into the field logbook as detailed in *SOP 701 Field Documentation*.

2. Once positioned at the location, allow the GPS unit to process the point for a minimum of 30 seconds (or as otherwise specified in the manufacture's specifications).

3. While the unit is collecting the location, enter a location ID and other attribute data into the appropriate fields on the data collector for that point (e.g. – sample ID, description, etc.).

4. When a cloud-based database/file is being used (e.g. – SDE GIS Database) and an active internet connection is available, the data collected will be automatically synched as it is collected. In the event an active internet is not available, data will be saved to the device and synched as soon as the field personnel has access to internet (end of each day).

5. If a cloud-based database/file is not in use, the data will be downloaded for temporary storage after the data has been collected and uploaded to the project drive when access to the internet is available.

6. Prior to leaving the project site, the collected features will be reviewed for accuracy and completeness to determine if any additional data should be collected and/or if features need to be verified.

7. When finalized, the dataset will be processed and managed in accordance with project requirements.

8.2 Lines and Polygons

Collecting line and polygon features will be performed using GPS instruments to document the location of linear features and areas (e.g. –excavation extent, building, etc.). Specific procedures for operation of the GPS unit selected for the project will be conducted in accordance with the unit-specific operator's manual (provided by the manufacturer). The following general procedure will be used for collecting line and polygon features:

1. Prior to collecting data, compare the selected GPS unit's accuracy to the project requirements. Information on the GPS unit including make and model should be entered into the field logbook as detailed in *SOP 701 Field Documentation*.

2. Position the unit at the start of the location (or first vertex), then allow the GPS unit to process the point for the minimum duration specified in the manufacture's specifications.

3. While the unit is collecting the location, enter a location ID and other attribute data into the appropriate fields on the data collector for that point (e.g. – feature ID, description, etc.).

4. When a cloud-based database/file is being used (e.g. – SDE GIS Database) and an active internet connection is available, the data collected will be automatically synched as it is collected. In the event an active internet is not available, data will be saved to the device and synched as soon as the field personnel has access to internet (end of each day).

5. If a cloud-based database/file is not in use, the data will be downloaded for temporary storage after the data has been collected and uploaded to the project drive when access to the internet is available.

6. Prior to leaving the project site, the collected features will be reviewed for accuracy and completeness to determine if any additional data should be collected and/or if features need to be verified.

7. When finalized, the dataset will be processed and managed in accordance with project requirements.

9.0 DATA AND RECORDS MANAGEMENT

GPS data will be managed in accordance with the Project-Specific Work Plan and client requirements.

10.0 QUALITY ASSURANCE/QUALITY CONTROL

Prior to the start of any field activity, Burns & McDonnell personnel will have read and understood the Project-Specific Work Plan as well as this SOP. Necessary site-specific information including but not

limited to topographic maps, site boundary, and site base map will be uploaded to the GPS instruments prior to entering the field. Upon arrival at the site, the GIS instrument's accuracy will be tested against a known point prior to field use. This field verification will be performed at the start of a project, when new GPS equipment is brought on to a project, if the GPS equipment has been sent to the home office/manufacturer for software updates, and as specified in Project-Specific Work Plan.

11.0 REFERENCES

Burns & McDonnell Engineering, Co, Inc. (Burns & McDonnell), 2018. *Policy Manual*,

- Chapter 8, Employee Safety & Health, April 2017.
- Chapter 10, Quality Control Manual, January 2017.

United States Environmental Protection Agency (USEPA), 2007. *Guidance for Preparing Standard Operating Procedures*. EPA/600/B-07/001. April

12.0 ATTACHMENTS

None.

SOP 504
Decontamination

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04/06/2018

Approved by:

04/03/2018

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04/04/2018

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04/06/2018

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1.0 PURPOSE AND APPLICABILITY

The purpose of *Standard Operating Procedure (SOP) 504 Decontamination* is to establish a uniform procedure for field personnel in the decontamination of environmental equipment. Proper equipment decontamination is essential in ensuring the quality and integrity of samples collected during a given sampling event. This SOP covers the ***process*** for the equipment decontamination; specifics of decontamination including decontamination fluids and rinses, location of decontamination places and pad, and extra washes and rinses to be used are detailed in the Project-Specific Work Plans. *SOP 504 Decontamination* has been prepared in accordance with the *Guidance for the Preparing of Standard Operating Procedures* (USEPA, 2007) and the Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) *Policy Manual* (Burns & McDonnell, 2018).

2.0 SUMMARY OF METHOD

Decontamination is the process of removing contamination from equipment prior and post sampling. Removing contaminants from equipment minimizes the likelihood of sample cross contamination, reduces transfer of contaminants to clean areas, and prevents the mixing of incompatible substances. Decontamination typically includes both physical (scrubbing) and chemical (soap and acid or solvent rinses). It is important that decontamination is performed using materials and equipment that can effectively remove anticipated contaminants of concern while not damaging the equipment. After decontamination, equipment should be handled only by personnel wearing clean gloves and moved out of the decontamination area to prevent re-contamination.

3.0 DEFINITIONS

- **Distilled Water** - Water that has had many of its impurities removed through distillation. Distillation involves boiling the water and then condensing the steam into a clean container.

- **Laboratory Grade Detergent** – A detergent formulated specifically for use in laboratories to be clean rinsing and phosphate free. Standard brands include Alconox® and Liquinox®.

- **Potable Water** - Treated municipal water or well water used and approved for drinking.

