April 1, 2020

Mr. Chris Krafcheck
Alabama Department of Environmental Management
UST Corrective Action Section
1400 Coliseum Blvd
Montgomery, Alabama 36110

Re: Corrective Action Plan
(Cost Proposal No. 18)
31st Street Texaco
3100 12th Avenue North
Birmingham, Alabama
Facility I.D. No. 23423-073-007394
Incident No. UST16-10-02
PPM Project No. 460102-CAPD

Dear Mr. Krafcheck:

Enclosed please find one copy of the Corrective Action Plan (Cost Proposal No. 18) prepared by PPM Consultants, Inc. for the referenced site.

If you have any questions or need additional information, please do not hesitate to contact me at (205) 836-5650.

Sincerely,
PPM Consultants, Inc.

Michael W. Dillon, P.G.
Senior Geologist/Project Manager

c: Mr. Mike Panjwani, QA & AAA, Inc.

CORRECTIVE ACTION PLAN
(COST PROPOSAL NO. 18)

QA & AAA, INC.
31ST STREET TEXACO
3100 12TH AVENUE NORTH
BIRMINGHAM, ALABAMA

FACILITY I.D. NO. 23423-073-007394
INCIDENT NO. UST16-10-02

PPM PROJECT NO. 460102-CAPD

APRIL 1, 2020

PPM CONSULTANTS

CORRECTIVE ACTION PLAN
(COST PROPOSAL NO. 18)

FOR

31ST STREET TEXACO
3100 12TH AVENUE NORTH
BIRMINGHAM, ALABAMA

FACILITY I.D. NO. 23423-073-007394
INCIDENT NO. UST16-10-02

PREPARED FOR:

QA & AAA, INC.
3100 12TH AVENUE NORTH
BIRMINGHAM, ALABAMA 35234

PPM PROJECT NO. 460102-CAPD

APRIL 1, 2020

PREPARED BY:

MICHAEL W. DILLON, P.G.
AL NO. 1233
SENIOR GEOLOGIST/
PROJECT MANAGER

REVIEWED BY:

MATTHEW J. EBBERT, P.G.
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SENIOR GEOLOGIST

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BIRMINGHAM, ALABAMA 35210
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FIGURES (Appendix A)

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CERTIFICATION PAGE

I certify under penalty of law that the Corrective Action Plan for the 31st Street Texaco located at 3100 12th Avenue North in Birmingham, Alabama, and the plans, specifications, and technical data submitted within were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiring of the person or persons who directly gathered the enclosed information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information.

Michael L. Ellison, P.E.
AL No. 23757

04/01/20
Date

UST RELEASE FACT SHEET

GENERAL INFORMATION:

SITE NAME: 31st Street Texaco

ADDRESS: 3100 12th Avenue North, Birmingham, Alabama

FACILITY I.D. NO.: 23423-073-007394

INCIDENT NO.: UST16-10-02

RESULTS OF EXPOSURE ASSESSMENT:

How many private drinking water wells are located within 1,000 ft. of site?	0
How many public water supply wells are located within 1 mile of the site?	0
Have any drinking water supply wells been impacted by contamination from this release?	{ } Yes { X } No
Is there an imminent threat of contamination to any drinking water wells?	{ } Yes { X } No
Have vapors or contaminated groundwater posed a threat to the public?	{ } Yes { X } No
Are any underground utilities impacted or imminently threatened by the release?	{ } Yes { X } No
Have surface waters been impacted by the release?	{ } Yes { X } No
Is there an imminent threat of contamination to surface waters?	{ } Yes { X } No
What is the type of surrounding population?	Commercial/Residential

CONTAMINATION DESCRIPTION:

Type of contamination at site: { X} Gasoline, { } Diesel, { } Waste Oil { } Kerosene, { } Other _

Free product present in wells? { X } Yes { } No Approx. 1.05 feet in MW-12V on August 6, 2019

Maximum BTEX or PAH concentration measured in soil:	<0.005 mg/kg benzene (all samples) BDL total BTEX (all samples) 0.191 mg/kg MTBE (SB-1-40-42) <0.025 mg/kg naphthalene (all samples)

Current maximum COC concentrations measured in groundwater: (November 14, 2019)	1.970 mg/L benzene (MW-7D) 63.730 mg/L total BTEX (MW-7D) 0.310 mg/L MTBE (MW-7D) 2.560 mg/L naphthalene (MW-7D)

ADEM Form 479 8/02

ADEM GROUNDWATER BRANCH
UST SITE CLASSIFICATION SYSTEM CHECKLIST

Please read all of the following statements and mark either yes or no if the statement applies to your site. If you have conducted a Preliminary or Secondary Investigation, all questions should be answered. Closure site assessment reports may not provide you with all the necessary information, but answer the statements with the knowledge obtained during the closure site assessment.

SITE NAME: 31st Street Texaco
SITE ADDRESS: 3100 12th Avenue North, Birmingham, Alabama

FACILITY I.D. NO.: 23423-073-007394
INCIDENT NO.: UST16-10-02

OWNER NAME: QA & AAA, Inc.
OWNER ADDRESS: 3100 12th Avenue North, Birmingham, Alabama 35234

NAME & ADDRESS OF PERSON COMPLETING THIS FORM: Michael W. Dillon, P.G., PPM Consultants, Inc.
5555 Bankhead Highway, Birmingham, Alabama 35210

CLASSIFICATION	***DESCRIPTION***	***YES***	***NO***
CLASS A	IMMEDIATE THREAT TO HUMAN HEALTH, HUMAN SAFETY OR SENSITIVE ENVIRONMENTAL RECEPTOR		
A.1	Vapor concentrations at or approaching explosive levels that could cause health effects, are present in a residence or building.	☐	☒
A.2	Vapor concentrations at or approaching explosive levels are present in subsurface utility system(s), but no buildings or residences are impacted.	☐	☒
CLASS B	IMMEDIATE THREAT TO HUMAN HEALTH, HUMAN SAFETY OR SENSITIVE ENVIRONMENTAL RECEPTOR		
B.1	An active public water supply well, public water supply line, or public surface water intake is impacted or immediately threatened.	☐	☒
B.2	An active domestic water supply well, domestic water supply line or domestic surface water intake is impacted or immediately threatened.	☐	☒
B.3	The release is located within a designated Wellhead Protection Area I.	☐	☒
CLASS C	IMMEDIATE THREAT TO HUMAN HEALTH, HUMAN SAFETY OR SENSITIVE ENVIRONMENTAL RECEPTOR		
C.1	Ambient vapor/particulate concentrations exceed concentrations of concern from an acute exposure, or safety viewpoint.	☐	☒
C.2	Free product is present on the groundwater, at ground surface, on surface water bodies, in utilities other than water supply lines, or in surface water runoff.	☒	☐
CLASS D	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
D.1	There is a potential for explosive levels, or concentrations of vapors that could cause acute effects, to accumulate in a residence or other building.	☐	☒
D.2	A non-potable water supply well is impacted or immediately threatened.	☐	☒

ADEM GROUNDWATER BRANCH
UST SITE CLASSIFICATION SYSTEM
CHECKLIST (continued)

CLASSIFICATION	*DESCRIPTION*	*YES*	*NO*
D.3	Shallow contaminated surface soils are open to public access, and dwellings, parks, playgrounds, day care centers, schools or similar use facilities are within 500 feet of those soils.	☐	☒
CLASS E	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
E.1	A sensitive habitat or sensitive resources (sport fish, economically important species, threatened and endangered species, etc.) are impacted and affected.	☐	☒
CLASS F	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
F.1	Groundwater is impacted and a public well is located within 1 mile of the site.	☐	☒
F.2	Groundwater is impacted and a domestic well is located within 1,000 feet of the site.	☐	☒
F.3	Contaminated soils and/or groundwater are located within designated Wellhead Protection Areas (Areas II or III).	☐	☒
CLASS G	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
G.1	Contaminated soils and/or groundwater are located within areas vulnerable to contamination from surface sources.	☒	☐
GLASS H	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
H.1	Impacted surface water, stormwater or groundwater discharges within 500 feet of a surface water body used for human drinking water, whole body water-contact sports, or habitat to a protected or listed endangered plant and animal species.	☐	☒
CLASS I	LONG TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
I.1.	Site has contaminated soils and/or groundwater but does not meet any of the above-mentioned criteria.	☐	☒

ADDITIONAL COMMENTS:

According to personnel with the Birmingham Water Works, there are no public drinking water wells or surface water intakes for public drinking water within one mile radius of the site.

Complete the classification evaluation questions listed above. Upon completion, determine the highest rank of the site (A.1 is the highest rank) based on the statements answered with a yes.

Enter the determined classification ranking:	**C.2**

ADEM GROUNDWATER BRANCH
SITE CLASSIFICATION CHECKLIST
(5/8/95)

1.0 INTRODUCTION

PPM Consultants, Inc. (PPM) has prepared this Corrective Action Plan (CAP) on behalf of QA&AAA, Inc. for the 31st Street Texaco, facility located at 3100 12th Avenue North in Birmingham, Alabama. The CAP was required by the Alabama Department of Environmental Management (ADEM) in correspondence dated January 24, 2020. Investigative and corrective actions at the site are in response to an accidental release of petroleum hydrocarbons from an underground storage tank (UST) system. Constituents of concern (COCs) for the site include benzene, ethylbenzene, toluene, and total xylenes (BTEX), methyl tertiary butyl ether (MTBE), and naphthalene. The CAP provides site background information, a summary of pertinent environmental activities conducted to date, information regarding subsurface conditions, and a detailed description of the selected method of site remediation.

2.0 BACKGROUND

2.1 SITE LOCATION

The 31st Street Texaco facility is a retail petroleum station located at 3100 12th Avenue North in Birmingham, Alabama. The site is situated in the northeast ¼ of the northeast ¼ of Section 25, Township 17 South, Range 3 West of the Birmingham North, Alabama, Quadrangle. More specifically, the site is located at 33° 32’ 04" north latitude and 86° 47' 57" west longitude. The site location is shown in **Figure 1**, **Site Location Map** in **Appendix A**, **Figures**.

2.2 SURROUNDING AREA

The property is located on the northern corner of the intersection of 31st Street and 12th Avenue North in a commercial/residential area of Birmingham, Alabama. Norwood Seventh-Day Adventist Church is located adjacent to the facility to the northwest. A residential property is located adjacent to the facility property to the north. Lewie’s Appliance property is located adjacent to the facility property to the northeast and across 12th Avenue North to the southeast. McDonald’s restaurant property is located across the intersection of 31st Street and 12th Avenue North to the south. A Shell petroleum station property is located across 31st Street to the southwest. A residential property is located across 31st Street to the west. Residential properties are located further west, northwest, north, and northeast of the facility property.

2.3 SITE DESCRIPTION

The topography of the site gently slopes to the southwest. Structures at the site include a store building and a canopy southwest of the store building containing three dispensers beneath the canopy. The UST system includes one 10,000-gallon regular gasoline UST, one 10,000-gallon premium gasoline UST, one 10,000-gallon diesel UST, and associated product transfer piping. The three USTs are located within a single UST pit located adjacent to and south of the canopy. The product piping likely extends from the north portion of the tank pit to the three dispensers.

Underground utilities identified at the site include water, sanitary sewer, natural gas, fiber optic, and underground electric. The water lines traverse from northwest to southeast along the northeast side of 31st Street North and from southwest to northeast along the northwest side of 12th Avenue North. The sanitary sewer line and natural gas line traverse from southwest to northeast along the northwest side of 12th Avenue North. Fiber optic lines traverse from northwest to southeast paralleling the northeast property boundary along the alley and from southwest to northeast along the northwest side of 12th Avenue North. Underground electric lines that provide power to the dispensers, the facility sign, and lights are located in various areas of the site. The location of utility service laterals to the store building could not be located. Site features and approximate utility locations are shown in **Figure 2**, **Site Map**.

2.4 SITE HISTORY

The following provides a brief summary of pertinent activities conducted at the site to date.

After a routine tightness test failed on the premium unleaded gasoline UST, ADEM notified QA & AAA, Inc. of the requirement to conduct investigative and corrective actions and assigned UST Incident No. UST16-10-02 to the potential release in correspondence dated October 15, 2015. Additionally, the release was determined to be eligible for Alabama Tank Trust Fund (ATTF) coverage and Cost Proposal No. 1 (CP-1) for conducting a Preliminary Investigation and developing a Secondary Investigation Plan was pre-approved. The results of the testing also prompted QA & AAA, Inc. to conduct fiberglass reinforcement of the 10,000-gallon fiberglass, premium unleaded gasoline UST. Tank Tech of Blodgett, Missouri, measured the thickness of the tank walls and conducted the fiberglass reinforcement (tank lining) on November 4, 2015.

Preliminary Investigation

The Preliminary Investigation was conducted in February and March 2016, and included the advancement of four soil borings and installation of four monitoring wells. Soil and groundwater samples were collected during the investigation to evaluate potential COC-impact to the subsurface. Four Type II monitoring wells (MW-1 through MW-4) were constructed in soil borings SB-1 through SB-4, respectively.

Analytical results indicated that COC concentrations in soil exceeded ADEM's Initial Screening Levels (ISLs) in borings SB-1 and SB-2. COC concentrations in groundwater exceeded ISLs at monitoring wells MW-1, MW-2, and MW-3. Free product was not observed in soil or groundwater. The extent of COC impact in soil and groundwater was not adequately delineated. The Preliminary Investigation Report was submitted to ADEM on April 25, 2016.

Secondary Investigation

The Secondary Investigation site activities began on October 10, 2016, and included the advancement of three soil borings (SB-5 through SB-7) and installation of two, 2-inch inside diameter (I.D.), Type II monitoring wells (MW-5 and MW-6), and one 2-inch I.D., Type III monitoring well (MW-7D) in bedrock. A 4.7-foot thick void space was observed in bedrock at MW-7D at a depth of 60 feet below ground surface (BGS). Groundwater, strong petroleum odor, and free product were observed in the void space. Soil and groundwater samples were collected during the investigation to evaluate potential COC-impact to the subsurface.

During groundwater sampling activities on October 28, 2016, 0.18 feet of free product was measured on top of groundwater in the bailer from MW-7D. The dissolved benzene concentration exceeded the ISL of 0.005 milligrams per liter (mg/L) in monitoring wells MW-2 (0.025 mg/L) and MW-7D (6.710 mg/L) which are located just west of the UST pit. The dissolved MTBE concentrations exceeded the ISL of 0.020 mg/L in groundwater samples from MW-1 (0.174 mg/L), MW-2 (0.299 mg/L), and MW-4 (0.117 mg/L) which are all located in the vicinity of the UST system. The dissolved naphthalene concentration exceeded the ISL of 0.020 mg/L in the groundwater sample collected from bedrock well MW-7D (14.000 mg/L) only. The horizontal extent of impact to groundwater in the residuum (upper groundwater zone) was not defined for benzene or MTBE to the south, west, and north. Groundwater samples were not collected to the south and northwest of this area because MW-3 and MW-5 were dry or contained insufficient water to sample on October 28, 2016. Dissolved naphthalene concentrations in the residuum were below ISLs. The extent of impact

to groundwater within the bedrock was not defined horizontally in any direction or vertically for benzene or naphthalene. Free product was not defined horizontally in any direction in bedrock. The Secondary Investigation Report was submitted to ADEM on December 15, 2016.

Monitoring Well Installation

In August 2017, additional monitoring wells were installed for the purpose of further characterizing the horizontal and/or vertical extent of impact in the residuum and bedrock. Prior to installation of the wells, an electrical resistivity study was conducted to determine ideal locations for the bedrock wells. Seven borings (SB-8D, SB-9, SB-9D, SB-10D, SB-11, SB-11D, and SB-12V) were advanced and two Type II monitoring wells (MW-9 and MW-11), four double-cased, Type III monitoring wells (MW-8D, MW-9D, MW-10D, and MW-11D), and one, 3 7/8-inch, triple-cased, Type III monitoring well (MW-12V) were installed into the borings. An air and water-filled void space with free product and petroleum vapors was encountered in bedrock from 55.5 feet to 61.5 feet at MW-12V. Beneath this void space, from 67 feet to 67.5 feet, was a saturated void space containing dark stained clay/mud and petroleum vapors. Based on field observations, the horizontal extent of impact in residuum and bedrock appeared adequately defined at the site. PPM recommended no further vertical delineation because multiple void spaces within the bedrock in the area of impact would require a quadruple-cased Type III well or greater to further vertically delineate impact. The construction of this type of well would be costly and difficult. The triple-cased vertical delineation well (MW-12V) installed in the deeper void space was constructed as a 3 7/8-inch I.D., open hole well so that the well could serve as a recovery well and remove impact from the void space. The Monitoring Well Installation Report was submitted to ADEM on October 10, 2017.

Alabama Risk-Based Corrective Action (ARBCA) Evaluation

PPM conducted an ARBCA Evaluation for the site to assess current and potential future risk for the subject property and adjacent properties. The ARBCA Evaluation was submitted to ADEM on March 26, 2018. Results of the evaluation indicated representative COC concentrations in soil were below the proposed Site-Specific Target Levels (SSTLs) and Groundwater Resource Protection (GRP) values. Representative COC concentrations in groundwater were below the proposed SSTLs; however, the representative benzene and naphthalene concentrations in groundwater at the source exceeded the proposed GRP values. Additionally, the benzene and naphthalene concentrations at point of compliance (POC) well

MW-12V exceeded the proposed GRP values. The proposed Site-Specific Corrective Action Levels (SSCALs) were approved by ADEM in correspondence dated May 7, 2018.

Groundwater Monitoring and MEME Events

Quarterly groundwater monitoring and mobile-enhanced multiphase extraction (MEME) events were conducted at the site from October 2017 to September 2019.

Corrective Action Plan Evaluation

ADEM requested a CAP Evaluation be conducted for the site in correspondence dated February 12, 2019. The CAP Evaluation was conducted to assess remedial strategies that would effectively decrease COC concentrations in soil and groundwater to below GRP values established for the site. The CAP Evaluation was submitted to ADEM on August 2, 2019, and recommended remediation by natural attenuation (RNA) monitoring combined with MEME events and potential future short-term duration air or ozone sparging if needed. ADEM agreed with the recommendation and in correspondence dated December 20, 2019, requested a CAP be prepared for conducting RNA monitoring and MEME events.

RNA Groundwater Monitoring and MEME events

Based on ADEM's prior agreement with the recommendation of the CAP Evaluation, RNA groundwater monitoring and periodic 8-hour MEME events began at the site in November 2019 and continue today.

2.5 SITE CONDITIONS

2.5.1 Soil and Bedrock

Subsurface soil and bedrock were identified from visual inspection during advancement of borings performed during the Preliminary Investigation, Secondary Investigation, and subsequent monitoring well installation activities. The soil generally consists of gravelly clay from beneath concrete/ground surface to dolomite bedrock at depths ranging from approximately 37 feet to 57 feet BGS. Some borings contained several feet of clay and/or silt above bedrock from depths of 33 feet to 57 feet BGS. An air and water-filled void space with free product and petroleum vapors was encountered in bedrock from 60 feet to 64.7 feet BGS at MW-7D and 55.5 feet to 61.5 feet in MW-12V. Beneath this void space at MW-12V from 67 feet to 67.5 feet was a saturated void space containing dark stained clay/mud and

petroleum vapors. The soil and rock are consistent with what is expected to be encountered when associated with the Copper Ridge Dolomite.

An electrical resistivity study was also conducted for geophysical characterization of the subsurface and determination of ideal locations for delineation bedrock wells prior to the well installation. The study revealed karst conditions as expected and the spatial relationships between bedrock and residuum that reduced guess work and bedrock drilling costs.

A representative cross-section of the soil and rock encountered at the site are presented in **Figure 3**, **Geologic Cross-Section A-A'**. Soil boring logs and monitoring well construction logs are provided in **Appendix B**, **Soil Boring Logs/Monitoring Well Construction Logs**.

2.5.2 Groundwater

During the most current groundwater sampling event conducted on November 14, 2019, depth to groundwater in the Type II monitoring wells screened in the residuum ranged from 17.30 feet below top of casing (BTOC) in monitoring well MW-1 to 43.99 feet BTOC in MW-3. Depth to groundwater in the Type III intermediate bedrock wells ranged from 53.75 feet BTOC in MW-9D to 61.16 feet BTOC in MW-7D. The depth to groundwater in the Type III vertical delineation bedrock well MW-12V was 62.03 feet BTOC. Groundwater flow in the residuum appears to be toward the northwest in the area of the UST system and in the area of MW-23, toward the south. Groundwater flow in the bedrock appears to be toward the southwest in the area of the UST system and toward the southeast to the west of the UST system. The hydraulic gradient for the residuum groundwater in the area of the UST pit was estimated to be 0.80 feet per foot (ft/ft). The estimated hydraulic gradient between intermediate bedrock wells MW-9D and MW-7D was 0.06 ft/ft.

Groundwater elevations measured at the site are shown in **Table 1**, **Groundwater Elevation Survey Data, Appendix C, Tables** and in **Figure 4**, **Groundwater Elevation Map – Residuum (November 14, 2019)** and **Figure 5**, **Groundwater Elevation Map – Bedrock (November 14, 2019)**.

2.5.3 COCs in Soil

Free product was not encountered in any of the soil samples collected during the Preliminary Investigation, Secondary Investigation, and subsequent monitoring well installation activities. Results from headspace analyses from all samples to date ranged from 0 parts per million by volume (ppmv) to 100 ppmv. The highest headspace reading (100 ppmv) was measured in boring SB-2 from 9 to 11 feet BGS. Soil boring SB-2 is located just west of the UST pit.

MTBE concentrations were detected in soil samples from borings SB-1, SB-2, and SB-12; however, the concentrations were below approved SSCALs for indoor inhalation and GRP. COC concentrations in the remaining soil samples were below detection limits (BDL). A summary of soil data is presented in **Table 2, Soil Analytical Summary**. The soil data are also presented on **Figure 6, COC Concentrations in Soil**.

2.5.4 COCs in Groundwater

On November 14, 2019, dissolved benzene concentrations exceeded the SSCALs at bedrock wells MW-7D (1.970 mg/L) and MW-12V (0.590 mg/L). The dissolved naphthalene concentration exceeded the SSCAL at bedrock well MW-7D (2.560 mg/L). The horizontal extent of dissolved COCs has been defined except toward the south toward the intersection of 12th Avenue and 31st Street.

Groundwater analytical results are summarized in **Table 3, Groundwater Analytical Summary**. The horizontal extent of dissolved COC impact is shown in the following figures:

- **Figure 7, Dissolved Benzene Isoconcentration Map (November 14, 2019)**
- **Figure 8, Dissolved MTBE Isoconcentration Map (November 14, 2019)**
- **Figure 9, Dissolved Naphthalene Isoconcentration Map (November 14, 2019)**.

2.5.5 Exposure Assessment

An ARBCA Evaluation was completed for the site on March 26, 2018. A detailed exposure assessment was included as part of the evaluation. The exposure assessment considered current and potential future use of the property impacted by COCs and potential impacts to off-site properties.

2.5.6 Site Conceptual Exposure Model

Based on the Site-Conceptual Exposure Model (SCEM) that was completed during the ARBCA Evaluation, the complete routes of exposure have been identified as indoor inhalation of vapors from subsurface soil (for on- and off-site locations) and indoor and outdoor inhalation of vapors from groundwater (for on- and off-site locations). Human receptors considered for the study included commercial worker and construction worker for current and potential future on-site property use and residential child and adult, commercial worker, and construction worker for current and potential future off-site property use.

The routes of exposure through which the selected on- and off-site human receptors could potentially be exposed to COC by current and/or future conditions were selected based on complete pathway(s), presence of a potential receptor, and the presence of COC concentrations above ISLs for soil and/or groundwater.

2.5.7 Potential Migration Pathways

Potential migration pathways identified at the site include underground utilities for water, sanitary sewer, natural gas, fiber optics, and underground electrical lines located on or near the site. UST system components include three 10,000-gallon USTs and associated product transfer lines. There are no other known underground manmade structures, such as basements or accessible utility vaults, on the site. Based on the depth to groundwater, it does not appear that subsurface utilities are at a risk of contact with groundwater during times of higher groundwater elevation. The approximate locations of site utilities are shown on **Figure 2**.

Biological receptors such as plants and animals in the site vicinity do not appear to have been stressed or impacted by the release.

The nearest surface water body is Village Creek located approximately 3,700 feet north-northwest of the site. Surface water runoff from the area ends up in Village Creek, which flows generally toward the west where it ultimately empties into the Locust Fork of the Black Warrior River approximately 17 miles northwest of the site. Based on the overall distance to Village Creek, it is unlikely it has been impacted by a release from the UST system.

Birmingham Water Works provides drinking water to the area. According to information relayed to PPM and as discussed above, there are no public drinking water wells or public drinking water surface intakes located within a 1-mile radius of the site and the site is not located within a Wellhead Protection Area. A door-to-door survey of residences and business within a 1,000-foot radius of the site indicated no private water supply wells.

2.5.8 Potential Drinking Water Receptors

Birmingham Water Works provides drinking water to the area. According to information relayed to PPM and as discussed above, there are no public drinking water wells or public drinking water surface intakes located within a 1-mile radius of the site and the site is not located within a Wellhead Protection Area. A door-to-door survey of residences and business within a 1,000-foot radius of the site indicated no private water supply wells.

The use of private wells in this area is unlikely as commercial and residential developments in the area are connected to city water (Birmingham Water Works). Additionally, the City of Birmingham has an ordinance that prevents installing water wells within the city limits.

2.5.9 Most Stringent Exposure Pathways

SSCALs are comprised of SSTLs and GRP values, each for soil and groundwater. The SSCALs are based on the most stringent pathway for each route of exposure (SSTLs) and select POC (GRP values). These include:

SSTLs for Soil:	Indoor Inhalation – Commercial Worker (Current and Future Conditions On-site and Off-site); and Resident Child (Current and Future Conditions Off-site)
SSTLs for Groundwater:	Indoor Inhalation – Commercial Worker (Current and Future Conditions On-site and Off-site); and Resident Child (Current and Future Conditions Off-site)
GRP Values:	Source soil, source groundwater, and groundwater at each POC. PPM notes that GRP may not be relevant for the release due to the ordinance enacted by the City of Birmingham that prohibits installing a water well within the city limits.

The SSCALs for soil and groundwater are provided in the COC summary tables for soil and groundwater, **Table 2** and **Table 3**, respectively.

3.0 REMEDIAL OBJECTIVES

This CAP has been prepared to achieve the following objectives:

- Remove free product
- Reduce the potential for further migration of dissolved COCs
- Reduce COC concentrations in groundwater to below SSCALs
- Accomplish site objectives in a safe, timely, and cost-effective manner.

4.0 REMEDIAL APPROACH

A CAP Evaluation was conducted to assess remedial strategies that will effectively and efficiently, remove free product and decrease COC concentrations groundwater to below SSCALs established for the site. The CAP Evaluation was submitted to ADEM on August 2, 2019, and recommended RNA monitoring combined with MEME events and potential future air or ozone sparging if needed. ADEM agreed with the recommendation and in correspondence dated January 24, 2020, requested the CAP be prepared for conducting RNA monitoring and MEME events.

The following provides a description of the RNA and MEME approach.

4.1 MEME

MEME is a common remedial technology that has proven to be effective at removing select adsorbed and dissolved phase contaminants from the soil and groundwater. The concept is similar to conventional dual-phase vacuum extraction (DPVE) in that vacuum is applied to a well to facilitate removal of volatile organic compounds (VOCs). This technology involves the application of vacuum to the soil matrix, creating a negative pressure gradient that results in the removal of contaminants from soil and subsequent movement of vapors toward a recovery point. Induced vacuum may be accomplished by means of an appropriately sized blower (regenerative or liquid ring, typical) that is connected to multiple extraction points strategically positioned at key areas within the zone of impact.

Prior experience with similar projects has indicated that MEME technology is successful in removing COC-impact in soil at most UST sites and is somewhat effective at removing COC-impact in groundwater. Soil at the site is primarily gravelly clay, which limits the effectiveness of MEME. However, most COC-impact appears to be present within solution features in the dolomite bedrock where wells are screened for recovery purposes. Nine periodic 8-hour MEME events have been conducted within recovery wells MW-7D and MW-12V, since November 2017. Hydrocarbon recovery data, although limited, indicates greater hydrocarbon recovery rates during times when there are fluctuations in groundwater levels during the transition from rainy to dry seasons. The recovery rate appears greatest following a rise and then fall of the water levels in the bedrock wells. Because of lower dissolved COC concentrations and the cost effectiveness of the technology, MEME events are considered a feasible approach for the site.

4.2 RNA

RNA is a term applied to the natural processes that help reduce contaminant concentrations and, in some cases, reduce the potential for contaminant migration. There are multiple components that comprise natural attenuation including: biodegradation; sorption; dispersion and dilution; and volatilization. Biodegradation is often considered the most important component of RNA as it results in chemical changes to the contaminant often rendering it less harmful to the environment. RNA is often augmented by use of MEME events to aid in source removal.

RNA is typically not considered for sites with elevated petroleum concentrations or free product, as it will generally not achieve site objectives within a reasonable timeframe. However, RNA is often selected for sites with low to moderate impact that show indications that it may be effective as a standalone technology or in conjunction with other remedial methods that address contaminant source control.

