Illinois Environmental Protection Agency

Bureau of Land • 1021 North Grand Avenue East • P.O. Box 19276 • Springfield • Illinois • 62794-9276

ILLINOIS EPA RCRA CORRECTIVE ACTION CERTIFICATION

This certification must accompany any document submitted to Illinois EPA in accordance with the corrective action requirements set forth in a facility's RCRA permit. The original and two copies of all documents submitted must be provided.

1.0 Facility Identification

Name: WRB Refining LP - Wood River Refinery
County: Madison
Street Address: 900 S. Central Ave
Site No. (IEPA): 1191150002
City: Roxana, IL 62084
Site No. (USEPA): ILD 080 012 305

2.0 Owner Information

Name: Not Applicable
Mail Address:
City:
State: Zip Code:
Contact Name:
Contact Title:
Phone:

3.0 Operator Information

Name: Equilon Enterprises LLC d/b/a SOPUS
Mail Address: 17 Junction Drive, PMB #399
City: Glen Carbon
State: IL Zip Code: 62034
Contact Name: Kevin Dyer
Contact Title: Senior Principal Program Manager
Phone: 618-288-7237

4.0 Type of Submission (check applicable item and provide requested information, as applicable)

- ☐ RFI Phase I Workplan/Report
- ☐ RFI Phase II Workplan/Report
- ☐ CMP Report;
- ☑ Other (describe):

IEPA Permit Log No. B-43R-M-9,M-10,M-11,M-12,M-13&M-15
Date of Last IEPA Letter on Project: Jun 13, 2014
Log No. of Last IEPA Letter on Project: See Above

Does this submittal include groundwater information: ☐ Yes ☑ No

Standard Operating Procedures updates

Date of Submittal: Jul 3, 2014

5.0 Description of Submittal: (briefly describe what is being submitted and its purpose)

Routine updates to previously submitted Standard Operating Procedures (SOPs)

6.0 Documents Submitted (identify all documents in submittal, including cover letter; give dates of all documents)

Cover Letter, SOP 18, SOP 23, SOP 24, and SOP 28 dated July 3, 2014.

7.0 Certification Statement

(This statement is part of the overall certification being provided by the owner/operator, professional and laboratory in Items 7.1, 7.2 and 7.3 below). The activities described in the subject submittals have been carried out in accordance with procedures approved by Illinois EPA. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

For: EquilonEnterprisesLLCd/b/aSOPUS

Date of Submission: Jul 3, 2014

7.1 Owner/Operator Certification

(Must be completed for all submittals. Certification and signature requirements are set forth in 35 IAC 702.126.) All submittals pertaining to the corrective action requirements set forth in a RCRA Permit must be signed by the person designated below (or by a duly authorized representative of that person):

1. For a Corporation, by a principal executive officer of at least the level of vice president.
2. For a Partnership or Sole Proprietorship, by a general partner or the proprietor, respectively.
3. For a Governmental Entity, by either a principal executive officer or a ranking elected official.

A person is a duly authorized representative only if:

1. the authorization is made in writing by a person described above; and
2. the written authorization is provided with this submittal (a copy of a previously submitted authorization can be used).

Owner Signature: ______________________ Date: ____________

Title: ______________________

Operator Signature: Kevin Ex[illegible] Date: 8/8/2014

Title: Senior Principal Program Manager

7.2 Professional Certification (if necessary)

Work carried out in this submittal or the regulations may also be subject to other laws governing professional services, such as the Illinois Professional Land Surveyor Act of 1989, the Professional Engineering Practice Act of 1989, the Professional Geologist Licensing Act, and the Structural Engineering Licensing Act of 1989. No one is relieved from compliance with these laws and the regulations adopted pursuant to these laws. All work that falls within the scope and definitions of these laws must be performed in compliance with them. The Illinois EPA may refer any discovered violation of these laws to the appropriate regulating authority.

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44 (h))

Professional's Signature: ______________________ Date: ____________

Professional's Name ______________________

Address ______________________ Professional's Seal:

City ______________________

State _____ Zip Code ____________

Phone ______________________

7.3 Laboratory Certification (if necessary)

The sample collection, handling, preservation, preparation and analysis efforts for which this laboratory was responsible were carried out in accordance with procedures approved by Illinois EPA.