- **Project-Specific Accident Prevention Plan/Site Safety and Health Plan** (Project-Specific APP/SSHP) – A plan or plans that address occupational safety and health hazards associated with site operations.

- **Project-Specific Work Plan** – The plan that details the rationale, scope, and techniques to be used at the Site to achieve the project objectives. Project-Specific Work Plans can include work plans, field sampling plans, quality assurance project plans, technical memorandums, and other documentation of proposed work.

4.0 SAFETY AND HEALTH

Field activities as detailed in this SOP will be performed in accordance with applicable safety related documents/requirements which may include but are not limited to: Site Safety and Health Plans, the Burns & McDonnell *Safety and Health Program* (Burns & McDonnell, 2017), and site / client-specific requirements. Personal protective equipment (PPE) including safety glasses and gloves should be worn as appropriate and as detailed in the Project-Specific APP/SSHP. PPE requirements should be assessed daily and on a per task basis. Rinses such as acids and solvents should be handled with care during transportation to and from the site and stored properly while on site. A Safety Data Sheet should be on site for all chemical rinses.

5.0 CAUTIONS

High concentrations of contaminants or the requirement of very low detection levels may require decontamination procedures that are more stringent than that described in this SOP. This should be considered during work plan development but also recognized if encountered in the field.

Prior to field mobilization, the expected types of contamination should be evaluated to determine if the field cleaning and decontamination activities will generate rinsates and other wastewaters that might be considered Resource Conservation and Recovery Act (RCRA) hazardous waste thus require special handling and disposal procedures.

Care should be taken to remove all visible potential contamination from sample equipment to prevent cross contamination which could result in false positive analytical results.

6.0 PERSONNEL QUALIFICATIONS

Burns & McDonnell personnel conducting on-site environmental activities will have completed the 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) course and annual 8-hour HAZWOPER refresher courses. At a minimum, one person on site will be certified in first aid and cardiopulmonary resuscitation (CPR) and, if multiple people are on site, at least one person will have completed the 8-hour HAZWOPER Supervisor

Training course. If Burns & McDonnell subcontractors are on site then, at a minimum, one Burns & McDonnell person will have completed the OSHA 30-hour Construction Industry Outreach Training course.

7.0 EQUIPMENT AND SUPPLIES

Typical decontamination equipment and supplies include the following items:

- Potable water
- Distilled water
- Non-phosphate laboratory-grade detergent
- Wash bottles
- Buckets
- Scrub brushes
- Plastic sheeting
- Garbage bags
- PPE and safety equipment per the Project-Specific APP/SSHP

Additional rinsates including methanol, isopropyl, and hexane, may be required dependent upon the chemicals of concern.

Prior to the start of field activities, the Field Site Manager and/or the Project Manager should determine that 1) necessary permits, and right of entries have been obtained; 2) the Project-Specific APP/SSHP has been reviewed by Burns & McDonnell personnel participating in the work and subcontractors who will be on site; 3) appropriate PPE has been obtained for Burns & McDonnell personnel and will be available on site; 4) equipment and meters are available, in working order, and complete with needed components; and 5) applicable safety data sheets are on site and available to the field team.

8.0 PROCEDURES

8.1 Decontamination of Non-Dedicated Bladder Pumps

Non-dedicated bladder pumps will be decontaminated according to the following procedure:

1. Leave or attach approximately 4 feet of air supply and water discharge tubing to the pump. Place the pump inside a solid/blank 5-foot section of 2-inch inside diameter polyvinyl chloride (PVC) pipe that has one end capped.

2. Attach the air supply tube to the controller, which is attached to the compressed air source, and direct the discharge tube back into the PVC pipe to recirculate the wash water. Fill the PVC pipe with distilled or potable water, adding approximately one-half teaspoon of non-phosphate, laboratory-grade detergent.

3. Turn on the pump and circulate the wash water for approximately one minute.

4. Direct the discharge into a bucket and pump the detergent water from the PVC pipe.

5. Pump 3 to 5 liters of distilled water through the pump, adding water to the pipe as needed, to rinse the detergent from the pump.

6. Retain decontamination fluids per *SOP 601 Investigative Derived Waste Storage, Sampling, and Disposal*.

8.2 Decontamination of Other Sample-Contacting Equipment

Non-disposable and other non-dedicated equipment which contacts the sample will be decontaminated prior to the collection of each sample and at the close of each day. This equipment includes, but is not limited to, sampling knives and spoons, mixing bowls, split-sampling barrels, direct-push shoes and subs, and reusable containers.

Sampling equipment will be decontaminated according to the following procedure:

1. Fill a nonmetallic wash tub or bucket to a depth of approximately 6 inches with potable water. Mix a detergent solution in the tub. The solution shall consist of approximately 1 tablespoon of non-phosphate laboratory-grade detergent (e.g. Liquinox) per gallon of water.

2. Scrub sampling equipment with a stiff-bristled brush and detergent solution to physically remove visible gross contamination.

3. Transfer the equipment to another wash tub partially filled with distilled water and rinse.

4. Rinse the sampling equipment again with fresh distilled water.

5. Place the equipment on clean plastic and allow it to air dry.

6. Store the equipment covered with plastic or aluminum foil upon the completion of decontamination.

7. Retain decontamination fluids per *SOP 601 Investigative Derived Waste Storage, Sampling, and Disposal*.

8.3 Decontamination of Meters and Probes

Meter probes, water level indicator and oil/water interface probe, will be decontaminated prior to use at each sample location and at the close of each day. Water indicator probes and tapes will be decontaminated per the following procedure.