Because dissolved COC concentrations appear to be stable and are relatively low, an RNA monitoring program may be successful at the site. RNA supplemented with MEME events and potentially mobile air sparge events would not only reduce the overall contaminant mass, but would also create conditions conducive to microbial activity.

RNA monitoring combined with MEME events and/or short-term duration ozone sparge events appear to be the best alternative for remediating soil and groundwater at the site. Initially, RNA and MEME events can be implemented. Ozone sparging can be implemented in the event that MEME events appear insufficient for timely remediation of impacted media. If ozone sparging is implemented, an Underground Injection Control (UIC) permit would be required and preferably sparge wells would be installed in strategic locations of the site. Additionally, an electrical power connection would need to be installed for the short-term duration ozone sparging.

4.3 ANTICIPATED SITE RESPONSE

PPM anticipates that MEME combined with RNA groundwater monitoring will enhance the site cleanup; however, it is difficult to quantitatively predict the clean-up time. With that being said, PPM anticipates one to three years to reduce dissolved COC concentrations to below SSCALs.

5.0 PROPOSED SCOPE OF WORK

The scope of work for the proposed corrective action consists of the following activities on a quarterly basis:

- Performance of quarterly 8-hour MEME events as needed to reduce petroleum hydrocarbons
- Completion of quarterly groundwater elevation surveys
- Collection of groundwater samples on a quarterly basis from site wells for analysis of COCs per Environmental Protection Agency (EPA) Method 8260
- Disposal of accumulated purge water and water recovered from the MEME events
- Preparation of quarterly RNA groundwater monitoring reports that present the findings and conclusions from the MEME event and sampling event as well as recommendations for any further actions.

Field activities will be conducted in general accordance with PPM's Quality Assurance/Quality Control (QA/QC) Plan for groundwater sampling consistent with EPA/ADEM protocol. No deviation from the proposed scope of work will be made without approval from ADEM.

6.0 FIELDWORK METHODOLOGY

The following provides a detailed description of the investigative methodology to be employed during the completion of the proposed scope of work.

6.1 MEME EVENTS

To reduce adsorbed and dissolved COC concentrations at the site, one 8-hour MEME event will be conducted per quarter as needed.

A representative of PPM will be on site during the MEME event, which will be conducted by Fruits & Associates, Inc. utilizing a vacuum truck equipped with a thermal oxidizer. The thermal oxidizer will be used to treat off-gases prior to release to the atmosphere. Jefferson

County will be notified prior to initiating MEME events at the site. The MEME events will concentrate at extracting impact primarily from monitoring wells MW-7D and MW-12V.

Groundwater levels will be measured at select well locations prior to initiating each MEME event to establish static conditions for comparison to conditions observed during the event. Vacuum gauges will be installed in the flexible 2-inch hoses that connect the wellheads to the vacuum pump. A gate valve will control the applied vacuum to the extraction point. Airflow rates, VOC concentrations, and applied vacuum will be measured periodically throughout the event. Field measurements will be used to evaluate the site response to treatment and estimate the pounds of hydrocarbons removed throughout the operating period. Locations containing free product and/or exhibiting COC concentrations above SSCALs will be the primary recovery points. Other locations may be selected based on existing COC data.

The duration/frequency of the MEME events can be modified, with ADEM approval, based on results of subsequent groundwater sampling activities.

6.2 GROUNDWATER ELEVATION SURVEY

Site depth to groundwater and groundwater flow direction will be estimated through a groundwater elevation survey that will be conducted prior to groundwater sampling. Depth to groundwater measurements will be accomplished with an oil/water interface probe capable of measuring the water depth to within +/- 0.01 feet. The interface probe will be cleaned prior to use at each well location by means of a phosphate free soap rinse, an isopropyl rinse, and a rinse of distilled water. Rinse fluids will be discharged to the land surface in areas that do not drain back to the respective well locations.

Groundwater depths will be measured in each accessible well from a point on the north side of the top of casing using the interface probe. The well casing elevations and groundwater depths will be used to calculate groundwater elevations and flow direction. In addition, groundwater depths will be used to calculate well-casing volumes prior to well purging activities.

6.3 GROUNDWATER SAMPLING

Monitoring wells will be sampled quarterly in general accordance with PPM's internal QA/QC plan. Full scope sampling will be conducted during one quarter each year and limited sampling will be conducted during the remaining three quarters. Groundwater sampling will occur approximately one month prior to the 8-hour MEME event to be conducted at the site. Prior to sampling, each well will be purged of approximately three well-casing volumes (or to

near dryness) in an effort to obtain samples representative of subsurface conditions. Single use, disposable polyvinyl chloride (PVC) bailers, and nylon rope will be used to purge each well and to facilitate sample collection. Purge water from all wells will be temporarily stored in drums and removed from the site during the subsequent 8-hour MEME event. Fruits & Associates, Inc. will transport the water to Sunoco, LLC in Birmingham, Alabama for final disposal.

Each sample will be transferred from the bailer into 40-milliliter (ml) glass vials containing hydrochloric acid (HCl) as a preservative. Each container will be filled with the sample, promptly capped, and appropriately labeled to indicate the sample origin. Containers will be subsequently placed in an iced cooler for preservation during shipment to the laboratory. A duplicate sample will be collected from one well in accordance with QA/QC protocol.

Disposable nitrile gloves will be worn during each well purge and sample collection in an effort to reduce the potential for cross-contamination. Gloves will be changed and discarded between each sample acquisition.

6.4 SAMPLE PRESERVATION AND DISPATCH

Groundwater samples retained for laboratory analyses will be promptly placed on ice and cooled to or near 4 degrees Celsius (^{o}C). The samples will be labeled to document the appropriate project information. Samples will be sealed within insulated coolers and transported (via common courier or PPM) under chain-of-custody protocol to an independent laboratory for analysis.

6.5 LABORATORY ANALYSES

Groundwater samples collected during each sampling event will be analyzed for BTEX, MTBE, and naphthalene per EPA Method 8260.

7.0 REPORTING

Quarterly RNA monitoring reports will be prepared and submitted within approximately 45 days of each MEME event. Reports will include a detailed description of the work performed during the MEME events and groundwater sampling events and a summary of the associated findings. Current and historical groundwater elevation and analytical data will be presented in summary tables. In addition, figures will be provided indicating the apparent direction of groundwater flow and estimated extent of COC impact. The report will be reviewed by an

engineer or geologist experienced in conducting subsurface environmental investigations and corrective actions.

8.0 SITE HEALTH AND SAFETY

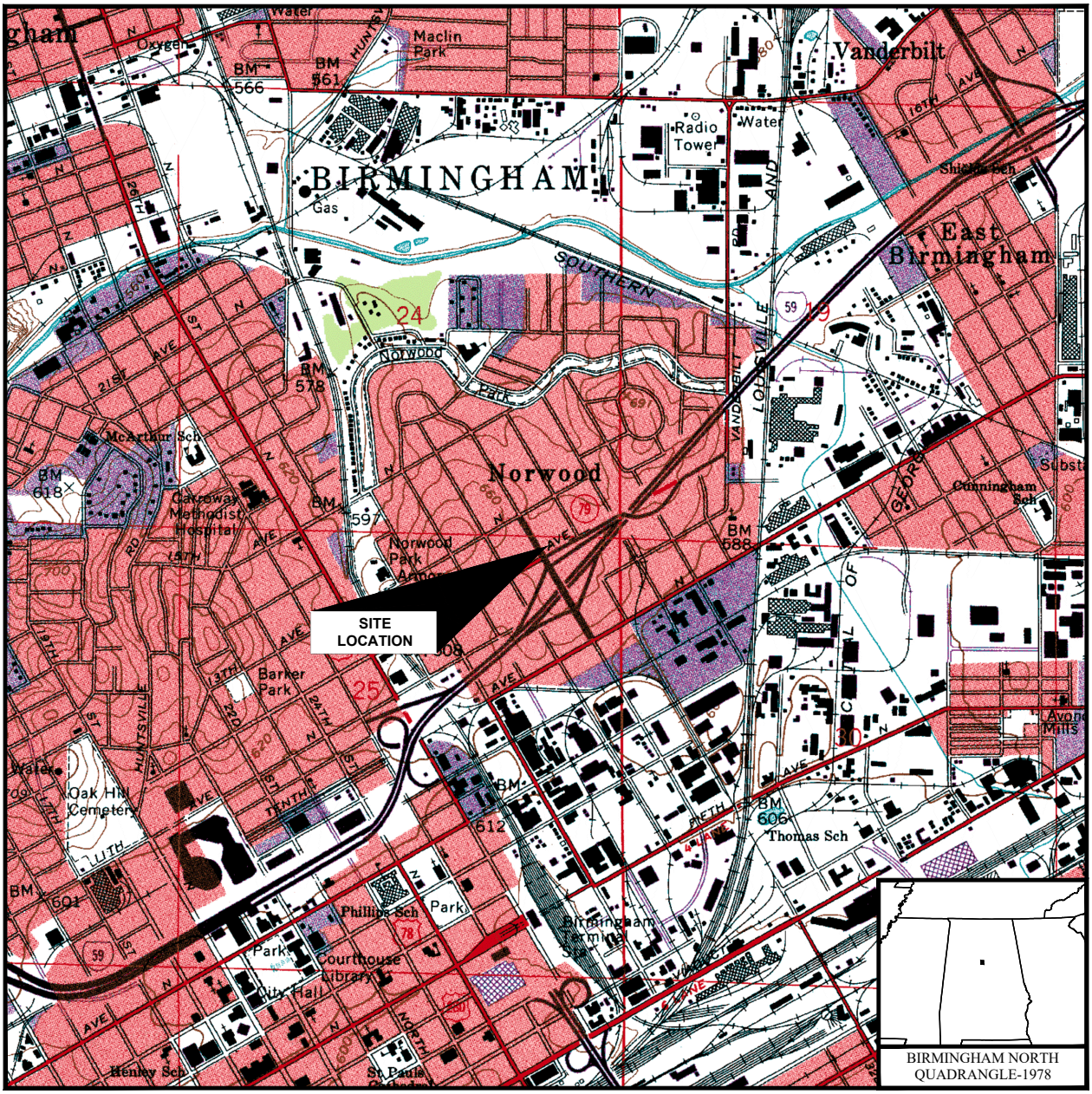
A site-specific Health and Safety Plan (HASP) for the proposed corrective action activities at the facility is included in **Appendix D, Site Health and Safety Plan**. The HASP was specifically designed to address the proposed activities at the site. All project personnel will be familiar with the HASP, and the HASP will be kept on site during field operations.

9.0 PROJECT SCHEDULE

PPM proposes to conduct the MEME events and effectiveness monitoring on a quarterly basis for at least one year or until COC concentrations at the facility remain at or below SSCALs for two consecutive quarterly periods. Groundwater sampling will be conducted approximately one month prior to the MEME event. Quarterly RNA monitoring groundwater sampling events are already approved through September 2020. After the CAP is approved, PPM will submit additional cost proposals to continue quarterly RNA and MEME beyond September 2020, as needed. If at any time during these activities it is deemed necessary to perform additional efforts, PPM will contact ADEM to discuss and subsequently submit an addendum request or new cost proposals to perform the additional work.

APPENDICES

APPENDIX A – FIGURES



SCALE: 1 : 24,000

1 .5 0 1
MILES

1000 0 1000 5000 10,000
FEET

1 0 KILOMETER 1 2
1000 0 METER 1000 2000

N

PPM CONSULTANTS, INC. www.ppmco.com		QA & AAA, INC. **31ST STREET TEXACO** 3100 12TH AVENUE NORTH BIRMINGHAM, ALABAMA	SITE LOCATION MAP
DRAWN BY: BWH	DRAWN DATE: 03/24/20		FIGURE NUMBER 1
PROJECT NUMBER: 460102	PHASE: CAPD		

N

0 15 30

SCALE: 1"=30'
(Approximate)

NORWOOD SEVENTH-DAY ADVENTIST

LEWIE'S APPLIANCE

STORE

SB-9D/ MW-9D

SB-9/ MW-9

POWER METER

SB-8D/ MW-8D

DUMPSTER

CONCRETE SIDEWALK

31ST STREET NORTH

PROPERTY BOUNDARY

SB-5/ MW-5

DISPENSER ISLANDS

CANOPY

SB-4/ MW-4

SB-6/ MW-6

FIBER OPTIC MANHOLE

SB-7D/ MW-7D

SB-2/ MW-2

UST PIT

SB-10D/ MW-10D

SB-12V/ MW-12V

SB-1/ MW-1

PAY PHONE

SB-3/ MW-3

SIGN

SB-11D/ MW-11D

SB-11/ MW-11

12TH AVENUE NORTH

LEWIE'S APPLIANCE SALES AND SERVICE

LEGEND:

- SOIL BORING / TYPE II MONITORING WELL LOCATION
- SOIL BORING / TYPE III MONITORING WELL LOCATION
- P — OVERHEAD POWER LINE
- UE — UNDERGROUND POWER LINE
- FO — FIBER OPTIC LINE
- W — WATER LINE
- G — NATURAL GAS LINE
- SS — SANITARY SEWER LINE
- X — FENCE
- ? — UNKNOWN LINE
- POWER POLE
- LIGHT POLE
- SANITARY SEWER MANHOLE

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PROJECT NUMBER: 460102	PHASE: CAPD

QA & AAA, INC.
31ST STREET TEXACO
3100 12TH AVENUE NORTH
BIRMINGHAM, ALABAMA

SITE MAP

FIGURE NUMBER
2

LEGEND:

- CLAYEY SILT
- GRAVELLY CLAY / CLAY
- DOLOMITE BEDROCK
- ASPHALT
- CONCRETE
- TOP SOIL

TOC=649.46 TOP OF CASING (ft.)

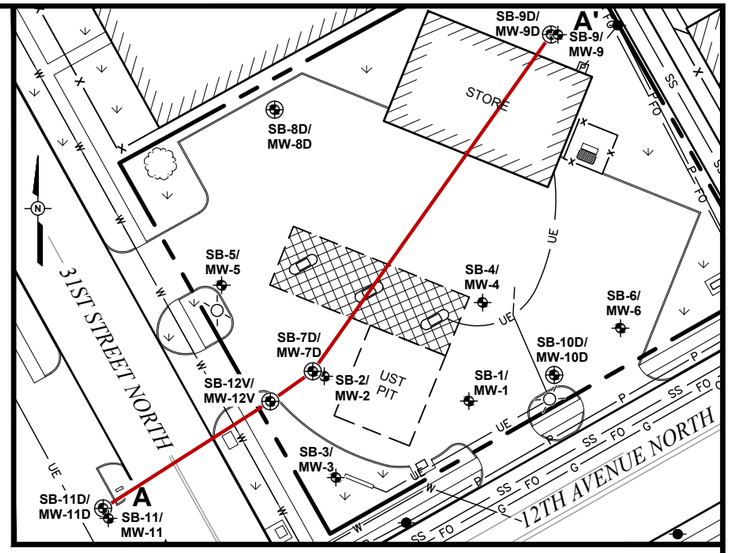
SE=649.8 SURFACE ELEVATION (ft.)

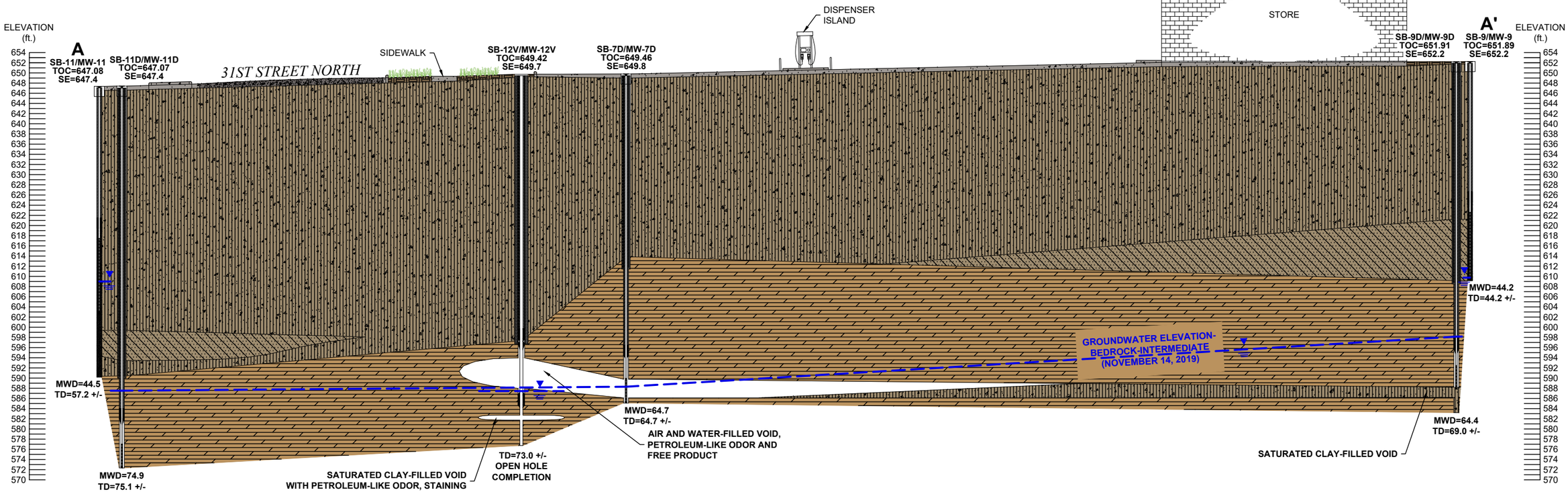
TD=64.7 +/- TOTAL DEPTH OF BORING (ft.)

MWD=64.7 MEASURED WELL DEPTH (ft.)

SCREENED INTERVAL W/SUMP

HORIZ. SCALE: 1"=20'
VERT. SCALE: 1"=20'





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DRAWN BY:	DRAWN DATE:
BWH	03/24/20
PROJECT NUMBER:	PHASE:
460102	CAPD

QA & AAA, INC.
31ST STREET TEXACO
3100 12TH AVENUE NORTH
BIRMINGHAM, ALABAMA

GEOLOGIC CROSS-SECTION
A-A'

FIGURE NUMBER
3

N

0 15 30

SCALE: 1"=30'
(Approximate)

NORWOOD SEVENTH-DAY ADVENTIST

LEWIE'S APPLIANCE

STORE

CANOPY

CONCRETE SIDEWALK

31ST STREET NORTH

12TH AVENUE NORTH

LEWIE'S APPLIANCE SALES AND SERVICE

UST PIT

MW-8D

MW-9D

MW-9
<608.3

MW-5
<606.7

MW-4
627.19

MW-6
628.66

MW-7D

MW-2
<612.9

MW-12V

MW-10D

MW-1
632.70

MW-3
604.84

MW-11D

MW-11
609.00

630.00
625.00
620.00
615.00
610.00
605.00

LEGEND:

- TYPE II MONITORING WELL LOCATION
- TYPE III MONITORING WELL LOCATION
- 632.70 GROUNDWATER ELEVATION (ft.)
- 605.00 GROUNDWATER ELEVATION CONTOUR (ft.)
- GROUNDWATER FLOW DIRECTION

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DRAWN BY: BWH	DRAWN DATE: 03/24/20
PROJECT NUMBER: 460102	PHASE: CAPD

QA & AAA, INC.
31ST STREET TEXACO
3100 12TH AVENUE NORTH
BIRMINGHAM, ALABAMA

GROUNDWATER ELEVATION MAP - RESIDUUM
(NOVEMBER 14, 2019)

FIGURE NUMBER
4

N

0 15 30

SCALE: 1"=30'
(Approximate)

NORWOOD SEVENTH-DAY ADVENTIST

LEWIE'S APPLIANCE

31ST STREET NORTH

CONCRETE SIDEWALK

STORE

CANOPY

UST PIT

12TH AVENUE NORTH

LEWIE'S APPLIANCE SALES AND SERVICE

MW-9D 598.16
MW-9
MW-8D 594.41
MW-5
MW-4
MW-6
MW-7D 588.30
MW-2
MW-1
MW-10D 591.83
MW-12V 587.39
MW-3
MW-11D 587.57
MW-11

598.00
597.00
596.00
595.00
594.00
593.00
592.00
591.00
590.00
589.00
588.00

LEGEND:

- TYPE II MONITORING WELL LOCATION
- TYPE III MONITORING WELL LOCATION
- 588.30 GROUNDWATER ELEVATION (ft.)
- 588.00 GROUNDWATER ELEVATION CONTOUR (ft.)
- GROUNDWATER FLOW DIRECTION

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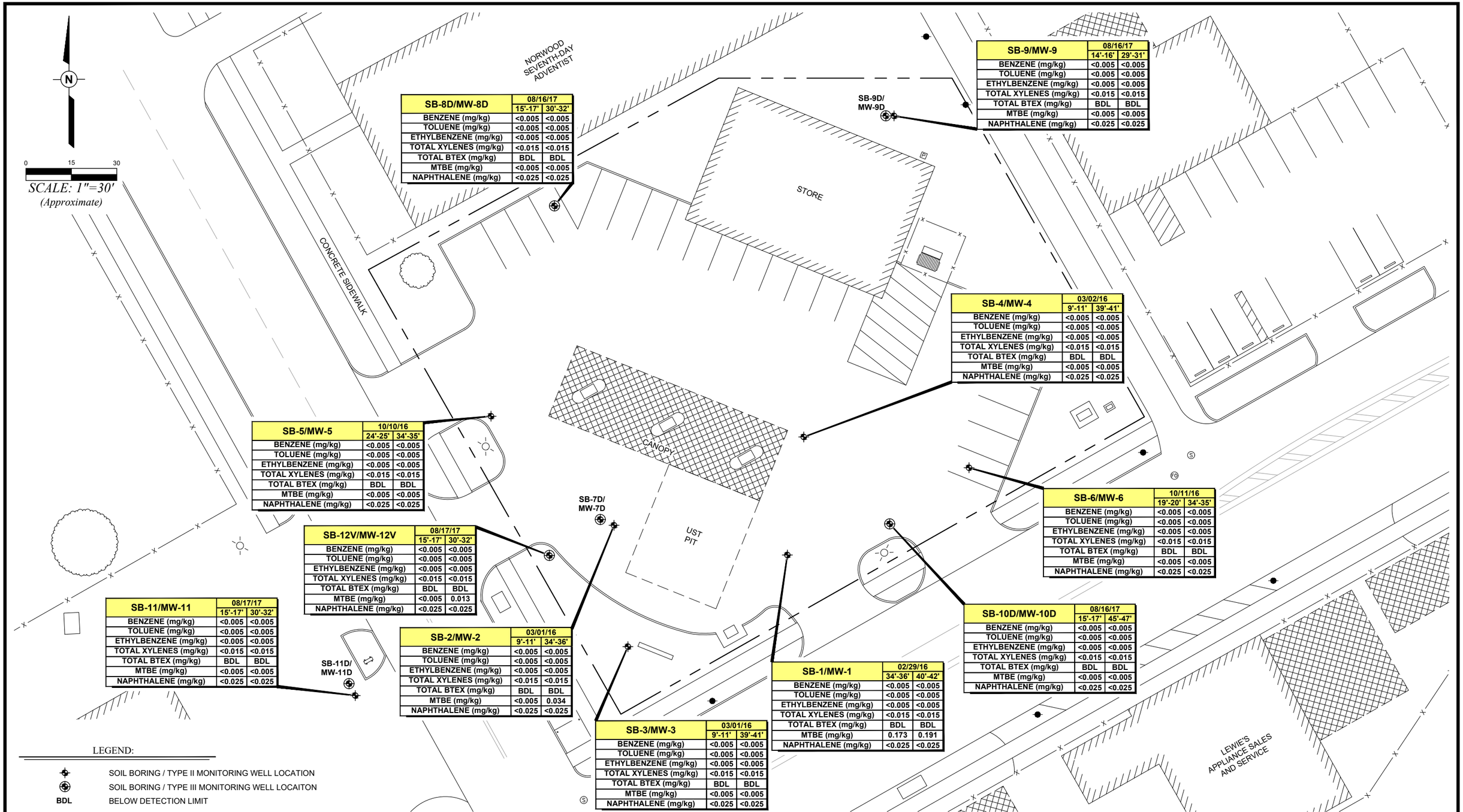
DRAWN BY: BWH	DRAWN DATE: 03/24/20
PROJECT NUMBER: 460102	PHASE: CAPD

QA & AAA, INC.
31ST STREET TEXACO
3100 12TH AVENUE NORTH
BIRMINGHAM, ALABAMA

GROUNDWATER ELEVATION MAP - BEDROCK
(NOVEMBER 14, 2019)

FIGURE NUMBER
5



SB-8D/MW-8D	08/16/17	
	15'-17'	30'-32'
BENZENE (mg/kg)	<0.005	<0.005
TOLUENE (mg/kg)	<0.005	<0.005
ETHYLBENZENE (mg/kg)	<0.005	<0.005
TOTAL XYLENES (mg/kg)	<0.015	<0.015
TOTAL BTEX (mg/kg)	BDL	BDL
MTBE (mg/kg)	<0.005	<0.005
NAPHTHALENE (mg/kg)	<0.025	<0.025

SB-9/MW-9	08/16/17	
	14'-16'	29'-31'
BENZENE (mg/kg)	<0.005	<0.005
TOLUENE (mg/kg)	<0.005	<0.005
ETHYLBENZENE (mg/kg)	<0.005	<0.005
TOTAL XYLENES (mg/kg)	<0.015	<0.015
TOTAL BTEX (mg/kg)	BDL	BDL
MTBE (mg/kg)	<0.005	<0.005
NAPHTHALENE (mg/kg)	<0.025	<0.025

SB-4/MW-4	03/02/16	
	9'-11'	39'-41'
BENZENE (mg/kg)	<0.005	<0.005
TOLUENE (mg/kg)	<0.005	<0.005
ETHYLBENZENE (mg/kg)	<0.005	<0.005
TOTAL XYLENES (mg/kg)	<0.015	<0.015
TOTAL BTEX (mg/kg)	BDL	BDL
MTBE (mg/kg)	<0.005	<0.005
NAPHTHALENE (mg/kg)	<0.025	<0.025

SB-5/MW-5	10/10/16	
	24'-25'	34'-35'
BENZENE (mg/kg)	<0.005	<0.005
TOLUENE (mg/kg)	<0.005	<0.005
ETHYLBENZENE (mg/kg)	<0.005	<0.005
TOTAL XYLENES (mg/kg)	<0.015	<0.015
TOTAL BTEX (mg/kg)	BDL	BDL
MTBE (mg/kg)	<0.005	<0.005
NAPHTHALENE (mg/kg)	<0.025	<0.025

SB-6/MW-6	10/11/16	
	19'-20'	34'-35'
BENZENE (mg/kg)	<0.005	<0.005
TOLUENE (mg/kg)	<0.005	<0.005
ETHYLBENZENE (mg/kg)	<0.005	<0.005
TOTAL XYLENES (mg/kg)	<0.015	<0.015
TOTAL BTEX (mg/kg)	BDL	BDL
MTBE (mg/kg)	<0.005	<0.005
NAPHTHALENE (mg/kg)	<0.025	<0.025

SB-12V/MW-12V	08/17/17	
	15'-17'	30'-32'
BENZENE (mg/kg)	<0.005	<0.005
TOLUENE (mg/kg)	<0.005	<0.005
ETHYLBENZENE (mg/kg)	<0.005	<0.005
TOTAL XYLENES (mg/kg)	<0.015	<0.015
TOTAL BTEX (mg/kg)	BDL	BDL
MTBE (mg/kg)	<0.005	0.013
NAPHTHALENE (mg/kg)	<0.025	<0.025

SB-11/MW-11	08/17/17	
	15'-17'	30'-32'
BENZENE (mg/kg)	<0.005	<0.005
TOLUENE (mg/kg)	<0.005	<0.005
ETHYLBENZENE (mg/kg)	<0.005	<0.005
TOTAL XYLENES (mg/kg)	<0.015	<0.015
TOTAL BTEX (mg/kg)	BDL	BDL
MTBE (mg/kg)	<0.005	<0.005
NAPHTHALENE (mg/kg)	<0.025	<0.025

SB-2/MW-2	03/01/16	
	9'-11'	34'-36'
BENZENE (mg/kg)	<0.005	<0.005
TOLUENE (mg/kg)	<0.005	<0.005
ETHYLBENZENE (mg/kg)	<0.005	<0.005
TOTAL XYLENES (mg/kg)	<0.015	<0.015
TOTAL BTEX (mg/kg)	BDL	BDL
MTBE (mg/kg)	<0.005	0.034
NAPHTHALENE (mg/kg)	<0.025	<0.025

SB-3/MW-3	03/01/16	
	9'-11'	39'-41'
BENZENE (mg/kg)	<0.005	<0.005
TOLUENE (mg/kg)	<0.005	<0.005
ETHYLBENZENE (mg/kg)	<0.005	<0.005
TOTAL XYLENES (mg/kg)	<0.015	<0.015
TOTAL BTEX (mg/kg)	BDL	BDL
MTBE (mg/kg)	<0.005	<0.005
NAPHTHALENE (mg/kg)	<0.025	<0.025

