San Juan River Gas Plant

Phase 2 Site Characterization Work Plan
San Juan River Gas Plant
Kirtland, San Juan County, New Mexico

January 2019

El Paso Natural Gas Company, LLC

San Juan River Gas Plant

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Contents

Figures

Tables

Appendix

Acronyms and Abbreviations

°F	degree(s) Fahrenheit
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAS	Chemical Abstract Service
CCI	Castleton Commodities International, LLC
CH2M	CH2M HILL Engineers, Inc.
CLP	Contract Laboratory Program
CO_3	carbonate
COC	chemical of concern
DPT	direct push technology
DRO	diesel-range organics
EPNG	El Paso Natural Gas Company, LLC
ft	feet
GRO	gasoline-range organics
HCO_3	bicarbonate
HSP	Health and Safety Plan
JHA	Job Hazard Analysis
MCL	maximum contaminant level
mg/kg	milligram per kilogram
mg/L	milligram per liter
MS/MSD	matrix spike/matrix spike duplicate
MW	monitoring well
NA	not available
NMOCD	New Mexico Oil Conservation Division
NMOSE	New Mexico Office of the State Engineer
NMWQCC	New Mexico Water Quality Control Commission
O&M	operations and maintenance
ORC	oxygen reducing compound
ORO	oil range organics
PMW	Praxair Pond monitoring well
PVC	polyvinyl chloride
RSL	Regional Screening Level
SJRP	San Juan River Plant
TDS	total dissolved solid
TPH	total petroleum hydrocarbon
USEPA	U.S. Environmental Protection Agency
VOCs	volatile organic compounds

1. Introduction

This Phase 2 Site Characterization Work Plan presents the activities that will be performed to identify the nature and extent of environmental impacts at the San Juan River Gas Plant (SJRP) that resulted from historical El Paso Natural Gas, LLC (EPNG) operations. The work will incorporate and utilize data gathered during the 2017 Site Characterization, historical soil and groundwater data, meetings with the EPNG project manager, and the current conceptual site model. Investigation of both soil and groundwater is proposed.

1.1 Site Location

The SJRP is in San Juan County, Township 29N, Range 15W, Section 1, near Kirtland, New Mexico. The SJRP processes natural gas collected from production wells located in the San Juan Basin of New Mexico and southern Utah. The site is a 630-acre facility that contains active and closed natural gas processing facilities, two raw water ponds (now closed), three wastewater evaporation ponds (now closed), a sulfur recovery plant, water and hydrocarbon tanks, a pigging station, flare pits, and several 16- to 24-inch diameter natural gas pipelines that cross the facility. Surrounding land use includes recreation (golf course) to the south, commercial and residential to the east and south, and coal mining operations to the west and north. The SJRP site is shown on Figure 1.

1.2 Summary of Previous Investigations and Removal Actions

In 1985, the New Mexico Oil Conservation Division (NMOCD) issued a directive for oil and gas producers to cease discharging production fluids to unlined surface impoundments (pits) located in the groundwater recharge areas of the San Juan Basin and major river drainages to the San Juan, Animas, and La Plata Rivers. Once discharge had ceased, producers were required to investigate and remediate soil and groundwater contamination caused by these pits. In response, a number of investigations and removal actions have been completed at the SJRP.

- Several investigations were conducted between 1985 and 1995, including installation of 24 groundwater monitoring wells.
- In 1992, approximately 18,200 cubic yards of contaminated material were removed from the north flare pit and approximately 3,520 cubic yards of contaminated material were removed from the south flare pit and landfarmed on the southwest portion of the site. On June 29, 1993, NMOCD granted closure of the flare pits, with the condition that designated monitoring wells located down gradient of each former pit location be sampled on an annual basis. On June 17, 1997, NMOCD granted closure of the soil landfarms.
- Between 1995 and 1996, the former wastewater evaporation ponds were capped and closed.
- In 1995, 17 monitoring wells were abandoned (E-1B, E-1A, E-3, E-9, E-10, E-11, MW-1, MW-2, MW-3, P-2, P-5, P-6, P-7, P-8, P-9, P-10, P-12), 2 wells were upgraded (MW-2 and MW-4), and 5 new wells were installed (MW-5, MW-6, MW-7, MW-8, and MW-9).
- In January 2001, a groundwater remediation work plan was submitted to the NMOCD to address elevated benzene concentrations detected in monitoring wells MW-8 and MW-9. The work plan included provisions to install an air sparging system consisting of two air sparging wells; one injection point located within 10 feet of each monitoring well.
- The air sparging system air injection wells (SW-8 and SW-9) were installed in October 2001. A pre-pilot air sparging test was conducted at both wells in November 2001. Results from this test indicated good communication between SW-9 and MW-9 but poor communication between SW-8 and MW-8. As a result of poor communication between SW-8 and MW-8, an oxygen release compound sock consisting of magnesium peroxide, was recommended for remediation in this area. The ORC sock was installed in MW-8 in mid-November 2001.