Name of Laboratory ______________________

______________________ Date: ____________

Signature of Laboratory Responsible Officer

Mailing Address of Laboratory

Address ______________________

City ______________________

State _____ Zip Code ____________

____

Name and Title of Laboratory Responsible Officer

URS

July 3, 2014

Mr. Steven F. Nightingale, P.E.
Manager, Permit Section
Illinois Environmental Protection Agency
Bureau of Land
1021 North Grand Avenue East
Springfield, Illinois 62794

Subject: Routine Updates to Previously Submitted Standard Operating Procedures
Roxana, Illinois
119115002 – Madison County

Dear Mr. Nightingale:

As part of URS Corporation's (URS's) routine quality improvement process, we recently performed a review of the Standard Operating Procedures (SOPs) used by field staff performing activities at the Investigation Site in Roxana, Illinois. Prior revised versions of these SOPs were submitted to the Illinois Environmental Protection Agency (IEPA) in a September 27, 2013, submittal from URS. These procedures were originally submitted within the *Dissolved Phase Groundwater Investigation & P-60 Free Phase Product Delineation Work Plan* and *Report*, dated January 21, 2009, and February 18, 2010, respectively. We are therefore submitting this package of updated SOPs for informational purposes. The SOPs included with this submittal, along with a summary of the revisions made, are listed below.

SOP No.	SOP Title	Revision
18	Low Flow Groundwater Purging and Sampling	Editorial
23	Quality Assurance Samples	Editorial
24	Sample Classification, Packaging and Shipping	Editorial
28	Soil Sampling	Editorial

1001 Highland Plaza Drive West, Suite 300
St. Louis, MO 63110
Phone: 314.429.0100
Fax: 314.429.0462

If you have any questions, please contact Lindsay Rathnow, at lindsay.rathnow@urs.com (314/743-4199), or Bob Billman at bob.billman@urs.com (314/743-4108).

Sincerely,

Lindsay Rathnow
Geologist

Robert B. Billman
Senior Project Manager

Enclosures Revised SOPs

Cc: Gina Search, IEPA (Collinsville, IL)
Kevin Dyer, SOPUS
Shannon Haney, Greensfelder Hemker
Amy Boley, IEPA (Springfield, IL)
Project File
Repository (Village of Roxana, Website)

1. Objective

This document defines the standard operating procedure (SOP) and necessary equipment for collection of groundwater samples in monitoring wells, extraction wells, or piezometers using low-flow techniques. The term “Low Flow” refers to the velocity that the groundwater is removed from the soil formation immediately adjacent to the well screen.

In this technique, in order to withdraw water from within the well screen and to lessen drawdown, a pump that minimizes disturbance to the groundwater is operated at a low flow rate. The well is only purged within the screened interval until specific parameters have stabilized and as according to the site-specific work plan. Therefore, the groundwater samples collected are representative of the water bearing formation and hydraulically isolated from the water in the casing. The need to purge three well volumes, as required in traditional techniques, is not necessary with low flow purging and sampling. The low flow procedure described in this SOP is not necessarily applicable for every site or for wells screened in materials with very low permeability.

2. Equipment

Equipment potentially used during well purging and sampling:

- Well installation information for well being sampled
- Well keys
- Disposable latex or nitrile gloves
- Assorted tools (socket, screwdriver, clamps, etc.)
- New synthetic rope (to alleviate raising and lower of the submersible pump by the electrical wires)
- Pump and required accessories (described in more detail in following section)
- Deep cycle marine battery, or vehicle battery
- Electronic water level indicator or water/product interface probe with 0.01-foot increments
- Graduated cylinder, measuring cup, or similar
- Water quality instrument with appropriate sensors
- Flow-through cell

- Calibration fluids
- Paper towels or Kimwipes
- Trash bags
- Calculator
- Panasonic Toughbook®
- Bound field logbook (logbook)
- Waterproof pen and permanent marker
- Plastic buckets
- 55-gallon drums or truck-mounted tank
- Plastic sheeting or similar for clean working surface at each well (i.e. for flow thru cell, sample bottles, etc.)
- Appropriate decontamination equipment (see SOP No. 4)
- Cooler with ice
- Sample containers and labels
- Clear tape, if needed
- Groundwater sampling form
- Chain-of-Custody form
- Appropriate health and safety equipment (e.g., photoionization detector (PID)).
- Canopy, if needed/feasible

3. Sampling Procedure

This section provides the step-by-step procedure for collecting groundwater samples in the field. Observations made during groundwater purging and sampling should be recorded in a logbook and Toughbook® in accordance with procedures described in SOP No. 8 Field Reporting and Documentation.

A. Any reusable equipment used in the sampling procedure that could contact groundwater should be properly decontaminated before each use (see SOP No.4 Decontamination).

B. Equipment should be calibrated based on the manufacturers' instructions. The frequency of calibration should be specified in the site-specific Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP) or work plan. Refer to SOP No. 3 Calibration and Maintenance of Field Instruments for additional information.

