SUN Company, Inc. (R & M)

Philadelphia Refinery

ENSR

RFI Work Plan Amendment SWMU 3 Deep Aquifer Characterization

ENSR Consulting and Engineering

May 1993

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1.0 INTRODUCTION

The Guard Basin is a stormwater retention pond in the southern portion of the South Yard of the Sun Company, Inc. (R&M), Philadelphia Refinery. The basin began operation prior to 1959. At the beginning of operations, the basin borders extended 175 feet southeast of its present boundary. The bottom of the basin is unlined and, therefore, may act as a source of recharge to or discharge from the surficial water-bearing zone. Channeled stormwater from the plant passes through an oil-water separator and oil skimmer before discharging to the Guard Basin. The treatment system is designed as a barrier for migration of potential contaminant releases to local surface water. Water is pumped to the Refinery's onsite wastewater treatment plant or, during emergencies, passes through the basin and is discharged to the Schuylkill River via a pipe. Discharge to the river is regulated by the plant's NPDES permit.

The Guard Basin is known as Solid Waste Management Unit No. 3 (SWMU 3) in the Philadelphia Refinery's RCRA permit. SWMU 3 was investigated during the RCRA Facility Investigation (RFI) conducted in the winter and spring, 1992. The RFI entailed the installation and sampling of several shallow-deep well clusters. Intermediate wells were also installed to investigate the hydraulic relationship between the PRM aquifer and the two overlying water bearing units. The installations in SWMU 3 are presented on Plate 4 in the RFI report; a copy of Plate 4 is attached to this work plan amendment.

1.1 Rationale

The analysis of groundwater data from deep monitor wells during the RFI revealed that there were three potential compounds of concern in groundwater at SWMU 3. Benzene and antimony were found to exceed federal maximum contaminant levels for drinking water and carbazole was found to exceed it's risk based action level (AL). The derivation of the AL was based on drinking water exposure. The RFI report (ENSR, September 1992) and subsequent response to EPA (SUN March 5, 1993) recommended a focused sampling event to determine if this result represents an actual concentration in the aquifer or is an artifact from laboratory, sampling or drilling practice. This RFI Work Plan Amendment (Plan) presents the recommended focused sampling approach. The Plan utilizes the Quality Assurance Project Plan (QAPP, ENSR, January 1992) and Health and Safety Plan (HASP, ENSR January 1992 as amended May, 1993) written for the initial RFI.

2.0 GROUNDWATER SAMPLING AND ANALYSIS

The resampling of groundwater at SWMU 3 will consist of the collection of samples from the four shallow/intermediate/deep well clusters installed as part of the RFI and illustrated on Plate 4 of the RFI (attached). The wells selected for groundwater sampling are presented on Table 2-1. A round of water level measurements will also be collected and mapped as they were in the RFI report. Table 2-2 lists the wells to be included for water level measurement.

The well clusters to be sampled consist of one upgradient well cluster and three downgradient well clusters. Groundwater samples will be analyzed for the selected parameters listed on Table 2-3.

Physical parameters such as temperature, pH, Reduction-Oxidation Potential (Eh), and specific conductance will be measured in the field at the time of sampling.

2.1 Hydraulic Conductivity Testing

The four intermediate depth wells listed on Table 2-1 will also have their horizontal hydraulic conductivity tested via "slug" tests. This will provide data which is consistent with that collected from the shallow and deep wells in the RFI.

TABLE 2-1

Wells to be Sampled and Analyzed for the Parameters Listed on Tables 2-3

Well	Screen Depth
MW-1	Shallow
MW-2	Deep
MW-23	Intermediate
MW-4	Shallow
MW-10	Deep
MW-22	Intermediate
MW-8	Shallow
MW-9	Deep
MW-24	Intermediate
MW-6	Shallow
MW-11	Deep
MW-26	Intermediate
Note: Wells at an individual cluster are grouped together	

TABLE 2-2

Wells to be Measured for Water Level/Product Thickness

Wells		
MW-1	MW-11	S-43*
MW-2	MW-22	S-44
MW-3	MW-23	S-47
MW-4	MW-24	S-49
MW-5	MW-25	S-51
MW-6	MW-26	S-52
MW-7*	S-18	Schulykill River
MW-8	S-30	Guard Basin
MW-9	S-32*	
MW-10	S-33	

*Indicates wells which have had product observed on previous measurements

TABLE 2-3

Groundwater Analytical Parameters

Method	Compounds Detected
SW 846 Method 8020	Benzene
	Toluene
	Xylene
Base Neutral Extractable Organics EPA Method 8270	Carbazole
ICAP	Total Antimony
	Dissolved Antimony

3.0 SAMPLE COLLECTION PROCEDURES

Water levels measurements in each well will be collected from the surveyed elevation mark at the top of casing with an electric sounding device. Water levels will be measured to an accuracy of .01 feet. The time to the nearest minute will be recorded with each measurement. Static water levels will be recorded before purging and sampling.

To obtain a representative sample of the groundwater, a volume of stagnant water in the wellbore will first be purged. The recommended length of time required to purge or bail a well before a sampling event will depend on the well and aquifer characteristics, the type of sampling equipment being used, and the parameters being sampled. Wells will be pumped or bailed until the measurements of pH, temperature, and specific conductance have stabilized to within 10 percent of the previous reading or at least three well volumes have been removed, whichever is greater. Samples will be collected within three hours of purging.