1. As the tape is being reeled onto the instrument, the tape will be wiped with paper towels that have been sprayed or dampened with a detergent solution. The solution shall consist of approximately 1 tablespoon of non-phosphate laboratory-grade detergent (e.g. Liquinox) per gallon of water.

2. Decontaminate the probe portion of the instrument by spraying with the detergent solution then rinsing with water. If sediment is present on the probe, then ensure the sediment is removed by the cleaning followed by a distilled water rinse.

If nonaqueous phase liquids are encountered or if the measured media is severely impacted, then decontaminate water level indicators and oil/water interface probes by:

1. Fill a nonmetallic wash tub or bucket to a depth of about 6 inches with potable water. Mix a detergent solution in the tub. The solution shall consist of approximately 1 tablespoon of non-phosphate laboratory-grade detergent (e.g. Liquinox) per gallon of water.

2. Clean the portions of the meters and probes that had contact with site media with the detergent solution.

3. Rinse the portions of the meters and probes with distilled water.

4. Place the equipment on clean plastic and allow it to air dry.

5. Store the equipment in the provided case or covered with plastic or aluminum foil.

6. Retain decontamination fluids per *SOP 601 Investigative Derived Waste Storage, Sampling, and Disposal*.

Instruments such as pH meters, conductivity meters, and other instruments that do not come into contact with the material that will be collected for analysis may be decontaminated by thoroughly rinsing the instrument probes.

8.4 Decontamination of Non-Sample-Contacting Equipment

Down-hole sampling tools such as drill string, augers, and direct-push rods, as well as drill rigs and direct-push trucks/vans, will be decontaminated prior to the start of work on site, between each borehole, and prior to leaving the site. Decontamination of subcontractor-owned equipment is typically the responsibility of the subcontractor. Decontamination should be according to the following procedure:

1. Construct a three-sided decontamination pad using planks as a frame and plastic sheeting as the bottom. The pad should be constructed on a slight slope with the open side facing uphill.

2. Back the drill rig or direct-push rig into the decontamination pad or place equipment in a rack off the ground inside the pad.

3. Use pressurized, potable water to completely remove visible soil and contamination from surfaces. Include the inside of drill string, augers, and direct-push rods. If necessary, use a stiff-bristled brush to remove soil and contamination. Dependent upon the contaminant present, the Project-Specific Work Plan may require the use of hot, pressurized water with laboratory grade detergent. The use of a detergent wash will require a rinse with potable water.

4. Place the equipment on clean plastic and allow to air dry.

5. Store equipment and cover with plastic after decontamination.

6. Retain decontamination fluids as described in *SOP 601 Investigative Derived Waste Storage, Sampling, and Disposal*.

9.0 DATA AND RECORDS MANAGEMENT

A documentation of field activities will be maintained in the field logbook as described in *SOP 701 Field Documentation*. Field documentation will be completed as activities are conducted and will be relayed to the Field Site Manager or Project Manager at a minimum weekly or on a more frequent basis if so stated in the Project-Specific Work Plan.

10.0 QUALITY ASSURANCE/QUALITY CONTROL

Equipment rinstate blanks (ERBs) are often collected from non-disposable, sample-contacting equipment to determine if cross contamination is occurring. Procedures for the collection of ERBs can be found in the SOPs for the specific sampling method.

Prior to the start of any field activity, Burns & McDonnell personnel will have read and understood the Project-Specific Plans as well as this SOP. Field personnel will be trained for a minimum of 40 hours prior to their working solo on environmental field activities.

11.0 REFERENCES

Burns & McDonnell Engineering, Co, Inc. (Burns & McDonnell), 2018. *Policy Manual*,

- Chapter 8, Employee Safety & Health, April 2017.
- Chapter 10, Quality Control Manual, January 2017.

United States Environmental Protection Agency (USEPA), 2007. *Guidance for Preparing Standard Operating Procedures*. EPA/600/B-07/001. April

12.0 ATTACHMENTS

None.

SOP 592
Sample Packaging and Shipping

Revision 01
04/06/2018

Approved by:

04/03/2018

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Date

02/22/2018

Justin Carter, PG, Senior Geologist,
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Date

04/06/2018

John Hesemann, PE,
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Biennial Review:

Revision/Review	Date	Responsible Party	Description of Change
Revision 01	02/22/2018	Carter, Justin	Minor grammar and updated references.

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1.0 PURPOSE AND APPLICABILITY

The purpose of *Standard Operating Procedure (SOP) 592 Sample Packaging and Shipping* is to establish a uniform procedure for field personnel to use in the packaging and shipping of environmental samples for chemical and physical analysis. This SOP only applies to the packaging and shipping of limited quantity, low concentration environmental samples. This procedure does not apply to those samples considered hazardous materials, hazardous waste, mixed waste, radioactive waste, and/or dangerous goods. Requirements for packing and shipping those types of samples are specified in the U.S. Department of Transportation (DOT) 49 Code of Federal Regulation (CFR) 114-327 and the International Air Transport Association (IATA) procedures. This SOP covers the *process* for the packaging and shipping of environmental samples; specific of shippers and shipping dates are detailed in the Project-Specific Work Plan. *SOP 592 Sample Packaging and Shipping* has been prepared in accordance with the *Guidance for the Preparing of Standard Operating Procedures* (USEPA, 2007) and the Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) *Policy Manual* (Burns & McDonnell, 2018).