C. Before well purging begins, the following steps should be performed at each well:

- Inspect the well and surrounding site for security, damage, and evidence of tampering. If damage or tampering is evident, contact the task or project manager for guidance.
- Place clean plastic sheeting or similar in the work area near the well to keep equipment and sample bottles clean.
- Measure ambient volatile organic compounds (VOCs) background levels in the immediate vicinity of the well (i.e., using a PID or a flame ionization detector (FID) per the Health and Safety Plan (HASP).
- Remove the well cap and immediately measure VOCs at the rim of the well and record the readings in the logbook, in the Toughbook®, and on the groundwater sampling form. Give the water in the well adequate time to reach equilibrium.

D. After the well has reached equilibrium, the groundwater elevation should be measured to the nearest 1/100-foot. The total well depth and screened interval should be obtained from the well construction information. Measuring the total depth prior to sampling should be avoided to prevent resuspension of settled solids in the well casings and to minimize the necessary purge time for turbidity equilibration. The total depth of the well should be confirmed after sampling has been completed, if necessary. A detailed description of monitoring well gauging activities is provided in SOP No. 10 Well Gauging Measurements.

E. Following measurement of the static groundwater elevation, the appropriate equipment will be slowly and carefully placed in the well. If the wells have light or dense non-aqueous-phase liquids (LNAPLs or DNAPLs) and are still to be sampled, care should be taken to place sampling equipment below or above the NAPL. If NAPL is encountered, contact the task or project manager for further direction.

F. Selection of the proper pump is important for low-flow sampling activities. USEPA guidance (1996) notes that dedicated sampling devices capable of purging and sampling are preferred over any other type of device. In addition, the pump must be capable of flow rates between about 50 and 500 mL per minute. A variety of portable sampling devices are available, such as bladder pumps, peristaltic pumps, electrical submersible pumps, gas-driven pumps, inertial lift foot-valve samplers (e.g. check-ball systems), and bailers (a list of pump manufacturers and suppliers is included on pg. 8). However, some of this sampling equipment has drawbacks or has been specifically rejected for low-flow sampling. The peristaltic pump can only be used for shallow applications and it can cause degassing of groundwater and loss of volatiles. Degassing results in the alteration of pH and alkalinity values as well as some loss of volatiles. Also, USEPA guidance asserts that inertial lift foot-valve type samplers and bailers cause too much groundwater disturbance and may invite unacceptable operator variability. Therefore, these sampling devices should be avoided for low-flow sampling activities.

G. Submersible pumps require a battery as a power source. If a deep cycle marine battery will be used, proceed to **Step H**. If a vehicle battery with the vehicle running will be used for an adequate power supply, the following will be performed:

- The vehicle will be positioned such that it is not over a significant amount of vegetation.
- The parking brake will be applied.
- A fire extinguisher will be staged nearby for easy access, if necessary.
- Personnel will remain in attendance of the vehicle while running so the vehicle may be promptly shut off in case of fire, etc.

H. When placing the equipment in the well, the pump intake should be set near the middle or slightly above the middle of the screened interval or water column, whichever is deeper. In situations in which contaminants of interest are known to concentrate near the top or the bottom of the screened zone it may be desirable to position the pump intake to target this zone instead. Pump placement is best measured from the top of the well down to the pump. Lowering the pump to the bottom of the well and then pulling it up the required distance will cause agitation of sediment and create unnecessary turbidity in the water.

I. Tubing should be connected from the pump to a flow-through cell. Then, calculate the volume of water to fill the flow-through cell. According to American Society for Testing and Materials (ASTM) Standard D 6771 (2002), the frequency of measurements should be equal to the time required to completely evacuate one volume of the cell (minimum). This ensures that independent measurements are made.

J. The pump should be started at a low flow rate, approximately 50 to 100 mL/min or the lowest flow rate possible. The pumping rate can be increased up to 500 mL/min as long as significant drawdown does not occur (200 to 300 mL/min is the optimum flow rate for sampling VOCs).

K. Water level measurements should continue as calculated until the measurements indicate that significant drawdown is not occurring. According to ASTM standards (2002), allowable drawdown should never exceed the distance between the top of the well screen and the pump intake. Including a safety factor, also provided by ASTM, drawdown should actually not exceed 25% of this distance. This ensures that water stored in the casing is not purged or sampled. For example, for a 4-foot screen, the pump should be placed at the midpoint of the screen (two feet from the top of the screen to the pump intake). With a safety factor of 25%, this would require drawdown not to exceed six inches.

If drawdown surpasses 25% of the distance from the pump intake to the top of the screen even while pumping is occurring at the lowest flow rate possible, samplers should refer to the project specific criteria as found in the appropriate FSP or work plan.

If drawdown is encountered in exceedance of the above scenario and does not stabilize, contact the task or project manager for further guidance.

