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FACILITY WIDE GW MONITORING PLAN

2019

Western Refining Southwest, Inc.
Bloomfield Terminal • #50 Road 4990 • Bloomfield, NM • 87413

Facility-Wide Groundwater Monitoring Plan

June 2019

Report Prepared By:

Western Refining Southwest, Inc.
Bloomfield Terminal
50 Road 4990
Bloomfield, NM 87413

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EXECUTIVE SUMMARY

This Facility-Wide Groundwater Monitoring Plan ("Plan") has been prepared pursuant to the terms and conditions of an Order issued on July 27, 2007 by the New Mexico Environment Department (NMED) to San Juan Refining Company and Giant Industries Arizona, Inc. This Plan also satisfies the requirement as stated in the facility's Discharge Permit GW-001 required by New Mexico Energy, Minerals, and Natural Resources Department Oil Conservation Division (OCD) for the Bloomfield Facility.

This Plan has been prepared to identify groundwater monitoring activities to be performed for the purpose of characterizing the nature and extent of potential impacts to groundwater at and migrating from the Bloomfield Facility owned by San Juan Refining Company and operated by Western Refining Southwest, Inc. ("Western"). This Plan also includes monitoring the effectiveness of interim containment and remediation systems implemented at the Facility, specifically the North Boundary Barrier Wall and the River Terrace Bioventing System. Groundwater sampling activities included in this Plan include sampling of San Juan River, existing outfall locations in the east portion of the Facility, and seeps located along the western portion of the Facility.

This Plan divides the Facility into four areas for periodic monitoring; the Former Refinery Complex, the North Boundary Barrier, San Juan River Bluff, and the San Juan River Terrace. The number of sampling locations, the target analytes, and monitoring frequencies vary by area. With exception of the River Terrace area and sump wells, designated monitoring wells and sample points in these areas will be monitored on a semi-annual frequency, with a more-comprehensive monitoring well network sampled on an annual frequency. Monitoring wells in the River Terrace area will be sampled as summarized in Table 3 of this Plan.

Groundwater monitoring activities have been conducted at the Facility since the early 1990's in response to various directives issued by NMED and the OCD. This Plan serves as the prevailing document for comprehensive groundwater monitoring at the Bloomfield Facility.

Effectiveness of the North Boundary Barrier Wall, active pumping systems, and remedial actions at the River Terrace continue to be evaluated. Western will review historic facility-wide monitoring data each year, and assess the monitoring program presented in this Plan. Results of facility-wide monitoring activities, with the exception of the River Terrace results, are included in the *Groundwater Remediation and Monitoring Annual Report*, which is submitted by April 15th of each year. Results of River Terrace monitoring are submitted separately as part of the *River Terrace Voluntary Corrective Measures Bioventing System Annual Report*, which is submitted by March 1st of each year. Any proposed revisions to the Facility-Wide Groundwater Monitoring Plan will be submitted for agency approval prior to implementing. These revisions may include, but not be limited to, a reduction or change in monitoring locations, monitoring frequency, and/or target analytes.

1. INTRODUCTION

This Facility-Wide Groundwater Monitoring Plan ("Plan") has been prepared to optimize the on-going groundwater monitoring program at the Bloomfield Terminal in efforts to assess the nature and extent of potential impacts to groundwater from historic refinery operations and current bulk storage operations. The monitoring program also allows assessment of the effectiveness of interim containment and remediation systems implemented at the Facility.

The Plan follows the requirements of the July 2007 Order issued by the New Mexico Environment Department (NMED) and includes the following information:

- Site description
- Description of facility operations
- Summary of historic monitoring data
- Description of subsurface conditions
- Monitoring and sampling methods
- Monitoring and sampling locations and frequency
- Monitoring and sampling schedule

1.1. FACILITY OWNERSHIP AND OPERATION

A Class I permit modification was approved on June 10, 2008 to reflect the change in operation of the Facility to Western Refining Southwest, Inc.

Owner:	San Juan Refining Company 123 W. Mills Avenue, Suite 200 El Paso, TX 79901	
Operator:	Western Refining Southwest, Inc. P.O. Box 159 Bloomfield, New Mexico 87413	(Postal address)
Facility Name:	Bloomfield Terminal #50 County Road 4990 Bloomfield, New Mexico 87413 Facility Status: Corrective Action/Compliance	(Physical address)
US EPA ID:	NMD089416416	
SIC Code:	5171	

2. BACKGROUND

2.1. SITE LOCATION AND DESCRIPTION

The Bloomfield Facility operated as a crude oil refining facility with a process capacity of 18,000 barrels per day. Refining operations ceased November 23, 2009. The Facility currently operates as a Petroleum Bulk Terminal. The Facility is located approximately one mile south of Bloomfield, New Mexico, in San Juan County. A site location map is provided in Figure 1.

The Facility is located on the south side of the San Juan River and the Hammond Irrigation Ditch (Hammond Ditch), and is situated on a bluff approximately 120 feet above the river. The top of the bluff is relatively flat and is at an elevation of approximately 5,540 feet above sea level. Property managed by the Bureau of Land Management (BLM) borders the Facility to the south. Undeveloped company property and the San Juan River border the Facility to the north. Undeveloped private and public lands border the property to the east and several gravel pits border the property to the west. A large portion of the undeveloped land in the vicinity of the Bloomfield Terminal is used for oil and gas production and as range for grazing. An unnamed arroyo flows toward the San Juan River on the southern and western edges of the site. East of the site, a well-defined arroyo cuts a small canyon from the bluff to the San Juan River. The Hammond Ditch lies on the bluff between the San Juan River and the Facility.

The portion of the Facility located north of County Road 4990 includes office buildings, warehouse space and storage yard, parking lots, the former refining process areas, an API separator and wastewater treatment surface impoundments, raw water ponds, tank farm, fire training area, a Class I injection well (WDW #2), and an inactive solid waste disposal area. Running southwest through the center of the Facility are four utility pipelines operated by El Paso Natural Gas, Enterprise, Conoco-Phillips, and Giant Industries Arizona, Inc. ("Giant"). The Enterprise and Giant pipelines are currently not in service. The Facility south of County Road 4990 includes the terminal office and parking areas, finished product loading rack and unloading area, crude unloading area, a hazardous waste storage area (less than 90-day), the regional office and parking area, the transportation maintenance facility and truck parking areas, and evaporation ponds. Figure 2 provides a Site Plan of the Facility.