2.0 SUMMARY OF METHOD

Samples collected for laboratory analysis shall be packed and shipped in a way to maintain quality control and limit breakage of sample containers. Dependent upon the analyses, samples may require placement in coolers with an appropriate amount of ice to maintain an internal temperature of 4° Celsius (C) during shipping from the field to the lab. Chain-of-custody (COC) documentation will be included inside of the cooler.

Samples will be sent to the laboratory via overnight shipment (ie FedEx) or a laboratory courier. If sent via FedEx, a FedEx air bill will be completely filled out and the cooler(s) will be delivered directly to a FedEx agent or to an authorized agent for shipment. The shipment tracking number will be recorded in the field logbook. (For additional questions regarding shipping, contact FedEx at 1-800-463-3339.) If sent via laboratory courier, the courier will sign the COC upon receipt of the packed samples.

3.0 DEFINITIONS

- **Environmental Sample** - A limited quantity, low concentration sample that does not require DOT or IATA hazardous waste labeling as a hazardous waste or material.

- **Hazardous Material** - A substance or material in a quantity or form, which may pose an unreasonable risk to health, safety, and/or property when transported in commerce. Hazardous material is defined and regulated by DOT (49 CFR 173.2 and 172.101) and IATA (Section 4.2).

- **Hazardous Waste** - Any substance listed in 40 CFR Subpart D (260.30 et seq.) or otherwise characterized as ignitable, corrosive, reactive, or toxic as specified in Subpart C (261.20 et seq.) that would be subject to manifest and packaging requirements specified in 40 CFR 262. Hazardous waste is defined and regulated by the United States Environmental Protection Agency (USEPA).

- **Hazardous Waste Sample** - A medium or high concentration sample requiring, either DOT or IATA labeling as a hazardous waste or material.

- **Project-Specific Accident Prevention Plan/Site Safety and Health Plan** (Project-Specific APP/SSHP) – A plan or plans that address occupational safety and health hazards associated with site operations.

- **Project-Specific Work Plan** – The plan that details the rationale, scope, and techniques to be used at the Site to achieve the project objectives. Project-Specific Work Plans can include work plans, field sampling plans, quality assurance project plans, technical memorandums, and other documentation of proposed work.

- **Sample** - Physical evidence collected from a facility or the environment which is representative of conditions at the point and time at which the sample is collected.

4.0 SAFETY AND HEALTH

Field activities as detailed in this SOP will be performed in accordance with applicable safety related documents/requirements which may include but are not limited to: Project-Specific APP/SSHP, the Burns & McDonnell *Safety and Health Program* (Burns & McDonnell, 2017), and site / client-specific requirements. Care should be taken when handling sample bottles that have been prepared with preservatives such as acids or bases. Personal protective equipment (PPE) as listed in the Project-Specific APP/SSHP should be worn while handling and packing filled sample containers. PPE requirements should be assessed daily and on a per task basis.

5.0 CAUTIONS

Sample quality is dependent upon proper preservation including sample temperature. Care should be taken not to over or under dilute the preservative within pre-preserved sample containers. Care should be taken to ensure that sufficient ice is present in the coolers during sampling and that the ice is replenished prior to shipping. Samples that contain liquids (including the ice) should be double bagged so to prevent leakage during shipment.

6.0 PERSONNEL QUALIFICATIONS

Burns & McDonnell personnel conducting on-site environmental activities will have completed the 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) course and annual 8-hour HAZWOPER refresher courses. At a minimum, one person on site will be certified in first aid and cardiopulmonary resuscitation (CPR) and, if multiple people are on site, at least one person will have completed the 8-hour HAZWOPER Supervisor Training course. If Burns & McDonnell subcontractors are on site then, at a minimum, one Burns & McDonnell person will have completed the OSHA 30-hour Construction Industry Outreach Training course.

7.0 EQUIPMENT AND SUPPLIES

Equipment and supplies required when shipping and handling samples can include:

- Packing materials such as bubble wrap, plastic sealable bags, tape, etc.
- Contractor-grade plastic trash bags
- Ice
- Coolers
- Labeling supplies such as shipping labels, waterproof pens, etc.
- PPE and safety equipment per the Project-Specific APP/SSHP

Equipment to be used for decontamination and documentation can be found in the SOPs for those activities.

Prior to the start of field activities, the Field Site Manager and/or the Project Manager should determine that 1) the Project-Specific APP/SSHP has been reviewed by Burns & McDonnell personnel participating in the work and subcontractors who will be on site; 2) appropriate PPE has been obtained for Burns & McDonnell personnel and will be available on site; 3) equipment and supplies are available, in working

order, and complete with needed components; and 4) sample shipping containers provided by the laboratory are the correct size and type, and are sufficient in number for the planned field activities.

8.0 PROCEDURES

The sample packaging and shipping procedures to be used for the shipment of samples by an overnight carrier are based on USEPA specifications and Department of Transportation regulations (49 CFR Parts 172 and 173). Samples will be packed and shipped according to requirements for low hazard-level samples. The following procedure will be used to pack samples being shipped by overnight carrier:

1. At the time of sampling, wipe the outside of each sample container with a paper towel and place a label on each container. Each glass container will be wrapped with bubble wrap. Place each sample bottle in an individual, sealable plastic bag. Volatile organic compound (VOC) vials may be grouped within a bag by sample. Remove as much air as possible from the plastic bag prior to sealing. Complete the COC as detailed in *SOP 701 Field Documentation.*

2. Prior to shipping, arrange sample containers in groups by sample number.

3. Tape drains shut on shipping cooler, if present.

4. Place an absorbent pad in the bottom of the cooler, followed by a layer of bubble wrap.

5. Insert a contractor-grade (minimum of 2 mils thick) plastic trash bag into the cooler.

6. Place the sample containers inside the trash bag in an upright position so they do not touch. Place one temperature blank in each cooler.