L. Parameters should be documented on the groundwater sampling form, in the logbook and in the Toughbook®. Refer to SOP No. 33 Water Quality Monitoring for information. The time between parameter measurements is calculated as follows:

$$T = \frac{V}{Q}$$, where

T = time between measurements (minutes)

V = volume of the flow-through cell (liters)

Q = purge flow rate (liters per minute)

M. Sampling should be as stated in the FSP or work plan. However, in most cases, purging will continue until specific parameters have stabilized over three consecutive flow-through cell volumes or until a specific time requirement is met, whichever happens first. Table 1 provides guidelines that may be used for parameter stabilization as specified by USEPA, ASTM, and in the Nielsen and Nielsen Technical Guidance on Low-Flow Purging and Sampling and Minimum-Purge Sampling (Nielsen and Nielsen, 2002). These guidelines are to be used in combination with professional judgment.

Table 1. Stabilization Guidelines for Low-Flow Sampling

Parameter	Stabilization Guidelines		
	EPA	**ASTM**	**Nielsen & Nielsen**
DO	+/- 10%	+/- 10% or +/-0.2 mg/L, whichever is greatest	+/- 10% or +/-0.2 mg/L, whichever is greatest
ORP	+/- 10 mV	+/- 20 mV	+/- 20 mV
PH	+/- 0.1 units	+/- 0.2 units	+/- 0.2 units
Specific Conductivity	+/- 3%	+/- 3%	+/- 3%
Temperature	Not Specified	Not Specified	+/- 0.2 ºC
Turbidity	+/- 10%	Not Specified	Not Specified

N. After the relevant parameters have stabilized, the flow-through cell should be disconnected or bypassed for sampling. If, after a considerable number of readings have been taken, parameters have not stabilized, samplers should refer to the work plan or possibly use alternative sampling methods. Contact the task or project manager for further guidance.

O. A canopy or modified sampling order should be utilized, as feasible, in an effort to shield the flow-through cell from the weather and elements that may interfere with stabilization parameter readings (i.e. sun and wind).

P. A new pair of disposable latex or nitrile gloves should be put on immediately before sampling.

Q. During sampling, the sample shall be collected directly from the tubing (e.g. sample shall not flow through the flow-through cell while filling bottle sets), do NOT allow the sample tubing to come into contact with the sample bottles, and do NOT place sample bottles on the ground.

R. The constituents should be sampled for in the order given below:

- VOCs – Vials should be filled completely so that the water forms a convex meniscus then capped so that no air space exists in the vial. Turn the vial over and tap it to check for bubbles. If air bubbles are observed in the sample vial, remove the lid and attempt to fill the vial two more times, (being careful not to dump out any groundwater currently in the vial). If air bubbles are present twice more, discard the sample vial and repeat the procedure with a new vial. If, after three attempts, air bubbles are still in the vial, make a note of this and place the vial in the cooler.
- Gas sensitive parameters (e.g., ferrous iron, methane, alkalinity)
- Semivolatile organic compounds, pesticides, polychlorinated biphenyls, and herbicides
- Petroleum hydrocarbons
- Metals (unfiltered)
- Explosives
- Any filtered analytes (use in-line filters if possible) – About 100-1000 mL should be purged through the filter prior to sample collection

S. Place all samples on ice inside a cooler immediately.

T. Each sample should be identified with the Sample ID, location, analysis number, preservatives, date and time of sampling event, and sampler.

U. The sample time and constituents to be analyzed for should be recorded in the logbook, in the Toughbook®, and on the groundwater sampling form.

V. Chain-of-custody procedures should be started (SOP No. 26 Sample Control and Custody Procedures).

W. Sample equipment should be decontaminated (SOP No. 4 Decontamination).

X. The well sampling order should be dependent on expected levels of contamination in each well, if known, and should be determined prior to sampling. Sampling should progress approximately from the least contaminated to the most contaminated well. Quality assurance/quality control (QA/QC) samples should be collected during groundwater sampling as required in the work plan and/or QAPP (SOP No. 23 Quality Assurance Samples).

4. References

ASTM 2002, Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations, ASTM D6771-02, American Society for Testing and Materials. West Conshohocken, PA.

Nielsen, David and Nielsen, Gillian. Technical Guidance on Low-Flow Purging and Sampling and Minimum-Purge Sampling. Second Edition. NEFS-TG001-02. April 2002.

USEPA. 1996. Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures. EPA/540/S-95/504. OSWER, April 1996.

1. Objective

This document defines the standard Quality Assurance/Quality Control (QA/QC) samples. QA/QC samples are collected during field studies for various purposes which include the isolation of site effects (control samples), define background conditions (background sample), and evaluate field/laboratory variability (spikes and blanks, trip blanks, duplicate, split samples). This SOP is intended to be used together with several other SOPs.