Surface waters in the vicinity of the Facility include the San Juan River and the Hammond Irrigation Ditch. The San Juan River originates in the San Juan Mountains of Colorado approximately 100 miles northeast of Bloomfield and is located north of the Facility flowing west/southwest. The San Juan River is controlled upstream by the Navajo Dam and is used for potable drinking water for the city of Bloomfield and surrounding areas. Hammond Ditch is located on the bluff between the river and the process area of the Facility, flowing east to west across the site. Hammond Ditch is a man-made canal, lined with concrete in 2002, which transports water used for irrigation and watering livestock only. In addition, manmade surface water features at the Facility includes the facility evaporation ponds, raw water ponds, and the wastewater treatment surface impoundments.

2.2. FACILITY OPERATIONS

Kimball Campbell Corporation constructed the Facility as a crude topping unit in the late 1950's. Ownership of the refinery has changed hands over the years. The current Facility owner is San Juan Refining Company, a New Mexico corporation. The facility is operated by Western Refining Southwest, Inc., formally known as Giant Industries Arizona, Inc., an Arizona corporation.

Prior to the shutdown of refining operations in November 2009, the Facility had a capacity to receive crude oil and process over 18,000 barrels per day (bpd). The main source of crude oil supply came from the Four Corners area, and was transported via tanker truck. The former refining process area of the Facility included the following process units: crude distillation, reforming, fluidized catalytic cracking, sulfur recovery, merox treater, catalytic polymerization, and diesel hydrotreating. Past operations produced leaded and unleaded gasoline, diesel fuels, Jet-A fuel, JP-4 jet fuel, kerosene, propane, butane, naphtha, residual fuel, heavy fuel oils, and liquefied petroleum gas. On-going operations at the Facility include crude and product storage, crude and product unloading, product loading, waste management (closed and existing facilities), and non-petroleum material storage.

2.3. HISTORIC SITE-WIDE MONITORING

Since the early 1990s, numerous monitoring wells have been completed and samples collected across the Facility in support of various investigations to monitor potential impacts to groundwater quality associated with historic refinery operations.

2.3.1. Former Refinery Complex Groundwater Monitoring

Between 2003 and 2007, groundwater samples collected at selected monitoring wells within the Former Refinery Complex were collected on a semi-annual basis. Samples were analyzed for volatile organic compounds (VOCs), dissolved and total metals, and general chemistry parameters. Sample analysis has been performed in compliance with the Corrective Measures Study and Corrective Measures Implementation letter dated January 6, 2003. Concurrently, OCD guidance had been followed per the Site Investigation and Abatement Plan letter dated December 30, 2002.

Since September 2008, RCRA investigation activities have been conducted pursuant to the terms and conditions of the Order issued on July 27, 2007 by NMED. The investigation activities have included the collection and analysis of soil and groundwater samples from newly installed borings and monitoring wells. As of 2014, a total of 28 monitoring wells, referred to in this Plan as RCRA wells, have been installed and incorporated into the Facility-Wide Monitoring Program. In addition, two monitoring wells were installed outside and up-gradient of the Facility Operations area for the purpose of evaluating naturally occurring constituents (Figure 4). These background wells are part of a Background Investigation Study for the Facility, and therefore are not included in this Sampling Plan.

Between 2008 to present, groundwater samples from selected monitoring wells have been collected twice per year. Figure 3 shows the locations of the monitoring wells at the Facility within and near the Former Refinery Complex. Samples from selected monitoring wells collected in April of each year (as part of the Semi-Annual Monitoring Event) were analyzed for target list VOCs, total petroleum hydrocarbons-diesel range organics (TPH-DRO), and total petroleum hydrocarbons-gasoline range organics (TPH-GRO). Samples collected from selected monitoring wells in August of each year (as part of the Annual Monitoring Event) were analyzed for VOCs (full suite), semi-volatile organic compounds (SVOCs), TPH-DRO, TPH-GRO, dissolved and total metals, carbon dioxide, and general chemistry. Results of each sampling event were reporting as part of the "Groundwater Remediation and Monitoring Annual Report" that was submitted by April 15th of each following year. Figure 5 provides a summary of the target VOCs detected in the Former Refinery Complex area during the most recent August 2018 Sampling Event.

2.3.2. North Boundary Barrier Monitoring

Collection and Observation Wells

Between 2005 and 2007 following the installation of the North Boundary Barrier and Collection System in April 2005, groundwater samples were collected from the collection and observation wells and analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), methyl tert butyl ether (MTBE), TPH-DRO, total metals, and general chemistry parameters. Results of groundwater monitoring along the North Boundary Barrier were included in the System Start-Up Six Month Report of the North Boundary Barrier Collection System Phase II (submitted January 5, 2006), and the Annual Report of the North Boundary Barrier Collection System Phase II May 2005 to May 2006 Report (submitted June 28, 2006). Figure 3 shows the location of the collection wells (CWs) and observation wells (OWs) at the Facility.

Between 2008 to present, groundwater samples were collected from observation wells and selected collection wells on a semi-annual basis. Samples collected from the selected collection wells were analyzed for target list VOCs and TPH-DRO. Samples collected from the observation wells were analyzed for target list VOCs, TPH-DRO, and TPH-GRO. Analytical results from the Semi-Annual and Annual Sampling events were reported in the "Groundwater Remediation and Monitoring Annual Report" which was submitted to NMED by April 15th of each year.

Figure 2 and Figure 3 show the locations of monitoring wells along the North Boundary Barrier.

Sump Wells

In February 2006, seven sump wells (SWs) were installed along the river-side of the North Boundary Barrier. These wells extend several feet into the Nacimiento Formation. Groundwater samples are not collected at these wells; however, groundwater elevation data has been collected following major precipitation events.

Figure 2 and Figure 3 show the locations of the sump wells.

2.3.3. San Juan River Bluff Monitoring

Outfalls

Along the northeast portion of the San Juan River bluff area, there are three Outfalls. Groundwater samples have been collected from East Outfall #2 and East Outfall #3 on a semi-annual basis since 2003. Samples have been analyzed for VOCs, total metals, dissolved metals, and general chemistry parameters.

Prior to 2010, groundwater from East Outfall #1 was pumped to the Facility's fresh water ponds via Tank 33. During that time, samples were initially collected of the water at Tank 33 monthly for one year, and then quarterly thereafter. The samples were analyzed for BTEX. Since January 2010, groundwater captured from Outfall #1 has been routed directly to the facility's wastewater treatment plant via Tank 38.

Figure 2 shows the approximate location of the Outfalls.

Seeps

In 2004, hydrocarbons and water were observed to be seeping out of seven areas on the north side of the former Bloomfield Refinery. Four seeps (Seep 1, 2, 5, and 9) were located within two small drainage tributaries to the San Juan River at a location north of monitoring well MW-45. Two seeps (Seep 6 and 7) were discovered along the bluff north of monitoring well MW-46, and one seep (Seep 8) was located along the bluff above the San Juan River north of monitoring well MW-47.