7. Add ice (double packaged in sealable plastic bags).

8. Check the COC against the contents of the cooler. Sign the COC and indicate the time and date the cooler is sealed. Record the time in the field logbook.

9. If shipping via overnight carrier (i.e. FedEx):

    a. Separate the copies of the COCs. Seal the top form (original) in a large, sealable, plastic bag and tape them to the inside of the cooler lid.

    b. Complete shipping paperwork (if applicable). Include air bill number and name of carrier on the COC, and record the information in the field logbook.

c. Close the lid and latch the cooler. Tape the cooler shut on both ends, make several revolutions with the strapping tape. The strapping tape should cover the ends of the clear tape used to secure the shipping label but should not cover the label.

d. Affix signed custody seals over lid openings (opposite corners of the cooler). Cover the seals with clear, plastic tape.

e. Attach the FedEx air-bill to the top of the cooler. Use two strips of clear tape to securely fasten the shipping label to the cooler so that the label will not peel off even if the coolers are stacked during shipment. The clear tape should extend across the entire top of the cooler. Field samples will be shipped to the contracted laboratory(ies).

f. Enter the appropriate information including air-shipping number, and time and date relinquished to the shipper in the field logbook.

10. If shipping via a laboratory courier:

a. Have the courier sign the COC noting receipt of samples.

b. Separate the copies of the COCs. Seal the top form (original) in a large, sealable, plastic bag and tape to the inside of the cooler lid.

c. Close the lid and latch the cooler. Tape the cooler shut on both ends, make several revolutions with the strapping tape. The strapping tape should cover the ends of the clear tape used to secure the shipping label but should not cover the label.

d. Affix signed custody seals over lid openings (opposite corners of the cooler). Cover the seals with clear, plastic tape.

e. Enter the appropriate information including name of the courier, and time and date relinquished to the courier in the field.

9.0 DATA AND RECORDS MANAGEMENT

Shipping information including COC numbers, shipping numbers, and date and times should be entered into the field logbook as detailed in *SOP 701 Field Documentation*. Field documentation will be completed as activities are conducted and will be relayed to the Field Site Manager or Project Manager at a minimum weekly or on a more frequent basis if so stated in the Project-Specific Work Plan.

10.0 QUALITY ASSURANCE/QUALITY CONTROL

Prior to the start of any field activity, Burns & McDonnell personnel will have read and understood the Project-Specific Plans as well as this SOP. Field personnel will be trained for a minimum of 40 hours prior to their working solo on environmental field activities.

11.0 REFERENCES

Burns & McDonnell Engineering, Co, Inc. (Burns & McDonnell), 2015. *Policy Manual*,

- Chapter 8, Employee Safety & Health, April 2017.
- Chapter 10, Quality Control Manual, January 2017.

United States Environmental Protection Agency (USEPA), 2007. *Guidance for Preparing Standard Operating Procedures*. EPA/600/B-07/001. April

12.0 ATTACHMENTS

None.

SOP 701
Field Documentation

Revision 01
04/06/2018

Approved by:

04/03/2018

Martha Hildebrandt, PG, Associate Geologist,
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Date

04/02/2018

Ben Clement, R.G., Senior Geologist,
Environmental Services Division

Date

04/06/2018

John Hesemann, PE,
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Date

Biennial Review:

Revision/Review	Date	Responsible Party	Description of Change
Revision 01	04/06/2018	Hildebrandt, Martha	Minor grammar and reference updates.

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1.0 PURPOSE AND APPLICABILITY

The purpose of *Standard Operating Procedure (SOP) 701 Field Documentation* is to establish a uniform procedure for documentation of field activities on environmental sites. Soil and bedrock logging for excavations and borings is not included in this SOP but can be found in *SOP 521 Soil and Bedrock Logging*. This SOP covers the ***process*** for the field documentation; specific documentation requirements that may be required by the client, regulator, or specific processes are detailed in the Project-Specific Work Plan. *SOP 701 Field Documentation* has been prepared in accordance with the *Guidance for the Preparing of Standard Operating Procedures* (USEPA, 2007) and the Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) *Policy Manual* (Burns & McDonnell, 2017).

2.0 SUMMARY OF METHOD

Each sample, field measurement, and field activity will be properly documented to facilitate timely, correct, and complete analyses, and support actions concerning site work. The documentation system will provide a means to identify, track, and monitor individual samples from the point of collection through the final reporting of data and to record field activities that occurred. Field forms referenced in this SOP are attached.

3.0 DEFINITIONS

- **Field Forms** – Forms prepared for specific activities. Forms used in the field should either be Burns & McDonnell standard forms or be included in the Project-Specific Work Plans.

- **Field Logbook –** A bound logbook that is kept per team during environmental work. Whenever possible, logbooks should have pre-numbered pages and stitched bindings.

- **Project-Specific Accident Prevention Plan/Site Safety and Health Plan** (Project-Specific APP/SSHP) – A plan or plans that address occupational safety and health hazards associated with site operations.

- **Project-Specific Work Plan** – The plan that details the rationale, scope, and techniques to be used at the site to achieve the project objectives. Project-Specific Work Plans can include work plans, field sampling plans, quality assurance project plans, technical memorandums, and other documentation of proposed work.