2. Equipment

The following equipment typically is required for this SOP:

- Waterproof coolers (hard plastic or metal)
- Nitrile gloves, or similar
- Custody Seals
- Field forms such as COC or sample collection sheet
- Field Notebook
- Ice
- Bubble Wrap
- Clear Tape
- Duct Tape
- Zip Loc Bags
- Sample Containers
- Waterproof Pen
- Permanent Marker.

3. QA/QC Samples

- Background Sample – a sample (usually a grab sample) collected from an area, water body, or site similar to the one being studied, but located in an area known or thought to be free from pollutants of concern.
- Split Sample – A sample which has been portioned into two or more containers from a single sample container or sample mixing container. The primary purpose of a split

sample is to measure sample handling variability. A split sample will also measure inter-or intra-laboratory precision.

- Duplicate Sample – Two or more samples collected from, and representative of, a given population. The purpose of a duplicate sample is to estimate the variability of a given characteristic or contaminant associated with a population.
- Field duplicate results are used to evaluate precision of the entire data collection activity, including sampling, analysis and site heterogeneity. When results for both duplicate and sample values are greater than 5 times the practical quantitation limit (PQL), satisfactory precision is indicated by a relative percent difference (RPD) less than or equal to 25% for aqueous samples, and 50% for non-aqueous samples. Where one or both of the results of a field duplicate pair are reported at less than 5 times the PQL, satisfactory precision is indicated if the field duplicate results agree within 2 times the quantitation limit. Field duplicate results that do not meet these criteria may indicate unsatisfactory precision of the results.
- Trip Blanks – A sample which is prepared by the laboratory prior to the sampling event in a laboratory provided container and is stored with the investigative sample bottles and samples throughout the sampling event. They are then packaged for shipment with the other samples and submitted for analysis. At no time after their preparation are trip blanks to be opened before they reach the laboratory. Trip blanks are used to assess volatile organic compound (VOC) cross contamination of samples during storage and/or transportation back to the laboratory (a measure of sample handling variability resulting in positive bias in contaminant concentration). If VOC samples are to be shipped, trip blanks are to be provided with each cooler containing VOC samples.
- Spikes (also known as proficiency test (pt) samples) – A sample with known concentrations of contaminants. Spike samples are often packaged for shipment with other samples and sent for analysis. At no time after their preparation are the sample containers to be opened before they reach the laboratory. Spiked samples are normally sent with each shipment to contract laboratories only. Spiked samples are used to measure bias due to sample handling or analytical procedures.
- Equipment Field Blanks – a sample collected using organic-free water which has been collected using investigative sample collection equipment in the same manner that

investigative samples are collected (e.g. run over/through equipment). These samples are used to assess the effectiveness of equipment decontamination procedures. Equipment field blanks are often associated with collecting rinse blanks of equipment that has been field cleaned. Equipment blanks should be labelled with the ID of the next sample to be collected.

- Temperature Blanks – A container of water shipped with each cooler of samples requiring preservation by cooling to 4°C ± 2°C (ice). The temperatures of the blanks are measured at the time of sample receipt by the laboratory. No temperature blank is necessary for samples designated as “waste”.
- Preservative Blanks – A sample that is prepared in the field and used to determine if the preservative used during field operations was contaminated, thereby causing a positive bias in the contaminant concentration. On studies of short duration, usually only a post-preservative blank is prepared at the end of all sampling activities. On studies extending beyond one week, a pre-preservative blank should also be prepared prior to beginning sampling activities. At the discretion of the project leader, additional preservative blanks can be prepared at intervals throughout the field investigation. These blanks are prepared by putting organic/analyte-free water in the container and then preserving the sample with the appropriate chemical.
- Field Blanks – A sample that is prepared in the field to evaluate the potential for contamination of a sample by site contaminants from a source not associated with the sample collected (for example air-borne dust or organic vapors which could contaminate a soil sample). Organic-free water is taken to the field in sealed containers or generated on-site. The water is poured into the appropriate sample containers at pre-designated locations at the site. Field blanks should be collected in dusty environments and/or from areas where volatile organic contamination is present in the atmosphere and originating from a source other than the source being sampled.
- Material Blanks – Samples of sampling materials (e.g., material used to collect wipe samples, etc.), construction materials (e.g., well construction materials), or reagents (e.g., organic/analyte free water generated in the field, water from local water supplies used to mix well grout, etc.) collected to measure any positive bias from sample handling variability. Commonly collected material blanks are listed below:

- Wipe Sample Blanks – A sample of the material used for collecting wipe samples. The material is handled, packaged, and transported in the same manner as all other wipe samples with the exception that it is not exposed to actual contact with the sample medium.