Nine catchments basins were installed as temporary measures when hydrocarbon seeps were observed to capture total fluids so they could be pumped back to the on-site wastewater treatment system (the catchment locations were identified as Seep 1 through Seep 9). Seep 3 and Seep 4 were secondary catchments to Seep 1. Seep 2 and Seep 5 have had historic flows, but discharges have since ceased since the installation of the north boundary barrier. All seep locations were visually inspected weekly (NMED, 2008).

In August 2014, NMED was notified of a significant rain event that resulted in severe flash flooding in the Bloomfield, New Mexico area. The storm caused the Hammond ditch to reverse flow directions, resulting in the entire roadway along the north boundary barrier to fill with water. The significant run-off along the river bluff resulted in Seep 4, Seep 6, Seep 7, Seep 8 and Seep 9 being permanently erode away due to the heavy surface run-off. Prior to the flooding event, these locations were no longer actively collecting seep water due to the existence of the north boundary barrier, and had previously been investigated as part of the 2007 Consent Order. Therefore, as of August 2014, the only existing catchment locations are Seep 1, Seep 2, Seep 3, and Seep 5.

Figure 10 shows the locations of the existing seep areas.

2.3.4. San Juan River Terrace Monitoring

San Juan River Terrace

In 2006, a biovent system was installed to provide oxygen to the subsurface and support aerobic biodegradation activities in the subsurface. The biovent system included a dewatering system and a monitoring well network. Groundwater samples were collected in 2006 from two monitoring wells (MW-48 and MW-49), two dewatering wells (DW-1 and DW-2), and twelve temporary piezometers (TP-1 thru TP-3, and TP-5 thru TP-13) to monitor the River Terrace Sheet Pile Area groundwater quality on both sides of the sheet pile barrier. Prior to the start of the Bioventing System in January 2006, the highest groundwater concentrations were observed within the western half of the River Terrace area.

After the installation of the Bioventing System, on-going sampling at the River Terrace was conducted in accordance with the approved Bioventing System Monitoring Plan, dated October 28, 2006, and in accordance with an NMED comment letter dated April 18, 2007. River Terrace sampling activities conducted through 2012 were conducted in accordance with the requirements established in NMED's *Proposals to Modify Monitoring at the River Terrace Area* letter dated March 15, 2011 (NMED, 2011).

In October 2012, Western initiated field activities approved by NMED to optimize the remediation efforts at the River Terrace area. The optimization activities completed included removal of impacted subsurface clay layers within the southwestern portion of the River Terrace, and conversion of a portion of the biovent system to an air sparging system. During the impacted soil excavation activities, two piezometers (TP-1 and TP-2) were removed in order to remove the impacted soil within the vicinity of the wells. As a replacement for TP-1, Western installed a dewatering well (currently identified as DW-3) within the same vicinity as TP-1. Dewatering well DW-3 serves as an efficient dewatering well, targeting the area where groundwater concentrations were the highest within the river terrace area.

In a letter from NMED dated June 15, 2015, Western received approval to discontinue sampling at TP-3, TP-10, TP-11, TP-12, and TP-13 (NMED, 2015b). However, depth-to-groundwater data continues to be collected at these locations. In correspondence dated June 13, 2018 (*Disapproval River Terrace Voluntary Corrective Measures Bioventing/Air Sparging System Annual Report*, March 2018), NMED required that samples collected in 2018 at the granular activated carbon (GAC)-Inlet, GAC-Lead, and GAC-Lag be analyzed for VOCs by method 8260.

Figure 6 provides a general layout of the current river terrace system. Figure 7 provides a summary of the BTEX concentrations detected in 2018 at the River Terrace area during low flow conditions.

San Juan River

Sampling activities conducted at the Bloomfield Facility include the collection of river water samples. San Juan River samples were collected monthly in 2004, and have been collected quarterly thru 2007, and then semi-annually thereafter. The river samples have recently been analyzed for target list VOCs, TPH-DRO, TPH-GRO, total and dissolved metals, and general chemistry. Samples are collected from four locations: one upstream of the Facility, two immediately downstream of the River Terrace, and one downstream of the Facility. Analytical results from historic river sampling events have been reported in the annual groundwater reports submitted to NMED and OCD in April of each year. The San Juan River sample locations are shown on Figure 11.

3. SUBSURFACE CONDITIONS

3.1. FACILITY SITE

The Bloomfield Facility is located within the San Juan Basin, a sub-province of the Colorado Plateau physiographic province, about 120 feet above the present San Juan River level and about 500 feet south of the river.

Groundwater at the Facility is present at depths ranging from approximately 6 to 50 feet below ground surface (bgs), increasing in depth from west to east across the site due to the change in surface elevation across the site. Groundwater flow direction is generally from the southeast to the northwest towards the Hammond Ditch. Figure 8 provides groundwater elevation contours recorded during the August 2018 monitoring event. The thickness of SPH detected in 2018 is summarized in Figure 9. The shallow groundwater consists of an aquifer where groundwater migrates through the permeable glacial outwash deposits designated as the Jackson Lake Terrace overlying the nearly impermeable Nacimiento Formation. A permanent shallow aquifer formed above the Nacimiento Formation likely as a result of site development, former refinery operations, and leakage from the Hammond Ditch. This shallow aquifer is not currently used for drinking water. Below the Nacimiento Formation is the Ojo Alamo sandstone formation, a water-bearing unit used as a potable water source.

The geologic units that underlie the Facility are as follows: the uppermost unit consists of unconsolidated surface soils, silts, and fine windblown sands forming loess deposits. The silty fine sand is underlain by the Jackson Lake Terrace deposit, approximately 10 to 15 feet thick. The Jackson Lake Terrace consists of well-rounded boulders, cobbles, gravels and sands exhibiting moderate to high permeability. Below the Jackson Lake Terrace is the Nacimiento Formation. The Nacimiento Formation is composed of interbedded, black carbonaceous mudstone, siltstone, and argillaceous sandstones. The Nacimiento Formation has been investigated at the Facility to a depth of approximately 100 feet; however, literature suggests the formation ranges up to 900 feet in total thickness. The Nacimiento Formation demonstrates low permeability and acts as a confining unit for the Jackson Lake Terrace. Below the Nacimiento Formation is the Ojo Alamo Sandstone, a water-bearing unit consisting of tertiary sandstones. Directly below the Ojo Alamo are the Cretaceous Kirtland Shale and the Fruitland Formation.

The Nacimiento Formation acts as a confining layer to vertical migration of groundwater beneath the Bloomfield Facility, which does not infiltrate to the underlying Ojo Alamo Sandstone. The morphology of the contact between the Jackson Lake Terrace and the underlying Nacimiento Formation in the vicinity of the facility is important in that it influences the direction of the perched groundwater flow. Approximately 100 feet of the

Nacimiento Formation is exposed in the precipice (bluff) face north of the Facility adjacent to the San Juan River.