- Except for a 48-hour shutdown prior to the four-week sampling event in December 2001, the air sparging system operated continuously from mid-November 2001 to mid-January 2002. The air sparging pilot test culminated with a sampling event in late January 2002. An additional sampling event was performed in mid-late February 2002, to evaluate the potential for contaminant concentration rebound following a four-week shutdown.
- From February 2002 through December 2002, the air sparging system was placed into continuous operation following the pilot test. Site activities during that time included operation and maintenance (O&M) of the air sparge system and site-wide annual groundwater monitoring.
- During 2003, site activities included periodic operations and maintenance (O&M) of the air sparging system, replacement of ORC socks at MW-8, quarterly sampling of MW-8 and MW-9, and site-wide annual groundwater monitoring.
- Based on benzene, toluene, ethylbenzene and total xylenes (BTEX) concentrations below New Mexico Water Quality Control Commission (NMWQCC) standards, the air sparging system was shut down in February 2004 to assess static groundwater conditions at the site. From 2004 through 2006, site activities included replacement of oxygen release compound socks at MW-8, quarterly sampling of MW-8 and MW-9, and site-wide annual groundwater monitoring.
- A Stage I Abatement Plan was submitted to NMOCD in November 2005 to investigate hydrocarbon impacts encountered in groundwater at MW-5, near the Praxair evaporation pond (Praxair Pond) at the SJRP. The source of the hydrocarbons was unknown. NMOCD approval was received on January 23, 2006 to begin investigative actions. The investigation was completed in February 2006 and consisted of drilling and sampling borings using direct push technology (DPT). Drill tool refusal occurred in hard shale, siltstone, a silty-sand mix and sandstone at interval depths of 8-15 feet, which was short of the planned investigation depth of roughly 22 feet below ground surface (ft bgs). The lithology generally changed from a clay soil near the surface to alternating weathered shale and sandstone. Total BTEX concentrations were detected at five of 15 soil borings, in 10 of 39 samples. Detected total BTEX concentrations ranged from 0.1 J milligrams per kilogram (mg/kg) in the 13 to 14 ft bgs sample at GPH-11 to 813 mg/kg in the 11.5 to 12.5 ft bgs sample at GPH-8. Three of the detected concentrations were found between 10 and 12.5 ft bgs at GPH-6, GPH-8, and GPH-10. Additionally, total BTEX concentrations were detected in all four soil samples collected at GPH-6 which is located to the northeast of the Former Raw Water Pond. Results of this investigation recommended that further investigation be conducted via hollow-stem auger, due to the limited effectiveness of DPT at the site. The air sparge system has remained turned off since system shut down in 2004.
- In May 2007, monitoring well MW-7, which was located immediately adjacent to the Praxair facility, was plugged and abandoned at Praxair’s request, to facilitate new process construction.
- During the May 2008 sampling event, field personnel noted that monitoring well MW-5 had been destroyed in conjunction with subsurface coal mining activities by BHP Billiton, Ltd. Destruction of the well is believed to have occurred between February and May 2008. Subsequently, BHP Billiton acknowledged that MW-5 had been removed by backfilling it with bentonite and removing the top of the PVC casing and the surface completion.
- The 2011 environmental program at the SJRP consisted of the continuation of dissolved-phase hydrocarbon remediation (using oxygen enhancement) and sitewide groundwater monitoring. The groundwater monitoring program included sitewide annual groundwater sampling and quarterly gauging. On August 31, 2011, monitoring wells MW-4, MW-6, MW-9, and MW-2 were sampled for BTEX compounds, NMWQCC metals, total dissolved solids (TDS), alkalinity, nitrate/nitrite, chloride, and sulfate. MW-8 was reported as dry during this sampling event. Also, quarterly groundwater sampling for BTEX was completed at monitoring well MW-9 in February, May, August, and November 2011 to evaluate the effectiveness of previous and ongoing hydrocarbon remediation activities in this area. Historically, MW-8 was also sampled quarterly, but in 2011 this well was dry. By 2013 groundwater elevation at MW-8 had risen sufficiently to collect groundwater samples, groundwater samples have been collected from MW-8 annually since 2013. Sitewide groundwater elevation measurements were also collected quarterly at each well.

- In 2011, NMWQCC groundwater exceedances included benzene (0.113 milligrams per liter [mg/L]) concentrations at MW-9, cadmium (0.0131 mg/L), selenium (0.351 mg/L) and nitrate (92.2 mg/L) concentrations at MW-6, selenium (0.122 mg/L) and nitrate (16.7 mg/L) concentrations at MW-2. Other secondary standard exceedances for aluminum, cobalt, iron, manganese, nickel, chloride, sulfate, and TDS were observed in the wells. The TDS concentrations at MW-6, MW-8, and MW-9 were reported above 10,000 mg/L. Background TDS in groundwater appears to be between 2,775 and 4,500 mg/L. However, background for surface water (Stevens Arroyo) to the west, reportedly exceeds 10,000 mg/L TDS. The concentrations of the various general chemistry inorganics and metals were similar to previous years' results.
- In 2013, annual groundwater samples were collected in December. Sitewide groundwater elevation measurements were collected from monitoring wells MW-4, MW-6, MW-8, MW-9, and MW-2. Groundwater samples were collected from each of the five monitoring wells. NMWQCC exceedances included benzene (0.186 mg/L) in MW-9 and other metals and inorganic constituents in each of the five wells.
- In 2014, annual groundwater samples were collected in December. Sitewide groundwater elevation measurements were collected from monitoring wells MW-4, MW-6, MW-8, MW-9, and MW-2. Groundwater samples were collected from each of the five monitoring wells. NMWQCC exceedances included benzene (0.0461 mg/L) in MW-9 and other metals and inorganic constituents in each of the five wells.
- In 2015, annual groundwater samples were collected in December (CH2M HILL Engineers, Inc. [CH2M], 2016). Sitewide groundwater elevation measurements were collected from monitoring wells MW-2 MW-4, MW-6, MW-8, and MW-9. Groundwater samples were collected from each of the five monitoring wells. NMWQCC exceedances included benzene (0.104 mg/L) in MW-9 and other metals and inorganic constituents in each of the five wells.
- In 2016, annual groundwater samples were collected in December (CH2M, 2017). Sitewide groundwater elevation measurements were collected from monitoring wells MW-2, MW-4, MW-6, MW-8, and MW-9. Groundwater samples were collected from each of the five monitoring wells. NMWQCC exceedances included benzene (0.097 mg/L) in MW-9 and other metals and inorganic constituents in each of the five wells.
- In 2017, six monitoring wells and 19 soil borings were installed as part of a Site Characterization Investigation focused on the Historic Burn Area on the northern portion of the SJRP facility (Figure 1). The findings of this investigation have not been reported, pending the results of this Phase 2 Site Characterization Investigation that will collect additional data, but soil and groundwater data collected during the initial Site Characterization Investigation were considered during the development of this Phase 2 Site Characterization Work Plan. During the 2017 investigation, soil and groundwater samples were collected from soil borings and monitoring wells, including Praxair Pond monitoring wells. Total petroleum hydrocarbons (TPH) were detected in 33 of 84 soil samples, BTEX compounds were detected in 23 of 84 soil samples. The highest detected TPH concentration was found in the 9 to 10-foot bgs sample at MW-15 at a concentration of 2,928 mg/kg. Benzene and xylene concentrations exceeded the NMWQCC standard at monitoring wells PMW-2a, MW-9, MW-11, MW-13, MW-15, and MW-16. Though benzene concentrations have historically exceeded NMWQCC standards at MW-9, concentrations found in groundwater collected during 2017 (PMW-2a, MW-13, MW-15, and MW-16) are an order of magnitude greater than those found at MW-9. Xylene concentrations exceeding the NMWQCC standard at PMW-2a, MW-13, MW-15, and MW-16 are two orders of magnitude greater than those found at MW-9. Toluene exceeded the NMWQCC standard at PMW-2a at a concentration of 2.81 mg/L. Monitoring wells MW-9 and MW-16 are located downgradient of the Historic Burn Area and discharge pipe. There is uncertainty regarding the groundwater flow direction near the Praxair Pond, however, based on the October 2017 measurements, monitoring wells MW-13 and MW-15 are presented as upgradient of the Praxair Pond. Other metals and inorganic constituents exceeded NMWQCC standards in each of the 14 wells (CH2M, 2018). Based on the 2017 soil and groundwater analytical data, the nature and extent of BTEX in groundwater has not been fully delineated.