- Grout Blanks – a sample of the material used to make seals around the annular space in monitoring wells. Filter Pack Blanks -- a sample of the material used to create an interface around the screened interval of a monitoring well.

- Construction Water Blanks – a sample of the water used to mix or hydrate construction materials such as monitoring well grout.

- Organic/Analyte Free Water Blanks – a sample collected from a field organic/analyte free water generating system. The sample is normally collected at the end of sampling activities since the organic/analyte free water system is recharged prior to use on a study. On large studies, samples can be collected at intervals at the discretion of the project leader. The purpose of the organic/analyte free water blank is to measure positive bias from sample handling variability due to possible localized contamination of the organic/analyte free water generating system or contamination introduced to the sample containers during storage at the site. Organic/analyte free water blanks differ from field blanks in that the sample should be collected in as clean an area as possible (a usual location for the organic/analyte free water system) so that only the water generating system/containers are measured.

- Matrix Spike – A sample collected in the same manner as the investigative sample, with known concentrations of contamination added by the laboratory upon laboratory analysis, which is introduced into a second aliquot. The spiked sample is processed through the entire analytical procedure. Analysis of the matrix spike is used to assess the accuracy and precision of the analytical process on an analytical sample in a particular matrix.

- Matrix Spike Duplicate – A sample collected in the same manner as the investigative sample, with known concentration of contaminants added by the laboratory upon laboratory analysis (same as the matrix spike) of a target analyte(s) which is introduced into a third sample aliquot. The spiked sample is processed through the entire analytical procedure. Analysis of the matrix spike duplicate is used as an indicator of sample matrix effect on the recovery of target analyte(s) as well as method precision.

4. Sample Containers

Certified commercially clean sample containers will be obtained from the contract analytical laboratory. The lab will indicate the type of sample to be collected in each bottle type. The work plan may list the appropriate sample containers for the specific analyses require for each project.

5. Sample Preservation

Samples will be preserved at the time of the sample collection. Chemical preservatives, if necessary, will be added to the sample containers either by the laboratory prior to shipment to the field, or in the field by sampling personnel.

After sample collection, each container will be labeled (see SOP No. 24) and stored on ice at 4°C ± 2°C in an insulated cooler until packed for shipment to the laboratory. The ice or the sample bottles will be bagged in sealed storage bags, or as otherwise recommended by the laboratory. Freezing samples will not be permitted. Any breakable sample bottles need to be wrapped in protective packing material (bubble wrap) to prevent breakage during shipping.

6. QA/QC Sample Collection Frequency

QA/QC Sample	Frequency
Background Sample	Project Specific
Split Sample	Project Specific
Duplicate Sample	One per 10 samples collected per matrix
Trip Blank	One per cooler containing VOC samples
Spikes	Project Specific One per 20 samples collected per matrix
Equipment Field Blanks	One per 10 samples collected
Temperature Blanks	Laboratory/project specific One per cooler
Preservative Blanks	Project Specific One post sampling – for projects less than one week. Two samples (one pre- and one post sampling) – for projects longer than one week.
Field Blanks	Project Specific One per 20 samples collected per matrix
Material Blanks	Project Specific One per matrix
Matrix Spike	One per 20 samples collected per matrix

QA/QC Sample	Frequency
Matrix Spike Duplicate	One per 20 samples collected per matrix

1. Objective

This document defines the standard protocols for sample handling, identification, labeling, documentation, and tracking. This SOP serves as a supplement to the Work Plan Addendum and Sampling and Analysis Plan Addendum and is intended to be used together with several other SOPs.

2. Equipment

The following equipment will be needed for sample classification, packaging and shipping:

- Chain-of custody form
- Sample bottles (laboratory provided)
- Sample labels
- Water proof pen or similar
- Trash bag or similar for lining cooler
- Bubble wrap
- Ice
- Zipper storage bags
- Custody seal
- Clear packing tape, if necessary
- Shipping label, if necessary
- Sample cooler

3. Procedures

Sample Identification

Samples collected during site activities shall have discrete and site specific sample identification numbers. These sample IDs are necessary to identify and track each of the many samples collected for analysis during the life of project. In addition, the sample IDs can be used in a database to identify and retrieve the analytical results received from the laboratory.

Each sample is identified by a unique code which indicates the specific project, site identification, sample location number, sample matrix identifier, sample depth, and/or date. The sample locations will be numbered sequentially.