SB-1/MW-1	02/29/16	
	34'-36'	40'-42'
BENZENE (mg/kg)	<0.005	<0.005
TOLUENE (mg/kg)	<0.005	<0.005
ETHYLBENZENE (mg/kg)	<0.005	<0.005
TOTAL XYLENES (mg/kg)	<0.015	<0.015
TOTAL BTEX (mg/kg)	BDL	BDL
MTBE (mg/kg)	0.173	0.191
NAPHTHALENE (mg/kg)	<0.025	<0.025

SB-10D/MW-10D	08/16/17	
	15'-17'	45'-47'
BENZENE (mg/kg)	<0.005	<0.005
TOLUENE (mg/kg)	<0.005	<0.005
ETHYLBENZENE (mg/kg)	<0.005	<0.005
TOTAL XYLENES (mg/kg)	<0.015	<0.015
TOTAL BTEX (mg/kg)	BDL	BDL
MTBE (mg/kg)	<0.005	<0.005
NAPHTHALENE (mg/kg)	<0.025	<0.025

PPM CONSULTANTS, INC. www.ppmco.com		QA & AAA, INC. **31ST STREET TEXACO** 3100 12TH AVENUE NORTH BIRMINGHAM, ALABAMA	FIGURE NUMBER 6
DRAWN BY: BWH	DRAWN DATE: 03/24/20		
PROJECT NUMBER: 460102	PHASE: CAPD	COC CONCENTRATIONS IN SOIL	

N

0 15 30

SCALE: 1"=30'
(Approximate)

NORWOOD SEVENTH-DAY ADVENTIST

LEWIE'S APPLIANCE

STORE

CANOPY

UST PIT

CONCRETE SIDEWALK

31ST STREET NORTH

12TH AVENUE NORTH

LEWIE'S APPLIANCE SALES AND SERVICE

MW-9D <0.001
MW-9 DRY
MW-8D <0.001
MW-5 DRY
MW-4 <0.001
MW-6 <0.001
MW-10D <0.001
MW-7D 1.970
MW-2 DRY
MW-1 0.004
MW-12V 0.590
MW-3 0.025
MW-11D <0.001
MW-11 0.018

0.005
0.1
1.0

LEGEND:

- TYPE II MONITORING WELL LOCATION
- TYPE III MONITORING WELL LOCATION
- 1.970 — BENZENE CONCENTRATION (mg/L) (VALUE IN RED EXCEEDS ISL)
- 0.005 — BENZENE CONCENTRATION CONTOUR-RESIDUUM AND BEDROCK (mg/L)
- 0.1 — BENZENE CONCENTRATION CONTOUR-BEDROCK (mg/L)

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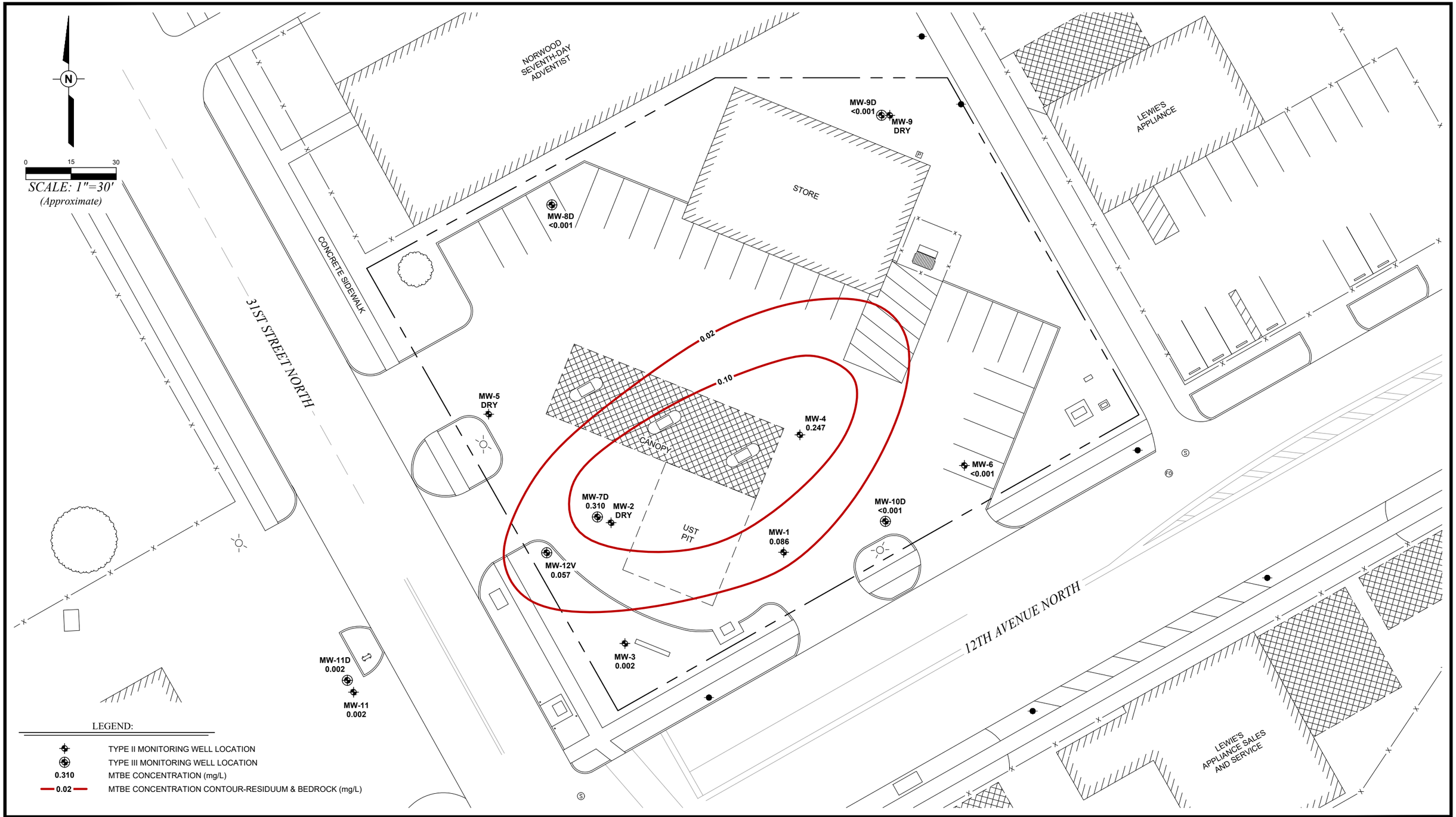
DRAWN BY:	DRAWN DATE:
BWH	03/24/20
PROJECT NUMBER:	PHASE:
460102	CAPD

QA & AAA, INC.
31ST STREET TEXACO
3100 12TH AVENUE NORTH
BIRMINGHAM, ALABAMA

DISSOLVED BENZENE ISOCONCENTRATION MAP (NOVEMBER 14, 2019)

FIGURE NUMBER
7



PPM CONSULTANTS, INC. www.ppmco.com	QA & AAA, INC. **31ST STREET TEXACO** 3100 12TH AVENUE NORTH BIRMINGHAM, ALABAMA	DISSOLVED MTBE ISOCONCENTRATION MAP (NOVEMBER 14, 2019)	FIGURE NUMBER 8
DRAWN BY: BWH / DRAWN DATE: 03/24/20			
PROJECT NUMBER: 460102 / PHASE: CAPD			

N

0 15 30

SCALE: 1"=30'
(Approximate)

NORWOOD SEVENTH-DAY ADVENTIST

LEWIE'S APPLIANCE

STORE

CONCRETE SIDEWALK

31ST STREET NORTH

12TH AVENUE NORTH

CANOPY

UST PIT

MW-9D <0.005
MW-9 DRY
MW-8D <0.005
MW-5 DRY
MW-4 <0.005
MW-6 <0.005
MW-10D <0.005
MW-7D 2.560
MW-2 DRY
MW-12V 0.296
MW-1 <0.005
MW-3 <0.005
MW-11D <0.005
MW-11 <0.005

0.02
0.10
1.0

LEWIE'S APPLIANCE SALES AND SERVICE

LEGEND:

- TYPE II MONITORING WELL LOCATION
- TYPE III MONITORING WELL LOCATION
- 2.560 — NAPHTHALENE CONCENTRATION (mg/L) (VALUE IN RED EXCEEDS ISL)
- 0.02 — NAPHTHALENE CONCENTRATION CONTOUR-BEDROCK (mg/L)

PPM CONSULTANTS, INC. www.ppmco.com	
DRAWN BY: BWH	DRAWN DATE: 03/24/20
PROJECT NUMBER: 460102	PHASE: CAPD

QA & AAA, INC.
31ST STREET TEXACO
3100 12TH AVENUE NORTH
BIRMINGHAM, ALABAMA

DISSOLVED NAPHTHALENE ISOCONCENTRATION MAP (NOVEMBER 14, 2019)

FIGURE NUMBER
9

APPENDIX B – SOIL BORING LOGS/MONITORING WELL CONSTRUCTION LOGS

LOG OF BORING: SB-1/MW-1

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-PI
Project Type:	Preliminary Investigation

Boring Information:

Date / Time:	2/29/16 / 9:50
Logged By:	Andrew Paradis
Drilling Company / Driller:	Tri-State
Drilling Method:	HSA
Total Boring Depth:	44.9 ft BGS
Initial Saturation (ft)/Date:	42.0 ft BGS (2/29/16)
Static GW level (ft)/Date:	23.52 ft BTOC (3/9/16)
Surface Elevation (ft):	650.3 ft
Sampling Interval:	Continuous

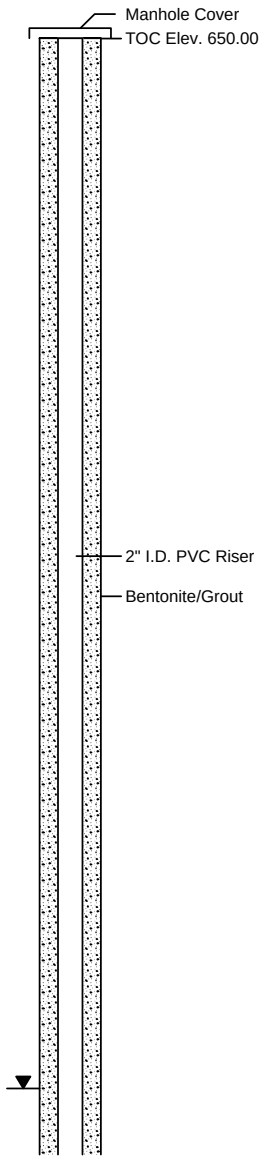
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	3/2/16
Total Well Depth:	44.80 ft BTOC
Screened Interval:	29.8 ft - 44.4 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Sub pump
Gallons Purged:	24 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.650.3	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	Depth in Feet
0	650		ML		CLAYEY SILT, moderately plastic, soft, homogenous, moist, tan to brown, gravel-sized chert	1	N/A	N/A	N/A	0
					CLAYEY SILT, moderately plastic, soft, homogenous, moist, tan to brown, light gravel-sized chert	2	N/A	0	100%	
5	645		SC		CLAYEY SAND, low plastic, very soft, homogneous, poorly graded, medium grained, dense, subangular, moist, tan/light tan, no chert	3	N/A	0	100%	5
			ML		CLAYEY SILT, moderately plastic, soft, homogneous, moist, tan to brown	4	N/A	0	100%	
10	640		CL		CLAY, highly plastic, soft, mottled, moist, brown to red, and tan mottled	5	N/A	0	<10%	10
					CLAY, highly plastic, soft, mottled, moist, brown to red, poor recovery					
					CLAY, highly plastic, firm, mottled, moist, red to brown, abundant chert	6	N/A	0	100%	
15	635				No recovery	7	N/A	0	N/A	15
			CL		CLAY, moderately plastic, firm, mottled, moist, brown, and tan mottled	8	N/A	0	100%	
			ML		CLAYEY SILT, moderately plastic, very soft, homogenous, mosit, tan to brown	9	N/A	0	100%	
20	630		CL		CLAY, highly plastic, firm, mottled, moist, red to brown	10	N/A	0	50%	20
		▼			CLAY, highly plastic, firm, mottled, moist, red to brown, poor recovery	11	N/A	0	<10%	
25					CLAY, highly plastic, firm, mottled, moist, reddish brown, tan, and orange mottled	12	N/A	0	100%	25

Well Schematic: MW-1



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

05-04-2016 C:\Program Files\mtech2012\Boring Log files\460102-PI\MW-1.bor

LOG OF BORING: SB-1/MW-1

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-PI
Project Type:	Preliminary Investigation

Boring Information:

Date / Time:	2/29/16 / 9:50
Logged By:	Andrew Paradis
Drilling Company / Driller:	Tri-State
Drilling Method:	HSA
Total Boring Depth:	44.9 ft BGS
Initial Saturation (ft)/Date:	42.0 ft BGS (2/29/16)
Static GW level (ft)/Date:	23.52 ft BTOC (3/9/16)
Surface Elevation (ft):	650.3 ft
Sampling Interval:	Continuous

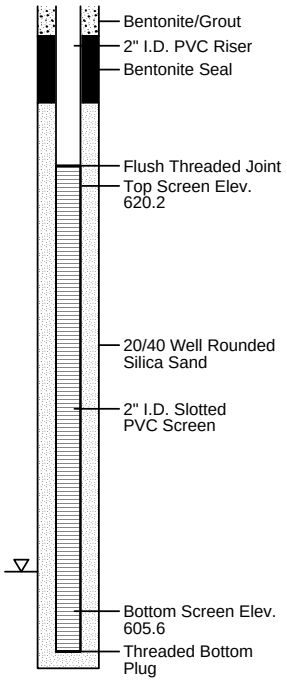
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	3/2/16
Total Well Depth:	44.80 ft BTOC
Screened Interval:	29.8 ft - 44.4 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Sub pump
Gallons Purged:	24 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.650.3	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery
25	625				CLAY, highly plastic, firm, mottled, moist, red to brown	12	N/A	0	100%
					CLAY, highly plastic, firm, mottled, moist, red to brown	13	N/A	0	25%
						14	N/A	0	100%
30	620		CL		CLAY, highly plastic, hard, mottled, moist, red to brown, fine grain chert gravel	15	N/A	0	50%
					CLAY, highly plastic, very hard, mottled, moist, brown to red, ~8" push	16	N/A	0	<10%
					CLAY, highly plastic, hard, mottled, moist, brown to red, fine grained chert gravel	17	N/A	0*	100%
35	615				CLAY, highly plastic, firm, mottled, moist, red to brown, very poor recovery, gravel-sized dolomite	18	N/A	0	<10%
					No recovery	19	20	0	<10%
40	610	▽	CL		CLAY, highly plastic, very hard, mottled, moist, brown to red, abundant fine chert gravel	20	N/A	0*	25%
					CLAY, moderately plastic, firm, homogenous, saturated, brown to red, fine chert gravel	21	N/A	0	100%
45	605				*(Boring terminated @ 44.8 ft BGS)*				
50	600								
55									

Well Schematic: MW-1



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

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LOG OF BORING: SB-2/MW-2

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-PI
Project Type:	Preliminary Investigation

Boring Information:

Date / Time:	3/1/16 / 8:50
Logged By:	Andrew Paradis
Drilling Company / Driller:	Tri-State
Drilling Method:	HSA
Total Boring Depth:	37.0 ft BGS
Initial Saturation (ft)/Date:	NA
Static GW level (ft)/Date:	34.85 ft BTOC (3/9/16)
Surface Elevation (ft):	649.9 ft
Sampling Interval:	5'

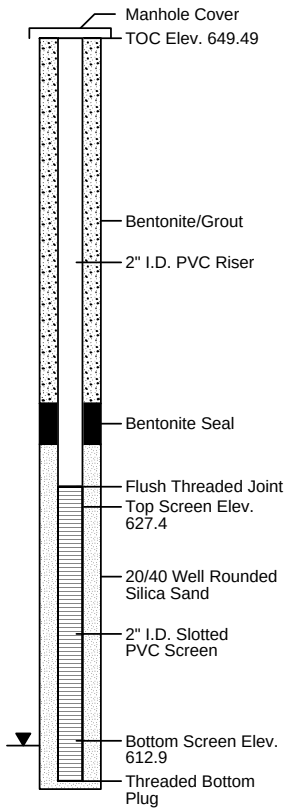
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	3/2/16
Total Well Depth:	37.06 ft BTOC
Screened Interval:	22.1 ft - 36.6 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	NA
Gallons Purged:	NA

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.649.9	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	Depth in Feet
0	649				CLAYEY SILT, low plastic, soft, homogenous, moist, brown to red, abundant chert gravel	1	N/A	0	N/A	0
5	644		ML		CLAYEY SILT, low plastic, soft, homogenous, moist, red to brown, light chert	2	N/A	55	100%	5
10	639		CL		CLAY, moderately plastic, firm, mottled, moist, reddish brown, orange, and tan mottled	3	N/A	100*	100%	10
15	634				No recovery	4	N/A	0	N/A	15
20	629				CLAY, moderately plastic, firm, mottled, red to brown, poor recovery, headspace only	5	N/A	15	<10%	20
25	624		CL		CLAY, moderately plastic, firm, mottled, moist, red to brown, chert	6	N/A	5	25%	25
30	619				CLAY, moderately plastic, firm, mottled, moist, abundant chert, red and dark orange mottled	7	N/A	0	25%	30
35	614	▼	ML		CLAY, highly plastic, firm, homogenous, moist, red to orange	8	N/A	15*	50%	35
			CL		SILT, very soft, homogenous, moist, tan to white					
					CLAY, highly plastic, firm, homogenous, moist, red to orange					
40	609				*(Auger refusal @ 37.0 ft BGS)*					40
45	604									45
50	599									50
55										55

Well Schematic: MW-2



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

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LOG OF BORING: SB-3/MW-3

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-PI
Project Type:	Preliminary Investigation

Boring Information:

Date / Time:	3/1/16 / 13:17
Logged By:	Andrew Paradis
Drilling Company / Driller:	Tri-State
Drilling Method:	HSA
Total Boring Depth:	45.2 ft BGS
Initial Saturation (ft)/Date:	39 ft BGS (3/1/16)
Static GW level (ft)/Date:	38.92 ft BTOC (3/9/16)
Surface Elevation (ft):	649.1 ft
Sampling Interval:	5'

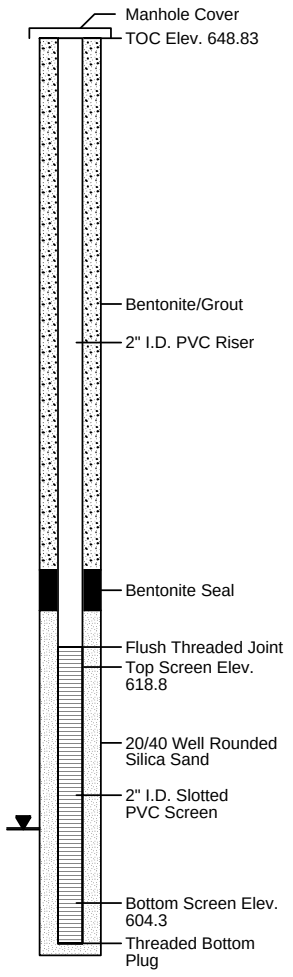
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	3/4/16
Total Well Depth:	45.00 ft BTOC
Screened Interval:	30.0 ft - 44.6 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Bailer
Gallons Purged:	0.75 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.649.1	USCS	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	DESCRIPTION
0	649						
			1	N/A	0	N/A	CLAYEY SILT, low plastic, very soft, mottled, moist to wet, dark tan to brown, fill with foundry slag
5	644		2	N/A	0	100%	CLAYEY SILT, low plastic, very soft, mottled, moist to wet, dark tan to brown, fill with iron nodules
		ML					
10	639		3	N/A	0*	100%	CLAYEY SILT, moderately plastic, firm, mottled, moist, orange to red, and tan mottled
15	634		4	N/A	0	100%	CLAY, moderately plastic, firm, mottled, moist, red to orange, with light chert gravel
20	629		5	N/A	0	100%	CLAY, moderately plastic, firm, mottled, moist, red with orange mottling, with light chert
25	624		6	N/A	0	100%	CLAY, moderately plastic, very hard, mottled, moist, red with orange mottling, abundant chert
		CL					
30	619		7	N/A	0	100%	CLAY, moderately plastic, firm, mottled, moist, orange to red, light chert
35	614		8	N/A	0	<10%	CLAY, moderately plastic, very hard, homogenous, moist, red, poor recovery, no sample
40	609		9	N/A	0	50%	CLAY, moderately plastic, firm, mottled, moist to wet, red to orange, abundant chert, may be wet zone
45	604		10	N/A	0	N/A	No recovery
							(Boring terminated @ 45.2 ft BGS)
50	599						
55							

Well Schematic: MW-3



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

05-04-2016 C:\Program Files\mtech2012\Boring Log files\460102-PI\MW-3.bor

LOG OF BORING: SB-4 /MW-4

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-PI
Project Type:	Preliminary Investigation

Boring Information:

Date / Time:	3/2/16 / 6:52
Logged By:	Andrew Paradis
Drilling Company / Driller:	Tri-State
Drilling Method:	HSA
Total Boring Depth:	45.6 ft BGS
Initial Saturation (ft)/Date:	44 ft BGS (3/2/16)
Static GW level (ft)/Date:	36.03 ft BTOC (3/9/16)
Surface Elevation (ft):	651.1 ft
Sampling Interval:	5'

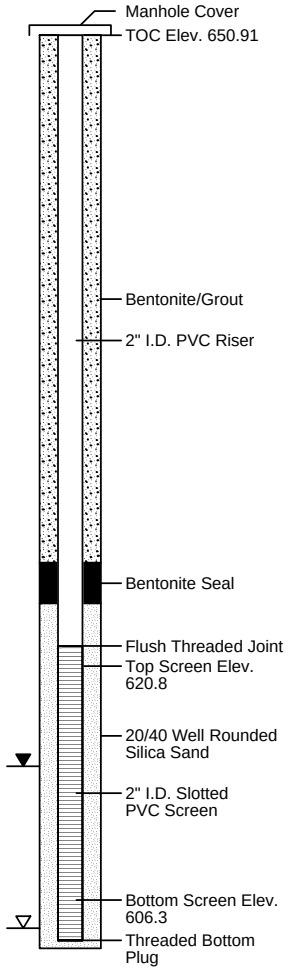
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	3/2/16
Total Well Depth:	45.07 ft BTOC
Screened Interval:	30.1 ft - 44.6 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Bailer
Gallons Purged:	0.50 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.651.1	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	Depth in Feet
0	651									0
5	646		ML		CLAYEY SILT, low plastic, soft, homogenous, moist, brown to red, no chert	1	N/A	0	100%	5
10	641				CLAYEY SILT, low plastic, soft, homogenous, moist, red to brown, light chert gravel	2	N/A	0*	25%	10
15	636				No Recovery	3	N/A	0	N/A	15
20	631		CL		CLAY, moderate plastic, firm, mottled, moist, red to orange and tan mottled, light chert	4	N/A	0	100%	20
25	626				CLAY, highly plastic, firm, mottled, moist, no chert, red and tan mottled	5	N/A	0	25%	25
30	621				CLAY, moderate plastic, firm, mottled, moist, red to orange, light chert	6	N/A	0	100%	30
35	616	▼			CLAY, highly plastic, firm, mottled, moist, red to orange and tan mottled, poor recovery	7	N/A	0	<10%	35
40	611				CLAY, highly plastic, firm, mottled, moist, red to orange, chert and dolomite present	8	N/A	0	25%	40
45	606	▽			CLAY, highly plastic, hard, mottled, moist to wet, red to orange, chert and dolomite present	9	N/A	0*	75%	45
					(Boring terminated @ 45.0 ft BGS)					
50	601									50
55										55

Well Schematic: MW-4



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

05-04-2016 C:\Program Files\mtech2012\Boring Log files\460102-PI\MW-4.bor

LOG OF BORING: SB-5 /MW-5

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-SI
Project Type:	Secondary Investigation

Boring Information:

Date / Time:	10/10/16 / 15:10
Logged By:	Brandy Hall
Drilling Company / Driller:	Technical Drilling
Drilling Method:	4.25" I.D. HSA
Total Boring Depth:	43.5 ft BGS
Initial Saturation (ft)/Date:	40 ft BGS (10/10/16)
Static GW level (ft)/Date:	Dry
Surface Elevation (ft):	649.7 ft
Sampling Interval:	2 ft every 5 ft

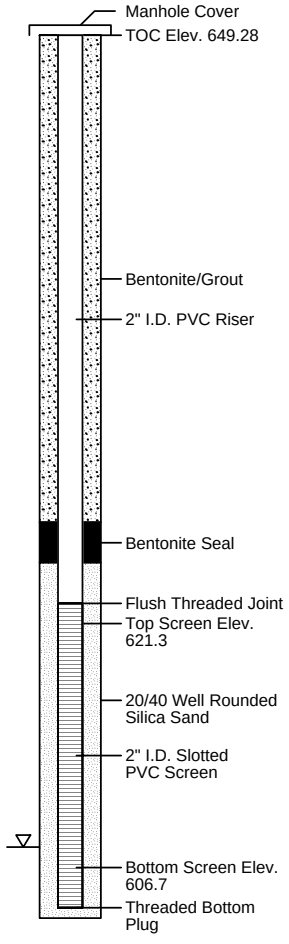
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	10/10/16
Total Well Depth:	43.2 ft BTOC
Screened Interval:	28.0 ft - 42.6 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	NA - dry
Gallons Purged:	NA - dry

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.649.7	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery
0	649				SILTY CLAY with gravel, non-plastic, hard, homogenous, dry, red - orange, no odor, coarse, sub-rounded, chert ~30%	1	N/A	0	--
5	644				SILTY CLAY, non-plastic, hard, mottled, dry, red - orange with white - gray, no odor	2	N/A	0	100%
10	639				CLAY, non-plastic, hard, laminated, dry, red - orange, no odor	3	N/A	0	80%
15	634				CLAY with gravel, low plastic, hard, mottled, moist, red - orange, no odor, coarse, sub-rounded, chert ~10%	4	N/A	0	70%
20	629		CL		CLAY, moderate plastic, firm, homogenous, moist, red - orange, no odor	5	N/A	0	70%
25	624				GRAVELLY CLAY, low plastic, hard, mottled, moist, red - orange, no odor, coarse, subangular, chert ~20%	6	N/A	0*	100%
30	619				GRAVELLY CLAY, moderate plastic, hard, homogenous, moist, red - orange, no odor, medium, subangular, chert ~20%	7	N/A	0	100%
35	614				GRAVELLY CLAY, high plastic, hard, homogenous, moist, red - orange, no odor, coarse, chert ~20%	8	N/A	0*	100%
40	609	▽			GRAVELLY CLAY, high plastic, firm, homogenous, moist, red - orange, no odor, coarse, subangular, chert ~40% from 1cm to 1", saturated at 40'	9	N/A	0	50%
45	604				*(Auger refusal @ 43.5 ft BGS)*				
50	599								
55									

Well Schematic: MW-5



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

12-15-2016 C:\Program Files\mtech2012\Boring Log files\460102-SI\MW-5.bor

LOG OF BORING: SB-6 /MW-6

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-SI
Project Type:	Secondary Investigation

Boring Information:

Date / Time:	10/11/16
Logged By:	Brandy Hall
Drilling Company / Driller:	Technical Drilling
Drilling Method:	4.25" I.D. HSA
Total Boring Depth:	44 ft BGS
Initial Saturation (ft)/Date:	41 ft BGS (10/11/16)
Static GW level (ft)/Date:	35.34 ft BTOC (10/12/16)
Surface Elevation (ft):	651.5 ft
Sampling Interval:	2 ft every 5 ft

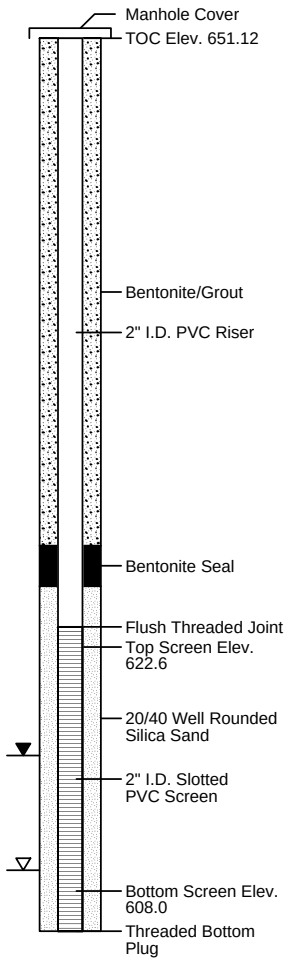
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	10/11/16
Total Well Depth:	43.7 ft BTOC
Screened Interval:	28.5 ft - 43.2 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Pump
Gallons Purged:	4.25 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.651.5	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery
0	651				SILTY CLAY with gravel, non-plastic, firm, homogenous, dry, red - orange, no odor, coarse, subangular, chert ~10%, ~2-3 cm	1	N/A	0	--
5	646				CLAY with gravel, non-plastic, hard, homogenous, dry, red - orange, no odor, coarse, subangular, chert ~10%, ~2-3 cm	2	N/A	0	90%
10	641				GRAVELLY CLAY, low plastic, hard, homogenous, moist, red - orange, no odor, coarse, subangular, chert ~20%	3	N/A	0	80%
15	636				CLAY with gravel, non-plastic, hard, homogenous, dry, red - orange, no odor, coarse, subangular, chert ~10%	4	N/A	0	90%
20	631		CL		GRAVELLY CLAY, moderate plastic, hard, homogenous, moist, red - orange, no odor, coarse, subangular, chert ~40%	5	N/A	0*	80%
25	626				GRAVELLY CLAY, high plastic, hard, homogenous, moist, red - orange, no odor, coarse, subangular, chert ~20%	6	N/A	0	90%
30	621				GRAVELLY CLAY, high plastic, hard, homogenous, moist, red - orange, no odor, coarse, subangular, chert ~30%	7	N/A	0	100%
35	616	▼			CLAY with gravel, high plastic, hard, homogenous, moist, red - orange, no odor, coarse, subangular, chert ~10%	8	N/A	0*	90%
40	611	▽			CLAY with gravel, high plastic, hard, homogenous, moist, red - orange, no odor, coarse, subangular, chert ~10%, saturated at 41' at chert	9	N/A	0	80%
45	606				*(Boring terminated @ 44.0 ft BGS)*				
50	601								
55									

Well Schematic: MW-6



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

12-15-2016 C:\Program Files\mtech2012\Boring Log files\460102-SI\MW-6.bor

LOG OF BORING: SB-7 /MW-7

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-SI
Project Type:	Secondary Investigation

Boring Information:

Date / Time:	10/11/16
Logged By:	Brandy Hall
Drilling Company / Driller:	Technical Drilling
Drilling Method:	6.25" I.D. HSA / Air Rotary
Total Boring Depth:	64.7 ft BGS
Initial Saturation (ft)/Date:	61 ft BGS (10/11/16)
Static GW level (ft)/Date:	61.45 ft BTOC (10/12/16)
Surface Elevation (ft):	649.8 ft
Sampling Interval:	2 ft every 5 ft

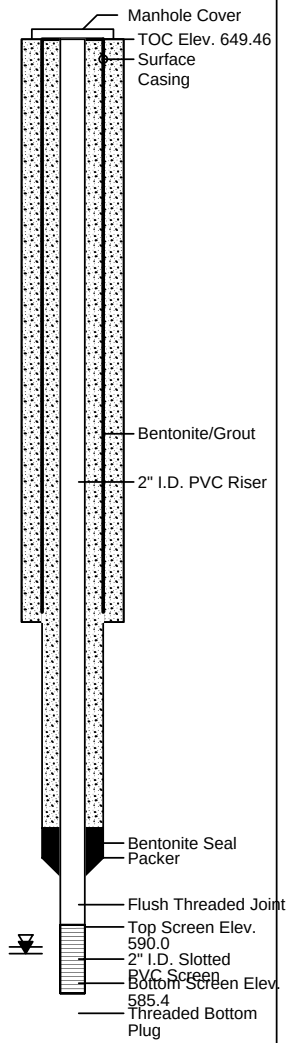
Well Information:

Well Type:	Type III
Well Purpose:	Monitoring
Well Construction Date:	10/11/16
Total Well Depth:	64.7 ft BTOC
Screened Interval:	59.5 ft - 64.1 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Pump
Gallons Purged:	0.25 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.649.8	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	Depth in Feet
0	649									0
5	644									5
10	639									10
15	634									15
20	629									20
25	624									25
30	619									30
35	614									35
40	609				BEDROCK - DOLOMITE					40
45	604									45
50	599									50
55	594									55
60	589	▼			VOID SPACE					60
65	584				*(Boring terminated @ 64.7 ft BGS at base of void space)*					65
70	579									70
75										75

Well Schematic: MW-7



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

12-15-2016 C:\Program Files\mtech2012\Boring Log files\460102-SI\MW-7.bor

LOG OF BORING: SB-8D / MW-8D

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-MWI
Project Type:	Monitoring Well Install.