4.0 SAFETY AND HEALTH

Field activities as detailed in this SOP will be performed in accordance with applicable safety related documents/requirements which may include but are not limited to: Project-Specific APP/SSHP, the Burns & McDonnell Safety and Health Program (Burns & McDonnell, 2017), and site / client-specific requirements. Personal protective equipment (PPE) should be worn as appropriate and as detailed in the Project-Specific APP/SSHP. PPE requirements should be assessed daily and on a per task basis.

5.0 CAUTIONS

Field documentation should be completed with indelible marking/ink pens preferably in blue or black. Hand entries should be printed and the author should ensure that the writing is legible and clear. Any errors made should be lined out so that the original writing is still visible, initialed, and dated. Field documentation should stay either with the field personnel on site or be kept within a secure location. Upon completion of the field activities, field documentation is kept with the project files. The Project Manager should ensure that photographs or videos are allowed prior to the start of field activities.

6.0 PERSONNEL QUALIFICATIONS

Burns & McDonnell personnel conducting on-site environmental activities will have completed the 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) course and annual 8-hour HAZWOPER refresher courses. At a minimum, one person on site will be certified in first aid and cardiopulmonary resuscitation (CPR) and, if multiple people are on site, at least one person will have completed the 8-hour HAZWOPER Supervisor Training course. If Burns & McDonnell subcontractors are on site then, at a minimum, one Burns & McDonnell person will have completed the OSHA 30-hour Construction Industry Outreach Training course.

7.0 EQUIPMENT AND SUPPLIES

Equipment to be used during field documentation may include:

- Field logbooks
- Field forms
- Labels and seals
- Indelible marking pen/ink pens, black or blue in color
- Digital cameras/recorders

- Personal protective equipment (PPE) and safety equipment per the Project-Specific APP/SSHP

Equipment to be used for sampling activities can be found in the SOPs for those activities.

8.0 PROCEDURES

Included below are procedures for completing field logbooks and specific forms and labels. Which forms and labels should be completed on a project is a function of the activities to be performed and the preferences of the client and regulator. Refer to the Project-Specific Work Plan for the specific project documentation that is to be completed.

Field documentation should be completed as the activities are being done. On a regular basis, typically not less than once a week, the field personnel should scan their field documentation for placement in the project file. At the completion of a field effort, the field personnel are responsible for ensuring that a complete scan of the documentation is in the files and that the originals have been given to the project manager for inclusion in the project files.

8.1 Corrections to Documentation

Original recorded data will be written with indelible, waterproof ink. Accountable serialized documents will not be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. Errors will be corrected by marking a line through the error, entering the correct information, and initialing and dating the correction. The erroneous information will not be obliterated. Any subsequent error discovered later on an accountable document will be corrected, initialed, and dated by the person who made the entry.

8.2 Field Logbook

Information pertinent to the investigation will be recorded in a bound logbook with consecutively-numbered, water-resistant pages. The field personnel responsible for the entries will sign and date each entry or page. Logbook entries will be made in waterproof, indelible ink. The time and date of each entry will be noted in the logbook.

General rules cannot specify the exact information that must be entered in a logbook for a particular site. However, the logbook should contain sufficient information so that field activities can be reconstructed without discussion with the original author. Logbooks will be kept in the field personnel's possession or a secure place during the investigation. Following the investigation, logbooks will become part of the

project file. The following list contains typical field logbook entries to be recorded on a daily basis, depending upon field activities being performed.

- Date
- Weather conditions
- Names of field personnel and site visitors including time on and off the site
- Documentation of daily safety meeting including topics and attendance
- Calibration record of field equipment
- Name and location of area of investigation
- Location of sample (may include a sketch)
- Type of sample (soil, groundwater, sediment, air, etc.)
- Time (military) of sample collection
- Sample identification number
- Interval and depth of sample
- Field screening results
- Sample collection procedure/equipment
- Sample description (color, odor, etc.)
- Field observations of sampling event
- Parameters requested for analyses
- Field measurements
- Quality assurance/quality control (QA/QC) sample information
- Equipment decontamination procedures
- Sample shipment information
- Number assigned to chain of custody (COC)
- Documentation of investigative derived waste (IDW) per *SOP 601 Investigative Derived Waste Storage, Sampling, and Disposal*
- Air monitoring results
- Level of PPE

8.3 Field Forms

Field forms can be specific forms for field measurements such as water level forms, sampling forms, forms associated with specific activities such as well development or in-situ testing, equipment calibration forms, or health and safety forms. Specific field forms to be used should be referenced in the Project-

Specific Work Plan or the Project-Specific APP/SSHP. In all cases, the forms should be completed in entirety. Items on the forms that do not apply should be filled with NA. Forms should be completed in waterproof, indelible ink. Time entries should be military.

8.4 Daily Quality Control Reports

Daily Quality Control Reports (DQCR) are used to transmit a summary of daily activities to the client or to the regulators. DQCRs are used on most Department of Defense projects. DQCRs can be used on state or private projects if the client or regulator requests a daily field summary. With DQCRs, field activities will be recorded daily by the Field Site Manager (FSM) to verify that procedures outlined in the Project-Specific Work Plans are implemented. DQCRs will be completed with the following information:

- **Site Information** - To accurately track field activities from one site location to another, site-specific information will be recorded on the DQCR form. Information such as site location, project number, area of investigation, date, time, crew numbers, names of crew members, and the name of the FSM will be recorded.

