ATTACHMENT 5: SAMPLING AND ANALYSIS PLAN

1.0 INTRODUCTION

This Sampling and Analysis Plan is for the closed hazardous waste impoundments at the Former Pennzoil Refinery, Roosevelt, Duchesne County, Utah, known as the Waste Disposal Cell (WDC). Sampling of monitoring wells associated with the WDC is required by the post-closure permit and will continue through the post-closure period.

1.1 Purpose and Objectives

The purpose of the sampling and analysis described herein is to detect any hazardous waste or hazardous waste constituents associated with the WDC. This will be accomplished by annual monitoring of specific wells and analysis for constituents likely to be derived from the waste.

1.2 Site Description

The Former Pennzoil Roosevelt Refinery is located on US Highway 40 west of Roosevelt, Utah. The refinery processed locally produced crude oil from 1968 to 1994. The former wastewater treatment impoundments (WDC) were closed in 1992 and are in post-closure care.

1.3 Uppermost Aquifer

Groundwater at the site occurs in shallow unconsolidated sediments and in consolidated rock. The uppermost aquifer varies by location across the site, from unconfined in unconsolidated sediments to confined in consolidated sediments. The unconfined aquifer consists primarily of interbedded clay, silt, sand, and gravel typical of fluvial erosion and deposition in an arid environment. Sediment type changes fairly rapidly in both the vertical and horizontal directions. The confined aquifer lies within the Tertiary Duchesne River Formation, which consists of poorly stratified, generally fine-grained sedimentary rocks.

1.4 Wells

Wells to be monitored during post-closure care of the WDC include MW-7, MW-11, MW-12, MW-19, MW-20, and MW-21 (Figure 5-1). The wells will be monitored in the following order:

1) MW-12
2) MW-7
3) MW-21
4) MW-19
5) MW-20
6) MW-11

SAMPLING

2.1 Water Level Measurements

Prior to purging and sampling, water level measurements will be collected from each designated monitoring well using an electronic water level indicator. Depth to water below the reference point at the top of each casing will be measured to the nearest 0.01 foot and recorded on the sampling log (Figure 2). The total depth of each well will also be measured and recorded to detect possible silting of the well screen.

2.2 Purging

Each well will be purged by means of a peristaltic pump or submersible pump capable of pumping at flow rates less than 100 milliliters per minute (mL/m) prior to collection of groundwater quality samples. Silicon tubing will be used for the pump mechanism and Teflon tubing will be used for lifting water at each well. Non-dedicated tubing will be disposed of after each sampling event. If dedicated tubing is used, the tubing will be decontaminated as described in section 2.7 and placed in a sealed labeled container or bag for storage between monitoring event. Wells that are typically dewatered prior to purging three well volumes may be purged with a bailer.

The purpose of purging is to remove stagnant and stratified water from the well screen and casing, and ensure that the water sampled is representative of the monitored aquifer. Well purging will be conducted at a sufficiently low pumping rate (approximately 0.15 gpm or 500 mL/m) to minimize turbulent flow and stripping of volatile constituents.

The volume of water purged will equal three times the computed casing volume where possible. The casing volume is calculated using the total standing depth of water in the well and the well diameter. Wells which are dewatered prior to three well volumes being removed (such as MW-11), will be allowed to recharge prior to sampling. No additional purging will be conducted after the wells are initially dewatered.

During purging, pH, conductivity, and temperature readings will be obtained approximately every 10 minutes. All equipment used for field analyses will be calibrated prior to use according to the manufacturer's instructions and will be decontaminated prior to use at each well using the procedures described in Section 2.7. The pH values will be measured to the nearest 0.01 unit, conductivity to at least 2 significant digits, and temperature to the nearest 0.1 °C.

2.3 Sample Collection

All bottles used for sampling will be supplied by the analytical laboratory and will arrive pre-cleaned with appropriate preservative added. The following order will be used for sample collection:

1) Volatile organic compounds
2) Metals
3) Other Constituents

Samples for analysis of volatile organic compounds will be collected from the discharge tubing at reduced flow rates (<100mg/L). Vials for volatile organic analyses will be filled to overflowing with a convex meniscus forming at the mouth of the vial. The lids with Teflon-lined septa will be attached, and the vial will be inverted and gently tapped to check for air bubbles (zero headspace). If bubbles exist, the sample will be discarded and another sample collected using the above procedures until zero headspace is assured.

Samples for non-volatile analyses will also be collected by filling the bottles directly from the discharge tubing of the peristaltic pump. This will be done at a rate equal to that used to purge the wells. Samples for dissolved metals will be filtered by attaching a 0.45 micron filter to the discharge tubing.