Boring Information:

Date / Time:	8-16-17
Logged By:	Andrew Paradis
Drilling Company / Driller:	Technical Drilling
Drilling Method:	DPT/6.25" I.D. HSA/Air Rotary
Total Boring Depth:	74.0 ft BGS
Initial Saturation (ft)/Date:	69.5 ft BGS (8-16-17)
Static GW level (ft)/Date:	56.61 ft BTOC (9-6-17)
Surface Elevation (ft):	651.5 ft
Sampling Interval:	Continuous

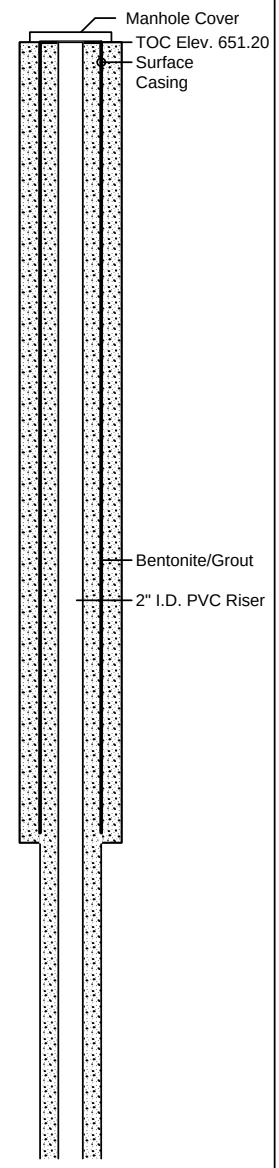
Well Information:

Well Type:	Type III
Well Purpose:	Monitoring
Well Construction Date:	8-25-17
Total Well Depth:	73.7 ft BTOC
Screened Interval:	68.7 ft - 73.1 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Bailer
Gallons Purged:	20 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.651.5	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	Depth in Feet
0	651				CONCRETE (8")					0
					GRAVELLY CLAY, low plasticity, very hard, homogenous, mosit, reddish orange, no odor, gravel is fine, angular					
5	646				GRAVELLY CLAY, low plasticity, very hard, homogenous, moist, reddish orange, no odor, gravel is fine, angular to subangular	1	N/A	0	100%	5
10	641				GRAVELLY CLAY, low plasticity, very hard, homogenous, moist, reddish orange, no odor, gravel is fine, angular to subangular, limestone	2	N/A	0	100%	10
15	636				GRAVELLY CLAY, low plasticity, very hard, homogenous, moist, reddish orange, no odor, gravel is fine, angular to subangular	3	N/A	0*	100%	15
			CL		GRAVELLY CLAY, low plasticity, very hard, homogenous, moist, reddish orange, no odor, gravel is fine, angular to subangular	4	N/A	0	100%	
20	631				GRAVELLY CLAY, low plasticity, very hard, moist, red, orange, and tan mottled, no odor, gravel is fine, angular to subangular	5	N/A	0	100%	20
25	626				GRAVELLY CLAY, low plasticity, very hard, moist, red, orange, tan mottled, no odor, gravel is fine, subangular	6	N/A	0	100%	25
30	621				GRAVELLY CLAY, low plasticity, firm, wet, red, orange, tan mottled, no odor, gravel is fine, angular	7	N/A	0*	100%	30
35	616				No recovery					35
					DOLOMITE bedrock at 36 ft BGS					
40	611		DO							40
45	606									45
50										50

Well Schematic: MW-8D



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

10-10-2017 C:\Program Files\mtech2012\Boring Log files\460102-MWI\MW-8D.bor

LOG OF BORING: SB-8D / MW-8D

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-MWI
Project Type:	Monitoring Well Install.

Boring Information:

Date / Time:	8-16-17
Logged By:	Andrew Paradis
Drilling Company / Driller:	Technical Drilling
Drilling Method:	DPT/6.25" I.D. HSA/Air Rotary
Total Boring Depth:	74.0 ft BGS
Initial Saturation (ft)/Date:	69.5 ft BGS (8-16-17)
Static GW level (ft)/Date:	56.61 ft BTOC (9-6-17)
Surface Elevation (ft):	651.5 ft
Sampling Interval:	Continuous

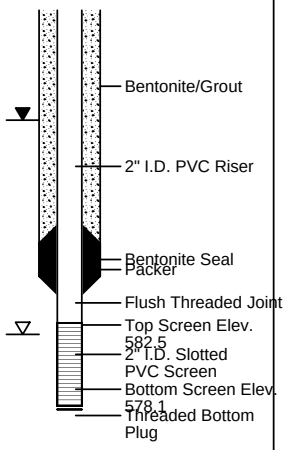
Well Information:

Well Type:	Type III
Well Purpose:	Monitoring
Well Construction Date:	8-25-17
Total Well Depth:	73.7 ft BTOC
Screened Interval:	68.7 ft - 73.1 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Bailer
Gallons Purged:	20 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.651.5	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	Depth in Feet
50	601									50
55	596	▼								55
60	591		DO							60
65	586									65
70	581	▽	CL		CLAY, saturated					70
			DO		DOLOMITE					
75	576				*(Boring terminated @ 74.0 ft BGS)*					75
80	571									80
85	566									85
90	561									90
95	556									95
100	551									100
105	546									105
110	541									110
115										115

Well Schematic: MW-8D



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

10-10-2017 C:\Program Files\mtech2012\Boring Log files\460102-MWI\MW-8D.bor

LOG OF BORING: SB-9 / MW-9

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-MWI
Project Type:	Monitoring Well Install.

Boring Information:

Date / Time:	8-16-17
Logged By:	Andrew Paradis
Drilling Company / Driller:	Technical Drilling
Drilling Method:	DPT/4.25" I.D. HSA
Total Boring Depth:	43.1 ft BGS
Initial Saturation (ft)/Date:	31.0 ft BGS (8-16-17)
Static GW level (ft)/Date:	42.14 ft BTOC (9-6-17)
Surface Elevation (ft):	652.2 ft
Sampling Interval:	Continuous

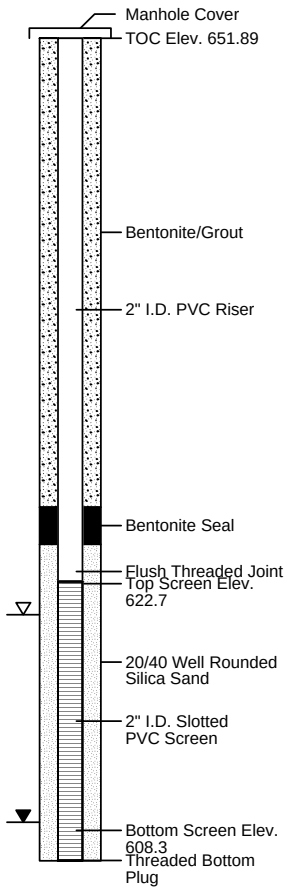
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	8-24-17
Total Well Depth:	44.2 ft BTOC
Screened Interval:	29.2 ft - 43.6 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Bailer
Gallons Purged:	3.0 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.652.2	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery
0	652				GRAVELLY CLAY, low plasticity, hard, homogenous, moist, reddish brown, no odor, gravel is fine, angular to subangular	1	N/A	0	NA
5	647				GRAVELLY CLAY, low plasticity, hard, homogenous, moist, reddish brown, no odor, gravel is fine, angular to subangular, limestone	2	N/A	0	100%
10	642				GRAVELLY CLAY, low plasticity, very hard, homogenous, moist, reddish brown, no odor, gravel is fine, angular to subangular, limestone	3	N/A	0	100%
15	637		CL		GRAVELLY CLAY, low plasticity, very hard, moist, red, orange, and tan mottled, no odor, gravel is fine, angular to subangular	4	N/A	0*	100%
20	632				GRAVELLY CLAY, low plasticity, very hard, moist, red, orange, tan mottled, no odor, gravel is fine, angular to subangular	5	N/A	0	100%
25	627				GRAVELLY CLAY, low plasticity, very hard, moist, red, orange, tan mottled, no odor	6	N/A	0	100%
30	622	▽			GRAVELLY CLAY, low plasticity, very hard, moist, red, orange, and tan mottled, no odor, gravel is fine, angular to subangular	7	N/A	0*	100%
35	617		ML		CLAYEY SILT with GRAVEL, no plasticity, soft, homogenous, saturated, orange, tan, no odor, gravel is fine, angular to subangular	8	N/A	0	100%
40	612	▼			CLAYEY SILT, no plasticity, firm, homogenous, saturated, orange, tan, no odor	9	N/A	0	100%
45	607				GRAVELLY CLAYEY SILT, low plasticity, firm, saturated, red, orange, tan mottled, no odor, gravel is fine, angular to subangular, saturated	10	N/A	0	100%
50	602				GRAVELLY CLAYEY SILT, low plasticity, firm, saturated, red, orange, tan mottled, no odor, gravel is fine, angular				
55	597				GRAVELLY CLAYEY SILT, no plasticity, firm, saturated, orange and tan mottled, no odor, gravel is fine, angular to subangular				
60					*(Boring terminated @ 43.1 ft BGS)*				

Well Schematic: MW-9



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

10-10-2017 C:\Program Files\mtech2012\Boring Log files\460102-MWI\MW-9.bor

LOG OF BORING: SB-9D / MW-9D

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-MWI
Project Type:	Monitoring Well Install.

Boring Information:

Date / Time:	8-16-17
Logged By:	Andrew Paradis
Drilling Company / Driller:	Technical Drilling
Drilling Method:	DPT/6.25" I.D. HSA /Air Rotary
Total Boring Depth:	69.0 ft BGS
Initial Saturation (ft)/Date:	64.0 ft BGS (8-16-17)
Static GW level (ft)/Date:	52.57 ft BTOC (9-6-17)
Surface Elevation (ft):	652.2 ft
Sampling Interval:	Continuous

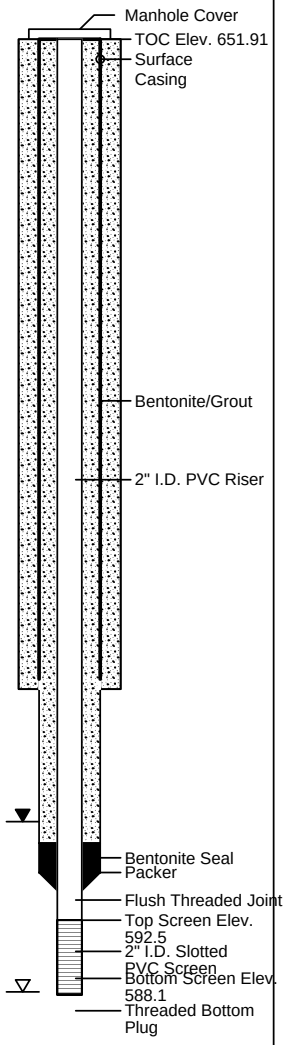
Well Information:

Well Type:	Type III
Well Purpose:	Monitoring
Well Construction Date:	8-28-17
Total Well Depth:	64.4 ft BTOC
Screened Interval:	59.4 ft - 63.8 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Bailer
Gallons Purged:	5.0 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.652.2	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	Depth in Feet
0	652		CL		GRAVELLY CLAY, low plasticity, hard, homogenous, moist, reddish brown, no odor, gravel is fine, angular to subangular	1	N/A	0	NA	0
5	647				GRAVELLY CLAY, low plasticity, hard, homogenous, moist, reddish brown, no odor, gravel is fine, angular to subangular, limestone	2	N/A	0	100%	5
10	642				GRAVELLY CLAY, low plasticity, very hard, homogenous, moist, reddish brown, no odor, gravel is fine, angular to subangular, limestone	3	N/A	0	100%	10
15	637				GRAVELLY CLAY, low plasticity, very hard, moist, red, orange, and tan mottled, no odor, gravel is fine, angular to subangular	4	N/A	0*	100%	15
20	632				GRAVELLY CLAY, low plasticity, very hard, moist, red, orange, tan mottled, no odor, gravel is fine, angular to subangular	5	N/A	0	100%	20
25	627				GRAVELLY CLAY, low plasticity, very hard, moist, red, orange, tan mottled, no odor	6	N/A	0*	100%	25
30	622				GRAVELLY CLAY, low plasticity, very hard, moist, red, orange, and tan mottled, no odor, gravel is fine, angular to subangular	7	N/A	0	100%	30
35	617		ML		CLAYEY SILT with GRAVEL, no plasticity, soft, homogenous, saturated, orange, tan, no odor, gravel is fine, angular to subangular	8	N/A	0	100%	35
40	612				CLAYEY SILT, no plasticity, firm, homogenous, saturated, orange, tan, no odor	9	N/A	0	100%	40
45	607		DO		GRAVELLY CLAYEY SILT, low plasticity, firm, saturated, red, orange, tan mottled, no odor, gravel is fine, angular to subangular, saturated	10	N/A	0	100%	45
50	602	▼			GRAVELLY CLAYEY SILT, low plasticity, firm, saturated, red, orange, tan mottled, no odor, gravel is fine, angular					50
55	597				GRAVELLY CLAYEY SILT, no plasticity, firm, saturated, orange and tan mottled, no odor, gravel is fine, angular to subangular					55
60	592				DOLOMITE BEDROCK at 43 ft BGS					60
65	587	▽	CL		CLAY, saturated					65
			DO		DOLOMITE					
70	582				*(Boring terminated @ 69.0 ft BGS)*					70
75										75

Well Schematic: MW-9D



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

10-10-2017 C:\Program Files\mtech2012\Boring Log files\460102-MWI\MW-9D.bor

LOG OF BORING: SB-10D / MW-10D

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-MWI
Project Type:	Monitoring Well Install.

Boring Information:

Date / Time:	8-16-17
Logged By:	Andrew Paradis
Drilling Company / Driller:	Technical Drilling
Drilling Method:	DPT/6.25" I.D. HSA /Air Rotary
Total Boring Depth:	64.9 ft BGS
Initial Saturation (ft)/Date:	64.0 ft BGS (8-16-17)
Static GW level (ft)/Date:	59.47 ft BTOC (9-6-17)
Surface Elevation (ft):	651.0 ft
Sampling Interval:	Continuous

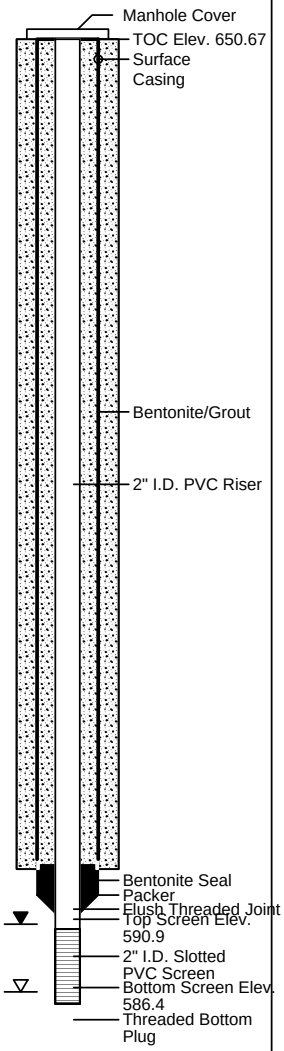
Well Information:

Well Type:	Type III
Well Purpose:	Monitoring
Well Construction Date:	8-25-17
Total Well Depth:	64.9 ft BTOC
Screened Interval:	59.8 ft - 64.2 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Bailer
Gallons Purged:	14.0 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.651.0	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	Depth in Feet
0	651				CONCRETE (10")					0
					GRAVELLY CLAY, low plasticity, hard, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular	1	N/A	0	NA	
5	646					2	N/A	0	100%	5
10	641				GRAVELLY CLAY, low plasticity, hard, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular	3	N/A	0	100%	10
15	636				GRAVELLY CLAY, low plasticity, hard, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular	4	N/A	0*	100%	15
20	631				GRAVELLY CLAY, low plasticity, hard, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular	5	N/A	0	100%	20
25	626				GRAVELLY CLAY, low plasticity, soft, homogenous, moist, red, orange, no odor	6	N/A	0	100%	25
30	621		CL		GRAVELLY CLAY, low plasticity, hard, homogenous, moist, reddish brown, no odor, gravel is fine, angular to subangular	7	N/A	0	100%	30
35	616				GRAVELLY CLAY, low plasticity, hard, homogenous, moist, reddish brown, no odor, gravel is fine, angular to subangular	8	N/A	0	100%	35
40	611				GRAVELLY CLAY, low plasticity, hard, homogenous, moist, reddish brown, no odor	9	N/A	15	100%	40
45	606				CLAY, moderate plasticity, soft, homogenous, wet, red, no odor	10	N/A	15*	100%	45
50	601				GRAVELLY CLAY, high plasticity, very soft, homogenous, saturated, red, no odor, gravel is fine, angular to subangular	11	N/A	0	<10%	50
55	596				GRAVELLY CLAY, high plasticity, very soft, homogenous, saturated, red, no odor, gravel is fine, angular to subangular					55
60	591	▼	DO		DOLOMITE BEDROCK at 55 ft BGS					60
65	586	▽	CL		CLAY, saturated					65
					(Boring terminated @ 65.0 ft BGS)					
70	581									70
75										75

Well Schematic: MW-9D



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

10-10-2017 C:\Program Files\mtech2012\Boring Log files\460102-MWI\MW-10D.bor

LOG OF BORING: SB-11 / MW-11

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-MWI
Project Type:	Monitoring Well Install.

Boring Information:

Date / Time:	8-17-17
Logged By:	Andrew Paradis
Drilling Company / Driller:	Technical Drilling
Drilling Method:	DPT/4.25" I.D. HSA
Total Boring Depth:	57.2 ft BGS
Initial Saturation (ft)/Date:	35.0 ft BGS (8-17-17)
Static GW level (ft)/Date:	36.78 ft BTOC (9-6-17)
Surface Elevation (ft):	647.4 ft
Sampling Interval:	Continuous

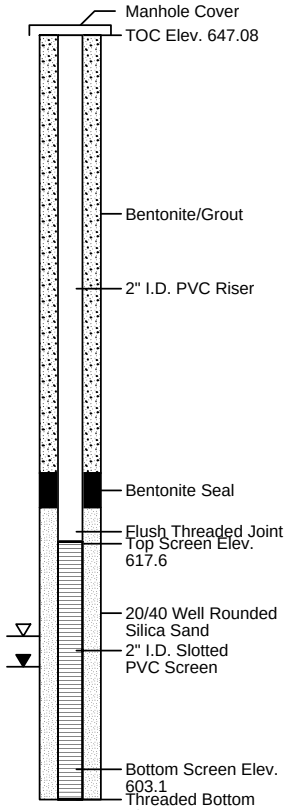
Well Information:

Well Type:	Type II
Well Purpose:	Monitoring
Well Construction Date:	8-25-17
Total Well Depth:	44.5 ft BTOC
Screened Interval:	29.5 ft - 43.9 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Bailer
Gallons Purged:	6.0 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.647.4	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	Depth in Feet
0	647				CONCRETE (10")	1	N/A	0	NA	0
5	642				GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, no odor, gravel is fine, angular to subanuglar	2	N/A	0	100%	5
10	637				GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, no odor, gravel is fine, angular to subangular, limestone chert gravel	3	N/A	0	100%	10
15	632				GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular	4	N/A	0*	100%	15
20	627				GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular, limestone chert gravel	5	N/A	0	100%	20
25	622		CL		GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular, limestone chert gravel	6	N/A	0	100%	25
30	617				GRAVELLY CLAY, moderate plasticity, soft, homogenous, wet, red, orange, no odor, gravel is fine, angular to subangular	7	N/A	0*	100%	30
35	612	▽ ▼			GRAVELLY CLAY, high plasticity, very soft, homogenous, saturated, red, orange, no odor, gravel is fine, angular to subangular, limestone and chert gravel	8	N/A	0	100%	35
40	607				GRAVELLY CLAY, high plasticity, very soft, homogenous, saturated, orange, no odor, gravel is fine, angular to subangular	9	N/A	0	100%	40
45	602				GRAVELLY CLAY, high plasticity, firm, homogenous, moist, orange, red, no odor, gravel is fine, angular to subangular	10	N/A	0	100%	45
50	597		ML		CLAYEY SILT, no plasticity, soft, homogenous, saturated, tan, gray, no odor	11	N/A	0	100%	50
55	592		CL		CLAYEY SILT, no plasticity, soft, lamianted, tan, gray, no odor	12	N/A	0	100%	55
60	587				CLAY, moderate plasticity, firm, homogenous, saturated, orange, red, no odor					60
65					CLAY, moderate plasticity, firm, homogenous, saturated, orange, red, no odor					65
					(Boring terminated @ 57.2 ft BGS)					

Well Schematic: MW-11



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

10-10-2017 C:\Program Files\mtech2012\Boring Log files\460102-MWI\MW-11.bor

LOG OF BORING: SB-11D / MW-11D

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-MWI
Project Type:	Monitoring Well Install.

Boring Information:

Date / Time:	8-17-17
Logged By:	Andrew Paradis
Drilling Company / Driller:	Technical Drilling
Drilling Method:	DPT/6.25" I.D. HSA/Air Rotary
Total Boring Depth:	75.1 ft BGS
Initial Saturation (ft)/Date:	70 ft BGS (8-17-17)
Static GW level (ft)/Date:	58.31 ft BTOC (9-6-17)
Surface Elevation (ft):	647.4 ft
Sampling Interval:	Continuous

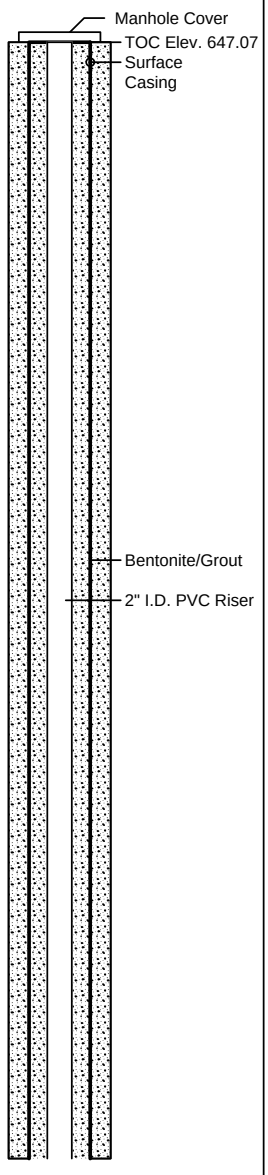
Well Information:

Well Type:	Type III
Well Purpose:	Monitoring
Well Construction Date:	8-28-17
Total Well Depth:	74.9 ft BTOC
Screened Interval:	69.9 ft - 74.3 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Bailer
Gallons Purged:	11.0 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.647.4	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	Depth in Feet
0	647				CONCRETE (10")					0
					GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, no odor, gravel is fine, angular to subanuglar	1	N/A	0	NA	
5	642				GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, no odor, gravel is fine, angular to subangular, limestone chert gravel	2	N/A	0	100%	5
10	637				GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular	3	N/A	0	100%	10
15	632				GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular, limestone chert gravel	4	N/A	0	100%	15
20	627		CL		GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular, limestone chert gravel	5	N/A	0	100%	20
25	622				GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular, limestone chert gravel	6	N/A	0	100%	25
30	617				GRAVELLY CLAY, moderate plasticity, soft, homogenous, wet, red, orange, no odor, gravel is fine, angular to subangular	7	N/A	0	100%	30
35	612				GRAVELLY CLAY, high plasticity, very soft, homogenous, saturated, red, orange, no odor, gravel is fine, angular to subangular, limestone and chert gravel	8	N/A	0	100%	35
40					GRAVELLY CLAY, high plasticity, very soft, homogenous, saturated, orange, no odor, gravel is fine, angular to subangular					40

Well Schematic: MW-11D



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

10-10-2017 C:\Program Files\mtech2012\Boring Log files\460102-MWI\MW-11D.bor

LOG OF BORING: SB-11D / MW-11D

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-MWI
Project Type:	Monitoring Well Install.

Boring Information:

Date / Time:	8-17-17
Logged By:	Andrew Paradis
Drilling Company / Driller:	Technical Drilling
Drilling Method:	DPT/6.25" I.D. HSA/Air Rotary
Total Boring Depth:	75.1 ft BGS
Initial Saturation (ft)/Date:	70 ft BGS (8-17-17)
Static GW level (ft)/Date:	58.31 ft BTOC (9-6-17)
Surface Elevation (ft):	647.4 ft
Sampling Interval:	Continuous

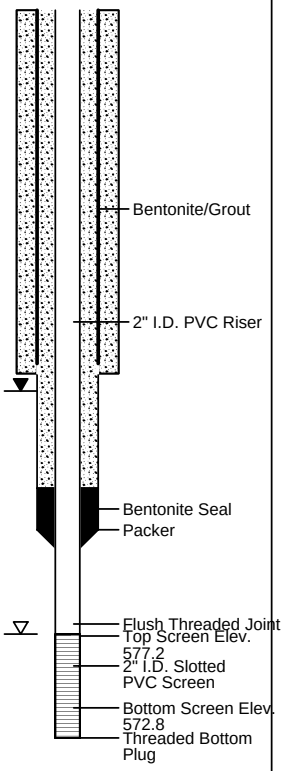
Well Information:

Well Type:	Type III
Well Purpose:	Monitoring
Well Construction Date:	8-28-17
Total Well Depth:	74.9 ft BTOC
Screened Interval:	69.9 ft - 74.3 ft BTOC
Screen Slot Size:	0.01 in
Development Method:	Bailer
Gallons Purged:	11.0 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.647.4	USCS	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	DESCRIPTION
40	607						
45	602	CL	9	N/A	0	100%	GRAVELLY CLAY, high plasticity, firm, homogenous, moist, orange, red, no odor, gravel is fine, angular to subangular
			10	N/A	0	100%	
50	597	ML					CLAYEY SILT, no plasticity, soft, homogenous, saturated, tan, gray, no odor
			11	N/A	0	100%	CLAYEY SILT, no plasticity, soft, lamianted, tan, gray, no odor
55	592	CL	12	N/A	0	100%	CLAY, moderate plasticity, firm, homogenous, saturated, orange, red, no odor
							CLAY, moderate plasticity, firm, homogenous, saturated, orange, red, no odor
60	587						DOLOMITE BEDROCK at 57 ft BGS
65	582	DO					
70	577						
75	572						*(Boring terminated @ 75.1 ft BGS)*
80	567						
85	562						
90							

Well Schematic: MW-11D



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

10-10-2017 C:\Program Files\mtech2012\Boring Log files\460102-MWI\MW-11D.bor

LOG OF BORING: SB-12V / MW-12V

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-MWI
Project Type:	Monitoring Well Install.