1.3 Current Regulatory Status

EPNG is responsible for remediation of environmental conditions identified prior to the sale of the facility to Western Gas Resources in 1992. There is no Discharge Permit for this facility associated with the historical EPNG environmental liabilities. In May 2014, Western Gas Resources sold the facility to Castleton Commodities International, LLC (CCI), and the SJRP is currently operated by CCI.

In November 2005, a Stage I Abatement Plan was submitted to NMOCD to investigate hydrocarbon impacts encountered in groundwater near the Praxair Pond at the SJRP. Approval of this abatement plan was received from NMOCD on January 23, 2006, and the investigation was performed in February 2006. Results of the initial investigation were detailed in the Stage I Interim Report submitted by March 28, 2006. Revisions to the work plan for additional investigation included in the Stage I Interim Report were submitted on September 28, 2006.

In October 2015, EPNG submitted a Site Characterization Investigation Work Plan to the NMOCD online portal to investigate the nature and extent of petroleum hydrocarbon compounds in soil and groundwater on the northern portion of the facility, at the Historic Burn Area.

2. Current Site Activities

Numerous phases of investigation, monitoring, remediation, and reporting have been conducted over the last roughly 27 years at this site. Site investigations, groundwater monitoring, and remediation activities are being performed under various letters, reports, and work plans from EPNG with approvals from NMOCD. Groundwater analytical results will be compared to NMWQCC groundwater standards. The most recent annual groundwater monitoring event was completed in November 2018; and the annual groundwater monitoring results are used in the discussion below.

2.1 Current Site Monitoring Infrastructure

There are fourteen existing wells, including three Praxair monitoring wells, that are being used to monitor shallow groundwater at the SJRP (Table 2-1).

Table 2-1. Summary of Existing Monitoring Well Information and Groundwater Concentrations Relative to NMWQCC Standards for the San Juan River Plant

Well Identification	Comments
MW-2	Located furthest southwest and downgradient of the former South Flare Pit Within limits of the former landfarm No BTEX exceedances between 2001 – 2018 Aluminum exceedance 2007 – 2013 Iron exceedance 2001 – 2013 Selenium exceedance 2001 – 2018 Chloride, Nitrate+Nitrite, Sulfate, and TDS exceedances 2001 – 2018
MW-4	Southwest and downgradient of the former South Flare Pit Within limits of the former landfarm No BTEX exceedances between 2001 – 2018 Aluminum exceedance in 2001, 2003, 2007, and 2008 Boron exceedance in 2017 and 2018 Cobalt exceedance between 2001 – 2013 Iron exceedance between 2001 – 2018 Manganese exceedance between 2001 – 2018 Nickel exceedance between 2001 – 2013 Chloride exceedance 2003 – 2007 & 2009 – 2018 Sulfate and TDS exceedances from 2001 – 2018
MW-6	Upgradient monitoring well for the Main Plant area Proximal monitoring well located south of former evaporation pond #2 No BTEX exceedances between 2001 – 2018 Aluminum exceedance 2001 – 2018 Boron exceedance in 2017 and 2018 Cadmium exceedance 2001 – 2005, 2010 – 2013, and 2015 - 2018 Cobalt exceedance between 2001 – 2018 Iron exceedance in 2001, 2003, 2007, & 2009 – 2011 Manganese exceedance between 2001 – 2018 Nickel exceedance between 2001 – 2005, 2009 – 2013, and 2015 - 2018 Selenium exceedance 2001 – 2018 Chloride, Nitrate+Nitrite, Sulfate, and TDS exceedances from 2001 – 2018
MW-8	Located furthest northwest and downgradient of the former evaporation ponds; downgradient of the Historic Burn Area Aluminum exceedance between 2009 – 2010 and 2017 Chromium exceedance in 2002 Cobalt exceedance in 2003 Iron exceedances between 2001 – 2003 and 2008 – 2010, and 2015 - 2018 Manganese exceedances between 1999 – 2000, 2001, 2003 – 2013, and 2015 - 2018

Table 2-1. Summary of Existing Monitoring Well Information and Groundwater Concentrations Relative to NMWQCC Standards for the San Juan River Plant