If used, sample matrix identifiers may include the following:

SF - Direct-Push Soil Sample (Field Analysis)

SL - Direct-Push Soil Sample (Laboratory Analysis)

WF - Direct-Push Groundwater Sample (Field Analysis)

SS - Soil Sample

GW - Groundwater

MW - Monitoring Well

SW - Surface Water Sample

SD - Sediment Sample

SL - Sludge or Sewer Sediment Sample

TB - Trip Blank

RN - Rinsate (Deionized Water)

An example of the sample identification number codes for a groundwater monitoring well sample collected for field analysis will be: MW13-PROJECT-070713-EB.

Where MW indicates Monitoring Well, 13 indicates the well location, PROJ indicates the abbreviated project name, 070713 indicates the date, and EB indicates an equipment blank.

The project abbreviation, sample sequence, sampling locations, and sample type will be established prior to field activities for each sample to be collected. On-site personnel will obtain assistance from the Task or Project Manager in defining any special sampling requirements.

Sample Labeling

Sample labels will be filled out as completely as possible by a designated member of the sampling team prior to beginning field sampling activities each day. The date, time, sampler initials/signature should not be completed until the time of sample collection. All sample labels shall be filled out using waterproof ink, preferably black. At a minimum, each label shall contain the following information:

- Sampler's company affiliation
- Project/Site location
- Sample identification code

- Date and time of sample collection
- Analyses required
- Method of preservation (if any) used
- Sample matrix (i.e., soil, groundwater, surface water)
- Sampler's signature or initials.

Labels will be affixed to the sample bottle. The sample bottle will be wiped off to remove any dirt, moisture and/or contamination that may have become adhered to the outside of the bottle. Clear tape will be applied in order to keep the label attached to the sample and to keep the label legible. If waterproof or weatherproof labels are used to label sample bottles, clear tape is NOT required. If a sample bottle displays a tared weight from the laboratory, clear tape will NOT be used.

Sample Handling and Shipping

After sample collection, each container will be labeled as described above, and then stored on ice at 4°C (+/- 2°C) in an insulated cooler until packed for shipment to the laboratory. Coolers will be lined with a trash bag or similar and either the ice or the sample bottles will be bagged in sealed storage bags, or as otherwise recommended by the laboratory.

Sample bottles will be wiped off to remove any dirt, moisture and/or contamination that may have become adhered to the outside of the bottle. To the extent possible, the sample containers will be placed in resealable storage bags and wrapped in protective packing material (bubble wrap). Samples will then be placed right side up in a lined cooler with ice and a completed chain-of-custody (COC) form (placed in a separate zip-locked bag. The cooler will be taped with a custody seal for delivery to the laboratory. Samples will be hand delivered or shipped by overnight express carrier for delivery to the analytical laboratory. All samples must be shipped for laboratory receipt and analyses within specific holding times. This may require daily shipment of samples with short holding times. The temperature of all coolers will be measured upon receipt at the laboratory. A temperature blank will be included in each cooler for temperature measurement purposes, per laboratory specific requirements.

Sample Documentation and Tracking

Field Notes

Documentation of observations and data acquired in the field will provide information on the acquisition of samples and also provide a permanent record of field activities. The observations and data will be recorded using pens with permanent waterproof ink in a permanently bound weatherproof field log book containing consecutively numbered pages.

The information in the field book will include the following as a minimum. Additional information is included in the specific SOPs regarding the field books.

- Project name
- Location of sample
- Sampler's printed name and signature
- Date and time of sample collection
- Sample identification code including QC and QA identification
- Description of samples (matrix sampled)
- Sample depth (if applicable)
- Number and volume of samples
- Sampling methods or reference to the appropriate SOP
- Sample handling, including filtration and preservation, as appropriate for separate sample aliquots
- Analytes of interest
- Field observations
- Results of any field measurements, such as depth to water, pH, temperature, and conductivity
- Personnel present
- Level of PPE used during sampling.

Changes or deletions in the field book should be lined out with a single strike mark, initialed, and remain legible. Sufficient information should be recorded to allow the sampling event to be reconstructed without relying on the sampler's memory.

Each page in the field books will be signed by the person making the entry at the end of the day, as well as on the bottom of each page. Anyone making entries in another person's field book will sign and date those entries.

Sample Chain-of-Custody

During field sampling activities, traceability of the sample must be maintained from the time the samples are collected until laboratory data are issued. Initial information concerning collection of the samples will be recorded in the field log book as described above. Information on the custody, transfer, handling, and shipping of samples will be recorded on a COC form. The COC should contain project specific information. Sample labels should be checked against the COC to ensure everything intended for analysis is listed on the COC. Split samples should be on separate COCs and kept together in their own cooler(s).