Boring Information:

Date / Time:	8-17-17
Logged By:	Andrew Paradis
Drilling Company / Driller:	Technical Drilling
Drilling Method:	DPT/HSA/Air Rotary/Roller Bit
Total Boring Depth:	73.0 ft BGS
Initial Saturation (ft)/Date:	67.0 ft BGS (8-17-17)
Static GW level (ft)/Date:	62.11 ft BTOC (9-6-17)
Surface Elevation (ft):	649.7 ft
Sampling Interval:	Continuous

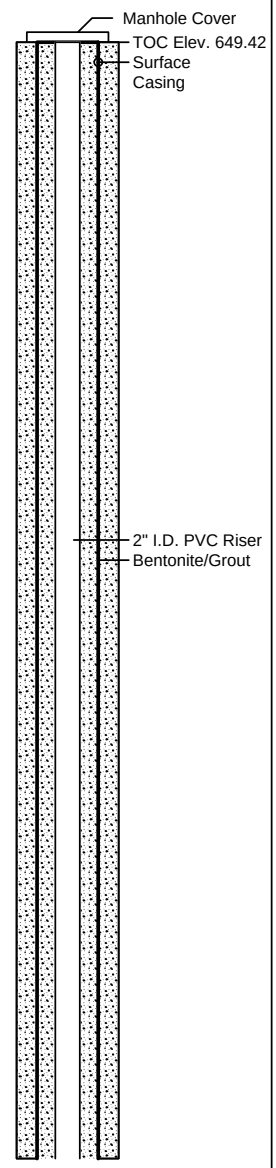
Well Information:

Well Type:	Type III
Well Purpose:	Monitoring
Well Construction Date:	8-28-17
Total Well Depth:	73.1 ft BTOC
Screened Interval:	Open hole 65.5 ft - 73.0 ft
Screen Slot Size:	
Development Method:	Bailer
Gallons Purged:	22.0 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.649.7	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery	Depth in Feet
0	649				CONCRETE (10")	1	N/A	0	NA	0
5	644		CL		GRAVELLY CLAY, low plasticity, hard, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular, chert and limestone gravel	2	N/A	0	100%	5
10	639				GRAVELLY CLAY, low plasticity, very hard, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular GRAVELLY CLAY, low plasticity, very hard, homogenous, moist to wet, red, orange, no odor, gravel is fine, angular to subangular	3	N/A	0	100%	10
15	634				GRAVELLY CLAY, low plasticity, very hard, homogenous, moist to wet, red, orange, no odor, gravel is fine, angular to subangular	4	N/A	0*	100%	15
20	629				GRAVELLY CLAY, low plasticity, very hard, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular	5	N/A	0	100%	20
25	624				GRAVELLY CLAY, moderate plasticity, firm, moist, red, orange, tan mottled, no odor, gravel is fine, angular to subangular	6	N/A	0	100%	25
30	619				GRAVELLY CLAY, moderate plasticity, firm, moist, red, orange, tan mottled, no odor, gravel is fine, angular to subangular	7	N/A	0	100%	30
35					GRAVELLY CLAY, moderate plasticity, firm, moist, red, orange, tan mottled, no odor, gravel is fine, angular to subangular	8	N/A	0	100%	35

Well Schematic: MW-12V



NOTES:

- Hand cleared to 4.0' BGS prior to drilling
-* Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

03-19-2018 C:\Program Files\mtech2012\Boring Log files\460102-MWI\MW-12V.bor

LOG OF BORING: SB-12V / MW-12V

PPM CONSULTANTS

Client / Site Information:

Client:	QA & AAA, Inc.
Site:	31st Street Texaco
Location:	Birmingham, AL
Agency Interest No.:	UST16-10-02
PPM Project No.:	460102-MWI
Project Type:	Monitoring Well Install.

Boring Information:

Date / Time:	8-17-17
Logged By:	Andrew Paradis
Drilling Company / Driller:	Technical Drilling
Drilling Method:	DPT/HSA/Air Rotary/Roller Bit
Total Boring Depth:	73.0 ft BGS
Initial Saturation (ft)/Date:	67.0 ft BGS (8-17-17)
Static GW level (ft)/Date:	62.11 ft BTOC (9-6-17)
Surface Elevation (ft):	649.7 ft
Sampling Interval:	Continuous

Well Information:

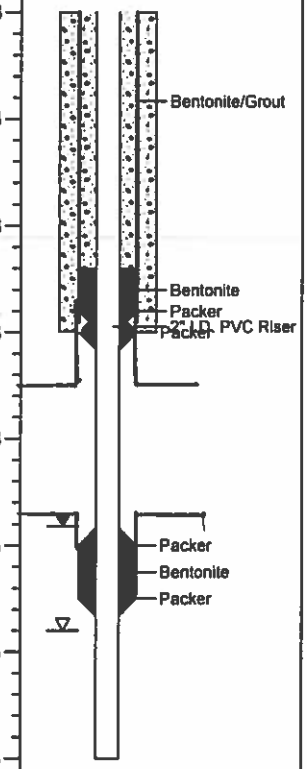
Well Type:	Type III
Well Purpose:	Monitoring
Well Construction Date:	8-28-17
Total Well Depth:	73.1 ft BTOC
Screened Interval:	Open hole 65.5 ft - 73.0 ft
Screen Slot Size:	
Development Method:	Bailer
Gallons Purged:	22.0 gal

Water Levels
▼ Static GW level
▽ Initial Saturation

Depth in Feet	Surf. Elev.649.7	Water Level	USCS	GRAPHIC	DESCRIPTION	Sample	Blow Count	Headspace Concentration (ppmv)	Percent Recovery
38	611							0	100%
					GRAVELLY CLAY, moderate plasticity, firm, homogenous, moist, red, orange, no odor, gravel is fine, angular to subangular	8	N/A		
43	606	▽	CL		GRAVELLY CLAY, moderate plasticity, soft, homogenous, wet, red, orange, no odor, gravel is fine, angular to subangular	9	N/A	0	100%
48	601				GRAVELLY CLAY, moderate plasticity, very soft, homogenous, saturated, red, orange, no odor, gravel is fine, angular to subangular	10	N/A	0*	100%
53	596		DO		GRAVELLY CLAY, high plasticity, very soft, homogenous, saturated, red, orange, petroleum-like odor, gravel is fine, angular to subangular	11	N/A	2,600	100%
					DOLOMITE BEDROCK				
58	591				Air and water-filled void, petroleum-like odor				
63	586	▼	DO		DOLOMITE				
68	581	▽	DO		CLAY-filled void, saturated, petroleum-like odor, stained DOLOMITE				
73	576				*(Boring terminated @ 73.0 ft BGS)*				
78	571								
83	566								
88									

Depth in Feet

Well Schematic: MW-12V



10-10-2017 C:\Program Files\mitech2012\Boring Log files\460102-MWI\MW-12V.bor

NOTES:

- Hand cleared to 4.0' BGS prior to drilling
- * Sample submitted for laboratory analysis
- Headspace conducted using RKI Eagle calibrated with hexane
- Soil descriptions generally based on visual inspection/professional judgment as described in ASTM D2488-09a: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). Laboratory testing not conducted, and the data should not be used for engineering purposes.

APPENDIX C – TABLES

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
31ST STREET TEXACO
BIRMINGHAM, ALABAMA

WELL I.D.	DATE	TOP OF CASING ELEVATION (ft)	GROUND SURFACE ELEVATION (ft)	SCREENED INTERVAL (ft)	WELL DEPTH (ft-BTOC)	DEPTH TO PRODUCT (ft-BTOC)	DEPTH TO WATER (ft-BTOC)	GROUND-WATER ELEVATION (ft)
MW-1	3/9/2016	650.00	650.3	620.2-605.6	44.8	-	23.52	626.48
	10/28/2016				44.8	-	22.17	627.83
	9/6/2017				44.8	-	20.10	629.90
	10/25/2017				44.8	-	19.33	630.67
	1/18/2018				44.8	-	20.33	629.67
	4/23/2018				44.9	-	18.73	631.27
	7/31/2018				44.8	-	20.10	629.90
	11/20/2018				44.8	-	18.62	631.38
	2/11/2019				44.9	-	18.10	631.90
	5/8/2019				44.8	-	18.61	631.39
	8/6/2019				44.8	-	19.47	630.53
	11/14/2019				44.7	-	17.30	632.70
MW-2	3/9/2016	649.49	649.9	627.4-612.9	37.0	-	34.85	614.64
	10/28/2016				37.0	-	36.50	<612.9
	9/6/2017				36.9	-	36.58	<612.9
	10/25/2017				37.0	-	36.52	612.97
	1/18/2018				37.0	-	36.54	<612.9
	4/23/2018				37.0	-	34.90	614.59
	7/31/2018				37.0	-	36.52	<612.9
	11/20/2018				36.9	-	36.11	613.38
	2/11/2019				37.0	-	36.53	<612.9
	5/8/2019				37.0	-	36.50	<612.9
	8/6/2019				36.9	-	36.47	<612.9
	11/14/2019				37.0	-	36.50	<612.9
MW-3	3/9/2016	648.83	649.1	618.8-604.3	45.0	-	38.97	609.86
	10/28/2016				45.0	-	DRY	DRY
	9/6/2017				45.0	-	44.16	604.67
	10/25/2017				45.0	-	43.44	605.39
	1/18/2018				45.0	-	43.71	605.12
	4/23/2018				44.9	-	44.23	604.60
	7/31/2018				45.0	-	43.05	605.78
	11/20/2018				45.0	-	42.79	606.04
	2/11/2019				45.0	-	42.92	605.91
	5/8/2019				45.0	-	44.06	604.77
	8/6/2019				45.0	-	44.38	604.45
	11/14/2019				45.0	-	43.99	604.84
MW-4	3/9/2016	650.91	651.1	620.8-606.3	45.0	-	36.03	614.88
	10/28/2016				45.0	-	32.44	618.47
	9/6/2017				45.1	-	26.30	624.61
	10/25/2017				45.1	-	26.48	624.43
	1/18/2018				45.0	-	27.78	623.13
	4/23/2018				45.0	-	23.81	627.10
	7/31/2018				45.1	-	27.51	623.40
	11/20/2018				45.0	-	23.22	627.69
	2/11/2019				45.0	-	23.54	627.37
	5/8/2019				45.0	-	25.11	625.80
	8/6/2019				45.0	-	28.19	622.72
	11/14/2019				45.2	-	23.72	627.19

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
31ST STREET TEXACO
BIRMINGHAM, ALABAMA

WELL I.D.	DATE	TOP OF CASING ELEVATION (ft)	GROUND SURFACE ELEVATION (ft)	SCREENED INTERVAL (ft)	WELL DEPTH (ft-BTOC)	DEPTH TO PRODUCT (ft-BTOC)	DEPTH TO WATER (ft-BTOC)	GROUND-WATER ELEVATION (ft)
MW-5	10/28/2016	649.28	649.7	621.3-606.7	43.0	-	DRY	<606.7
	9/6/2017				42.9	-	DRY	<606.7
	10/25/2017				43.1	-	DRY	<606.7
	1/18/2018				43.0	-	DRY	<606.7
	4/23/2018				43.0	-	DRY	<606.7
	7/31/2018				43.0	-	DRY	<606.7
	11/20/2018				43.0	-	DRY	<606.7
	2/11/2019				43.0	-	42.50	<606.7
	5/8/2019				43.0	-	42.45	<606.7
	8/6/2019				43.0	-	42.46	<606.7
	11/14/2019				43.0	-	42.55	<606.7
MW-6	10/28/2016	651.12	651.5	622.6-608.0	43.7	-	35.34	615.78
	9/6/2017				43.7	-	23.15	627.97
	10/25/2017				43.8	-	23.06	628.06
	1/18/2018				NM	-	NM	NM
	4/23/2018				43.7	-	20.98	630.14
	7/31/2018				43.7	-	23.93	627.19
	11/20/2018				43.7	-	22.48	628.64
	2/11/2019				43.7	-	22.10	629.02
	5/8/2019				43.7	-	23.14	627.98
	8/6/2019				43.7	-	24.87	626.25
	11/14/2019				43.7	-	22.46	628.66
MW-7D	10/28/2016	649.46	649.8	590.0-585.4	64.7	62.69	62.86	586.73
	9/6/2017				64.6	59.31	59.33	590.15
	10/25/2017				65.8	-	61.20	588.26
	1/18/2018				64.7	-	62.17	587.29
	4/23/2018				64.7	-	46.69	602.77
	7/31/2018				64.4	-	61.89	587.57
	11/20/2018				64.7	58.12	58.13	591.34
	2/11/2019				64.7	-	53.90	595.56
	5/8/2019				64.3	59.11	59.13	590.35
	8/6/2019				64.0	-	63.62	<585.4
	11/14/2019				64.8	-	61.16	588.30
MW-8D	9/6/2017	651.20	651.5	582.5-578.1	73.7	-	56.61	594.59
	10/25/2017				73.5	-	56.26	594.94
	1/18/2018				73.7	-	58.05	593.15
	4/23/2018				73.3	-	44.46	606.74
	7/31/2018				73.2	-	58.33	592.87
	11/20/2018				73.2	-	54.23	596.97
	2/11/2019				73.2	-	53.55	597.65
	5/8/2019				73.1	-	56.44	594.76
	8/6/2019				73.3	-	62.67	588.53
	11/14/2019				73.4	-	56.79	594.41
MW-9	9/6/2017	651.89	652.2	622.7-608.3	44.2	-	42.14	609.75
	10/25/2017				44.3	-	42.10	609.79
	1/18/2018				44.2	-	DRY	<608.3
	4/23/2018				44.3	-	39.60	612.29
	7/31/2018				44.2	-	43.72	<608.3
	11/20/2018				44.2	-	42.64	609.25
	2/11/2019				44.3	-	43.75	608.14
	5/8/2019				44.2	-	43.70	<608.3
	8/6/2019				44.2	-	43.69	<608.3
	11/14/2019				44.3	-	43.72	<608.3

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
31ST STREET TEXACO
BIRMINGHAM, ALABAMA

WELL I.D.	DATE	TOP OF CASING ELEVATION (ft)	GROUND SURFACE ELEVATION (ft)	SCREENED INTERVAL (ft)	WELL DEPTH (ft-BTOC)	DEPTH TO PRODUCT (ft-BTOC)	DEPTH TO WATER (ft-BTOC)	GROUND-WATER ELEVATION (ft)
MW-9D	9/6/2017	651.91	652.2	592.5-588.1	64.4	-	52.57	599.34
	10/25/2017				64.8	-	51.53	600.38
	1/18/2018				64.4	-	57.01	594.90
	4/23/2018				64.4	-	40.99	610.92
	7/31/2018				64.3	-	56.73	595.18
	11/20/2018				64.3	-	51.83	600.08
	2/11/2019				64.3	-	51.95	599.96
	5/8/2019				64.2	-	52.56	599.35
	8/6/2019				64.6	-	59.27	592.64
	11/14/2019				64.3	-	53.75	598.16
MW-10D	9/6/2017	650.67	651.0	590.9-586.4	64.8	-	59.47	591.20
	10/25/2017				64.9	-	58.75	591.92
	1/18/2018				64.8	-	60.88	589.79
	4/23/2018				64.8	-	43.93	606.74
	7/31/2018				64.8	-	60.56	590.11
	11/20/2018				64.8	-	56.54	594.13
	2/11/2019				64.9	-	53.60	597.07
	5/8/2019				64.8	-	57.44	593.23
	8/6/2019				64.8	-	63.70	586.97
	11/14/2019				65.8	-	58.84	591.83
MW-11	9/6/2017	647.08	647.4	617.6-603.1	44.5	-	36.78	610.30
	10/25/2017				44.5	-	36.68	610.40
	1/18/2018				44.5	-	38.17	608.91
	4/23/2018				44.5	-	37.42	609.66
	7/31/2018				44.4	-	38.65	608.43
	11/20/2018				44.5	-	38.64	608.44
	2/11/2019				44.6	-	36.85	610.23
	5/8/2019				44.5	-	37.90	609.18
	8/6/2019				44.5	-	39.09	607.99
	11/14/2019				44.0	-	38.08	609.00
MW-11D	9/6/2017	647.07	647.4	577.2-572.8	74.9	-	58.31	588.76
	10/25/2017				75.0	-	59.09	587.98
	1/18/2018				74.5	-	60.62	586.45
	4/23/2018				74.5	-	44.64	602.43
	7/31/2018				74.4	-	60.17	586.90
	11/20/2018				74.3	-	45.58	601.49
	2/11/2019				74.4	-	51.68	595.39
	5/8/2019				74.2	-	56.82	590.25
	8/6/2019				74.1	-	63.53	583.54
	11/14/2019				75.1	-	59.50	587.57

TABLE 1
GROUNDWATER ELEVATION SURVEY DATA
31ST STREET TEXACO
BIRMINGHAM, ALABAMA

WELL I.D.	DATE	TOP OF CASING ELEVATION (ft)	GROUND SURFACE ELEVATION (ft)	SCREENED INTERVAL (ft)	WELL DEPTH (ft-BTOC)	DEPTH TO PRODUCT (ft-BTOC)	DEPTH TO WATER (ft-BTOC)	GROUND-WATER ELEVATION (ft)
MW-12V	9/6/2017	649.42	649.7	583.9-576.4	67.8	62.10	62.11	587.32
	10/25/2017				65.7	-	62.22	587.20
	1/18/2018				75.2	62*	63.62	585.80
	4/23/2018				70.9	-	46.68	602.74
	7/31/2018				69.7	-	62.71	586.71
	11/20/2018				69.3	58.00	58.38	591.33
	2/11/2019				71.6	-	53.98	595.44
	5/8/2019				66.3	-	59.45	589.97
	8/6/2019				68.8	66.20	67.25	582.96
	11/14/2019				68.2	-	62.03	587.39

Notes: *Elevations based on approximate National Geodetic Vertical Datum (NGVD) of 650 feet referenced from the USGS topographic map (Birmingham, North Quadrangle)*

ft-BTOC - feet below top of casing

** - Interface probe would not detect top of free product. Estimated from free product in bailer*

Dry - Dry or insufficient water in well to accurately portray groundwater elevation

Source: *PPM Consultants, Inc.*

PPM Project No. 460102-CAPD

TABLE 2
SOIL ANALYTICAL SUMMARY
31ST STREET TEXACO
BIRMINGHAM, ALABAMA

SAMPLE I.D.	SAMPLE DEPTH (ft BGS)	SAMPLE DATE	HEADSPACE READING (ppmv)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	XYLENES (mg/kg)	TOTAL BTEX (mg/kg)	MTBE (mg/kg)	NAPHTHALENE (mg/kg)
SB-1-34-36	34-36	2/29/2016	0	<0.005	<0.005	<0.005	<0.015	BDL	0.173	<0.025
SB-1-40-42	40-42	2/29/2016	0	<0.005	<0.005	<0.005	<0.015	BDL	0.191	<0.025
SB-2-9-11	9-11	3/1/2016	100	<0.005	<0.005	<0.005	<0.0015	BDL	<0.005	<0.025
SB-2-34-36	34-36	3/1/2016	15	<0.005	<0.005	<0.005	<0.015	BDL	0.034	<0.025
SB-3-9-11	9-11	3/1/2016	0	<0.005	<0.005	<0.005	<0.0015	BDL	<0.005	<0.025
SB-3-39-41	39-41	3/1/2016	0	<0.005	<0.005	<0.005	<0.015	BDL	<0.005	<0.025
SB-4-9-11	9-11	3/2/2016	0	<0.005	<0.005	<0.005	<0.0015	BDL	<0.005	<0.025
SB-4-44-46	39-41	3/2/2016	0	<0.005	<0.005	<0.005	<0.015	BDL	<0.005	<0.025
SB-5-24-25	24-25	10/10/2016	0	<0.005	<0.005	<0.005	<0.0015	BDL	<0.005	<0.025
SB-5-34-35	34-35	10/10/2016	0	<0.005	<0.005	<0.005	<0.015	BDL	<0.005	<0.025
SB-6-19-20	19-20	10/11/2016	0	<0.005	<0.005	<0.005	<0.0015	BDL	<0.005	<0.025
SB-6-34-35	34-35	10/11/2016	0	<0.005	<0.005	<0.005	<0.015	BDL	<0.005	<0.025
SB-8-15-17	15-17	8/16/2017	0	<0.005	<0.005	<0.005	<0.0015	BDL	<0.005	<0.025
SB-8-30-32	30-32	8/16/2017	0	<0.005	<0.005	<0.005	<0.015	BDL	<0.005	<0.025
SB-9-14-16	14-16	8/16/2017	0	<0.005	<0.005	<0.005	<0.0015	BDL	<0.005	<0.025
SB-9-29-31	29-31	8/16/2017	0	<0.005	<0.005	<0.005	<0.015	BDL	<0.005	<0.025
SB-10-15-17	15-17	8/16/2017	0	<0.005	<0.005	<0.005	<0.0015	BDL	<0.005	<0.025
SB-10-45-47	45-47	8/16/2017	15	<0.005	<0.005	<0.005	<0.015	BDL	<0.005	<0.025
SB-11-15-17	15-17	8/17/2017	0	<0.005	<0.005	<0.005	<0.0015	BDL	<0.005	<0.025
SB-11-30-32	30-32	8/17/2017	0	<0.005	<0.005	<0.005	<0.015	BDL	<0.005	<0.025
SB-12-15-17	15-17	8/17/2017	0	<0.005	<0.005	<0.005	<0.0015	BDL	<0.005	<0.025
SB-12-45-47	45-47	8/17/2017	0	<0.005	<0.005	<0.005	<0.015	BDL	0.013	<0.025
SSCAL - Commercial Indoor Inhalation				0.5971	115.6	428.5	173.1	--	1,049	155.8
SSCAL - GRP Source				0.5971	115.6	428.5	173.1	--	83.72	155.8

Notes:
ft BGS - feet below ground surface
mg/kg - milligrams per kilogram
ppmv - parts per million by volume
BDL - below detection limit
Headspace analysis conducted with a RKI (calibrated to hexane)
BTEX, MTBE, naphthalene analyses conducted per EPA Method 8260
SSCAL - Site-Specific Corrective Action Limit
GRP - Groundwater Resource Protection
- Highlighted samples are compared to GRP source values

Source:
PPM Consultants, Inc.
PPM Project No. 460102-CAPD

TABLE 3
GROUNDWATER ANALYTICAL SUMMARY
31ST STREET TEXACO
BIRMINGHAM, ALABAMA

SAMPLE I.D.	SAMPLE DATE	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)	TOTAL BTEX (mg/L)	MTBE (mg/L)	NAPHTH-ALENE (mg/L)
MW-1	3/9/2016	0.002	<0.001	<0.001	<0.003	0.002	0.097	0.018
	10/28/2016	0.005	<0.001	<0.001	<0.003	0.005	0.174	<0.005
	10/25/2017	0.008	<0.001	<0.001	<0.003	0.008	0.130	<0.005
	1/18/2018	0.005	<0.001	<0.001	<0.003	0.005	0.145	<0.005
	4/23/2018	0.002	<0.001	<0.001	<0.003	0.002	0.137	<0.005
	7/31/2018	0.005	<0.001	<0.001	<0.003	0.005	0.099	<0.005
	11/20/2018	0.005	<0.001	<0.001	<0.003	0.005	0.119	<0.005
	2/11/2019	0.003	<0.001	<0.001	<0.003	0.003	0.108	<0.005
	5/8/2019	0.003	<0.001	<0.001	<0.003	0.003	0.088	<0.005
	8/6/2019	0.004	<0.001	<0.001	<0.003	0.004	0.079	<0.005
	11/14/2019	0.004	<0.001	<0.001	<0.003	0.004	0.086	<0.005
SSCAL - Source Well		0.3436	68.71	48.10	175	--	1.374	1.374
MW-2	3/9/2016	0.175	0.175	0.109	0.700	1.159	0.036	<0.005
	10/28/2016	0.025	0.001	<0.001	0.010	0.036	0.299	0.008
	10/25/2017	0.014	<0.001	<0.001	0.008	0.022	0.181	<0.005
	1/18/2018	NS	NS	NS	NS	NS	NS	NS
	4/23/2018	0.036	0.017	0.016	0.068	0.137	0.275	0.013
	7/31/2018	NS	NS	NS	NS	NS	NS	NS
	11/20/2018	0.015	0.003	0.003	0.019	0.040	0.255	0.016
	2/11/2019	0.019	0.001	0.004	0.004	0.028	0.198	<0.005
	5/8/2019	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	8/6/2019	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	11/14/2019	DRY	DRY	DRY	DRY	DRY	DRY	DRY
SSCAL - Source Well		0.3436	68.71	48.10	175	--	1.374	1.374
MW-3	3/9/2016	0.059	0.365	0.033	0.224	0.681	<0.001	0.008
	10/28/2016	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	10/25/2017	0.047	0.056	0.009	0.075	0.187	0.002	<0.005
	1/18/2018	0.047	0.035	0.010	0.066	0.158	0.002	0.036
	4/23/2018	**0.500**	0.360	0.740	2.200	3.800	*0.007*	*0.016*
	7/31/2018	0.052	0.032	0.020	0.105	0.209	0.002	<0.005
	11/20/2018	0.064	0.010	0.011	0.076	0.161	0.004	<0.005
	2/11/2019	0.098	0.015	0.017	0.153	0.283	0.003	<0.005
	5/8/2019	0.025	0.004	0.006	0.050	0.085	0.003	<0.005
	8/6/2019	0.006	0.001	0.002	0.008	0.017	0.002	<0.005
	11/14/2019	0.025	<0.001	0.004	0.009	0.038	0.002	<0.005
SSCAL - Source Well		0.3436	68.71	48.10	175	--	1.374	1.374
MW-4	3/9/2016	<0.001	0.001	<0.001	<0.003	0.001	0.002	0.009
	10/28/2016	<0.001	<0.001	<0.001	<0.003	BDL	0.117	0.018
	10/25/2017	<0.001	<0.001	<0.001	<0.003	BDL	0.177	<0.005
	1/18/2018	<0.001	<0.001	<0.001	<0.003	BDL	0.223	<0.005
	4/23/2018	<0.001	<0.001	<0.001	<0.003	BDL	0.253	<0.005
	7/31/2018	<0.001	<0.001	<0.001	<0.003	BDL	0.218	<0.005
	11/20/2018	<0.001	<0.001	<0.001	<0.003	BDL	0.239	<0.005
	2/11/2019	<0.001	<0.001	<0.001	<0.003	BDL	0.234	<0.005
	5/8/2019	<0.001	<0.001	<0.001	<0.003	BDL	0.215	<0.005
	8/6/2019	<0.001	<0.001	<0.001	<0.003	BDL	0.246	<0.005
	11/14/2019	<0.001	<0.001	<0.001	<0.003	BDL	0.247	<0.005
SSCAL - POC		0.3395	67.90	47.53	175	--	1.358	1.358