Well Identification	Comments
	Nickel exceedance in 2002 Chloride exceedance in 2001 – 2005, 2013, and 2015 - 2018 Sulfate and TDS exceedances from 2001 – 2018 Nitrate+Nitrite exceedance in 2001, 2003, and 2004 Historical B, E, X exceedances TPH – diesel range organics (DRO) detected in groundwater in 2017
MW-9	Northwest and downgradient of the former evaporation ponds; downgradient of the Historic Burn Area Benzene exceedances between 1998 – 2018 Aluminum exceedance 2001 – 2018 Boron exceedance in July 2017 and November 2018 Iron exceedance between 1999 - 2001 and 2003 – 2018 Manganese exceedance between 1999 – 2018 Cobalt exceedance in 2001 – 2003, and 2005 – 2018 Nickel exceedance between 2001 – 2018 Nitrate+Nitrite exceedance in 2001, 2003, and 2004 Chloride, Sulfate, and TDS exceedances from 2001 – 2018 TPH – DRO and TPH – gasoline range organics (GRO) detected in groundwater in 2017
MW-11	Southeast and upgradient of the Praxair Pond Manganese exceedance in 2017 Sulfate and TDS exceedances in 2017 and 2018 Chloride exceedance in November 2017 and 2018 No BTEX exceedances TPH – DRO and TPH – oil range organics (ORO) detected in groundwater in 2017
MW-12	Southeast and upgradient of the Praxair Pond Iron exceedance in July 2017 Manganese exceedance in 2017 and 2018 Chloride, Sulfate, and TDS exceedances in 2017 and 2018 No BTEX exceedances TPH – DRO and TPH – GRO detected in groundwater in 2017
MW-13	East and cross-gradient of the Praxair Pond and Historic Burn Area Iron exceedance in 2017 Manganese exceedance in 2017 Chloride, Sulfate, and TDS exceedances in 2017 Benzene and Xylene exceedances 2018 TPH – DRO and TPH – GRO detected in groundwater in 2017
MW-14	East and upgradient of the Historic Burn Area Manganese exceedance in 2017 Chloride, Sulfate, and TDS exceedances in 2017 and 2018 No BTEX exceedances TPH – DRO and TPH – ORO detected in groundwater in 2017
MW-15	Along the western edge of the Historic Burn Area Iron exceedance in 2017 and 2018 Manganese exceedance in 2017 and 2018 Chloride, Sulfate, and TDS exceedances in 2017 and 2018 Benzene exceedances in 2017 and 2018 Xylene exceedances in 2017 TPH – DRO and TPH – GRO detected in groundwater in 2017
MW-16	Located between MW-8 and MW-9, northwest and downgradient of the former evaporation ponds; downgradient of the Historic Burn Area Boron exceedance in 2017 and 2018

Table 2-1. Summary of Existing Monitoring Well Information and Groundwater Concentrations Relative to NMWQCC Standards for the San Juan River Plant

Well Identification	Comments
	Manganese exceedance in 2017 Chloride, Sulfate, and TDS exceedances in 2017 and 2018 Benzene and Xylene exceedances in 2017 and 2018 TPH – DRO and TPH – GRO detected in groundwater in 2017
PMW-1a	Located southwest of the Praxair Pond Chloride, Sulfate, and TDS exceedances in 2017 and 2018 TPH – DRO and TPH – ORO detected in groundwater in July 2017
PMW-2a	Located southeast and upgradient of the Praxair Pond Boron exceedance in 2017 and 2018 Manganese exceedance in July 2017 and November 2018 Chloride, Sulfate, and TDS exceedances in 2017 and 2018 Benzene, Toluene, and Xylene exceedances in 2017 and 2018 TPH – DRO and TPH – GRO detected in groundwater in 2017
PMW-4a	Located northwest and downgradient of the Praxair Pond Manganese exceedance in 2017 Chloride, Sulfate, and TDS exceedances in 2017 and 2018 No BTEX exceedances

3. Site Physical Setting

The SJRP is located on the eastern Colorado Plateau with an average elevation of 5,180 feet. The climate is semi-arid. The area can experience hot summers and cold winters with low precipitation throughout the year. The average annual snowfall is 10.9 inches and the average annual rainfall is 7.8 inches. The highest average temperatures occur in July (93 degrees Fahrenheit [°F]) and the lowest average temperatures occur in January (16.8°F).

The following description of site geology and hydrogeology is based on reports prepared by Philip Environmental in 1998 (Philip Environmental, June 1998) the DPT investigation performed in February 2006, and the initial site characterization investigation performed in March 2017.

Based on drilling logs from 1995 and prior activities, the site soils consist of fine sand to fine sandy-clay, with some gravel and cobbles. The soil samples from borings located in the valley or alluvial fans (such as P-10, P-7, P-9, MW-5, MW-8, and MW-9) consist of fine sand to clay. The soil samples from the borings located on the mesas, plateaus and terraces consist of fine sand with some gravel and cobble layers and some unconsolidated sandstone and shales.

The uppermost and most prevalent lithology at the site is comprised of alluvial sediments, which consist of fluvial deposits and, to a lesser extent, terrace deposits of gravel and cobbles. Beneath the alluvium are the consolidated sedimentary units of the Kirtland Shale Formation, which includes both shales and sandstone members. The portion of the site to the north of the plant is underlain by a shale member of the Kirtland Formation. The plant and the Flare Hill areas are underlain by a sandstone member of the Kirtland Formation. During remediation of the south flare pit in September 1992, a distinct clay layer was encountered at a depth of approximately 15 feet below the original bottom of the pit.

During the 2006 DPT investigation, refusal was met in hard shale, siltstone, a silty sand mix, and sandstone at interval depths of 8 to 15 ft bgs. Lithology generally changed from a clay soil near the surface to alternating weathered shale and sandstone. This interpretation was considered consistent with previous assessments of the geology, and it was reported that most of the soil borings likely met refusal in the Kirtland Formation.

During the 2017 site characterization, the geology at the site was described from soil samples collected from the soil borings. Borings were advanced to depths ranging from 10 to 80 feet bgs. Alluvium consisting of silt and clay was encountered and varied in thickness from 10 feet to as much as 25 feet bgs. Alluvium was underlain by sandstone in 4 of 25 boreholes and shale in 21 of 25 boreholes. The geological assessment performed during this site investigation was consistent with the results summarized in the 1998 Philip Environmental and 2006 MWH investigations.

Regional groundwater flow in the San Juan Basin is from the topographically high outcrop areas around the edges of the basin, towards the lower outcrop areas. The San Juan River Valley is indicated as the main discharge area of the San Juan Basin (Stone, 1983). The San Juan River is located approximately two miles to the south of the SJRP site. The results of potentiometric surface measurements collected in 2016 indicated a groundwater flow divide just north of the plant that directs flow to the southwest through the southern portion of the site, and to the northwest through the northern portion of the site, including the Praxair Pond area, towards the coal mining operation to the north and west. With the addition of new monitoring wells in the northern portion of the site in 2017 providing more groundwater elevation data, it appears groundwater flows toward Stevens Arroyo from both the east and west. The groundwater flow direction in the southern portion of the site appears unchanged.