3.2. RIVER TERRACE AREA

The River Terrace area is located adjacent to the San Juan River approximately 500 feet north of the former refinery process areas, and is the location of the pumping station used to deliver river water to the facility's raw water ponds. Surface water in the vicinity of the River Terrace includes the San Juan River to the north and west. The San Juan River level is approximately 120 feet lower than the grade level of the Former Refinery Complex.

Recharge of the River Terrace groundwater is predominantly influenced by the flow of the San Juan River, which is typically higher in the summer months due to high irrigation water demands. Groundwater elevations at the River Terrace are typically approximately three to seven feet bgs, depending on the flow rate of the San Juan River and operation of the river terrace dewatering system.

The near surface soils in the River Terrace consist of one to two feet of silt underlain by one to two feet of fine-grained sand. In some areas a six-inch clay lens exists beneath the silt layer. Beneath the fine-grained sediments are medium to coarse grained sands that extend from approximately three or four feet bgs to approximately ten feet bgs. At ten feet bgs the sand transitions to coarser grained material with some gravel. Boring logs indicate that the Nacimiento Formation is present beneath the River Terrace at approximately 15 to 17 feet bgs.

4. SAMPLING METHODS

4.1. MONITORING AND SAMPLING METHODS

4.1.1. Groundwater Levels

Depth-to-groundwater and SPH thickness measurements are collected on a semi-annual basis as part of the Semi-Annual and Annual Groundwater Monitoring Event activities. The active recovery wells will be turned off and the groundwater allowed to stabilize prior to collecting depth-to-fluid measurements during each sampling event. The depth-to-groundwater and SPH thickness levels will be measured to the nearest 0.01 ft using an oil/water interface probe. The groundwater and SPH levels will be measured in all wells within 48 hours of the start of obtaining water level measurements. The depth-to-groundwater and SPH thickness will be recorded relative to the surveyed well casing rim or other surveyed datum. A corrected water table elevation will be provided in wells containing SPH by adding 0.8 times the measured SPH thickness to the calculated water table elevation.

4.1.2. Groundwater Sampling

All monitoring wells scheduled for sampling during a groundwater sampling event will be sampled within 15 working days of the start of the monitoring and sampling event. In the event that groundwater sampling activities require additional time to complete, Western will contact NMED upon confirmation of the anticipated extended schedule.

4.1.3. Well Purging

Each monitoring well will be purged by removing groundwater prior to sampling in order to ensure that formation water is being sampled. Groundwater field parameters (temperature, pH, conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and total dissolved solids (TDS)) will be collected after purging one well volume. Total purge volume purged will be determined by monitoring groundwater pH, electrical conductance, and temperature parameters until they have stabilized to within 10 percent for three measurements.

Field parameters will be measured using an YSI hand-held instrument or equivalent. The volume of groundwater purged, the instruments used, and the readings obtained at each interval will be recorded on the field-monitoring log. Well purging and sampling will be performed using disposable bailers and/or appropriate sampling pumps.

4.1.4. Groundwater Sample Collection

Groundwater samples will be obtained from each well within 24 hours of the completion of well purging. Sample collection methods will be documented in the field monitoring reports. The samples will be transferred to the appropriate, clean, laboratory-prepared containers provided by the analytical laboratory. Sample handling and chain-of-custody procedures are described in Section 4.3. Decontamination procedures for reusable water sampling equipment are described in Section 4.1.6.

All purged groundwater and decontamination water will be disposed in the Bloomfield Facility's wastewater treatment system upstream of the API Separator. The procedures for disposable materials are described in Section 4.1.8.

Groundwater samples intended for metals analysis will be submitted to the laboratory as total metals samples, unless otherwise noted on Table 3 of this Plan. Groundwater samples obtained for dissolved metals analysis will be filtered using disposable filters with a 0.45 micrometers mesh size that are provided by the analytical laboratory.

4.1.5. Soil Gas Collection

Each well will be equipped with an air-tight well cap for sample extraction through a sample port/opening at the top of the well casing. Flexible poly tubing connects to the underside of the cap and extends down into the well casing to approximately 1 foot above the water table. The specific sample depth at each sample location will be determined based on depth to groundwater measurements collected prior to each soil gas sampling event. Flexible tubing from the suction end of the portable vacuum pump connects to the sample port at the well cap.

The vacuum pump is operated at a low flow rate (approximately 1 cubic foot per second) to purge stagnant air out of the soil gas sampling assembly. Approximately three purge volumes are withdrawn from the well casing prior to sample collection. After the well is purged, a sample tedlar bag is attached to the tubing at the discharge end of the vacuum pump for sample collection. All samples are properly labeled and placed in a sample cooler for delivery to the off-site laboratory.

During sample activities, field measurements of vapor-phase organics, oxygen and carbon dioxide concentrations are recorded using portable field instruments prior to collecting the sample for laboratory analysis. Once the well has been purged, a field sample is collected using a tedlar bag. Decontamination procedures include dedicated tubing for each of the wells sampled and a five-minute purge time of the vacuum pump in ambient air.

4.1.6. Sample Handling

At a minimum, the following procedures will be used when collecting samples:

- Neoprene, nitrile, or other protective gloves will be worn when collecting samples. New disposable gloves will be used to collect each sample.

- All samples collected for chemical analysis will be transferred into clean sample containers supplied by the analytical laboratory. The sample container will be clearly marked. Sample container volumes and preservation methods will be in accordance with the most recent standard EPA and industry accepted practices for use by accredited analytical laboratories. Sufficient sample volume will be obtained for the laboratory to complete the method-specific QC analyses on a laboratory-batch basis.
- Sample labels and documentation will be completed for each sample. Immediately after the samples are collected, they will be stored in a cooler with ice or other appropriate storage method until they are delivered to the analytical laboratory. Standard chain-of-custody procedures, as described in Section 4.3 of this Plan, will be followed for all samples collected. All samples will be submitted to the laboratory to allow the laboratory to conduct the analyses within the method holding times. At a minimum, all samples will be submitted to the laboratory within 48 hours after their collection.

The following shipping procedures will be performed during each sampling event:

- Individual sample containers will be packed to prevent breakage and transported in a sealed cooler with ice or other suitable coolant or other EPA or industry-wide accepted method. The drainage hole at the bottom of the cooler will be sealed and secured in case of sample container leakage.
- Each cooler or other container will be delivered directly to the analytical laboratory.
- Glass bottles will be separated in the shipping container by cushioning material to prevent breakage.
- Plastic containers will be protected from possible puncture during shipping using cushioning material.
- The chain-of-custody form and sample request form will be shipped inside the sealed storage container to be delivered to the laboratory.
- Chain-of-custody seals will be used to seal the sample-shipping container in conformance with EPA protocol.
- Signed and dated chain-of-custody seals will be applied to each cooler prior to transport of samples from the site.