2.4 Sample Preservation and Shipping

All samples will be preserved according to protocols outlined in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846. Samples will be placed on ice in an insulated cooler after collection. Sufficient ice will be added to the cooler to maintain temperatures at or below 4 °C during shipping. Samples will be shipped to the analytical laboratory the day following sample collection.

2.5 Documentation

Documentation will include use of sampling logs, labels, seals, and chain of custody forms. Sampling logs will be completed during the sampling (Figure 5-2). Labels provided by the laboratory will be completed and placed on each container at the time of sample collection. The label will be marked with indelible ink and include the following information at a minimum: date; time; and unique sample identification. Custody seals will be affixed to each shipping container (cooler) after packaging for shipping. The custody seal will be signed by the sampler and will be affixed such that the seal must be broken to open the cooler.

Chain of custody forms will be used to document sample possession from time of collection through laboratory analysis. The sampler will complete the form as samples are collected and will sign the form, including date and time, when relinquishing the samples to the laboratory or an overnight courier service. The form will be in duplicate: the original will be placed in the shipping container and the duplicate will be kept in the project files.

2.6 Quality Assurance/Quality Control

Quality will be assured during field activities by the following procedures:

- Sample area protection by use of plastic sheeting spread on the ground or sampling table
- Use of disposable equipment where possible, including pump tubing
- Decontamination of non-disposable equipment, such as meters
- Use of disposable latex or nitrile gloves when collecting each sample

Quality control samples will be collected in the field during each event as follows:

- Blind duplicate – 1 sample
- Equipment blank – 1 sample from new discharge tubing and filter (for metals)
- Field blank – 1 sample (VOC analysis only)
- Trip blank – 1 sample per shipping container with volatile samples (VOC analysis only)

2.7 Decontamination

All non-dedicated and non-disposable sample equipment will be decontaminated prior to each use and upon completion of the sampling event. Decontamination procedures will be as follows:

1) Wash using a non-phosphate laboratory detergent
2) Rinse with distilled water

2.8 Investigation-Derived Waste

Investigation-derived waste will include purge water and disposable equipment (tubing, gloves, plastic sheeting). Purge water will be collected and placed in DOT-approved 55-gallon drums, which will be labeled, sealed, and staged at the former wash pad until picked up for disposal. All disposable equipment will be allowed to dry, then will be disposed of properly as determined by waste characterization.

3.0 Analytical Parameters and Methods

Samples collected will be analyzed for the list of parameters and by the methods specified in Table 5-1. Substitute EPA and SW-846 methods shall require Executive Secretary approval. Trip blanks will only be analyzed for volatile organics.

TABLE 5-1

Post-Closure Sampling and Analytical Requirements
Former Pennzoil Roosevelt Refinery

Parameter	Container(s)	Preservative[1]	Method
Volatile Organic Compounds Benzene Carbon disulfide Chlorobenzene Chloroform 1,2-Dibromoethane 1,2-Dichloroethane 1,4-Dioxane Ethylbenzene Methyl ethyl ketone Methylene chloride Styrene Toluene Xylenes[2]	Three 40-mL glass vials with Teflon-lined septa in caps	HCl to pH<2	SW 8260B
Oil & Grease	Two 1-Liter amber glass	H_2SO_4 to pH<2	EPA 1664
Metals (Dissolved) Antimony Arsenic Barium Beryllium Cadmium Calcium Chromium Cobalt Copper Lead Magnesium Mercury Nickel Potassium Selenium Silver	One 1-Liter plastic	HNO_3 to pH<2	SW 6010B or 6010C, except SW 7470A for Hg

TABLE 5-1 (continued)

Parameter	Container(s)	Preservative[1]	Method
Sodium Thallium Vanadium Zinc			
Sulfide	One 1-Liter plastic	Zinc Acetate/ Sodium Hydroxide	EPA 376.2 or SM 4500S2 F-2011
Cyanide	One 1-Liter plastic	NaOH to pH>12	SW 9010B
General Alkalinity Bicarbonate Carbonate Chloride Fluoride Nitrate + Nitrite pH Specific Conductance Sulfate Total Dissolved Solids	One 1-Liter plastic	No chemical preservative	 EPA 310.1 or SM2320B-2011 EPA 310.1 or SM2320B-2011 EPA 310.1 or SM2320B-2011 EPA 9056A EPA 9056A EPA 353.2 EPA 9040C EPA 9050AorSM 2510B-2011 EPA 9056A EPA 160.1 or SM 2540C-2011

[1] Preservative in addition to cooling to 4°C.
[2] Ortho-, meta, and para- isomers, as well as total xylenes