TABLE 3
GROUNDWATER ANALYTICAL SUMMARY
31ST STREET TEXACO
BIRMINGHAM, ALABAMA

SAMPLE I.D.	SAMPLE DATE	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)	TOTAL BTEX (mg/L)	MTBE (mg/L)	NAPHTH-ALENE (mg/L)
MW-5	10/28/2016	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	10/25/2017	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	1/18/2018	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	4/23/2018	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	7/31/2018	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	11/20/2018	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	2/11/2019	<0.005	<0.005	<0.005	<0.015	BDL	<0.005	<0.025
	5/8/2019	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	8/6/2019	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	11/14/2019	DRY	DRY	DRY	DRY	DRY	DRY	DRY
SSCAL - POC		0.2228	44.56	31.19	175	--	0.8912	0.8912
MW-6	10/28/2016	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	10/25/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	1/18/2018	NS	NS	NS	NS	NS	NS	NS
	4/23/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	7/31/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	11/20/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	2/11/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/8/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	8/6/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	11/14/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
SSCAL - Off-Site Indoor Inh.		1.833	112.0	169	92.61	--	2,201	3.649
MW-7D	10/28/2016	**6.710**	**83.600**	**52.000**	**184.000**	326.310	*0.001*	**14.000**
	10/25/2017	**3.310**	24.600	25.700	103.000	156.610	0.444	**17.600**
	1/18/2018	**3.670**	16.000	10.200	42.200	72.070	0.520	**2.350**
	4/23/2018	**0.845**	2.430	5.150	14.700	23.125	0.128	1.080
	7/31/2018	**2.340**	9.100	8.580	34.600	54.620	0.370	**2.560**
	11/20/2018	**2.120**	7.020	11.500	48.700	69.340	0.232	**3.080**
	2/11/2019	**0.753**	0.819	3.370	9.080	14.022	0.185	**1.420**
	5/8/2019	**1.580**	9.360	10.600	54.700	76.240	0.140	**2.680**
	8/6/2019	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	11/14/2019	**1.970**	5.960	10.500	45.300	63.730	0.310	**2.560**
SSCAL - Source Well		0.3436	68.71	48.10	175	--	1.374	1.374
MW-8D	10/25/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	1/18/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	4/23/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	7/31/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	11/20/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	2/11/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/8/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	8/6/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	11/14/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
SSCAL - Off-Site Indoor Inh.		1.833	112.0	169	92.61	--	2,201	3.649
MW-9	10/25/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	1/18/2018	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	4/23/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	7/31/2018	NS	NS	NS	NS	NS	NS	NS
	11/20/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	2/11/2019	NS	NS	NS	NS	NS	NS	NS
	5/8/2019	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	8/6/2019	DRY	DRY	DRY	DRY	DRY	DRY	DRY
	11/14/2019	DRY	DRY	DRY	DRY	DRY	DRY	DRY
SSCAL - Off-Site Indoor Inh.		1.833	112.0	169	92.61	--	2,201	3.649

TABLE 3
GROUNDWATER ANALYTICAL SUMMARY
31ST STREET TEXACO
BIRMINGHAM, ALABAMA

SAMPLE I.D.	SAMPLE DATE	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)	TOTAL BTEX (mg/L)	MTBE (mg/L)	NAPHTH-ALENE (mg/L)
MW-9D	10/25/2017	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	1/18/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	4/23/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	7/31/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	11/20/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	2/11/2019	NS	NS	NS	NS	NS	NS	NS
	5/8/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	8/6/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	11/14/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
SSCAL - Off-Site Indoor Inh.		1.833	112.0	169	92.61	--	2,201	3.649
MW-10D	10/25/2017	<0.001	<0.001	<0.001	<0.003	BDL	0.004	<0.005
	1/18/2018	<0.001	0.001	<0.001	<0.003	0.001	0.001	<0.005
	4/23/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	7/31/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	11/20/2018	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	2/11/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	5/8/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	8/6/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
	11/14/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
SSCAL - POC		0.2286	57.73	40.41	175	--	1.155	1.155
MW-11	10/25/2017	0.016	<0.001	0.005	0.019	0.040	0.001	0.011
	1/18/2018	0.011	<0.001	<0.001	0.007	0.018	0.001	<0.005
	4/23/2018	0.005	<0.001	<0.001	0.005	0.010	0.002	<0.005
	7/31/2018	0.017	<0.001	0.002	0.027	0.046	0.001	0.012
	11/20/2018	0.023	<0.001	0.005	0.024	0.052	0.002	<0.005
	2/11/2019	0.028	<0.001	0.002	0.019	0.049	0.001	0.009
	5/8/2019	0.024	<0.001	0.003	0.004	0.031	0.002	<0.005
	8/6/2019	0.028	<0.001	0.002	<0.003	0.030	0.002	<0.005
	11/14/2019	0.018	<0.001	0.002	<0.003	0.020	0.002	<0.005
SSCAL - POC		0.1137	22.74	15.92	175	--	0.4548	0.4548
MW-11D	10/25/2017	<0.001	0.001	<0.001	0.005	0.006	0.002	<0.005
	1/18/2018	0.001	0.003	0.003	0.011	0.018	0.002	<0.005
	4/23/2018	<0.001	<0.001	<0.001	<0.003	BDL	0.001	<0.005
	7/31/2018	<0.001	<0.001	<0.001	<0.003	BDL	0.002	<0.005
	11/20/2018	<0.001	<0.001	<0.001	<0.003	BDL	0.002	<0.005
	2/11/2019	<0.001	<0.001	<0.001	<0.003	BDL	0.002	<0.005
	5/8/2019	<0.001	<0.001	<0.001	<0.003	BDL	0.002	<0.005
	8/6/2019	<0.001	0.001	0.001	0.007	0.009	0.002	<0.005
	11/14/2019	<0.001	0.003	0.004	0.014	0.021	0.002	<0.005
SSCAL - POC		0.1137	22.74	15.92	175	--	0.4548	0.4548
MW-12V	10/25/2017	**1.690**	58.400	37.000	**187.000**	284.090	*0.028*	**24.100**
	1/18/2018	**2.740**	46.800	5.120	31.000	85.660	<0.400	*0.420*
	4/23/2018	0.052	0.125	0.105	0.424	0.706	0.016	0.048
	7/31/2018	**0.996**	4.720	1.380	5.720	12.816	0.128	0.311
	11/20/2018	**1.010**	33.800	12.400	80.200	127.410	*0.026*	**3.020**
	2/11/2019	0.090	0.153	0.302	0.625	1.170	0.029	*0.094*
	5/8/2019	0.317	0.381	0.570	1.590	2.858	0.109	0.328
	8/6/2019	**FP (1.05')**	**FP (1.05')**	**FP (1.05')**	**FP (1.05')**	**FP (1.05')**	**FP (1.05')**	**FP (1.05')**
	11/14/2019	**0.590**	7.790	1.250	11.600	21.230	0.057	0.296
SSCAL - POC		0.3395	67.90	47.53	175	--	1.358	1.358

TABLE 3
GROUNDWATER ANALYTICAL SUMMARY
31ST STREET TEXACO
BIRMINGHAM, ALABAMA

SAMPLE I.D.	SAMPLE DATE	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)	TOTAL BTEX (mg/L)	MTBE (mg/L)	NAPHTH-ALENE (mg/L)
DUPLICATES								
DUP (MW-2)	3/9/2016	0.167	0.168	0.104	0.670	1.109	0.034	<0.005
DUP (MW-4)	10/28/2016	<0.001	<0.001	<0.001	<0.003	BDL	0.104	0.017
DUP (MW-7D)	10/25/2017	4.280	39.400	41.600	165.000	250.280	0.480	44.800
DUP (MW-12V)	1/18/2018	2.740	49.600	5.800	32.000	90.140	<0.400	*0.452*
DUP (MW-7D)	4/23/2018	0.948	2.390	4.950	14.200	22.488	0.138	0.878
DUP (MW-7D)	7/31/2018	2.140	8.560	7.300	31.200	49.200	0.340	2.840
DUP (MW-7D)	11/20/2018	2.040	6.200	10.600	45.300	64.140	0.224	2.600
DUP (MW-7D)	2/11/2019	0.768	0.850	3.550	9.590	14.758	0.197	1.200
DUP (MW-12V)	5/8/2019	0.334	0.380	0.580	1.630	2.924	0.122	0.374
DUP (MW-6)	8/6/2019	<0.001	<0.001	<0.001	<0.003	BDL	<0.001	<0.005
DUP (MW-7D)	11/14/2019	1.910	5.020	8.860	39.000	54.790	0.310	2.400

Notes: *mg/L - milligrams per liter*
BTEX/MTBE/naphthalene analysis conducted per EPA Method 8260
Bold type *indicates concentration or laboratory detection limit exceeds SSCAL*
Values in italics are estimated values below the detection limit and above the method dectection limit
SSCAL - Site-Specific Corrective Action Level
NS - Not sampled

Source(s): *PPM Consultants, Inc.*
PPM Project No. 460102-CAPD

APPENDIX D – SITE HEALTH AND SAFETY PLAN

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

HEALTH AND SAFETY PLAN FOR

GROUNDWATER MONITORING, SYSTEM OPERATION AND MAINTENANCE, COMPLIANCE AUDITS, PHASE 1 ESA, AND MOBILE OZONE/VACUUM EVENTS

LAST REVISED: 09/2016

PPM CONSULTANTS

PREPARED UNDER THE DIRECTION OF:
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HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

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HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

EMERGENCY SUMMARY INFORMATION

Medical Facility:

In cases of incidents or near-misses, the Health and Safety Director (HSD) must be verbally contacted immediately once any spills/releases have been contained and appropriately isolated. Incidents resulting in injury or illness must be reported immediately to the HSD for further instruction and injury case management. 911 should be called for life-threatening cases or cases requiring immediate attention. Be prepared to administer CPR and first aid care only if you have been trained to do so, acquire consent from injured worker (unless unconscious in which consent is implied), and training is up-to-date.

This information is provided in **Appendix A, Emergency Medical Facilities**.

Company and Emergency Contact Information:

Agency/Emergency Responder	Telephone	Website
Fire Department / Police Department / Ambulance	911	--
Center for Disease Control and Prevention	800-232-4636	www.cdc.gov
CDC – Public Health Preparedness and Response	404-639-7405	cdcinfo@cdc.gov
CDC – Bioterrorism Preparedness and Response	404-639-0385	cdcinfo@cdc.gov
CDC – Toxic Substances and Disease Registry	770-488-7100	cdcinfo@cdc.gov
Chemtrec [24-Hour Emergency Chemical Spill]	800-262-8200	chemtrec@chemtrec.com
EPA RCRA Superfund Hotline	800-424-9346	--
Poison Control Center	800-222-1222	www.aapcc.org

PPM Contact Information	Representative	Office	Cell
Principal [Primary Regional Safety PIC]	Shawn Ivey	318-323-7270	318-237-0677
Principal [Alternate Regional Safety PIC]	Zane Hood	205-836-5650	205-240-9883
Health and Safety Director	Jeri Thrasher	318-812-3454	318-884-8188
Safety Supervisor [Baton Rouge]	David Durbin	225-293-7270	225-603-8050
Safety Supervisor [Birmingham]	Brandy Hall	205-836-5650	205-913-5471
Safety Supervisor [Jackson]	Regan Byrd	601-956-8233	601-862-8693
Safety Supervisor [Mobile/Pensacola]	Kay Williams	251-990-9000	251-753-4455
Safety Supervisor [Monroe]	Matt Colvin	318-812-3467	318-355-6415
Safety Supervisor [Orlando]	Amy Guilfoyle	407-240-1127	941-730-5600

Note: District and Project Managers can be contacted by using the office phone numbers provided for each location.

Designated Break and Evacuation Locations:

Personal protective equipment is required at all times within the work zone and can only be doffed when in the site's designated break area. Smoking will be permitted within the break area pending the site's ambient contaminant concentrations. In the event of an emergency, workers must report to the designated evacuation area for a headcount.

1.0 INTRODUCTION

1.1 COMPANY COMMITMENT

PPM is committed to the safety and wellbeing of its employees and subcontractors. Our mission to exceed client expectations is done under the provision that worker health, safety and security is not compromised in the process. In addition, the company strives to ensure that the environment and its natural resources are preserved and not otherwise negatively impacted as the result of company-related processes. This commitment to our workers and our environment is outlined within our written health, safety, security and environmental (HSSE) program, which establishes the company's expectations through its policies and procedures.

1.2 HASP PURPOSE

The purpose of this health and safety plan (HASP) is to mitigate those hazards associated with routine company-related tasks that could not otherwise be substituted or eliminated. This document outlines the control measures, protective equipment and emergency response procedures necessary to ensure worker safety and wellbeing are maintained. This HASP has been prepared in accordance with the Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120 standard for typical conditions encountered during routine field activities.

1.3 APPLICABILITY

All field-related projects and/or tasks require a HASP, unless otherwise exempted by the safety department. The provisions outlined within this plan are applicable to all personnel assigned to the project and subcontracted workers hired by the company to complete the project. PPM will not be responsible for the safety of contracted workers hired directly by the client or partnering companies unless otherwise specified by these entities to do so. Accountability for the health, safety and security of contractors under these circumstances must be pre-established and explicitly outlined within the proposed scope of work and must additionally be approved by a Principal of the company.

1.4 EXCEPTIONS

This general report template has been prepared specifically for common chemicals and tasks associated with groundwater monitoring, system operation and maintenance, Phase I environmental site assessments (ESA), compliance audits, mobile ozone or vacuum events and other similar non-intrusive repetitive tasks. Any project involving a chemical or field-related task outside of this scope is considered non-routine and is not covered by the provisions of this written plan. HASP requests and proposed scope-of-work for non-routine chemicals and/or job-related tasks must be sent directly to the safety department so that a site-specific HASP can be prepared. When possible, please allow five days for preparation.

This plan applies only to those redundant tasks that require no field documentation. Intrusive site activities such as drilling, excavating, chemical injection, system installation and demobilization as well as other similar tasks will require a site-specific HASP, which will be prepared by the Safety Supervisor upon written request.

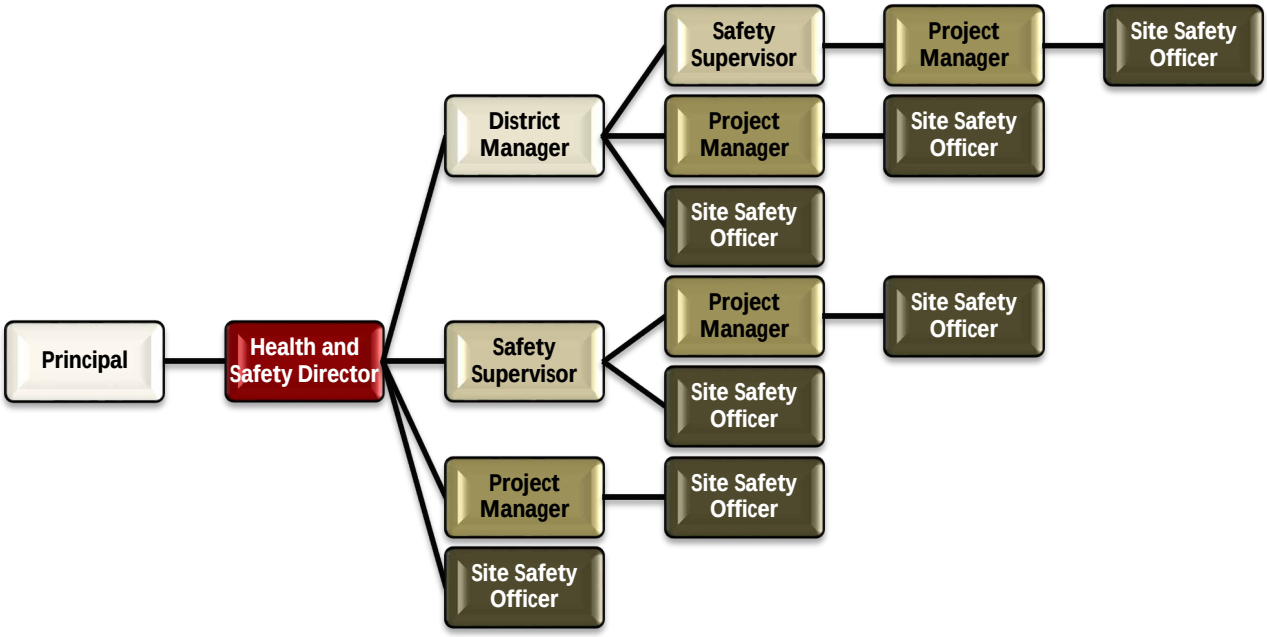
1.5 MANAGEMENT OF CHANGE

Should any unexpected conditions arise that introduces new hazards or eliminates existing hazards, work will cease immediately and this HASP will be amended to accommodate changes in site conditions. Additions or changes to this HASP will be communicated to all affected personnel and subcontractors.

2.0 ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

2.1 CHAIN-OF-COMMAND

The hierarchy of command creates a system for accountability and is extremely beneficial to the reporting process. As indicated by the graphic below, PPM has built-in redundancies within its command chain to ensure that all affected parties are notified and accountable as well as to compensate for designated personnel when they are inaccessible. There are various ways in which to notify management; however, when it involves worker safety and health, the Health and Safety Director (HSD) and Principal must be notified and cannot be by-passed.



2.2 PERSONNEL ROLES AND RESPONSIBILITIES

Safety is the responsibility of every worker within the company, regardless of position. Workers are accountable for their own personal safety as well as the safety of the co-workers around them. Also, key personnel within the company have additional safety obligations due to their designated leadership roles within the organization. PPM expects its managers to set the tone for safety through their exemplary leadership thereby creating the foundation for a strong safety culture. Positions requiring additional safety responsibilities include the following:

- **Principal**. Principals are assigned responsibility for different departments within the company. The primary Safety Principal-in-Charge (PIC) is Shawn Ivey [Monroe], and the alternate Safety PIC is Zane Hood [Birmingham]. Each is responsible for authorizing HSSE policies and procedures set forth by the safety department and establishing the final provisions when discrepancies are noted.
- **Health and Safety Director**. The HSD is responsible for proposing and generating HSSE policy/procedures under the advisement of the Safety PIC, communicating these provisions to all affected workers within the organization, and ensuring uniform implementation of these provisions throughout all branch offices.

- **District Manager**. Each branch office has a designated District Manager who is responsible for ensuring that HSSE policies and procedures are implemented by the workers assigned to his or her office. The District Manager is directly accountable to the Principals for the safety performance of his/her office.
- **Safety Supervisor**. Each branch office has a designated Safety Supervisor (SS) assigned by the District Manager. The SS is responsible for ensuring HSSE compliance by all within his/her office through consistent toolbox training, unscheduled site safety inspections and any other task delegated by the HSD. The SS is directly accountable to the HSD for his/her supervisory role and is also accountable to his/her District Manager regarding the office's safety performance.
- **Project Manager**. Project Managers are responsible for all aspects of their assigned projects, including the safety and wellbeing of the workers assigned to their jobsite. Project Managers establish the overall scope-of-work for the project and must consider the appropriate safety provisions (i.e., engineering design, protective equipment, etc.) during the planning phase. Project Managers are directly accountable to their District Managers for the job-related safety aspects.
- **Site Safety Officer**. A site safety officer (SSO) is assigned to each field project. An alternate SSO is assigned to any field project with more than one PPM employee onsite. The SSO is responsible for jobsite safety, which includes, but is not limited to, the following:
  - → Designate break and evacuation areas based on current site conditions
  - → Review the provisions outlined within the HASP and job safety analysis (JSA) with all affected personnel, subcontractors, client, and regulatory officials
  - → Ensure site security and preventing unauthorized entry to the work zone
  - → Ensure subsurface utilities have been marked and appropriate Principal approval has been obtained for exclusion zone disturbances
  - → Locate emergency shut-off devices to pumps and heavy equipment
  - → Establish communication system with equipment operators
  - → Ensure all workers and contractors wear required protective equipment
  - → Prohibit onsite smoking, except when permitted within designated areas
  - → Complete required field documentation outlined within the HASP for worker exposure monitoring and other site safety inspections
  - → Report to management any incident or near-miss involving worker injury/illness, property damage, contact with overhead or subsurface utilities, chemical/product releases or auto accident

  The alternate SSO is responsible for jobsite safety in the absence of the SSO or when under the direction of the SSO.

2.3 SHORT SERVICE EMPLOYEES

Short service employees are defined as any worker employed by PPM for less than six months or workers who have not yet completed required training and certification. Short service employees are assigned a mentor and supervised at all times when in the field - (exception: establishing offices that do not have a mentor may require that short service employees perform field duties unsupervised; however, Principal exemption is required).

2.4 TRAINING AND MEDICAL MONITORING

PPM field personnel associated with this project have received company HSSE policy and procedural training as part of their safety orientation. Personnel have additionally received initial 40-Hour HAZWOPER certification, which is updated annually through an 8-Hour refresher. This

training course meets the requirements of the OSHA 29 CFR 1910.120 standard. Short-service employees not otherwise HAZWOPER-certified will be provided training after 90-day probationary period.

In accordance with the medical monitoring requirements outlined within 29 CFR 1910.120, workers who are or may potentially be exposed to hazardous materials are provided a medical evaluation paid for by the company. Only those employees who have been medically cleared for duty by a physician are permitted to perform field duties.

3.0 HAZARD ASSESSMENT AND CONTROL MEASURES

A hazard is defined as a "situation that poses a level of threat to life, health, property or environment." For purposes of this written plan, hazards have been categorized in four ways – chemical, physical, biological and environmental. Hazards further outlined within the following sections are those that could not otherwise be eliminated or substituted as part of the risk assessment process. The control measures discussed throughout the following sections are required to mitigate the hazards posed to workers in order to ensure that worker safety and health is maintained.

3.1 CHEMICAL HAZARDS AND CONTROLS

PPM is an environmental consulting firm that specializes in environmental spill response, remediation and general regulatory compliance. As part of these functions, workers will likely be exposed to chemical hazards through the following routes: site contamination, chemicals used as part of the remediation process, chemicals used for equipment maintenance and calibrations, and chemicals used and/or stored at client facilities.

3.1.1 Gases and Fumes

3.1.1.1 Acids

Acids have a pH <7, change litmus paper to red, taste sour (most citrus fruits are acidic), are corrosive to metals, and are commonly found in car/forklift batteries, used as sample preservatives and used to prevent algae, calcium and other similar buildups in piping systems. Common acids encountered through company-related processes include but are not limited to: hydrochloric (muriatic), nitric, phosphoric and sulfuric acid. Acids can cause moderate to severe skin and eye burns, and breathing the fumes created by these materials can cause extreme burning of the respiratory system. Materials with a pH <2 must be disposed as a hazardous waste; however, acids can be neutralized with a bases/alkali.

Control Measures: Never pour water into acid! Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Thoroughly wash exposed skin and hands upon completion of handling to avoid skin/eye irritations, itching and burning and prevent accidental ingestion. Prevent contact with metals.

3.1.1.2 Bases/Alkali

Commonly referred to as caustics, bases have a pH >7, change litmus paper to blue, have a bitter taste, feel slippery and are commonly used to make soap and textiles, found in common household detergents, cleaners (i.e., Drano, oven cleaners and ammonia products), milk of magnesia and antacids. Common bases encountered through company-related processes include but are not limited to: sodium hydroxide, potassium hydroxide, calcium hydroxide, ammonia, and sodium carbonate. Bases can cause moderate to severe skin and eye burns, and breathing the fumes created by these materials can cause extreme burning of the respiratory

system and pulmonary edema. Materials with a pH >12.5 must be disposed as a hazardous waste. While bases react violently with acids, they can also be neutralized by acids.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Thoroughly wash exposed skin and hands upon completion of handling to avoid skin/eye irritations, itching and burning and prevent accidental ingestion.

3.1.1.3 Calibration and Fuel Gases

Calibration gases are used to calibrate air monitoring equipment. Common calibration gases used for equipment calibration include: hexane, isobutylene and methane. Calibration gases are used in small quantities, are highly flammable, and must be stored and handled safely. Gases such as hexane, methane, butane, and propane are used as fuel sources and may be encountered in larger quantities at oil and gas facilities. Workers may also come across methane gas through work in landfills, swamps, and agricultural land associated with raising livestock.

Control Measures: Keep containers upright, lids secured and store in climate-controlled environment away from heat sources. Calibration gases are asphyxiants (displace oxygen) so calibrate equipment in well-ventilated areas. When these gases are anticipated in larger quantities, workers must air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment.

3.1.1.4 Carbon Dioxide (Dry Ice)

Dry ice is carbon dioxide in a solid form. It may be used as a refrigerant and/or to displace vapors and has been used on some PPM jobsites for such purposes. Some hazards associated with the use of dry ice include, but are not limited to: frostbite through direct skin contact, asphyxiation due to displacement of oxygen in the atmosphere, and explosion from release of pressure exerted by the conversion of carbon dioxide solid to gas which could produce projectiles of the dry ice.

Control Measures: Avoid direct contact with solid dry ice to prevent frostbite. Avoid storing in areas with limited air flow (ventilation) such as buildings, vehicles, or other confined areas where gases can accumulate and be inhaled. Store inside a paper bag within a refrigerator, freezer, or cooler with a tight seal.

3.1.1.5 Hydrogen Sulfide

Hydrogen sulfide (H_2S) is a colorless gas known for its pungent odor (often referred to as a "rotten egg" odor) at low concentrations. It is a highly flammable and toxic substance associated with oil and gas refining, mining, tanning, pulp and paper processing, and rayon manufacturing. It can also occur naturally in sewers, well water, oil and gas wells, manure pits, and volcanoes. Hydrogen sulfide is heavier than air so it settles in low-lying enclosed areas such as manholes, sewers, and underground telephone vaults. Another characteristic of hydrogen sulfide is that it fatigues a worker's sense of smell so it cannot be relied upon in determining the continuous presence of H_2S gas. Health effects depend upon the exposure concentration and include, but are not limited to: irritation of eyes, respiratory system; apnea, coma, convulsions; conjunctivitis, eye pain, lacrimation (tears), photophobia (intolerance to light), corneal vesiculation; dizziness, headache, weakness, exhaustion, irritability, insomnia; gastrointestinal disturbance; as a liquid: frostbite.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Wear personal monitoring badges for H_2S within the breathing zone. Where applicable, rely upon stationary monitoring devices and when alarms are triggered, evacuate the area upwind immediately. Use escape only respiratory protection when issued by PPM and/or the client facility.

3.1.2 Oxidizers

3.1.2.1 Ozone

Ozone is a pale, blue gas with a distinctive odor similar to that of chlorine bleach and can be smelled at relatively low concentrations. It is a powerful oxidizer injected into subsurface soils for the treatment of contaminants such as MTBE, BTEX, hydrocarbons – aliphatic and polyaromatic, diesel fuel, chlorinated solvents, VOCs, and pesticides. Symptoms of exposure include: dryness of mouth, coughing, irritation to nose, throat and chest; difficult breathing, headache, and fatigue; eye irritation causing pain, lacrimation (tears) and inflammation.

Control Measures: Because ozone is injected into subsurface soils, worker exposures will likely result from a release at the monitoring wellhead, sparge point or other similar avenues that will lead the substance to ground surface. Workers must consistently air monitor sparge points and monitoring wells for evidence of ozone leakage. Collections must occur at the wellhead (source) as well as within the breathing zone of the worker. Ozone rapidly coverts into O_2, CO_2 and other less toxic molecules but exposure limits can be triggered at the wellhead so workers must keep face away from the source while collecting the sample until it can be confirmed that the sample is acceptable for worker exposure.

Although this system has built-in safety features which shut down the system if a leak is detected, sometimes ozone concentrations can build up inside the mobile ozone trailer. Workers should use caution when opening door and should keep door open while in use to allow for ventilation.

3.1.2.2 Hydrogen Peroxide (30-50%)

Hydrogen peroxide is a colorless liquid with a slightly sharp odor. It is a powerful oxidizer injected into subsurface soils, in conjunction with ozone, for the treatment of contaminants such as MTBE, BTEX, hydrocarbons – aliphatic and polyaromatic, diesel fuel, chlorinated solvents, VOCs, and pesticides. It is generally noncombustible, but upon contact with a combustible material, may result in spontaneous combustion. Direct contact may result in severe skin and eye damage. Symptoms of exposure include: irritation of eyes, nose, and throat; corneal ulcer; burning and redness of skin; and bleaching of hair.

Control Measures: Because hydrogen peroxide is injected into subsurface soils, worker exposures will likely result from a release at the monitoring wellhead, sparge point or other similar avenues that will lead the substance to ground surface. Therefore, workers must routinely air monitor around sparge points and monitoring wells for evidence of leakage. Collections must occur at the wellhead (source) as well as within the breathing zone of the worker. Hydrogen peroxide is injected into the subsurface via tubing from storage containers of liquid hydrogen peroxide so workers may have direct contact with these storage containers during initial setup and when replacing empty containers with new containers. Wear face shields, elbow-length gloves, and aprons as necessary to prevent direct contact with substance, and workers must keep face away from the source while collecting ambient air samples to avoid potential inhalation exposures and splash hazards.

3.1.3 Particulates and Fibers

Particulates are commonly referred as particulate matter and consist of pieces of solid matter suspended in a gas or liquid. Particulate matter can occur naturally or be man-made. Fibers consist of continuous filaments or elongated pieces like those similar to thread. Fibers are used to produce various materials such as paper, rope, and clothing. The common types of particulates and fibers encountered by personnel are outlined in the following sections.

3.1.3.1 Aluminum Oxide

Aluminum oxide is a byproduct generated by ozone remediation systems. Condensation forms on aluminum metal parts which when combined with oxygen creates a white, odorless, crystalline powder scale which can build up on metal parts of the system and presents a potential contact, inhalation, and/or ingestion exposure to workers. Aluminum oxide is a noncombustible solid, is not considered carcinogenic, and may include symptoms such as irritation of eyes, skin, and respiratory system.

Control Measures: To eliminate contact exposures, workers must wear chemical-resistant gloves and aprons to remove powder scale buildup from aluminum piping during routine system maintenance. Workers should avoid creating dust buildup of this substance, and when this cannot otherwise be avoided, workers must upgrade to respiratory equipment with P100 filter to prevent inhalation of this material.

3.1.3.2 Asbestos

Asbestos is a naturally-occurring fibrous material used in many products due to its attractive features. Asbestos has tensile strength, can easily be woven, and is heat and chemical resistant. It is most commonly found in roofing shingles, floor and ceiling tiles, textiles, coatings, paper and cement products, piping insulation and friction products such as automobile clutch, brake and transmission parts. The three most common forms of asbestos include:

- **Amosite**. Also called brown asbestos. Amphibole fiber formation (straight, needle-like fibers). Originated in Africa and used industrially as a fire retardant in thermal insulation, used in cement sheeting and is also found in ceiling tiles.