Groundwater elevations at the three Praxair Pond monitoring wells (PMW-1a, PMW-2a, and PMW-4a) differ by approximately 75 feet from southeast to northwest and total well depths vary from 78 feet bgs at PMW-2a to 140 feet bgs at PMW-4a. Soil boring logs and well completion diagrams are not available for these monitoring wells to confirm the lithology or initial depth at which groundwater was observed during drilling. Possible explanations for the disparity in groundwater elevations at the three Praxair Pond wells include:

- PMW-1a and PMW-4a are installed in the sandstone aquifer while all other site monitoring wells are installed in a perched shale zone
- A fault may be present between the site monitoring wells and PWM-1a and PMW-4a that affects the groundwater elevations
- Long-wall coal mining, oriented in a north-south configuration, has occurred beneath the western portion of the Praxair Pond. It appears that the mining operations, perhaps dewatering or ground settlement into the mined void, are having a significant local effect on the groundwater table in the vicinity of the Praxair Pond.

4. Data Gaps and Proposed Site Characterization Activities

Table 4-1 provides a summary of data gaps identified at the SJRP site and corresponding site characterization activities proposed to address data gaps. These locations have been selected to delineate known areas of contamination. The results of these site characterization activities will guide potential investigation of additional delineation locations and other potential sources, if identified.

Table 4-1. Summary of Data Gaps and Proposed Site Characterization Activities

Identified Data Gap	Proposed Site Characterization Activities
Presence of BTEX and TPH in deep soils and BTEX in groundwater near the Praxair Pond.	• Drill and sample one boring south-southeast and upgradient of PMW-2a and one boring near PMW-4a using rotary sonic drilling techniques to evaluate potential BTEX in deeper soils and confirm the lithology near the Praxair Pond. • Complete the soil borings upgradient and downgradient of the Praxair Pond as monitoring wells to evaluate BTEX concentrations in groundwater and groundwater elevation in this area.
Delineate the presence of soil contamination at the Historic Burn Area.	• Drill and sample five soil borings in the Historic Burn Area where TPH and BTEX were found during the 2017 site investigation. • Complete the five soil borings as monitoring wells to evaluate BTEX concentrations and groundwater elevation in this area.
Uncertainty regarding the source of hydrocarbon (BTEX) contamination in the Praxair Pond monitoring wells.	• Continue sampling at existing Praxair Pond wells MW-1a, MW-2a, and MW-4a during the annual site-wide groundwater monitoring program.
Lack of data regarding background TDS concentrations and uncertainty regarding TDS impacts to groundwater samples.	• Discuss TDS issue with NMOCD regulator to understand their requirements for aquifers with >10,000 mg/L TDS • Potentially: Identify and sample shallow domestic wells, Sample water in Stevens Arroyo, Sample water in the Former Seep Pond.
Uncertainty regarding lithology and disparity in groundwater elevation and flow direction near the Praxair Pond, specifically related to monitoring well PMW-4a.	• Drill and sample one boring adjacent to PMW-4a to confirm lithology and groundwater elevation. • Compare soil boring logs for site wells installed in 2017 and during this Phase 2 Site Characterization Investigation to evaluate the presence of a perched aquifer at the top of the sandstone versus a deeper aquifer or the presence of a fault. • Conduct and evaluate annual sitewide groundwater elevation measurements.

5. Site Characterization Field Activities

5.1 Notifications and Site Access

CCI is the current site operator. They will be informed of the planned drilling program to confirm that there are no concerns with the proposed work locations affecting their operations. Although the proposed drilling locations are outside of active operations areas, should conflicts with facility operations be identified, attempts will be made to move the proposed drilling location to a technically sound nearby location that is agreeable to all parties.

Prior to the start of field operations, the NMOCD Environmental Bureau will be notified of the planned investigation activities.

Prior to the installation of any new monitoring wells, well permits will be obtained from the New Mexico Office of the State Engineer (NMOSE). The well permit processes should be initiated no less than 30 days prior to the anticipated start of field operations.

5.2 Site Preparation

5.2.1 Health and Safety Plan

The existing Health and Safety Plan (HSP) for the SJRP site will be modified to define the procedures and requirements for the health and safety of Jacobs staff and visitors when they are physically on the work site. The site includes the project area and associated oil and gas processing infrastructure, and support facilities thereon, as applicable. The HSP has been developed in conformance with Occupational Safety and Health Administration Code of Federal Regulations 1910.120 to describe methods to be used to minimize risk resulting from environmental conditions and incorporate system safety design requirements into all phases of the work by eliminating hazards where feasible. The HSP adopts, by reference and as appropriate, the Standards of Practice in the Jacobs Corporate Health and Safety Program and Contractor Safety guidelines.

The HSP developed for the groundwater monitoring activities will be amended to describe the procedures for additional site characterization activities to include rotary sonic drilling operations, installation of soil borings and collection of soil samples for field screening and laboratory analysis, installation of new monitoring wells, location and elevation surveys of soil borings, monitoring wells, and other site features.

- All site operations will be coordinated with the EPNG project manager and CCI's SJRP field operations personnel.
- Copies of up-to-date Safety Data Sheets for all chemicals expected to be encountered at the SJRP site will be maintained onsite in a location where employees may easily access it for reference.
- All Jacobs and subcontractor vehicles will contain a first aid kit equipped with bloodborne pathogen protection kits.
- All subcontractor personnel will be trained and qualified in compliance with ISNetworld Safety Program.
- All Jacobs and subcontractor personnel will be required to don hardhat, safety glasses, fluorescent-color safety vests, hearing protection, steel-toed boots and fire-retardant clothing while working at the SJRP site.
- A daily Job Hazard Analysis (JHA) will be developed to review procedural methods and uncover hazards prior to starting up an operation. The JHA is used to address issues that may have developed after the start of the operation or a change in personnel during the operation. Once the hazards of an operation are known, proper solutions or controls can be developed to eliminate the potential for injury.

- All personnel will complete the Jacobs site-specific training before the start of fieldwork. This training will include a discussion of site entry/exit procedures, locations of support facilities, and potential site hazards.

5.2.2 Site Layout

Locations of planned soil borings and monitoring wells will be staked with wood lath and flagged with fluorescent survey ribbon. Plans for ingress and egress to work locations will be addressed in accordance with the Vehicular Traffic Control Plan. A portable toilet will be staged near the work area for use by site workers.

The location of the equipment staging area, including vehicle parking area, and equipment decontamination area will be established.