- **Weather Conditions** - General weather conditions such as air temperature, relative wind speed and direction, and relative humidity will be estimated daily and recorded on the DQCR forms. Any change in weather conditions encountered during the day will be recorded on the DQCR.

- **Subcontractors and Equipment** - The subcontractors performing work associated with the investigation at the site will be tracked by recording on the DQCR form the subcontractor's company name, crew size, and a list of the major equipment used during daily field activities.

- **Summary of Work Performed -** A brief description of the daily field activities performed at the site will be recorded on the DQCR form. For field measurements, the numerical value and units will be recorded on the DQCR form.

- **Instrument Calibration** - Instrumentation used for sampling and personal protection, and verification of instrument calibration during daily field activities will be recorded on the DQCR form. Additional instruments used will be written in the space provided. Further information on calibration procedures will be recorded on the calibration log for each instrument used during daily field activities.

- **Health and Safety Requirements** - The level of protection used during daily field activities and any other health and safety modifications will be recorded in the DQCR form. Modifications that may occur during field activities, including upgrading to higher levels of protection based on air-monitoring data and other chemical or physical hazards encountered at the site that were not previously known to exist, will also be recorded on the DQCR form.

- **Sample Numbers Collected Including QA/QC Samples** – A summary of the samples collected, including QA/QC samples and the relationship of the QA/QC samples to the original samples, will be recorded on the DQCR form under the "Summary of Work Performed" heading.

- **Deviations from the Approved Site-Specific Documents** - Any anticipated deviation in field activities that is not specified in the site-specific documents will be recorded on the DQCR form. The actual deviation will not be performed until a written request is submitted by the Project Manager to the client and approval, written or verbal, has been granted by the client.

- **Problems Encountered/Corrective Action Taken** - During daily field activities, any problems encountered and the corrective actions taken for each incident will be recorded on the DQCR form. For each problem encountered, the Project Manager will be notified and the date and time recorded of when notification was given.

- **Work Status for the Following Day** - A summary of field activities planned for the following day will be recorded on the DQCR form.

The FSM will verify completion by signing and dating the DQCR form. The DQCR form will be completed and forward to the Project Manager daily. The DQCRs and any attachments will be submitted to the client either daily or weekly as requested. Copies of the completed forms will be placed in the project file.

8.5 Chain-of-Custody Records

The COC will be employed as physical evidence of sample custody. Field personnel will initiate a COC with acquisition of the sample. Transferred possession of samples will be recorded on the COC by both the person relinquishing and the person receiving the samples by signing, dating, and noting the time the transfer of possession takes place. Samples are considered to be in a person's custody if they are within that person's line of sight, kept in a locked room or vehicle, or adequately sealed with custody seals.

A COC will be prepared for each cooler shipped or transported to the laboratory. All samples packed in the cooler will be recorded on the COC accompanying that cooler. A document control number consisting of the date and consecutive alphabetic suffix will be completed in the space provided on the COC. For example, if a shipment of samples is prepared on January 31, 2016 with two coolers, the document control numbers will be 01312016A for the COC(s) included with the first cooler and 01312016B for the COC(s) included with the second cooler.

The following information is to be included on the COC:

- Sample numbers
- Signature(s) of field personnel
- Date of collection
- Time (military) of collection
- Sample type (solid, etc.)
- Identification of sampling point (including depth)
- Number of containers
- Preservative used
- Parameters requested for analysis
- Signature of person(s) involved in the chain of possession
- Inclusive dates and times of possession
- Notations regarding the possible compromise of sample integrity
- Notation regarding sample temperature
- Document control number

After completing the COC, the original (white copy) will be enclosed in a plastic bag and secured to the inside of the cooler lid for the laboratory and the yellow copy will be placed in the project file.

8.6 Sample Labels

Each sample removed from a site and transferred to a laboratory for analysis will be identified with a sample label containing specific information regarding the sample. Each completed sample identification label will be securely fastened to the sample container. Complete sample labels will include the following information:

- Date

- Time (military) of sample collection
- Type of analyses requested
- Sample number
- Sample collection depth, if appropriate
- Location of sample collection
- Type of preservative
- Initials of sampler

8.7 Custody Seals

From the time the coolers are packed until they are opened in the laboratory, custody seals will be used to preserve the integrity of the cooler during shipment. Custody seals must be attached so that it is necessary to break the seals to open the cooler and should be initialized by the person applying the seal. The custody seals will be covered with clear tape. All samples shipped overnight to the laboratory will be shipped in coolers sealed on two opposite sides with custody seals. As long as the COCs are sealed inside the sample cooler and custody seals remain intact, commercial carriers and laboratory couriers are not required to sign the custody form.

8.8 Digital Cameras or Recorders

Sample points and field activities may be documented using cameras or recorders. Photographs and recordings may be used to document sample characteristics, sample collection activities, remediation activities, equipment used, and features of the site and surrounding areas. Photographs and recordings taken to document sampling points should include one or more reference points to facilitate relocating the sample location at a later date. Where appropriate, a scale should also be included in the photograph or recording. Date and time stamps should be turned on for all digital documentation. Photographs and recordings can be located using the built-in GPS unit on the camera or recorder, a handheld GPS, or a photograph location sketch drawn in the field logbook. The following information will be recorded in the field logbook for each photograph or recording:

- Date
- Time
- Photographer
- Name of building or area
- General direction faced and description of subject
- Sequential number of the photograph or recording

- Camera or recorder serial number

9.0 DATA AND RECORDS MANAGEMENT

9.1 Field Activities

Field documentation should be completed as the activities are being done. On a regular basis, typically not less than once a week, the field personnel should scan their field documentation for placement in the project file. At the completion of a field effort, the field personnel are responsible for ensuring that a complete scan of the documentation is in the files and that the originals have been given to the project manager for inclusion in the project files.