- **Chrysotile**. Also called white asbestos. Serpentine fiber formation (curled fibers). Is less friable (less-likely to be inhaled) than other types of asbestos and therefore viewed by many to be the safest type of the asbestos, which is why it is the most common form of asbestos used in the U.S. mostly in the form of building materials.

- **Crocidolite**. Also called blue asbestos. Amphibole fiber formation (straight, needle-like fibers). Originated in South Africa and Australia and used for thermal and chemical insulation as well as construction piping and water casings. Is considered to be the most dangerous type of asbestos.

When asbestos is disturbed through repairs, remodeling or demolition, airborne fibers can be inhaled by workers causing respiratory diseases such as lung cancer, asbestosis and mesothelioma – all of which have a latency period between exposure and onset of symptoms. These respiratory diseases are chronic in nature and generally irreversible. Smokers are more susceptible to the damaging health effects of asbestos exposures. Symptoms of asbestos exposure include: shortness of breath, difficult breathing or swallowing, persistent coughing that progressively worsens, wheezing and hoarseness, coughing up blood, pain or tightening in the chest, swelling of face or neck, loss of appetite, weight loss, fatigue or anemia.

Control Measures: Asbestos-containing areas must be identified by signs, which will likely be found when working at larger industrial and commercial facilities. In these cases, workers must avoid these areas and take all necessary precautions to prevent disturbing any materials within these areas. In most cases, potential asbestos exposures will be in the form of sample collection as part of environmental site assessments performed on commercial properties. Personnel must be certified asbestos inspectors to perform these collections. In some cases, demolition of structures potentially containing asbestos materials may be supervised. At a minimum, the designated PPM-representative must be asbestos certified; however, the demolition and air monitoring requirements will be subcontracted to an appropriately state-certified contractor.

Because the sample collection process disturbs asbestos-containing materials (ACM) or potential asbestos-containing materials (PACM), workers must wear air-purifying respiratory protection in the form of half-mask respirator with P100 high efficiency particulate air (HEPA) filters and must also wet the sample area with a soap-water mixture to reduce the dispersion of fibers. *Note: asbestos-containing materials will be presumed until otherwise verified through laboratory analysis. Buildings constructed prior to the 1980s have a greater likelihood of containing asbestos. PACMs must be treated as if they contain asbestos, and the greatest level of control should be used when collecting samples*.

3.1.3.3 Heavy Metals

Numerous heavy metals bind naturally to soils and can be leached into groundwater. Heavy metal exposures are most often inhalation hazards from dusty environments. PPM does not anticipate these types of exposure risks associated with the tasks covered by this written plan. Heavy metals are poisonous to humans and can cause severe health effects due to their proven or suspected carcinogenic characteristics. Common heavy metals encountered through company-related processes include:

- **Aluminum**. A silvery-white, malleable, ductile, and odorless solid (metal); combustible as a solid (although takes effort), but easily ignitable when in fine dust form which can cause explosions; can cause damage to the eyes, skin and respiratory system; symptoms include: skin, eye and respiratory irritation.
- **Arsenic**. A silver-gray or tin-white metal commonly associated with under-ground storage tanks; noncombustible in solid form but presents slight explosion hazard in dust form when exposed to flame; is considered potential lung and lymphatic system carcinogen and can also affect liver, kidneys and skin through inhalation, skin absorption, skin/eye contact and ingestion exposures; symptoms include: respiratory irritations such as ulceration of nasal septum, dermatitis, gastrointestinal disturbances, hyperpigmentation (darkening) of the skin, and peripheral neuropathy (problem with nerves that carry information to and from the brain and spinal cord which can result in pain, loss of sensation and inability to control muscles).

- **Barium**. A silvery-white metal that exists naturally in the environment; because it is very reactive in its natural state, it is often combined with other elements such as oxygen, carbon and sulfur; it has many uses, but one likely exposure source is that it is used by the oil and gas industry to make drilling mud, which lubricates the drill and simplifies the process when drilling through rock; barium in its natural state is highly flammable and reacts violently with water; may cause irritation of skin, eye, nose, throat and upper respiratory tract, allergic reactions, and central nervous system damage; symptoms include: corneal damage including blindness, poisoning, dermatitis, and skin, eye and throat burns.
- **Cadmium**. A soft, bluish-white metal commonly associated with underground storage tanks; noncombustible in solid form but will burn in powder form; is considered potential prostate and lung carcinogen and can also affect respiratory system, kidneys and blood through inhalation and ingestion exposures; symptoms include: pulmonary edema (fluid in air sacs of lungs) which causes difficult breathing, cough, chest tightness, substernal pain, headache, chills, muscle aches, nausea, vomiting, diarrhea, loss of smell, emphysema, proteinuria (protein in urine), and mild anemia.
- **Chromium**. A hard, steel-gray metal commonly associated with underground storage tanks; noncombustible in solid form but finely dispersed dust particles will rapidly burn when exposed to a flame; chromium is not considered a likely carcinogen, but does affect skin, eyes and respiratory system through inhalation, ingestion and contact exposures; symptoms include: skin and eye irritation and lung fibrosis (scarring of the lungs).
- **Copper**. A soft, malleable reddish-orange metal commonly associated with underground storage tanks; noncombustible in solid form but may ignite when in powder form; copper is not considered a likely carcinogen, but does affect skin, eyes, respiratory system, liver and kidneys through inhalation, ingestion and contact exposures; symptoms include: skin, eye and pharynx irritation, nasal septum perforation, metallic taste, and dermatitis.
- **Iron**. A lustrous metal with a grayish tinge commonly used in industry in the construction of machinery, tools, automobiles, ships and building components; it is the most commonly used of all metals and can also be found in numerous dietary sources; elevated iron in the blood can react with peroxides to produce free radicals that can damage DNA, proteins, lipids and other cellular components; upon exposure, iron can cause skin, eye, mucous and respiratory irritations; it is also flammable as a fine dust.
- **Lead**. A soft, gray metal commonly associated with underground storage tanks, paints and coatings; noncombustible in solid form; lead is not considered a likely carcinogen, but does affect eyes, gastrointestinal tract, central nervous system, kidneys, blood and gingival tissue (soft tissue of the mouth surrounding the teeth) through inhalation, ingestion and contact exposures; symptoms include: eye irritation, weakness, exhaustion, insomnia, facial pallor (paleness), weight loss/anorexia, malnutrition, constipation, abdominal pain, colic, anemia, gingival lead line, tremor, paralysis of wrist and ankles, encephalopathy (various brain disorders), kidney disease, and hypertension.
- **Magnesium**. A strong, silvery-white, light-weight metal that exists naturally in the environment; because it is very reactive in its natural state, it is often combined with other elements to form magnesium oxide, various salts, and other industrially-important compounds; magnesium is the third most commonly used metal; because it is light-weight, it is widely used in manufacturing numerous electronics; upon exposure, magnesium can cause skin and eye irritations; it is also flammable as a fine dust.

- **Mercury**. A silver-white, liquid metal associated with underground storage tanks, batteries, fluorescent bulbs, thermometers and thermostats; noncombustible liquid; mercury is not considered a likely carcinogen but does affect skin, eyes, respiratory system, central nervous system and kidneys through inhalation, skin absorption, ingestion and contact exposures; symptoms include: skin and eye irritation, cough, chest pain, difficult breathing, bronchitis, pnuemonitis (lung inflammation), tremor, insomnia, irritability, indecision, headache, weakness, exhaustion, stomatitis (inflammation of lining within the mouth), salivation, gastrointestinal disturbance, weight loss/anorexia, and proteinuria (protein in urine).
- **Selenium**. Crystalline, red to gray solid that is considered to be combustible when in fine dust form; elemental selenium is rare – it is most commonly produced as a byproduct of refining copper or producing sulfuric acid; selenium can cause damage to the skin, eyes, respiratory system, liver, kidneys, blood and spleen; symptoms include: skin, eye, nose, and throat irritations, visual disturbance, headache, chills, fever, difficulty breathing, bronchitis, metallic taste, garlic breath, gastrointestinal disturbance, dermatitis, and skin and eye burns.
- **Silver**. A white, lustrous metal that is noncombustible in solid form but can become flammable when in dust form. Silver can cause damage to the nasal septum, skin and eyes. Symptoms include: blue-gray eyes, nasal septum, throat and skin, ulceration of skin, and gastrointestinal disturbance.
- **Zinc**. A bluish-white metal commonly associated with underground storage tanks and used as an anti-corrosion agent; zinc is commonly found in common cold lozenges and over-the-counter cold remedies, as a dietary supplement and also within common foods such as beans, nuts, whole grains and pumpkin/sunflower seeds; zinc is commonly considered non-toxic but in abundance can result in gastrointestinal irritation through ingestion exposures; symptoms include: loss of appetite, nausea, vomiting, stomach cramps, diarrhea and headaches.

Control Measures: If dusty environments are encountered, soils should be wet and kept moist to reduce the amount of airborne dust concentrations generated. However, based on the likely exposure source (contact or unintentional ingestion of contaminated groundwater), workers should protective clothing and incorporate good sanitary procedures (i.e., washing hands) to prevent contact exposures.

3.1.3.4 Nuisance and Concrete Dust

Dust generation is a common occurrence when working with contaminated soils and when mixing or dismantling concrete. In most cases, activities that result in dust accumulation are subcontracted making them more susceptible to these respiratory hazards than PPM personnel. Generally, dust accumulation is minimal, but the SSO must ensure that subcontractors are using effective controls to minimize dust accumulation, and that they are also equipped and wearing the appropriate protective equipment when performing these tasks. Contaminants associated with common job-related dusty environments include:

- **Total and respirable dust**. Dust found in the air that can cause breathing difficulties if inhaled. OSHA has established permissible exposure limits (PELs) for both total and respirable dusts to regulate worker exposures. Respirable dust is defined as dust particles less than 10 micrometers in diameter, which is too small to be visible. Symptoms of exposure can include coughing, wheezing and breathing difficulties.
- **Concrete dust**. Commonly generated through core drilling and jack-hammering through concrete. Also, small areas of concrete can be replaced by workers who may

generate dusts from bags of cement as part of the mixing process. Trace amounts of crystalline silica, alkaline compounds and hexavalent chromium are found within cement. OSHA has established PELs for Portland cement to regulate worker exposures. Symptoms of exposure can include coughing, wheezing, eye irritations and in severe cases silicosis. Wet cement can also cause skin burns so workers should wear goggles and aprons or long-sleeved clothing when mixing cement.

Control Measures: Soils should be wet and kept moist to reduce the amount of airborne dust concentrations generated. Providing sufficient ventilation, wearing safety glasses with side-shield protection and wearing dust masks or respiratory equipment with P100 filter are other alternatives for working in dusty environments. Most PPM jobsites can be mitigated using wet methods only. Workers should use additional precautions when using both wet methods and power tools or corded equipment to avoid electrical shock.

3.1.4 Volatile and Semi-Volatile Organic Compounds

Volatile organic compounds (VOCs) are a broad group of materials that have the ability to vaporize (change from a solid or liquid into a gas) with an increase in ambient temperature. Some example VOCs include: paints and lacquers, paint thinners, pesticides, solvents and degreasers, glues/adhesives and petroleum fuels. Semi-volatile organic compounds (SVOCs) include phenols and polycyclic aromatic hydrocarbons (PAHs), which have a higher boiling point than water and may vaporize with an increase in ambient temperature. VOC/SVOCs are not known for acute toxicity but have significant chronic health effects because concentrations are often low and symptoms are slow to develop, which is why several VOC/SVOCs are suspected or known carcinogens. Common VOC/SVOCs are outlined in the following sections.

3.1.4.1 Chlorinated Compounds

A chlorinated solvent is a type of organochlorine, which is an organic compound (contains carbon) that also contains chlorine. They are found in a variety of products and used as part of the dry cleaning process due to its ability to dissolve materials such as fats and greases. Workers are most likely to be exposed to these chemicals as part of soil and groundwater assessment and remediation associated with dry cleaning contaminants. Chlorinated solvents can be environmentally persistent and tend to evaporate easily making inhalation the primary route of worker exposure. However, workers may additionally be exposed to chlorinated solvents through ingestion, absorption and skin/eye contact. Common chlorinated solvents encountered through company-related processes include:

- **Carbon tetrachloride**. A noncombustible, colorless liquid with ether-like odor; considered a potential carcinogen with damaging effects to the central nervous system, eyes, lungs, liver, kidneys, and skin; symptoms include: skin and eye irritation, central nervous system depression, nausea, vomiting, drowsiness, dizziness, and incoordination.
- **Chloroform**. A noncombustible, colorless liquid with pleasant odor; considered a potential carcinogen with damaging effects to the liver, kidneys, heart, eyes, skin, and central nervous system; symptoms include: skin and eye irritation, dizziness, mental dullness, nausea, confusion, headache, weakness, exhaustion, anesthesia, and enlarged liver.
- **Methylene chloride**. A combustible, colorless liquid with chloroform-like odor; considered a potential carcinogen with damaging effects to the eyes, skin, cardiovascular system, and central nervous system; symptoms include: skin and eye irritation, weakness, exhaustion, drowsiness, dizziness, numb and tingling limbs, and nausea.

- **Perchloroethylene (Tetrachloroethylene)**. A noncombustible, colorless liquid with mild chloroform-like odor; when in a fire, it decomposes to hydrogen chloride and phosgene; considered a potential carcinogen with damaging effects to the eyes, skin, respiratory system, liver, kidneys and central nervous system; symptoms include: skin, eye, nose, throat and respiratory irritation, nausea, flushed face and neck, dizziness, incoordination, headache, drowsiness, skin redness, and liver damage.
- **Trichloroethylene**. A combustible, colorless liquid with chloroform-like odor; will burn when exposed to flame, but is difficult to burn; considered a potential carcinogen with damaging effects to the eyes, skin, respiratory system, heart, liver, kidneys, and central nervous system; symptoms include: skin and eye irritation, headache, visual disturbance, weakness, exhaustion, dizziness, tremor, drowsiness, nausea, vomiting, dermatitis, cardiac arrhythmias, parasthesia (tingling or numbness of the skin), and liver injury.
- **Vinyl chloride**. A combustible, colorless gas or liquid (below 7º F) with pleasant odor at high concentrations; considered a potential carcinogen with damaging effects to the liver, central nervous system, blood, respiratory system, and lymphatic system; symptoms include: weakness, exhaustion, abdominal pain, gastrointestinal bleeding, enlarged liver, pallor or cyanosis of extremities, and frostbite (as a liquid).

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment.

3.1.4.2 Isopropyl Alcohol

After bailers and reusable sampling equipment is decontaminated with alconox® solution, it is then sprayed with isopropyl alcohol. Also referred to as isopropanol, isopropyl alcohol is a colorless, flammable liquid commonly known as rubbing alcohol. It is considered a skin, eye and respiratory system irritant that causes damage through inhalation, ingestion and skin/eye contact exposures. Symptoms of overexposure include: irritation of eyes, nose and throat, drowsiness, dizziness, headache and dry, cracking skin.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Increase frequency of air monitoring if action limits are triggered and remove or isolate all ignition sources if flammability limits are triggered. Thoroughly wash exposed skin and hands upon completion of handling to avoid skin/eye irritations.

3.1.4.3 Methyl-Tertiary Butyl Ether (MTBE)

MTBE is a colorless, flammable liquid with an ether-like odor used as a fuel additive to reduce emission gases such as ozone and carbon monoxide. At one point gasoline could consist of as much as 10-15% MTBE but has since been replaced with ethanol and other additions less harmful to humans and the environment. MTBE poses a concern because it is considered a potential human carcinogen, can easily travel through soils, and is very soluble in water creating larger contaminant plumes than other gasoline constituents. It is also more resistant to biodegradation making it more environmentally persistent. MTBE is considered a skin, eye, respiratory and central nervous system irritant with symptoms that include: skin, eye and mucous membrane irritation, dizziness, nausea, headache, intoxication, loss of balance and coordination, unconsciousness, coma, respiratory failure and death.

Control Measures: Avoid prolonged exposures to oil mist, liquid or vapor. Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Thoroughly wash exposed skin and hands upon completion of handling to avoid skin/eye irritations.

3.1.4.4 Organic Hydrocarbons

Total petroleum hydrocarbon (TPH) is a broadly used term referring to a large family of compounds that originate from crude oil. Crude oil is a naturally-occurring, flammable liquid comprised of a complex mixture of various hydrocarbons. It is recovered through oil drilling, but can be refined and separated into other substances such as gasoline, kerosene, diesel and lubricating oils. TPH is generally comprised of hydrogen and carbon; hence the term "hydrocarbon". Because there are so many different mixtures, TPH is divided into groups or fractions, and each fraction consists of hydrocarbons that exhibit similar soil and groundwater traits. Fractioning TPH is beneficial in the risk assessment process because certain fractions may be eliminated as contaminants of concern. Common petroleum-based chemicals encountered through company-related processes include:

- **Gasoline**. Gasoline is extracted from crude oil through a distillation process. It is comprised primarily of aliphatic hydrocarbons, but also includes some aromatic hydrocarbons such as benzene and toluene to increase octane ratings. Additional additives such as tetraethyl lead and methyl-tertiary butyl ether (MTBE) were added to gasoline to enhance performance and reduce harmful carbon monoxide exhaust emissions and reduce smog. Due its harmful effects to human health and the environment, neither additive is currently used and has been replaced instead with alcohols such as ethanol or methanol.

  Gasoline is used primarily as a fuel source but can also be used as a solvent. Components of gasoline are considered to be carcinogenic, and because gasoline is highly volatile, inhalation of vapors is always a concern for workers. Gasoline is also a skin and eye irritant, its vapors are highly flammable, and it is a major source of pollution gas (i.e., 1 U.S. gallon of gasoline produces 19.4 pounds of carbon dioxide, a greenhouse gas). Gasoline is comprised of the following four constituents:

  - Benzene – a colorless, flammable liquid with a sweet odor; makes up on average 0.62% to 1% of gasoline; is considered a known carcinogen with damaging effects to skin, eyes, respiratory system, blood, central nervous system and bone marrow, which can result in anemia (decreased red blood cell count making one weak and tired), decreased white blood cell count (difficult to fight off infections), and low blood platelet count (excessive bleeding); benzene causes damage through inhalation, skin absorption, ingestion and contact exposures; symptoms include: drowsiness, dizziness, headaches, confusion, tremors, skin/eye irritations, redness and blistering of the skin, vomiting, stomach irritation, convulsions, rapid heart rate, unconsciousness, leukemia (long-term) and death (large doses).
  - Toluene – a colorless, flammable liquid with benzene-like odor (smells like paint thinner); can produce damaging effects to skin, eyes, respiratory and central nervous systems, liver and kidneys; toluene causes damage through inhalation, skin absorption, ingestion, and contact exposures; symptoms include: eye and nose irritation, weakness, exhaustion, confusion, euphoria, dizziness, headaches, dilated pupils, lacrimation (tears), anxiety, muscle fatigue, insomnia,

parathesia (tingling or numbness of the skin), dermatitis, and liver/kidney damage.

→ Ethylbenzene – a colorless, flammable liquid with aromatic odor (smells like gasoline); is considered a potential human carcinogen that can produce damaging effects to skin, eyes, respiratory and central nervous systems; ethylbenzene causes damage through inhalation, skin/eye contact and ingestion exposures; symptoms include: irritation of the eyes, skin and mucuous membranes, headaches, dizziness, dermatitis, narcosis (unconsciousness) and coma.

→ Xylene – colorless, flammable liquid with sweet, balsam-like odor; is a mixture of ortho-, meta- and para-xylene isomers that releases carbon monoxide gas when burned; can produce damaging effects to skin, eyes, respiratory and central nervous systems, gastrointestinal tract, blood, liver and kidneys; xylene causes damage through inhalation, skin absorption, ingestion and skin/eye contact exposures; symptoms include: irritation of skin, eyes, nose and throat, dizziness, excitement, drowsiness, incoord-ination, staggering gait, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain and dermatitis.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Increase frequency of air monitoring once action limits are triggered to ensure that all ignition sources are removed or isolated when flammability limits are triggered.

§ **Kerosene**. Kerosene is a source of fuel refined from crude oil that is heavier than gasoline but lighter than diesel. It is a colorless to yellowish oily liquid used in households as a lamp oil and used industrially as jet fuel for aircraft and rocket engines. Kerosene has a strong odor, is highly flammable, and causes damage to the eyes, skin, respiratory system, and central nervous system. Workers may be exposed to liquid kerosene and its vapors through inhalation, ingestion, skin and/or eye contact. Symptoms include: irritation of eyes, skin, nose and throat; burning sensation in chest; headache, nausea, lassitude (weakness, exhaustion), restlessness, incoordination, confusion, drowsiness; vomiting, diarrhea; dermatitis; and chemical pneumonitis (aspiration liquid). Kerosene is commonly referred to as paraffin in other countries.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Increase frequency of air monitoring once action limits are triggered to ensure that all ignition sources are removed or isolated when flammability limits are triggered.

§ **Diesel/polycyclic aromatic hydrocarbons (PAHs)**. Diesel is a source of fuel refined from crude oil and used in diesel trucks, boats, school and city buses, trains, cranes, farming equipment, emergency response vehicles and power generators. Diesel is an attractive fuel source because it is less volatile and emits smaller amounts of greenhouse gases (CO and CO_2); however, during combustion it does release large amounts of soot which can lead to acid rain, smog and poor health conditions. PAHs are found in crude oil and soot and are also a by-product of petroleum processing or combustion, specifically the incomplete burning of oil and gas. Common PAH constituents include: acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene,

benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h) anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene. The regulated PAH constituents are outlined below:

- → Coal tar pitch volatiles - PAH components anthracene, benzo(a)pyrene, chrysene, phenanthrene, and pyrene, all of which have the same chemical description, target organs, and regulatory threshold limits are not addressed by NIOSH as individual components. Instead, they are classified and regulated as coal tar pitch volatiles. Coal tar pitch volatiles may vary slightly but are described as combustible, black or brown amorphous residues and are considered a potential human carcinogen with damaging effects to respiratory system, skin, bladder, and kidneys. Symptoms include: dermatitis and bronchitis.
- → Naphthalene – Naphthalene is a combustible, colorless to brown solid with an odor or mothballs that causes damaging effects to eyes, skin, blood, liver, kidneys, and central nervous system. Symptoms include: eye irritation, headache, confusion, excitement, discomfort, nausea, vomiting, abdominal pain, bladder irritation, profuse sweating, jaundice, blood in urine, renal failure, dermatitis, optic and cornea damage.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Increase frequency of air monitoring once action limits are triggered to ensure that all ignition sources are removed or isolated when flammability limits are triggered.

§ **Hydraulic and lubrication oils**. Oils used for internal combustion engines to lubricate moving parts, prevent corrosion and to cool the engine. Lubricating oils are made from crude oil but also include additives to improve certain properties. Lubricating oils can be highly flammable and can cause irritation of nose, throat and lungs, headaches, dizziness, nausea, vomiting and diarrhea.

Control Measures: Avoid prolonged exposures to oil mist, liquid or vapor. Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment. Thoroughly wash exposed skin and hands upon completion of handling to avoid skin/eye irritations.

3.1.4.5 Pesticides

A pesticide is another type of organochlorine commonly used for crop dusting agricultural farmland not only to kill insects, rodents and germs, but is also used for weed and mildew control. The term “pesticide” includes a broad category of chemicals that can be further broken down into insecticides, rodenticides and fungicides. Some older and more recently banned pesticides (such as DDT) tend to be environmentally persistent. Workers are potentially exposed to pesticides as part of the assessment or remediation of impacted farmland as well as commercial pesticide manufacturing and/or storage facilities. Similarly to chlorinated solvents, pesticides can be volatile making inhalation the primary route of worker exposures. However, workers may additionally be exposed to pesticides through ingestion, absorption and skin/eye contact. There are numerous pesticides tested as part of assessment and remediation of impacted sites; however, the following pesticides are OSHA-regulated materials that pose a potential health risk to workers:

- **Aldrin**. A noncombustible, colorless to dark-brown crystalline solid with mild chemical odor; may dissolve in flammable liquids; formerly used as an insecticide and is considered a potential carcinogen with damaging effects to the central nervous system, kidneys, liver, and skin; symptoms include: headache, dizziness, nausea, vomiting, vague feeling of discomfort, jerking of limbs, convulsions, coma, hematuria (blood in urine), and azotemia (blood containing high levels of urea, creatinine and other nitrogen-rich compounds).
- **Dichlorodiphenyltrichloroethane (DDT)**. A combustible, colorless crystals or off-white powder with a slight aromatic odor; considered a potential carcinogen with damaging effects to the eyes, skin, central nervous system, liver, kidneys, and peripheral nervous system; symptoms include: skin and eye irritation, tingling and numbness of tongue, lips and face, tremor, anxiety, dizziness, confusion, vague feeling of discomfort, headache, weakness, exhaustion, convulsions, partial loss or impaired movement of hands, and vomiting.
- **Dieldrin**. A noncombustible, colorless to light-tan crystals with a mild chemical odor; used as an insecticide and is considered a potential carcinogen with damaging effects to the central nervous system, liver, kidneys, and skin; symptoms include: headache, dizziness, nausea, vomiting, vague feeling of discomfort, sweating, jerking of limbs, convulsions, and coma.
- **Endrin**. A noncombustible, colorless to tan, crystalline solid with a mild chemical odor; may dissolve in flammable liquids; used as an insecticide with damaging effects to the central nervous system and liver; symptoms include: epileptic-like convulsions, stupor, headache, dizziness, abdominal discomfort, nausea, vomiting, anorexia, insomnia, aggressiveness, confusion, drowsiness, weakness, and exhaustion.
- **Heptachlor**. A noncombustible, white to light-tan crystals with a camphor-like odor; may dissolve in flammable liquids; used as an insecticide and is considered a potential carcinogen with damaging effects to the central nervous system and liver; symptoms provided for animals only and include: tremor, convulsions, and liver damage.
- **Lindane**. A noncombustible, white to yellow crystalline powder with slight, musty odor; may dissolve in flammable liquids; causes damaging effects to skin, eyes, respiratory system, central nervous system, blood, liver, and kidneys; symptoms include: skin, eye, nose and throat irritation, headache, nausea, convulsions, respiratory difficulty, cyanosis, aplastic anemia, and muscle spasm.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment.

3.1.4.6 Polychlorinated Biphenyls (PCB)

Polychlorinated biphenyls (PCBs) are a mixture of numerous chlorinated compounds and are commercially sold under the trade name Aroclor® 1242 (contains 42% Cl^-) and Aroclor® 1254 (contains 54% Cl^-). It is a colorless to light-yellow, oily solid or liquid with no known taste or smell and can volatilize to a vapor with a slight increase in temperature. PCBs were used as coolants and lubricants in transformers, capacitors and electrical equipment because they do not burn easily and are good insulators. Production in the U.S. was discontinued in 1977 due to its environmental persistence and damaging health effects. PCBs do not easily break down, bind strongly to soil, accumulate in fish and marine life, and can travel far distances in air.

Workers are likely to be exposed to PCBs through damaged or burning transformers, known/suspected site contamination, or ingestion of contaminated fish. PCBs can also be found in pre-1977 fluorescent light fixtures, electrical devices (TVs and appliances), and hydraulic oils. Worker exposures are likely to occur through inhalation, absorption, ingestion and contact causing damaging effects to the skin, eyes, liver and reproductive system. Symptoms include: eye irritation, chloracne (acne-like skin condition in adults), liver damage, and reproductive effects.

Control Measures: Air monitor site conditions to ensure assigned action limits are not triggered. Immediately report any triggered action limit to the safety department and be prepared to temporarily shut down jobsite to incorporate control measures (i.e., stand upwind of concentrations) or upgrade protective equipment.

3.1.5 Other/Unknown Chemicals

3.1.5.1 Activated Carbon

Also referred to as activated charcoal, this material comes in various forms but is most often purchased by PPM in granular form (occasionally purchased in pellet form). Activated carbon is porous material that is effective in the adsorption of gases and vapors and is commonly used as part of the groundwater treatment process. This material is non-toxic but can be irritating to the skin and eyes. Loose pellets can also present a slip hazard.

Control Measures: Keep pellets inside storage bag or carbon vessel and immediately remove spilled pellets from the work area to prevent slipping. Wear appropriate protective clothing such as gloves and safety glasses when working with/near this material to prevent skin and eye contact.

3.1.5.2 Alconox®/Liquinox®

Alconox® (powder) and Liquinox® (liquid) are detergents used to decontaminate bailers and equipment to prevent cross-contamination of samples. Detergents generally can be skin or eye irritants that can cause itching, pain, redness or burning.

Control Measures: Keep face away from solution when mixing and wear safety glasses with side-shield protection or goggles depending upon the degree of splashing.

3.1.5.3 Descaling Agents (Analytix AN-754GH)

Various chemicals may be used to prevent the accumulations of scaling along monitoring well walls. These descalers may vary by office location; however, most of these chemicals exhibit similar characteristics. They are typically acidic in nature and may be extremely corrosive to skin, eyes, and respiratory system.