The sampler will be responsible for initiating and filling out the COC form as samples are collected. The COC will be signed by the sampler when the sampler relinquishes the samples to anyone else. One COC form will be completed for each sampling team or project collected daily. The COC will contain the following information:

- Sampler's signature and company affiliation
- Project number
- Date and time of collection
- Sample identification number
- Sample type
- Analyses requested
- Preservative (where applicable), using number of containers to be analyzed
- Number of containers
- Signature of persons relinquishing custody, dates, and times
- Signature of persons accepting custody, dates, and times
- Method of shipment
- Shipping air bill number (if appropriate)
- Turnaround time (TAT) requested
- Appropriate project-specific Incident and SAP numbers (for Shell projects)

The person responsible for delivery of the samples to the laboratory will sign the COC form, retain a copy of the COC form, document the method of shipment, and send the original COC form with the samples. Upon receipt at the laboratory, the person receiving the samples will sign the COC form. Copies of the COC forms documenting custody changes and all custody documentation will be received and kept in the central files. The original COC forms will remain with the samples until final disposition of the samples by the laboratory. The analytical laboratory will dispose of the samples in an appropriate manner 60 to 90 days after data reporting. After sample disposal, a copy of the original COC will be sent to the Project Manager by the analytical laboratory to be incorporated into the central files.

1. Objective

This document defines the standard procedure for collection of soil samples for environmental characterization purposes. This procedure provides descriptions of equipment and field procedures necessary to collect soil samples.

2. Equipment

The following equipment is typically used to collect soil samples:

- Hand Auger (if required to collect sample)
- Latex/Nitrile gloves
- Organic Vapor meter (e.g. PID)
- Surveyor's stakes, pin flags, spray paint or similar
- Portable field table
- Stainless steel knife, if needed
- Stainless steel spoon or scoop, if needed
- Stainless steel bowl, if needed
- Sample containers
- Decontamination equipment
- Plastic Sheeting, if necessary
- Field data sheets/bound field logbook
- Health & Safety equipment
- Cooler with ice.

3. Soil Sample Collection Procedures

This section provides step-by-step procedures for collecting soil samples in the field. Observations made during soil sample collection should be recorded on applicable field sheets and in a bound field logbook in accordance with the procedures defined in SOP No. 8 Field Reporting and Documentation:

A. Remove appropriate sample containers from the transport container, and prepare the sample containers for receiving samples.

B. Fill out a self-adhesive label with the appropriate information and affix it to the appropriate sample container, or fill out the sample label attached by the laboratory. Place clear polyethylene tape over the completed label to protect it from dirt and water (unless a tare weight has been recorded by the lab on the container or a waterproof/weatherproof label is used). Sample labels can be prepared prior to sample collection except for time and date. Labels can be filled in with the date and time of sample collection just prior to collecting the sample. Sample containers will be kept cool with their caps on until they are ready to receive samples.

C. Place labeled sample containers near the sampling location.

D. Place clean plastic sheeting on the ground surface or the field table at the sampling area as needed.

E. Put on a pair of new nitrile or latex gloves.

F. Decontaminate the reusable sampling equipment as described in detail in SOP No. 4 Decontamination prior to beginning sampling activities.

G. Advance the sampler (direct push sampler, hand auger, split-spoon, etc.) to the desired sample depth and retrieve the sample.

H. VOC samples cannot be composited without losing volatiles. Therefore, collect a discrete VOC sample prior to compositing the remaining soil (if doing so). Collect the VOC sample with a Terra Core sampler (SOP No. 38 Methanol Preservation Sampling (Terracore)), or by placing it directly into an appropriate sample container. If the sample is transferred to a jar, the entire jar must be filled without any voids and the top surface of the soil should be smeared to prevent VOCs from escaping when opening the jar. After collecting the sample at the desired location within the sample interval, place the remainder of the sample into a stainless steel bowl/Ziploc bag, break up large chunks and mix the soil, if a composite sample is to be collected. Fill the remaining sample containers from the steel bowl.

I. Place the sample containers on ice in a cooler to maintain the samples at approximately 4oC as described in SOP No. 25 Sample Container, Preservation and Holding Times.

J. Begin chain-of-custody procedures. A sample chain-of-custody form is included in SOP No. 26 Sample Control and Custody Procedures. Ship the cooler to the laboratory for analysis within 24-48 hours of sample collection in accordance with the procedures described in SOP No. 24 Sample Classification, Packaging and Shipping.

K. Decontaminate the sample equipment as described in SOP No. 4 Decontamination.

L. Field notes shall be kept on applicable field sheets and in a bound field logbook.

4. Possible Soil Sample Collection Methods

- Geoprobe (micro or macro samplers)
- Split Spoon sampler using a conventional drill rig
- Hand Auger
- Surface Sampling with a stainless steel spoon or scoop.