4.1.7. Decontamination Procedures

The objective of the decontamination procedures is to minimize the potential for cross-contamination. The majority of field equipment used for groundwater sampling will be disposable and, therefore, not require decontamination. In order to prevent cross-contamination, field equipment that comes into contact with water or soil will be decontaminated between each sampling location. The decontamination procedure will consist of washing the equipment with a non-phosphate detergent solution (examples include Fantastik™, Liqui-Nox®), followed by two rinses of distilled water and air dried. Decontamination water and rinsate will be contained and disposed of the same way as purge water, as described in Section 4.1.8. Decontamination procedures and the cleaning agents used will be documented in the daily field log.

4.1.8. Field Equipment Calibration Procedures

Field equipment requiring calibration will be calibrated to known standards, in accordance with the manufacturers' recommended schedules and procedures. Calibration checks will be conducted daily and the instruments will be recalibrated if necessary. Calibration measurements will be recorded in the daily field logs.

If field equipment becomes inoperable, its use will be discontinued until the necessary repairs are made. Instrumentation used during sampling events will be recorded in the daily field logs.

4.1.9. Collection and Management of Investigation Derived Waste

Investigation derived waste (IDW) generated during each groundwater sampling event may include purge water, decontamination water, excess sample material, and disposable sampling equipment. All water generated during sampling and decontamination activities will be temporarily stored in labeled 55-gallon drums or a truck-mounted portable tank until disposed in the facility's wastewater treatment system upstream of the API separator. All other solid waste generated during sampling activities (including sampling gloves, tubing, etc.) will be disposed of with the facility's general municipal waste.

4.2. ANALYTICAL METHODS

Groundwater, soil gas and surface water samples collected during the monitoring events will be analyzed for one or more of the following constituents:

- VOCs by EPA Method 8260B and EPA Method 8021B;
- SVOCs by EPA Method 8270C;
- Total and Dissolved Metals by EPA Method 6010, except mercury which will be analyzed by EPA Method 7470.
- TPH – GRO by EPA Method 8015B;
- TPH – DRO extended (which includes TPH-DRO and TPH-MRO) by EPA Method 8015B;
- Total Dissolved Solids (TDS) by EPA Method 160.1 or field measurement;
- Electrical Conductance by EPA Method 120.1 or field measurement;
- Carbon Dioxide by EPA Method 310.1;

- General Chemistry by EPA Method 310.1 and EPA Method 300.0.

4.2.1. Target Analytes

Table 2 provides a summary of target analytes for each analytical method.

4.3. DOCUMENTATION OF FIELD ACTIVITIES

4.3.1. General

Daily field activities, including observations and field procedures, will be recorded using indelible ink on field sampling forms. The original field forms will be maintained at the Bloomfield Facility. The daily record of field activities will include the following information:

- Well ID
- Date
- Start and finish sampling time
- Field team members, including visitors
- Weather conditions
- Daily activities and times conducted
- Observations
- Record of samples collected with sample designations
- Photo log (if needed)
- Field monitoring data, including health and safety monitoring (if needed)
- Equipment used and calibration records, if appropriate
- List of additional data sheets and maps completed
- An inventory of the waste generated and the method of storage or disposal

4.3.2. Sample Custody

All samples collected for analysis will be recorded in the field report or data sheets. Chain-of-custody forms will be completed at the end of each sampling day, prior to the transfer of samples off site, and will accompany the samples during shipment to the laboratory. A signed and dated custody seal will be affixed to the lid of the shipping container. Upon receipt of the samples at the laboratory, the custody seals will be broken, the chain-of-custody form will be signed as received by the laboratory, and the conditions of the samples will be recorded on the form. The original chain-of-custody form will remain with the laboratory. Bloomfield Facility will maintain copies of all chain-of-custody forms generated as part of sampling activities. Copies of the chain-of-custody records will be included with all final laboratory reports submitted to NMED and OCD.

4.4. QUALITY ASSURANCE PROCEDURES

Contract analytical laboratories will maintain internal quality assurance programs in accordance with EPA and industry accepted practices and procedures. At a minimum, the laboratories will use a combination of standards, blanks, surrogates, duplicates, matrix spike/matrix spike duplicates (MS/MSD), blank spike/blank spike duplicates (BS/BSD), and laboratory control samples to demonstrate analytical QA/QC. The laboratories will establish control limits for individual chemicals or groups of chemicals based on the long-term performance of the test methods. In addition, the laboratories will establish internal QA/QC that meets EPA's laboratory certification requirements. The specific procedures to be completed are identified in the following sections.

4.4.1. Equipment Calibration Procedures and Frequency

The laboratory's equipment calibration procedures, calibration frequency, and calibration standards will be in accordance with the EPA test methodology requirements and documented in the laboratory’s quality assurance and SOP manuals. All instruments and equipment used by the laboratory will be operated, calibrated, and maintained according to manufacturers' guidelines and recommendations. Operation, calibration, and maintenance will be performed by personnel who have been properly trained in these procedures. A routine schedule and record of instrument calibration and maintenance will be kept on file at the laboratory.

4.4.2. Field QA/QC Samples

Field duplicates, field blanks, equipment rinsate blanks, and trip blanks will be obtained for quality assurance during sampling activities. The samples will be handled as described in Section 4.1.5.

Field duplicate water samples will be obtained at a frequency of ten percent of the total number of samples submitted for analysis. At a minimum, one duplicate sample per sampling event will be obtained.

Field blanks will be obtained at a frequency of one every two sampling days throughout the duration of each sampling event. Field blanks will be generated by filling sample containers in the field with deionized water and submitting the samples, along with the groundwater samples, to the analytical laboratory for the appropriate analyses.

Equipment rinsate blanks will be obtained for chemical analysis at the rate of one per sampling event. Rinsate samples will be generated using rinsing the water level meter with deionized water upon completion of groundwater elevation monitoring. The rinsate sample then will be placed in the appropriate sample container and submitted with the groundwater samples to the analytical laboratory for the appropriate analyses.

Trip blanks will accompany laboratory sample bottles and shipping and storage containers intended for VOC analyses. Trip blanks will consist of a sample of analyte-free deionized water prepared by the laboratory and placed in an appropriate sample container. The trip blank will be prepared by the analytical laboratory prior to the sampling event and will be kept with the shipping containers and placed with other water samples obtained from the site each day. Trip blanks will be analyzed at a frequency of one for each shipping container of samples that contain samples designated for VOC analyses.