5.2.3 Vegetation Clearance

To access some of the proposed soil boring and well installation locations, vegetation clearance may be required. Vegetation will be cleared to a height between three and six inches above the ground surface using man-portable weed-whackers. Vegetation clearance will be limited to cutting of brush, vines, small trees and tree limbs that would directly impede the movement of the drill rig, service vehicles and site personnel. Cut vegetation will be moved from the work areas so as not to impede field activities.

5.2.4 Utilities Clearance

Subsurface utility clearance will occur at monitoring well installation locations. The general areas to be cleared will be clearly marked and will include a 50-foot radius surrounding each proposed boring/well installation location. Utilities will be located and marked prior to drilling activities. Underground utilities will be marked as appropriate for each utility, (e.g.; electrical, gas, water or communication). Markings will be clearly visible with spray paint and/or pin flags capable of withstanding inclement weather and normal wear.

If a proposed monitoring well is located at or near subsurface utilities, the location will be moved a sufficient distance away, and utilities clearance completed again to retain the 10-foot radius surrounding each proposed boring/well installation location.

In addition to surface utility clearance, intrusive subsurface utility clearance will be completed. Soil will be removed from each monitoring well installation location from the ground surface to a depth of at least 10 feet bgs. Soil removal will be accomplished via high-pressure jet and vacuum recovery (i.e., hydroexcavation potholing). Removed soil will be managed as described in Section 5.6. If subsurface utilities are found during the potholing process the soil boring location will be moved and cleared of utilities.

5.3 Drill and Sample Soil Borings

Soil borings will be drilled and sampled to characterize volatile organic compounds (VOCs) including BTEX and total petroleum hydrocarbons (TPH), and total metals, and to provide information regarding potential actions necessary for site closure. Figure 2 shows the proposed locations of soil borings.

- **Praxair Pond Area**
  - One soil boring will be drilled and sampled upgradient of monitoring well PMW-2a at the Praxair Pond to evaluate potential BTEX, TPH, and metals in deeper soils. The boring is expected to be drilled and sampled to a depth of 80 feet bgs.
  - One soil boring well be drilled and sampled near monitoring well PMW-4a at the Praxair Pond to evaluate the TPH in deeper soils and assess the lithology and groundwater elevation north of the Praxair Pond. TPH was detected in groundwater at PMW-4a and groundwater elevations around

the Praxair Pond may indicate a groundwater divide or fault or impacts from long-wall coal mining at a depth of 500 feet directly beneath the pond. The boring is expected to be drilled and sampled to a depth of at least 140 feet bgs.

- **Historical Burn Area**
  - Five soil borings will be drilled and sampled at locations surrounding the Historical Burn Area to determine the nature and extent of potential BTEX, TPH, and metals in soils, based on analytical results collected during the 2017 site investigation. The borings are expected to be drilled and sampled to 40 feet bgs.

Soil borings will be completed using rotary sonic drilling techniques. The rotary sonic drilling methods allow for undisturbed soil cores to be continuously collected for logging, screening, and sampling. All boreholes will be advanced to 15 feet below the apparent top of the water table.

Soil samples for laboratory analysis will be collected every ten feet to the depth at which the boring is terminated, the apparent top of the water table, or the top of bedrock, whichever is shallower. Sample collection intervals will be modified in the field to collect soil that is observed to have staining, odors, or positive headspace readings. Collected soil samples will be immediately placed into a laboratory-certified clean glass jars. If required, additional soil will be collected in a plastic bag for lithologic description and headspace screening. Soil samples will be described using the Unified Soil Classification System (ASTM International D-1452, D-2487, and D-2488). A photoionization detector will be used to indicate the presence of VOCs in the soil by measuring the VOCs in the headspace of the bag.

Once the sample is collected, the sample container will be capped. The exterior of each sample container will be wiped clean of dirt and moisture using a paper towel. The sample will be properly labeled and logged onto chain-of-custody and field sampling form. A custody seal may be placed on the sample container or the insulated shipping package. The sample will be placed in an insulated container maintained at 4 degrees Celsius prior to being submitted to a laboratory for analysis.

Soil samples will be analyzed via the following:

- Total petroleum hydrocarbons using United States Environmental Protection Agency (USEPA) Method 8015 Modified for gasoline, diesel, and motor oil range organics
- BTEX using USEPA SW-846 Method 8260B
- NMWQCC metals including arsenic, barium, aluminum, boron, cadmium, chromium, cobalt, iron, lead, manganese, mercury, molybdenum, nickel, and selenium using USEPA SW 846 Method 6010B/7270A

Should unknown materials or discolored soils be discovered during soil boring activities, the need to evaluate additional COCs will be discussed with EPNG and may warrant the collection of additional soil samples.

All the soil borings are planned to be completed as monitoring wells, following the procedures described in Section 5.4

Once final soil sample results are received from the analytical laboratory, Jacobs will perform data quality assessment, or validation, on 100 percent of the samples analyzed. The analytical data will be reviewed and validated by Jacobs chemists, in accordance with the following documents:

- EPA Test Methods for Evaluating Solid Wastes, SW-846, Revision 6 (2007)
- EPA Contracts Laboratory Program (CLP) National Functional Guidelines for Evaluating Organic Data Review (June 2008)

Sample results will be subject to a Level IV data review that includes an evaluation of the following QC parameters:

- Data Completeness
- Holding Times and Preservation
- Calibrations
- Blank Analysis Results
- Analytical reporting limits, method detection limits, and limits of detection
- Surrogate Recoveries
- Laboratory Control Sample Results
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results
- Field Duplicates
- Laboratory Spike Results
- Sample Result Verification
- Overall Assessment

A data validation memorandum will be prepared that summarizes the results of the data review. The report will be appended to the Site Characterization Report.

5.4 Monitoring Well Installation

Soil borings for monitoring well installation will be drilled and sampled in accordance with the procedures described in Section 5.3. Monitoring wells will be constructed so that the screened interval intersects the top of shallow groundwater, as determined from examination of soil boring samples. Each 4-inch diameter polyvinyl chloride (PVC) well will be equipped with a maximum length of 25 ft of 0.010-inch mill slot screen. Approximately 10 feet of screen will be installed above the top of shallow groundwater to allow for possible potentiometric surface fluctuations.