9.2 Filing System

A project file will be established to organize and maintain data throughout the life of the project. The field data file will include either hard or electronic copies of record documents generated in the field including but will not be limited to the following:

- Field logbooks
- Site planning documents and project-specific plans
- Contract specifications
- Subcontractor agreements/purchase orders
- Safety Data Sheets for chemicals used on the site
- Field instrument operating manuals
- List of important phone numbers
- Shipping forms
- Equipment calibration records
- Health and safety forms
- Applicable field forms
- Applicable laboratory forms

Field forms in hard format should be electronically scanned and placed in the electronic project files upon return to the office.

The project file in the office can also include, but is not limited to:

- Chemical laboratory data file including copies of the COCs, cooler receipt forms, requests for chemical analysis, and the laboratory results
- Physical laboratory data file including requests for physical analysis and the laboratory results
- Field data file including boring log originals, field logbooks, field transmittals, photographs, and field performance and system reviews
- Data record file including backup copies of the computerized data record system.
- Project correspondence including transmittal letters
- Project memoranda including minutes of meetings and progress reports
- QA/QC file including copies of the laboratory's QA/QC manual, the laboratory's QA/QC project plan, the laboratory's QA/QC internal audit, and performance and system QA reviews
- Report originals in pdf (portable document file) format
- Drawing and plan file including original report exhibits, original maps, and miscellaneous plans and drawings related to the field investigation

10.0 QUALITY ASSURANCE/QUALITY CONTROL

Prior to the start of any field activity, Burns & McDonnell personnel will have read and understood the Project-Specific Work Plan as well as this SOP. Field personnel will be trained for a minimum of 40 hours prior to their working solo on environmental field activities. Field documentation will be completed as activities are conducted and will be relayed to the FSM or Project Manager at a minimum weekly or on a more frequent basis if so stated in the Project-Specific Work Plan.

11.0 REFERENCES

Burns & McDonnell Engineering, Co, Inc. (Burns & McDonnell), 2018. *Policy Manual*,

- Chapter 8, Employee Safety & Health, April 2017.
- Chapter 10, Quality Control Manual, January 2017.

United States Environmental Protection Agency (USEPA), 2007. *Guidance for Preparing Standard Operating Procedures*. EPA/600/B-07/001. April

12.0 ATTACHMENTS

The following example forms are attached to this SOP:

- DQCR

- COC
- Sample label
- Custody seal

Project-specific forms should be included with the Project-Specific Work Plans.

Attachments

DAILY QUALITY CONTROL REPORT

Site: _____
Project No: _____
Date: _____
Crew No: _____
Crew Mem: _____

	Weather (circle)					
	Bright Sun	Clear	Overcast	Rain	T-storm	Snow
Temp:	to 32	32-50	50-70	70-85	85+	
Wind:	Still	Gusty	Moder.	High	**Direction: NW**	
Humidity:	Dry	Moder.	Humid			

Subcontractors and Equipment on Site: None

Health and Safety Levels: (circle)

D	Mod. D.	C	B	A

Summary of Health and Safety Activities: _____

Instrument Used: (circle)	**PID**	**pH**	**Cond.**	**Therm.**	**Turbidity**	**DO**	**ORP**	**Other**
Calibrated: (check)								

For actual calibration results, see field calibration forms.

Summary of Work Performed: _____

All Samples Were Collected According to Procedures Outlined in the Work Plan?
Yes _____ No _____

Problems Encountered/Corrective Action Taken: _____

Time Project Manager Contacted: _____

Tomorrow's Expectations: _____

Name: _____ Signature: _____

Burns & McDonnell SINCE 1898

Request for Chemical Analysis and Chain of Custody Record

Burns & McDonnell Engineering 9400 Ward Parkway Kansas City, Missouri 64114 Phone: (816) 333-9400 Fax: (816) 270-0575 Attention:	Laboratory: Address: City/State/Zip: Telephone:	Document Control No: Lab. Reference No. or Episode No.:

Project Number:

Client Name:

Sample Number	Location	Material Sampled	Sample Collection Date	Sample Type Matrix: Air	Wipe	Bulk	Analysis				Remarks (sq. ft, linear ft, volume)

Sampler *(signature)*:		Sampler *(signature)*:		Special Instructions:
Relinquished By *(signature)*: 1.	Date/Time	Received By *(signature)*:	Date/Time	Ice Present in Container: Yes ☐ No ☐ / Temperature Upon Receipt:
Relinquished By *(signature)*: 2.	Date/Time	Received By *(signature)*:	Date/Time	Laboratory Comments:

032703 Form WCD-KC-105

ROUTE TO		ANALYSIS
	Burns & McDonnell WCD 9400 Ward Parkway Kansas City, MO 64114 Phone: (816) 333-9400	

Sample Group: _____

Sample Point: _____

Sample Designator: _____

Sample Round: _____ Year: _____

Sample Depth From: _____ To: _____

Date Sampled: _____

Time Sampled: _____

Preservation: _____

_____

090705 Form WCD-97N

WCD-101

Burns & McDonnell ENV
9400 Ward Parkway
Kansas City, MO 64114-3319

Signature _____

Date _____

APPENDIX B – PHOTOGRAPHIC DOCUMENTATION


BURNS McDONNELL