4.4.3. Laboratory QA/QC Samples

Analytical procedures will be evaluated by analyzing reagent or method blanks, surrogates, matrix spike/matrix spike duplicates (MS/MSDs), blank spike/blank spike duplicates (BS/BSDs) and/or laboratory duplicates, as appropriate for each method. The laboratory QA/QC samples and frequency of analysis to be completed will be documented in the cited EPA or other test methodologies. At a minimum, the laboratory will analyze laboratory blanks, MS/MSDs, BS/BSDs and laboratory duplicates at a frequency of one in twenty for all batch runs requiring EPA test methods and a frequency of one in ten for non-EPA test methods. Laboratory batch QA/QC samples will be project specific.

4.4.4. Laboratory Deliverables

The analytical data package will be prepared in accordance with EPA-established Level II analytical support protocol. As stated in the Order, the following will be included in the analytical laboratory reports:

- Transmittal letter, including information about the receipt of samples, the testing methodology performed, any deviations from the required procedures, any problems encountered in the analysis of the samples, any data quality exceptions, and any corrective actions taken by the laboratory relative to the quality of the data contained in the report;
- Sample analytical results, including sampling date; date of sample extraction or preparation; date of sample analysis; dilution factors and test method identification; water sample results in consistent units (milligrams per liter (mg/l) or micrograms per liter (µg/L)); and detection limits for undetected analytes. Results will be reported for all field samples, including field duplicates and blanks, submitted for analysis;
- Method blank results, including reporting limits for undetected analytes;
- Surrogate recovery results and corresponding control limits for samples and method blanks (organic analyses only);
- MS/MSD and/or BS/BSD spike concentrations, percent recoveries, relative percent differences (RPDs), and corresponding control limits;

- Laboratory duplicate results for inorganic analyses, including relative percent differences and corresponding control limits;
- Sample chain-of-custody documentation;
- Holding times and conditions;
- Conformance with required analytical protocol(s);
- Instrument calibration;
- Blanks;
- Detection/quantitation limits;
- Recoveries of surrogates and/or matrix spikes (MS/MSDs);
- Variability for duplicate analyses;
- Completeness; and
- Data report formats;

Data deliverables provided by the laboratory that include analysis of organic compounds will also include the following:

- A cover letter referencing the procedure used and discussing any analytical problems, deviations, and modifications, including signature from authority representative certifying to the quality and authenticity of data as reported;
- A report of sample collection, extraction, and analysis dates, including sample holding conditions;
- Tabulated results for samples in units as specified, including data qualification in conformance with EPA protocol, and definition of data descriptor codes;
- Reconstructed ion chromatograms for gas chromatograph/mass spectrometry (GC/MS) analyses for each sample and standard calibration;
- Selected ion chromatograms and mass spectra of detected target analytes (GCMS) for each sample and calibration with associated library/reference spectra;
- Gas Chromatograph/electron capture device (GC/ECD and/or gas chromatograph/flame ionization detector (GC/FID) chromatograms for each sample and standard calibration;
- Raw data quantification reports for each sample and calibrations, including areas and retention times for analytes, surrogates, and internal standards;
- A calibration data summary reporting calibration range used and a measure of linearity [include decafluorotriphenylphosphine (DFTPP) and p-bromofluorobenzene (BFB) spectra and compliance with tuning criteria for GC/MS];
- Final extract volumes (and dilutions required), sample size, wet-to-dry weight ratios, and instrument practical detection/quantitation limit for each analyte;

- Analyte concentrations with reporting units identified, including data qualification in conformance with the contract laboratory program Statement of Work (SOW) (include definition of data descriptor codes);
- Quantification of analytes in all blank analyses, as well as identification of method blank associated with each sample;
- Recovery assessments and a replicate sample summary, including all surrogate spike recovery data with spike levels/concentrations for each sample and all MS/MSD results (recoveries and spike amounts); and
- Report of tentatively identified compounds with comparison of mass spectra to library/reference spectra.

Data deliverables provided by the laboratory that include analysis of inorganic compounds will include the following:

- A cover letter referencing the procedure used and discussing any analytical problems, deviations, and modifications; including signature from authority representative certifying to the quality and authenticity of data as reported;
- Report of sample collection, digestion, and analysis dates, with sample holding conditions;
- Tabulated results for samples in units as specified, including data qualification in conformance with the contract laboratory program (CLP) statement of work (including definition of data descriptor codes);
- Results of all method QA/QC checks, including inductively coupled plasma (ICP) Interference Check Sample and ICP serial dilution results;
- Tabulation of instrument and method practical detection/quantitation limits,
- Raw data quantification report for each sample;
- A calibration data summary reporting calibration range used and a measure of linearity, where appropriate;
- Final digestate volumes (and dilutions required), sample size, and wet-to-dry weight ratios;
- Quantification of analytes in all blank analyses, as well as identification of method blank associated with each sample; and
- Recovery assessments and a replicate sample summary, including post-digestate spike analysis; all MS data (including spike concentrations) for each sample, if accomplished; all MS results (recoveries and spike amounts); and laboratory control sample analytical results).

Western will present summary tables of these data in the formats described in Section X of the NMED July 2007 Order. The raw analytical data, including calibration curves, instrument calibration data, data calculation work sheets, and other laboratory support data for groundwater monitoring samples, will be compiled and kept on file locally at Bloomfield Facility for reference. The data will be available to NMED upon request.

4.4.5. Review of Field and Laboratory QA/QC Data

The sample data, field, and laboratory QA/QC results will be evaluated for acceptability with respect to the data quality objectives (DQOs). Each group of samples will be compared with the DQOs and evaluated using data validation guidelines contained in EPA guidance documents: *Guidance Document for the Assessment of RCRA Environmental Data Quality, National Functional Guidelines for Organic Data Review, and Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*, and the most recent version of SW-846, and industry-accepted QA/QC methods and procedures. The laboratory will notify the Western Project Manager of data quality exceptions within one business day of identifying the data quality exception in order to allow for sample re-analysis, if possible.

4.4.6. Blanks, Field Duplicates, Reporting Limits and Holding Times

4.4.6.1. Blanks

The analytical results of field blanks and field rinsate blanks will be reviewed to evaluate the adequacy of the equipment decontamination procedures and the possibility of cross-contamination caused by decontamination of sampling equipment. The analytical results of trip blanks will be reviewed to evaluate the possibility for contamination resulting from the laboratory-prepared sample containers or the sample transport containers. The analytical results of laboratory blanks will be reviewed to evaluate the possibility of contamination caused by the analytical procedures. If contaminants are detected in field or laboratory blanks, the sample data will be qualified, as appropriate.

4.4.6.2. Field Duplicates

Field duplicates will consist of two samples either split from the same sample device or collected sequentially. Field duplicate samples will be collected at a minimum frequency of ten percent of the total number of samples submitted for analysis. Relative percent differences for field duplicates will be calculated. The analytical DQO for precision will be used for water duplicates.