Wells yielding greater than one gallon per minute (gpm) will be purged with a centrifugal pump or a submersible pump. The centrifugal pump will use three-quarter to 1-inch dedicated polyethylene tubing as the downhole suction line. Pump discharge will be controlled with a normal 3/4-inch gate valve on the discharge side of the pump. The submersible pump will use 1/2-inch dedicated polyethylene tubing as a discharge line. Discharge rates will be held below four gpm to prevent agitation of the aquifer. Pump decontamination will be conducted as described in the RFI Work Plan, this Plan and the QAPP. The polyethylene suction tubing will be cut up and properly disposed of after sampling.

In wells yielding less than one gpm, purging will be conducted with a teflon or stainless steel bailer. Bailers will be dedicated to a particular well and decontaminated in accordance with EPA-approved procedures outlined in the RFI work plan, this Plan and the QAPP.

In the case of monitoring wells that will not yield water at a rate adequate for effective purging, several procedures will be attempted. The first procedure includes removing water to the top of the screened interval to prevent the exposure of the gravel pack or formation to atmospheric conditions. The sample is then collected at a rate that would not cause rapid drawdown. Wells may also be pumped dry and allowed to recover. Samples should be collected as soon as a volume of water sufficient for the intended analytical parameters recharge the well.

Exposure of water entering the well for periods longer than two to three hours may render samples unsuitable and unrepresentative of water contained within the aquifer system. In these

cases, it may be desirable to collect small volumes of water over a period of time, each time pumping the well dry and allowing it to recover.

Whenever full recovery exceeds three hours, samples will be collected in order of their volatility as soon as sufficient volume is available to completely fill the appropriate container. Parameters that are not pH-sensitive or subject to loss through volatilization will be collected last.

Samples will be collected with a teflon or stainless steel bailer with a 5-foot stainless steel leader. The bailers and leader will be decontaminated in accordance with procedures outlined in chapter 4.0 of this Plan and in the QAPP. To ensure the integrity of the samples during collection, parameters will be collected in the following order:

- Volatiles
- Base neutrals
- Metals

Samples will be analyzed for pH, Eh, specific conductance, and temperature during purging. Samples collected for dissolved metal analysis will be field-filtered prior to preservation. A separate sample will be collected for metals that are not filtered.

Dissolved metal samples will be filtered through a disposable 0.45-micron filter with an electric vacuum or peristaltic pump or directly from submersible pump discharge lines.

4.0 QUALITY ASSURANCE PROCEDURES

All groundwater samples will be collected, logged and handled in accordance with the RFI QAPP previously established for this site in January, 1992. Section 4.0, of the QAPP, entitled Sampling Procedures, specifies decontamination procedures, groundwater monitoring requirements sample handling and field documentation as they relate to quality assurance. For ease of reference specific equipment decontamination procedures are presented below. Table 4-1 and Section 9.0 of the QAPP specify the sample frequency of field blanks, trip blanks, field duplicates, matrix spikes and matrix spike duplicates. Other field considerations such as sample labeling, chain of custody and sample disposal will be followed as discussed in Section 5.0 entitled Sample Custody of the QAPP.

4.1 Decontamination Procedures and Disposal of Investigatory Derived Wastes

4.1.1 Sampling Equipment

To prevent cross contamination between samples, sampling equipment (bailers, spatulas, split spoons) will be cleaned using the EPA-approved "triple rinse" methods. The triple rinse consists of a sequence of solvent washes and rinses as follows:

1. Wash and scrub with non-phosphate detergent
2. Tap water rinse
3. Distilled/deionized water rinse
4. Ten percent nitric acid rinse (one percent nitric acid rinse on carbon steel split spoons)
5. Distilled/deionized water rinse
6. Acetone or methanol rinse followed by hexane rinse, solvents must be pesticide grade
7. Rinse with deionized water, demonstrated analyte-free (HPLC water)
8. Total air dry
9. Wrap in aluminum foil, shiny side out, for transport

If a submersible bladder or air drive pump is used for purging, the following decontamination procedure will be used. Decontaminate the pump by washing the outside of the pump, tubing, power, and support cords with low-phosphate detergent and analyte-free deionized water rinse. Rinse the inside of the pump and tubing with low-phosphate detergent and potable water, then analyte-free deionized water.

TABLE 4-1

Collection Frequency for Quality Control Samples

Type	Frequency
Duplicate	1 per 10 min. 1 per day
Field Blank	1 per day per analysis
Trip Blank	1 per cooler VOC only
Matrix Spike (MS)	1 per 20 per analyte
Matrix Spike Duplicate (MSD)	1 per 20 per analyte

All wash and rinse water will be contained in steel 55-gallon U.S. DOT approved drums for proper disposal. Solvent and acid rinsates will be contained separately. All rinsates will be collected and disposed of in the Refinery's onsite wastewater treatment facility.

4.1.2 Personnel

Onsite personnel will follow the procedures outlined in Section 8 of the site HASP.

4.1.3 Disposal of Onsite Generated Wastes

Wastes derived from the collection of samples will include purge decon water, protective clothing, and other contaminated materials. Decontamination water and used protective clothing will be drummed. Purge water from each well will be contained in a separate drum pending analysis as detailed in Section 4.7 of the QAPP.

Drums will be labeled according to contents and assembled at a central secure area adjacent to each SWMU following drilling. Drum lids will be secured with 7/8-inch lug bolts. To determine the hazardous nature of drum contents, several representative samples will be collected from each group of drums and submitted for RCRA parameter analysis.

5.0 REPORTING

Upon receipt of the analytical data, they will be validated and entered into the project data base. A report, which presents the detected compounds and discusses the distribution of compounds as well as the hydraulic relationship of the shallow, intermediate and deep aquifers, will be prepared from the data gathered under this plan.