The proposed wells to be installed include the following and are shown on Figure 2:

- MW-17 through MW-19 and MW-21 and MW-22 – new wells surrounding the Historic Burn Area
- MW-20 and MW-23 – new wells at the Praxair Pond

The new monitoring wells will be constructed as follows:

- Schedule 40 PVC 4-inch blank casing – roughly 2 ft above ground surface to top of the screen interval.
- Schedule 40 PVC 4-inch 0.010-inch mill slot screen – a maximum screen length of 25 feet set approximately 10 feet above the top of noted saturated conditions in borings.
- Sand pack material properties will be selected to match screen slot size and will be installed in the annular space surrounding the well screen to approximately 1 foot above the top of the screen. The well screen will be swabbed during placement of the sand pack to settle the sand until the sand is 1 foot above the top of the screen. A 1-foot-thick hydrated bentonite chip or pellet seal will be installed above the sand pack, followed by bentonite slurry grout to approximately 2-feet bgs. Above-ground wellheads will be constructed at each location and will consist of a 5-foot-tall (approximately 3 feet of which will remain above ground) 8-inch-diameter steel wellhead protective casing set in a 3-feet by 3-feet by 6-inches-thick concrete pad. Four protective bollards will be installed at each wellhead. Wellhead completions will have a unique well identification number/name inscribed in the concrete pad or permanently affixed to the well. The wells will be secured with keyed locks.

Following monitoring well installation, all new wells will be swabbed, bailed, and purged until field measurement of turbidity stabilizes, or until 5 casing volumes have been removed, whichever is less. Development water will be containerized in the onsite temporary storage tank prior to disposal at the Basin Disposal facility in Bloomfield.

Upon completion of well development, HydraSleeve samplers will be set in each well, including the existing wells. Groundwater samples will be collected from the new wells no sooner than 72 hours following the completion of well development.

5.5 Decontamination

The drilling rig and support equipment will arrive at the site clean and ready for drilling activities. Decontamination of drilling rods, casings, downhole equipment, etc. will be conducted between drilling well installation locations and at the completion of all site work to avoid site cross-contamination and off-site transport of contamination. Decontamination will consist of Liquinox/Alconox solution wash/scrub, potable high-pressure wash, hot water rinse (steam cleaning) and water rinse. A decontamination pad will be constructed to contain overspray, liquids and solids generated during decontamination procedures. Decontamination fluids will be containerized and transported daily to the onsite water storage tank in the staging area. Upon completion of drilling activities, the temporary decontamination pad will be removed and properly disposed.

5.6 Management of Investigation Derived Wastes

General household-type trash (food and drink containers, packaging of well materials, etc.) generated during drilling operations will be disposed of at the Waste Management landfill in Bloomfield.

Mud generated during utility locating hydroexcavation will be transported in the onboard recovery tank of the hydroexcavation unit to the Envirotech landfarm. Soil generated during drilling activities, including solids from decontamination, will be containerized in lined roll-off containers for bulk storage and transport to the Envirotech landfarm. Samples will be collected from the IDW to characterize the waste and have it approved for disposal at the Envirotech landfarm.

Decontamination and well development water will be containerized onsite in a temporary storage tank and transported to and disposed of at the Basin Disposal facility in Bloomfield.

5.7 Groundwater Monitoring

A site characterization groundwater sampling event will be conducted at the completion of well installation activities.

5.7.1 Depth to Water Measurements

Depth to water measurements will be collected from all new and existing site monitoring wells, including the Praxair Pond monitoring wells to provide information on the hydrogeology at the site.

5.7.2 Site Characterization Monitoring

Groundwater samples will be collected from all new and existing site monitoring wells, including the Praxair Pond monitoring wells. The following procedures will be implemented for the monitoring.

All site operations will be coordinated with the EPNG project manager and local CCI operations personnel.

Sampling will be conducted using HydraSleeve sampling equipment, which will be installed in new monitoring wells at the completion of well development. The HydraSleeve is classified as a no-purge (passive) grab sampling device, meaning that it is used to collect ground-water samples directly from the screened interval of a well without having to purge the well prior to sample collection. The HydraSleeve causes no drawdown in the well (until the sample is withdrawn from the water column) and only minimal disturbance of the water column, because it has a very thin cross section and it displaces very little water (<100 ml) during deployment into the well. The HydraSleeve collects a sample from within the screen only, and it excludes water from any other part of the water column in the well using a self-sealing check valve at the top of the sampler. It is a single-use (disposable) sampler that is not intended for reuse, so there are no decontamination requirements for the sampler itself. If any purge or excess water is generated during sampling will be containerized in the water holding tank containing decontamination and well development water, sampled for characterization to determine the appropriate disposal method, and transported to the on-site designated staging area.

Groundwater samples will be submitted to the analytical laboratory for:

- VOCs using USEPA SW-846 Method 8260B,
- Nitrate plus nitrite using Method 300.0,
- NMWQCC metals including arsenic, barium, aluminum, boron, cadmium, chromium, cobalt, iron, lead, manganese, mercury, molybdenum, nickel, and selenium using USEPA SW 846 Method 6010B/7470A,
- Total dissolved solids using Method 160.1,
- Alkalinity using Method 310.1
- Sulfate using Method 300, and;
- Chloride using Method 300.

In addition, laboratory matrix spike/matrix spike duplicate (MS/MSD) samples will be collected to assess accuracy, precision, and matrix interference of the groundwater samples. These samples will be collected in the same manner as duplicate samples and are labeled extra volume samples for MS/MSD. Also, trip blanks will be collected to assess sample transport.

Once final results are received from the analytical laboratory, Jacobs will perform data quality assessment, or validation, on 100 percent of the samples analyzed. The analytical data will be reviewed and validated by Jacobs chemists, in accordance with the following documents:

- EPA Test Methods for Evaluating Solid Wastes, SW-846, Revision 6 (2007)
- EPA CLP National Functional Guidelines for Evaluating Organic Data Review (June 2008)

Sample results will be subject to a Level IV data review that includes an evaluation of the following QC parameters:

- Data Completeness
- Holding Times and Preservation
- Calibrations
- Blank Analysis Results
- Analytical reporting limits, method detection limits, and limits of detection
- Surrogate Recoveries
- Laboratory Control Sample Results
- MS/MSD Results
- Field Duplicates
- Laboratory Spike Results
- Sample Result Verification
- Overall Assessment

A data validation memorandum will be prepared that summarizes the results of the data review. The report will be appended to the Site Characterization Report, described below.