4.4.6.3. Method Reporting Limits

Method reporting limits for sample analyses will be established at the lowest level practicable for the method and analyte concentrations and will not exceed groundwater or surface water cleanup standards and screening levels. Detection limits that exceed established standards or screening levels and are reported as “not detected” will be considered data quality exceptions and an explanation for the exceedance and its acceptability for use will be provided.

4.4.6.4. Holding Times

The sampling, extraction, and analysis dates will be reviewed to confirm that extraction and analyses were completed within the recommended holding times, as specified by EPA protocol. Appropriate data qualifiers will be noted if holding times were exceeded.

4.4.7. Representativeness and Comparability

4.4.7.1. Representativeness

Representativeness is a qualitative parameter related to the degree to which the sample data represent the relevant specific characteristics of the media sampled. Procedures will be implemented to assure representative samples are collected and analyzed, such as repeated measurements of the same parameter at the same location over several distinct sampling events. Any procedures or variations that may affect the collection or analysis of representative samples will be noted and the data will be qualified.

4.4.7.2. Comparability

Comparability is a qualitative parameter related to whether similar sample data can be compared. To assure comparability, analytical results will be reported in appropriate units for comparison with other data (past studies, comparable sites, screening levels, and cleanup standards), and standard collection and analytical procedures will be implemented. Any procedure or variation that may affect comparability will be noted and the data will be qualified.

4.4.8. Laboratory Reporting, Documentation, Data Reduction, and Corrective Action

Upon receipt of each laboratory data package, data will be evaluated against the criteria outlined in the previous sections. Any deviation from the established criteria will be noted and the data will be qualified. A full review and discussion of analytical data QA/QC and all data qualifiers will be submitted as appendices or attachments to the groundwater monitoring reports. Data validation procedures for all samples will include checking the following, when appropriate:

- Holding times
- Detection limits
- Field equipment rinsate blanks
- Field blanks
- Field Duplicates
- Trip blanks
- Reagent blanks
- Laboratory duplicates

- Laboratory blanks
- Laboratory matrix spikes
- Laboratory matrix spike duplicates
- Laboratory blank spikes
- Laboratory blank spike duplicates
- Surrogate recoveries

If significant quality assurance problems are encountered, appropriate corrective action will be implemented. All corrective action will be reported and the corrected data will be qualified.

5. MONITORING AND SAMPLING PROGRAM

The primary objective of groundwater monitoring program at the Bloomfield Facility is to collect data that will be of value to assess groundwater quality at and near the Facility. Groundwater elevation data will also be collected to evaluate groundwater flow conditions. The groundwater monitoring program for the Facility will consist of sample collection and analysis from a series of monitoring wells, recovery wells, piezometers, seeps, outfalls, and river locations. The monitoring network is divided into four investigation areas (Former Refinery Complex; North Boundary Barrier Wall; San Juan River Bluff; and San Juan River Terrace). The sampling frequency, analyses and target analytes will vary for each investigation area. The combined data from these investigation areas will be used to assess groundwater quality beneath and immediately downgradient of the Facility, and evaluate local groundwater flow conditions.

Samples will not be collected from monitoring wells that have evidence of SPH. For wells that are purged dry, samples will be collected if recharge volume is sufficient for sample collection within 24 hours. Wells not sampled due to insufficient recharge will be documented in the field log. A summary of the Facility-Wide Monitoring Plan is provided in Table 3.

The following sections outline the monitoring program for each investigation area.

5.1. FORMER REFINERY COMPLEX

5.1.1. Sampling Locations

The following wells will be sampled within the Former Refinery Complex (NMED, 2007):

Background Wells

MW-3, MW-5, and MW-6

Cross-gradient Wells

MW-1, MW-13, MW-26, MW-27, MW-32, and MW-33.

Former Refinery Wells

RW-1, MW-4, RW-9, RW-15, RW-18, MW-20, MW-21, RW-23, RW-28, MW-29, MW-30, MW-31, MW-40, RW-42, RW-43, MW-44, and MW-52.

<u>*Downgradient Wells*</u>

MW-11, MW-12, MW-34, MW-35, MW-37, and MW-38.

<u>*RCRA Investigation Wells*</u>

MW-51, MW-53, MW-54, MW-55, MW-56, MW-57, MW-58, MW-59, MW-60, MW-61, MW-62, MW-63, MW-64, MW-65, MW-66, MW-67, MW-68, MW-69, MW-70, MW-71, MW-72, MW-73, MW-74, MW-75, MW-76, and MW-77.

The locations of the Former Refinery Complex monitor wells are shown in Figure 3. Information regarding the construction details of the monitor wells, including total well depth, screen interval, and top-of-casing elevation, is provided in Table 1.

Depth-to-groundwater and SPH thickness measurements will be collected from the seven sump wells (SW-1 through SW-7) following each major precipitation event. Any sump well where SPH is present will be equipped with an absorbent sock to prevent releases along the river bluff. Sump well monitoring activities will be included in the annual groundwater monitoring reports (NMED, 2008).

5.1.2. Sampling Frequency and Analyses

During each Annual Sampling Event (conducted in August of each year), groundwater samples will be collected from selected wells and analyzed for the following chemical constituents:

- VOCs;
- SVOCs *(specified Downgradient and RCRA Investigation Wells Only)*
- TPH-DRO extended;
- TPH-GRO; and
- Dissolved and Total Metals.

In addition, the following analyses will be conducted on a biennial basis:

- Carbon Dioxide;
- Alkalinity (total, bicarbonate, and carbonate); and
- Anions.

Analyses and target analytes are listed in Table 2. The list of sample locations and monitoring frequency is provided in Table 3.

As part of each Semi-Annual Sampling Event (conducted in April of each year), groundwater samples will be collected from monitoring well MW-1, MW-6, MW-12, MW-13, MW-20, MW-30, MW-33, MW-35, MW-37, MW-38, and MW-52. Samples will be analyzed for the target VOCs (target list). In addition, samples collected from

MW-1, MW-33, MW-12, MW-37, and MW-38 will be analyzed for TPH-GRO and TPH-DRO extended.

During each sampling event, field parameters will be collected and recorded on the field data sheets. Field parameters will be collected include to the following:

- Electrical Conductivity
- Temperature
- pH
- Oxidation Reduction Potential
- Total dissolved solids
- Dissolved Oxygen

5.2. NORTH BOUNDARY BARRIER

5.2.1. Sampling Locations

The following wells will be sampled within the North Boundary Barrier area:

Collection Wells

CW 0+60 and CW 25+95.

Observation Wells

OW 0+60, OW 1+50, OW 3+85, OW 5+50, OW 6+70. OW 8+10, OW 11+15, OW 14+10, OW 16+60, OW 19+50, OW 22+00, OW 23+10, OW 23+90, and OW 25+70.

Data collected from collection wells CW 0+60 and CW 25+95 will be used to monitor groundwater quality at each end of the barrier wall. The remaining collection wells along the Facility-side of the North Boundary Barrier will be monitored for change in groundwater elevation and the presence of SPH, but will not be sampled. Sample collection from the observation wells eliminates the need for sampling at MW-45, MW-46, and MW-47. These wells will continue to be monitored for groundwater elevation data and the presence of SPH. Figure 3 shows the monitoring well network for the North Boundary Barrier. Information regarding the construction details of the monitor wells, including total well depth, screen interval, and top-of-casing elevation, is provided in Table 1.

5.2.2. Sampling Frequency and Analyses

On a semi-annual basis, groundwater samples collected from collection wells CW 0+60 and CW 25+95, and from each observation well will be analyzed for the following chemical constituents, unless otherwise noted:

- VOCs (target list);
- TPH – DRO;
- TPH – GRO (Observation wells only)

Analyses and target analytes are listed in Table 2.

During each sampling event, field parameters will be collected and recorded on the field data sheets. Field parameters will collected include the following:

- Electrical Conductivity
- Temperature
- pH
- Oxidation Reduction Potential
- Total Dissolved Solids
- Dissolved Oxygen

5.3. SAN JUAN RIVER BLUFF

5.3.1. Monitoring and Sampling Locations

Groundwater and surface water samples will be collected from the following locations along the Bluff, if water is present:

Outfalls

East Outfall #2, and East Outfall #3

Seeps

Seep 1, Seep 2, Seep 3, and Seep 5.

Seep 3 serves as a secondary catchment to Seep 1. Seep 2 and Seep 5 have had historic flows, but groundwater discharge at these locations has ceased since the installation of the north boundary barrier. All seep locations will be visually inspected quarterly to monitor active groundwater discharge along the bluff. Groundwater will be removed from any seep catchment where analytical BTEX results exceed any of the respective screening levels.

Figure 10 and Figure 2 show the locations of the outfalls and seeps, respectively.

5.3.2. Sampling Frequency and Analyses

On a semi-annual basis, samples will be collected from East Outfall #2 and East Outfall #3, and analyzed for the following chemical constituents:

- VOCs (target list);
- Total and Dissolved Metals (target list); and
- Anions.

In addition, samples will be collected from Seep 1 if sufficient water is present, on a semi-annual basis and analyzed for the following chemistry constituents:

- VOCs (target list); and
- Anions.

If active discharges are present at Seep 2, 3, or 5, a sample will be collected during the semi-annual sampling event and analyzed for the above parameters (NMED, 2008).

During each sampling event, field parameters will be collected and recorded on the field data sheets. Field parameters will be collected to include the following:

- Electrical Conductivity
- Temperature
- pH
- Oxidation Reduction Potential
- Total Dissolved Solids

Analyses and target analytes are listed in Table 2.

5.4. SAN JUAN RIVER TERRACE

5.4.1. Sampling Locations

Groundwater and surface water samples will be collected from the following locations in the vicinity of the River Terrace and along the San Juan River:

River Terrace Monitoring Wells and Piezometers

MW-48, MW-49, DW-1, DW-2, DW-3, TP-5, TP-6, TP-7, TP-8 and TP-9.

River Terrace Recovery Locations

Collection Gallery

Figure 6 shows the groundwater sampling locations at the River Terrace.

San Juan River

Upstream (approximately 1,000 feet upstream of the River Terrace), River Bank north of MW-45, River Bank north of MW-46, and Downstream (approximately 2,000 feet downstream of the Facility). Figure 11 shows the sample locations for the San Juan River.

Information regarding the construction details of the monitor wells, including total well depth, screen interval, and top-of-casing elevation, is provided in Table 1.

5.4.2. Sampling Frequency and Analyses

Groundwater samples will be collected annually from the Collection Gallery, MW-49, DW-3, TP-5, TP-6, TP-8, and TP-9 during low flow operating conditions of the San Juan River. On a biennial basis (i.e., every two years), groundwater samples will be collected from DW-1, DW-2, MW-48, and TP-7. Biennial samples will be collected starting in 2011 during San Juan River low flow operating conditions. Groundwater samples will be analyzed for the following chemical constituents:

- VOCs (target list)
- TPH-GRO
- TPH-DRO extended
- Total Recoverable Metals (target list)

On an annual basis samples will be collected from the San Juan River and analyzed for the following chemical constituents:

- VOCs (target list)
- TPH-GRO
- TPH-DRO extended
- Total and Dissolved Metals (target list)
- Alkalinity (total, carbonate and bicarbonate)
- Anions (target list).

Analyses and target analytes for the River Terrace and San Juan River samples are listed in Table 2.

During each sampling event, field parameters will be collected and recorded on the field data sheets. Field parameters that will be collected from the river terrace monitoring wells and piezometer wells include the following:

- Conductivity
- Temperature
- pH
- Oxidation Reduction Potential

- Dissolved Oxygen

Field parameters collected from the San Juan River samples include the following:

- Total Dissolved Solids
- Conductivity

Refer to Table 3 for the list of sample locations and analyses.

5.4.3. Soil Gas Sampling

Soil gas samples will be collected at TP-5, TP-6, TP-8, BV-1, BV-3, BV-4, BV-5, BV-6, MW-48, DW-2, and DW-3 during the annual groundwater sampling event. Soil gas samples will not be at T-7 due to it being drilled in slurry wall, TP-9 as it is located east of slurry wall, MW-49 as it is west of slurry wall, and DW-1 as it is east of the slurry wall. The soil gas samples will be analyzed for BTEX and TPH-GRO.

5.4.4. Pressure Readings

Pressure readings will be recorded from BV-1, BV-3, BV-4, BV-5, BV-6, TP-5, TP-6, TP-7, TP-8, air sparge lines A and B, and at the main blower using a hand held magnehelic gauge and sample port at the top of each well. The pressure readings will be recorded during the semi-annual and annual groundwater sampling events.

5.5. MONITORING PROGRAM REVISIONS

Upon review of the analytical results, historic facility-wide monitoring data, available soil boring data, and Nacimiento Formation elevation data, Western Refining will assess the monitoring program presented in this Plan. Revisions to the Plan, as necessary, will then be presented for agency review and approval on an annual basis prior to June 30th of each year. These revisions may include, but not be limited to, a reduction or change in monitoring locations, monitoring frequency, and/or target analytes.

6. SCHEDULE

As discussed in Section 5.0, groundwater and surface water sampling events at the Facility have been assigned varying sampling requirements. Sampling events within each site investigation area (i.e., Former Refinery Complex, North Boundary Barrier, Bluff Outfalls, and River Terrace) will be completed within 15 working days of the start of the event.

7. REFERENCES

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