5.8 Site Characterization Report

Once the field activities have been completed and data have been received and evaluated, a Site Characterization Report will be prepared for the SJRP site to summarize the results of the 2017 site investigation and the soil boring, soil sampling, and monitoring well installation described in this Work Plan. The Site Characterization Report will include a presentation of field observations and tabular summary of all soil laboratory analytical results. The report will also summarize the results of QC sampling performed as part of the field program.

6. References

CH2M HILL Engineers, Inc. (CH2M). 2014. *2013 Annual Groundwater Monitoring Report, San Juan River Gas Plant, Kirtland, New Mexico*. March.

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CH2M HILL Engineers, Inc. (CH2M). 2018. *2017 Annual Groundwater Monitoring Report, San Juan River Gas Plant, Kirtland, New Mexico.* March.

Montgomery Watson Harza (MWH). 2012. *2011 Annual Report San Juan River Plant*. March.

New Mexico Oil Conservation Division (NMOCD). 1993. *Guidelines for Remediation of Leaks, Spills and Releases.* August 13.

Philip Environmental, 1998*. Summary of Investigations at the San Juan River Plant, Kirtland, New Mexico*, prepared for El Paso Natural Gas Company, Farmington, New Mexico. June 1998.

Figures

Figure 1
Site Map
Phase 2 Site Characterization Work Plan
San Juan River Gas Plant
Kirtland, New Mexico

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Figure 2
Proposed Monitoring Well Locations
Phase 2 Site Characterization Work Plan
San Juan River Gas Plant
Kirtland, New Mexico

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Appendix A
Soil and Groundwater Regulatory Screening Levels

TABLE A-1 Soil Sample Screening Criteria
Phase 2 Site Characterization Work Plan, San Juan River Gas Plant, Kirtland, New Mexico

Analyte	CAS Number	New Mexico Industrial/Occupational Soil Screening Criteria[1] (mg/kg)	NMOCD Recommended Remediation Action Level[2] (mg/kg)
Benzene	71-43-2	87.2	NA
Toluene	108-88-3	61,300	NA
Ethylbenzene	100-41-4	368	NA
Xylenes	1330-20-7	4,280	NA
TPH[3]	NA	NA	100
Aluminum	7429-90-05	1,290,000	NA
Arsenic	7440-38-2	21.5	NA
Barium	7440-39-3	255,000	NA
Boron	7440-42-8	259,000	NA
Cadmium	7440-43-9	1,110	NA
Chromium	16065-83-1	1,950,000	NA
Cobalt	744-48-4	NA	NA
Iron	7439-89-6	908,000	NA
Lead	7439-92-1	800	NA
Manganese	7439-96-5	160,000	NA
Mercury	7439-97-6	112	NA
Molybdenum	7439-98-7	6,490	NA
Nickel	7440-02-0	25,700	NA
Selenium	7782-49-2	6,490	NA

Notes:
[1] = New Mexico Environment Department Risk Assessment Guidance for Site Investigations and Remediation, March 2017.
[2] = Calculated following Section IV.A.2.b. of the NMOCD Guidelines for Remediation of Leaks, Spills and Releases. August 13, 1993. The Depth to Ground Water at the site is less than 50 feet, which generates a Total Ranking Score of 20 that indicates the listed Remediation Action Level is required.
[3] = TPH to be analyzed for gasoline range organics, diesel range organics, and motor oil organics via USEPA Method 8015 Modified. The total TPH concentration will be the sum of those three reported concentrations.
CAS = Chemical Abstract Service
mg/kg = milligrams per kilogram
NA = not applicable

Table A-2 Groundwater Sample Screening Criteria
Phase 2 Site Characterization Work Plan, San Juan River Gas Plant, Kirtland, New Mexico

Analyte	CAS Number	NMWQCC Standard[1] (mg/L)	USEPA MCL[2] (mg/L)
Benzene	71-43-2	0.01	0.005
Toluene	108-88-3	0.75	1
Ethylbenzene	100-41-4	0.75	0.7
Xylenes	1330-20-7	0.62	10
Nitrate-Nitrite as N	14797-55-8	10	0.01
Aluminum	7429-90-05	5.0[3]	NA
Arsenic	7440-38-2	0.1	0.01
Barium	7440-39-3	1	2
Boron	7440-42-8	0.75[3]	NA
Cadmium	7440-43-9	0.01	0.005
Chromium	16065-83-1	0.05	0.1
Cobalt	7440-48-4	0.05[3]	NA
Iron	7439-89-6	1	NA
Lead	7439-92-1	0.05	0.015
Manganese	7439-96-5	0.2	NA
Mercury	7439-97-6	0.002	0.002
Molybdenum	7439-98-7	1.0[3]	NA
Nickel	7440-02-0	0.2[3]	NA
Selenium	7782-49-2	0.05	0.05
Calcium	NA	NA	NA
Magnesium	NA	NA	NA
Potassium	NA	NA	NA
Sodium	NA	NA	NA
Sulfate	NA	600	NA
Chloride	NA	250	NA
Bromide	NA	NA	NA
Alkalinity as CO_3 and HCO_3	NA	NA	NA
Total Dissolved Solids	NA	1,000	NA

Notes:

[1]= New Mexico Administrative Code, Title 20 Environmental Protection, Chapter 6 Water Quality, Part 2 Ground and Surface Water Protection

[2] = United States Environmental Protection Agency Regional Screening Levels (RSL), January 2015

[3] = New Mexico Standard for Irrigation Use

CAS = Chemical Abstract Service

NA = Not Applicable

MCL = Maximum Contaminant Level

NMWQCC = New Mexico Water Quality Control Commission

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State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 522273

CONDITIONS

Operator:	
El Paso Natural Gas Company, L.L.C 1001 Louisiana Street Houston, TX 77002	OGRID: 7046
	Action Number: 522273
	Action Type: [UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT)

CONDITIONS

Created By	Condition	Condition Date
shanna.smith	Accepted for record only.	11/6/2025