Control Measures: Keep face away from solution when handling and wear safety glasses with side-shield protection or goggles depending upon the degree of splashing. Use safe precautions when handling material and make every effort to avoid direct contact with this material through the use of protective clothing and equipment such as chemical-resistant gloves, goggles and aprons. Avoid inhaling any fumes that may arise from these chemicals.

3.1.5.4 Unknown Chemicals and/or Concentrations

Workers do not often come into contact with unknown chemicals and/or chemical concentrations. Although rare, workers may potentially encounter unknowns during drum characterizations as requested by a particular client. When the client cannot identify the material(s) inside a drum or other container, this material(s) is to be treated as an extremely hazardous substance using the highest level of safety precautions including, but not limited to, personal protective clothing/equipment. When working with known chemicals at unknown concentrations, the same level of safety precautions must be implemented to preserve worker safety and wellbeing. These situations are considered an immediately dangerous to life and/or health (IDLH) environment.

Control Measures: When this type of work is proposed by a client, it must be presented and approved by Shawn Ivey or Zane Hood, Regional Principals. Due to the increase in safety precautions, a site-specific HASP must be generated by the Health and Safety Director, which may require additional time to prepare. Never open a site drum/container that does not belong to PPM if the contents or concentrations are unknown.

3.1.6 Chemical/Physical Properties

The following table outlines the chemical and physical properties associated with the most common volatile or semi-volatile constituents encountered by PPM.

Chemical Name	VP[1]	VD[2]	SG[3]	Sol[4]	FP[5]	LEL[6]	UEL[7]
Diesel	0.009 psia	>1	0.83-0.88	Negligible	125	0.6	7.5
Gasoline	38-300	3-4	0.72-0.76	Insoluble	45	1.4	7.6
Benzene	75	2.8	0.88	<1	12	1.2	7.8
Toluene	21	4	0.87	<1	40	1.1	7.1
Ethylbenzene	7	4	0.87	<1	55	0.8	6.7
Xylene	9	4	0.86	<1	81	1.1	7.0
MTBE	245-256	3.1	0.74	4.8	-17	1.6	8.4
Ozone	>1 atm	1.7	2.14	<1	N/A	N/A	N/A

1 – Vapor Pressure (mmHg) – the higher the VP, the more likely it is to change from a liquid to a vapor with an increase in temperature.
2 – Vapor Density – how heavy the material is in air; anything >1 will sink into worker breathing zone; anything <1 will rise.
3 – Specific Gravity – how heavy the material is in water; anything >1 will sink in water; anything <1 will float on water.
4 – Solubility (%) – how likely the material is to be dissolved in water.
5 – Flash Point (°F) – lowest temp that material vapors will ignite/burn.
6 – Lower Explosive Limit (%) – lowest concentration in which vapors will ignite.
7 – Upper Explosive Limit (%) – highest concentration in which vapors will ignite.

3.2 PHYSICAL HAZARDS AND CONTROLS

3.2.1 Combustion/Flammability

The three elements needed to produce a fire are: combustible material, oxygen, and ignition source (heat). As part of most projects, the presence of gasoline (flammable contaminant) within an outdoor environment (sufficient oxygen content) when combined with the use of heavy equipment (electrical source) provides all three elements necessary to produce a flammable setting. Fires can also be the result of overloading circuitry and improper chemical storage.

Control Measures: Monitor ambient site concentrations to ensure flammable action limits are not triggered. Oxidizers are capable of releasing oxygen and generating heat so store them away from combustible materials. Do not overload power outlets. Remove electrical devices if they trip ground fault circuit interrupters (GFCI) or produce burnt smell and/or smoke. Use ABC-rated fire extinguisher to extinguish fire or follow company evacuation procedures when warranted.

3.2.2 Contaminated Water/Splash Hazards

Beware of splash hazards posed by purging and/or development of groundwater monitoring wells. Chemical splash hazards may also be encountered during drum sampling of known contaminants. Contaminants are likely to vary; therefore, the chemical hazards section of this plan should be referenced to address the hazards posed by the contaminant.

Control Measures: Workers must wear safety glasses with side-shield protection. Goggles may be necessary depending upon the degree of splashing. Goggles are required when moving containers of or working with severe eye irritants, acids or caustics.

3.2.3 Cuts and Lacerations

Tubing materials used when groundwater sampling or used for air monitoring must be cut in various lengths. Shears or tube cutters are alternatives to using knives or other blades; however, there may be instances in which the use of knives or blades cannot be avoided.

Control Measures: Always use sharpened blades as dull blades can require more applied force. Wear leather or Kevlar® gloves to protect hands. Secure the object being cut keeping free hand out of the way and always cut away from the body. If cut must be made towards the body, cut the object at an angle away from the body. Utility knives must have a self-retracting blade and should not be stored in pockets of clothing.

3.2.4 Driving Safety

Most company-related field activities occur offsite and require personnel to drive from the office to the jobsite. Collision with another vehicle or into a structure can result in property damage, worker injury or even a fatality.

Control Measures: Drivers must have valid state license to drive and must be classified appropriate to the type of vehicle he/she will be required to operate (i.e., vehicles with gross vehicle weight rating [GVWR] >10,000 lbs or any vehicle/trailer combination GVWR >10,000 lbs requires a commercial drivers license). Additional safety precautions for driver safety include, but are not limited to, the following:

- Obey all federal and state traffic laws (i.e., speed limits, yielding, etc.)
- Plan route to site in advance to avoid traffic congestion, construction, road closures, inclement weather or other similar forms of delay
- Perform pre-use inspection to ensure vehicle is fueled and in good working order
- Ensure all materials are secured
- Avoid distractions such as changing radio stations, reading texts or emails, eating, drinking, or other similar functions
- Pull over to take or make a phone call even when using hands-free devices
- Texting while driving is strictly prohibited by PPM and is a law in several states
- Drive defensively - yield to aggressive drivers, slow down when driving through adverse weather conditions or when driving through school zones

3.2.5 Drowning

Water bodies where the potential for drowning exists includes: oceans, rivers, lakes, seas, gulfs, bays, ponds, wetlands, bayous, streams or other similar water sources. Work over or near these types of water bodies is rarely encountered, and routine company job tasks do not usually result in the use of a boat. However, when they arise, jobs of this nature do pose a risk of drowning. When sample collections are anticipated to occur from within a boat, this will likely take place in various locations of the water body with varying or unknown depths, currents, floating and subsurface debris, and/or other similar hazards.

Control Measures: Tasks requiring work over or near water where the potential for drowning could occur requires a minimum of two workers. Use a boat with a flat, stable surface to reduce the potential for rollover. In addition, workers must wear a U.S. Coast Guard-approved life preserver at all times when inside the boat or when otherwise performing a task where the potential for drowning still exists. Once over water, movement within the boat should be minimized, and workers must use caution when collecting the sample. Workers must be equipped with buoys or other similar means to extract any individual that should fall into the water.

3.2.6 Electrical

3.2.6.1 Overhead Utilities

Vacuum trucks must be parked away from overhead utility lines to avoid unintentional contact when installing the stack. Also, remediation systems are electrically operated and pose similar electrical hazards. Contact with power lines or exposed electrical wires can result in electric shock, severe skin burns and electrocution. Electrical wires are generally insulated as a first line of defense; however, tears or damage to the insulated material can directly expose workers to the wire.

Control Measures: Treat all electrical lines and wires as active and avoid contact. Keep all equipment at least 10 feet away from all overhead power lines unless they have been isolated or shielded by the local energy company. Add an additional 0.4 inches to this distance for every 1 kV in excess of 50 kV.

3.2.6.2 Electrical Tools and Power Cords

Assorted power tools may be required for certain tasks. Power tools can be battery operated or otherwise have an electrical power cord, which can be plugged into an electrical outlet. Due to this factor, energy can be controlled by plugging or unplugging the cord and does not require energy isolation. The electrical wires are typically insulated; however, kinks or cuts made to the power cord jacket can expose workers to these electrical wires resulting in electric shock or electrocution.

Control Measures: Perform an initial inspection to ensure tools and cords are in good working order and immediately discard or label damaged tools/cords to prevent use until repairs or replacements can be made. Additional safety precautions for electrical protection include, but are not limited to, the following:

- Only use electrical outlets and matching cords with grounding wire (3-prong)
- Never remove grounding prong to accommodate a 2-prong electrical outlet
- Electrical cords should be rated for hard or extra hard use
- Insulated jackets should show no evidence of kinks, cuts or tears; any sign of wear (frayed insulation or exposed wires) requires immediate labeling of the cord as "damaged" and must be immediately removed from the work area
- Avoid placing electrical cords or tools in pools of water or other wet areas
- All portable or temporary wiring must be protected by a ground fault circuit interrupter (GFCI)
- Avoid using tools or cords that trip the GFCI
- Do not run over cords or place them through doors, windows or other pinch points

3.2.6.3 Lockout/Tagout

Remediation systems are electrically-operated systems that may require energy isolation as part of operation, maintenance or repairs. According to 29 CFR 1910.147(a)(2)(ii), energy must be isolated when 1) a worker must remove or by-pass safety guards or devices; or 2) a worker must place a body part at the point of operation or where a danger zone exists in the operating cycle. These requirements do not apply to corded equipment as this power source can be isolated by unplugging the equipment. It also does not apply to other pressurized systems for gas or steam if it can be proven that continuity of service is essential or that shut down of the system is impractical.

Routine operations and maintenance procedures typically do not trigger the requirements for energy isolation. However, it should be noted that during certain system or component repairs, these criteria may be triggered and the locking and tagging of the system and/or its components is necessary to prevent the unintentional startup of the system.

Control Measures: Locking and tagging of the system must be conducted in accordance with company requirements outlined within its written Lockout/Tagout program. An itemized procedure list for system deactivation and reactivation are posted at all remediation systems.

3.2.7 Hand and Power Tools

The electrical hazards posed by the use of power tools have previously been addressed. However, other hazards are posed by the use of hand or power tools. Removing or by-passing safety guards can expose a worker to the piercing, cutting, crushing or rotating hazards of mechanical equipment. Improper posture or repetition of hand tools can lead to musculoskeletal disorders as outlined within the previous section.

Control Measures: Use equipment in accordance with manufacturer guidelines and according to its intended purpose. Always select the appropriate tool for the job and refrain from making adjustments. Never remove or bypass safety guards. Perform an initial inspection to ensure tools are in good working order and immediately discard or label damaged tools to prevent use until repairs or replacements can be made. Keep tools stored appropriately to prevent rust or other signs of weathering. Wear appropriate head, eye, hand, and foot protection at all times. Avoid wearing jewelry or loose-fitting protective gloves/clothing that could become entangled in moving parts of the tool.

3.2.8 Illumination

Most company-related tasks will be conducted during normal, daylight hours; however, some tasks may be required to be conducted at night. When these instances occur, visibility will be decreased making the jobsite and the task more dangerous. In addition, the overall visibility of workers to drivers, equipment operators, etc. may be decreased.

Control Measures: The National Cooperative Highway Research Program (NCHRP) Report 498: Illumination Guidelines for Nighttime Highway Work outlines a set of guidelines for adequate lighting when working at night. Workers should adhere to these requirements to ensure appropriate visibility during all phases of the project. The three categories outlined by the NCHRP include the following:

- Level I illuminance is necessary in areas where the work crew is in motion, moving from spot to spot. Required for low accuracy tasks that may involve the use of slow-moving equipment, and where large objects must be visible.

- § Level II illuminance is necessary in areas on or around construction equipment. A higher degree of lighting in this area will provide a safer environment for equipment operators allowing them to perform tasks that require a moderate level of accuracy.
- § Level III illuminance is necessary for tasks that require a higher level of visual acuity or difficulty.

Sample tasks and the illumination requirements for those tasks are outlined below:

SAMPLE TASKS (NOT ALL-INCLUSIVE)	ILLUMINATION LEVELS	AVERAGE MINIMUM MAINTAINED ILLUMINANCE
All work operation areas; setup of lane or road closures, lane closure tapes, and flagging stations	Level I	54 lux (5 foot-candles)
Areas on or around construction equipment; asphalt paving, milling and concrete placement and/or removal	Level II	108 lux (10 foot-candles)
Pavement or structural crack/ pothole filling; joint repair, pavement patching/repairs; installation of signal/electrical/ mechanical equipment	Level III	215 lux (20 foot-candles)

Note: A foot-candle (fc) is defined as a unit of illumination that is equal to one lumen per square foot, or 10.764 lux.

Increased lighting can be provided using portable light plant towers, balloon lighting, roadway luminaires mounted on temporary poles, and factory-installed lights on equipment. Workers should select a light source and position it in a manner that reduces the amount of glare. When conducting night tasks on or near road system right-of-ways, workers must additionally adhere to appropriate state DOT roadway and traffic control requirements. Reflective clothing/vests are required when working at night or decreased illumination.

3.2.9 Ladder Safety

3.2.9.1 Portable Ladder Safety

Portable ladders are commonly used when replacing spent carbon with inactivated granular carbon or to access stationary aboveground storage tanks for inspections and/or maintenance. Carbon vessels consist of 55-gallon drums or other vessels that commonly range from 8-30 feet in height. It should be noted that carbon vessels can exceed 30 feet but these vessels are not common to current company processes. As part of this change-out process, workers must climb portable ladders at heights greater than 4 feet and they must do so carrying 50-lb sacks of granular carbon.

Control Measures: Falls from ladder use are exempted from the fall protection standards (29 CFR 1926 Subpart M). Instead falls from ladders are outlined within Subpart X of 29 CFR 1926.1053, which does not require the use of personal fall arrest system when working at elevations in excess of 4 feet. Use buddy system when able or check in periodically with the office to relay status. Use a portable A-frame ladder and ensure that it is locked in place. Place ladder on level, compact ground surfaces and avoid wet areas. Never place ladder near entrance/exit or other pathway that could interfere with ladder usage. Use ladder for its intended purpose and in accordance with manufacturer's guidelines. Use two hands when ascending or descending. **Note: PPM purposely chooses to reference the most stringent safety measures under construction industry standards, while additionally enforcing the more stringent general industry height requirement of 4 feet. This is an overlap of standards but provides the greatest level of worker protection.*

3.2.9.2 Fixed Ladder Safety

Fixed ladders may be used at client facilities to access rooftops or other similar elevated walking/working surface. This is often necessary with asbestos and/or lead sample collections, vacuum events, and industrial compliance; specifically air compliance.

Control Measures: Falls from ladder use are exempted from the fall protection standards (29 CFR 1926 Subpart M). Instead falls from ladders are outlined within Subpart X of 29 CFR 1926.1053, which does not require the use of personal fall arrest system when working at elevations in excess of 4 feet (general industry). According to OSHA requirements, fixed ladders must have cages, wells, ladder safety devices, or self-retracting lifelines when the climb is less than 24 feet but the top of the ladder is greater than 24 feet above lower levels. When a fixed ladder is greater than 24 feet, it must be equipped with one of the following: ladder safety devices or self-retracting lifelines with rest platforms at intervals not to exceed 150 feet. When able and it does not otherwise introduce additional safety hazards, personnel may be required to use personal fall arrest system. This will be determined on a case-by-case basis. **Note: PPM purposely chooses to reference the most stringent safety measures under construction industry standards, while additionally enforcing the more stringent general industry height requirement of 4 feet. This is an overlap of standards but provides the greatest level of worker protection.*

3.2.10 Material Handling and Back Safety

It is common for workers to transport materials such as hand or power tools, bailers, sampling containers and monitoring equipment from the office to various site locations. Workers are also likely to relocate drums or other chemical storage containers. Materials may be heavy putting strain on the back, or they may be large or bulky and obstruct vision during transport.

Control Measures: When lifting or relocating heavy or large items, mechanical devices should be used as a first line of defense. When mechanical means are not available, workers should use the buddy system to lift and transport loads in excess of 50 lbs or load that obstruct view of travel. When lifting an object, workers should bend at the knees and lift with the legs – avoid applied pressure to the back as muscle strain will likely occur. Keep loads close to the body and avoid twisting while carrying loads. Ensure travel paths are free of obstructions prior to lift and relocating materials.

3.2.11 Mobile Equipment

3.2.11.1 Heavy Equipment and Machinery

The most common type of heavy equipment used for the tasks covered by the plan is the mobile vacuum truck. The use of this type of equipment is mostly subcontracted, and PPM requires its subcontractors be adequately trained to safely operate the vacuum truck. Hazards associated with vacuum trucks include, but are not limited to, the following:

- Pinch points from hoses and connections
- Falls from climbing ladder to install stack
- Contact with overhead utility by installed stack
- Operator blind spots when the truck must be moved
- Truck creates blind spots to other onsite drivers
- Combustion from contact of concentrations coming from stack and running engine
- Hydraulic lines operate under pressure
- Accidental roll-off if air brakes are not set properly
- Hot equipment parts

Control Measures: Use vacuum truck in accordance with its intended purpose. Vacuum truck must be grounded prior to use and parked at least 10 feet away from any overhead utility line

unless the line has been otherwise isolated or shielded from accidental contact. Wheels must be chocked to secure truck when at rest. Contact with hot parts must be avoided and it should be noted that metal parts become extremely hot with sun exposure, which can cause significant skin burns. Workers must be aware of operator blind spots which may require the use of a spotter. Workers must additionally use caution when moving around the truck because oncoming vehicles may not be able to see around the truck. Keep hands away from pressurized parts and use caution when connecting or disconnecting hoses to avoid pinch points.

3.2.11.2 Aerial and Scissor Lifts

Use of aerial and scissor lifts is strictly prohibited. Company personnel are not appropriately trained for working with aerial and scissor lifts and are therefore not authorized on these machines without additional safety training and approval from the safety department. Workers should be aware that aerial and scissor lifts are not synonymous and are covered under two separate OSHA regulations. Regulatory requirements for aerial lifts can be found in §1926.453, while requirements for scissor lifts (defined by OSHA as a mobile scaffolding system) can be found in §1926.452(w). This equipment can reach elevations in excess of 4 feet triggering fall protection. It should be noted that per OSHA guidelines, aerial lifts require the use of personal fall arrest systems in conjunction with the use of a guardrail system, while scissor lifts require the use of personal fall arrest systems only in the absence of a guardrail system.

3.2.12 Noise

OSHA regulates worker exposures to noise. The established action limit for an 8-hour workday is 85 decibels (dB), a time-weighted average (TWA). Levels at or in excess of this limit can cause hearing loss, which depending upon exposure can be a temporary or permanent loss. Noisy environments can also interfere with worker communication and comprehension, which poses additional safety risks.

Noise exposures can be measured using sound level meters or noise dosimeters. Certain work-related processes considered to be noisy include but are not limited to the following:

- Remediation systems – systems vary, but noise levels have been measured ≥90 dB
- Heavy equipment operation (including vac trucks) – have been measured ≥120 dB
- Use of power tools – sound levels vary (electric drill – 95 dB, power saw 110 dB, power drill – 130 dB, pneumatic drill – 120 dB)
- Work conducted nearby high traffic roadways – typical freeway traffic is 70 dB; however, large 18-wheelers have been measured ≥90 dB

Control Measures: When available, workers should carry sound level meters to assess noise levels. In the absence of monitoring equipment, workers who must shout at a co-worker 5 feet away are likely triggering regulatory threshold limits for noise exposures. Those environments ≥85 dB require the use of administrative controls or protective equipment. Administrative measures such as limiting work hours within noisy environments should be the first line of defense used to control worker exposures to noise levels in excess of 85 dB. When this cannot be achieved use hearing protectors such as earplugs, canal caps or ear muffs to protect worker hearing.

3.2.13 Repetitive Motion

Some tasks require a degree of repetition that may put strain on muscles and joints of the body. Poor posture can also put a similar degree of strain on the body. Typical symptoms of repetitive motion strain do not necessarily occur immediately (i.e., they can appear at rest during sleep) and include but are not limited to the following:

- Tingling, swelling or numbness of wrists, knees, elbow or other joints
- Sharp, piercing pain
- Loss of flexibility or muscle strength

Control Measures: Avoid performing repetitive tasks that target specific parts of the body for extended periods of time. Recognize symptoms promptly and vary job task for a while. Stretching and flexibility exercises can strengthen muscles over time. Report any signs or symptoms of repetitive motion strain to the HSD immediately. These injuries progressively worsen so prevention is imperative.

3.2.14 Scaffolding

Use of scaffolding systems, which includes walking, working, assembling, disassembling, and/or other similar uses, is strictly prohibited. Company personnel are not appropriately trained for working with scaffolding systems and are therefore not authorized on these systems without additional safety training and approval from the safety department. Work requiring the use of a scaffolding system will be subcontracted to appropriately qualified contractors.

3.2.15 Slips, Trips, and Falls

Workers are subjected to slip, trip and fall hazards from improper materials storage, unlevel working surfaces, aboveground piping associated with remediation systems, open monitoring wells, climbing the ladder of the vacuum truck to install the stack, and climbing a ladder to access aboveground storage tanks for inspection and/or maintenance. Current field tasks do not require work at elevations of ≥4 feet; however, workers must recognize that additional safety measures and use of fall protective equipment is required when working at these elevations. Therefore, workers must report these occurrences to the safety department in advance so that additional training and protective measures can be addressed. Only personnel who have received additional fall protection training are considered competent to work at elevations ≥4 feet – all other workers are prohibited from working at elevations ≥4 feet without additional training and certification.

Control Measures: Store all materials away from work areas until ready for use and keep all travel paths unobstructed. Walk around materials – never walk over them. Place and secure monitoring well covers when relocating to another well location. Use company truck and cones to isolate traffic from open monitoring wells while engaged in a task. Use caution when climbing ladder to install the stack or when collecting readings from the stack. Use both hands to climb ladder. Use personal fall arrest system to tie-off to stable structure when working on walking/working surfaces at elevations ≥4 feet (refer to Section 3.2.17). Refer to Section 3.2.9 for fall hazards associated with the use of ladders.

3.2.16 Traffic and Secluded Areas

Most petroleum remediation activities occur at active retail gasoline facilities, which expose workers to vehicular traffic. In some cases, work may be required within roadway right-of-ways or workers may be required to cross highways to perform work on an adjoining property or within a median. Secluded areas are not typical of most field-related projects; however, they do exist on occasion. Workers required to perform tasks at remote locations should be aware that these locations may be unlawfully inhabited and/or have the potential for illegal activities.

Control Measures: Use buddy system when working in high traffic areas as first line of defense, especially on spill bucket closures, groundwater sampling, or other similar tasks that require workers to bend, kneel or sit at or slightly above ground level which greatly decreases worker visibility. When these conditions are triggered, the buddy system will require one worker to stand nearby the other worker to create a unit whereby the observer has the primary responsibility of ensuring the safety of the worker with decreased visibility. When working upright, the buddy system will permit workers to separate only to distances that are clearly visible to both workers in a manner that ensures both can continuously monitor the other during all phases of the task. For example, during the sample collection, workers must fill vials or other containers at the vehicle so that they remain in an upright position during collection. Collections at the well are prohibited unless workers are together as a unit because when workers are separated, this process generally requires the worker to bend or kneel, which decreases the visibility of that individual. In addition, the worker is no longer in a position to observe his/her co-worker voiding the effectiveness of the buddy system. If operating as a unit, one worker may observe while the other collects the sample at the well.

When the buddy system cannot be implemented, use the company vehicle and cones to clearly define and block traffic from your work area. Relocate vehicle and cones when work area changes. Workers must wear high visibility safety shirts or ANSI Class II vests to increase visibility even when using additional safety precautions. Reflective clothing/vests are required when working at night or decreased illumination. Additional illumination requirements for night work can be found in Section 3.2.9. When conducting night tasks on or near road system right-of-ways, workers must additionally adhere to appropriate state DOT roadway and traffic control requirements. When working in secluded or unsafe areas, the following measures are required:

- Schedule work during daylight hours
- Contact local police department and inquire about security
- Never go to site alone; use buddy system
- Notify manager or co-worker regarding your location, estimated time to perform duties and anticipated time of return; make intermittent calls throughout the day
- Have cell phone readily available and pre-set to 911
- Carry whistle and pepper spray as alternate methods of defense
- Wear work clothes and protective equipment to identify you are there in a professional capacity
- Park vehicle nearby and never exit the vehicle if anyone or anything appears suspicious

Note: The use of the buddy system as outlined above applies to traffic hazards only and should not be incorporated universally without additional discussion and management approval. For instance, the use of the buddy system as required when conducting emergency response is clearly specified by OSHA §1910.120 in a manner that opposes the previously outlined requirements. In the absence of regulatory direction, PPM will adhere to this definition of the buddy system.

3.2.17 Walking/Working Surfaces

3.2.17.1 Elevated Walking/Working Surfaces

Carbon change-outs, asbestos/lead sampling, and aboveground storage tank inspections and/or maintenance may require work at elevations ≥4 feet. In addition, use of catwalks may exist at heights ≥4 feet. According to §1910.21, a catwalk is considered a runway which is defined as a passageway for persons, elevated above the surrounding floor or ground level, such as a footwalk along shafting or a walkway between buildings. When working on multilevel surfaces, any floor deteriorations or openings must be obstructed to prevent inadvertent falls from an elevated surface. Working at elevated heights can create fall hazards that can result in a fatality or serious physical impairment. Due to these risks, tasks such as these may require additional safety

measures such as the use of fall protective equipment (i.e. full-body harness and lanyard). Only personnel who have received additional fall protection training are considered competent for performing these tasks - all other workers are prohibited from working at elevations ≥4 feet without additional training and certification.

Control Measures: Walking/working surfaces located greater than 4 feet (general industry) above ground surface requires fall protection in the form of a guardrail system to protect against inadvertent falls from elevated heights. Use barriers to isolate floor openings to prevent inadvertent trips and/or falls through such openings. Holes and openings must always be covered when not otherwise needed to perform a task. To protect workers from falling objects, runways must include toeboards, screens, guardrail system, debris nets, catch platforms, canopy structures, or barricades. Workers on lower levels must also wear hard hats at all times. Runways should consist of a nonskid surface material or grating, handrail supports for 200 pounds of force, and means of egress that is permanent and stationary (ex. fixed ladders or stairs). Workers should wear laced footwear with rubber soles to give better foot and ankle support and to reduce the likelihood of slips.

3.2.17.2 Uneven Walking/Working Surfaces

Uneven walking and/or working surfaces are not uncommon. Sites with minimal grounds-keeping can disguise potholes, which could result in trips/falls or foot injuries. Dense vegetation can also disguise dips and potholes. Using limbs, branches, or other similar debris to cross over streams creates an unstable ground surface that can become structurally unsafe after repeated use.

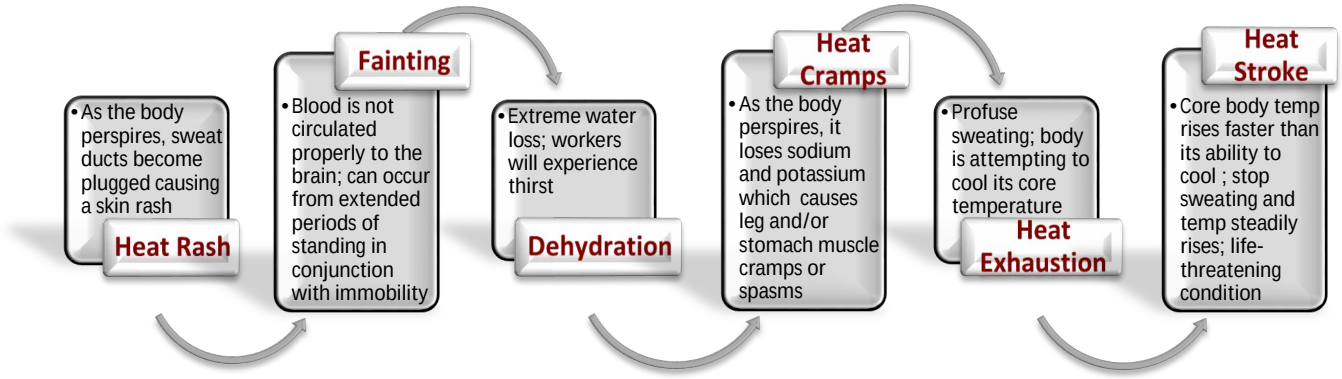
Control Measures: When work is to be performed at an inactive facility, bring weed eaters and sprayer to address overgrown vegetation. When grounds keeping is the responsibility of the client, the Project Manager should call in advance and request site maintenance be performed prior to PPM's arrival onsite. Workers should also wear laced, steel-toed boots which gives better ankle support than slip-on safety footwear. When working in highly vegetative areas that must be accessed, workers should use mechanical equipment to clear cut access paths or use other hand tools. Avoid walking over vegetation or other debris that may become unstable after repeated use.

3.2.18 Weather

3.2.18.1 Heat Stress

Heat is a common concern for states in the southern U.S. and the use of personal protective clothing only adds to this stress. Heat stress can occur in as little as 15 minutes. Symptoms are generally progressive but some exceptions do apply. Some symptoms of heat stress may not arise, may go unnoticed or may occur simultaneously depending on the degree of progression and the awareness level of the worker.

The following symptoms are associated with heat stress:



Control Measures: Heat stress can occur very rapidly; therefore, workers must be alert to the signs and symptoms and should be additionally aware of sluggishness or behavioral changes in their co-workers. Workers should be acclimated to their environment and breaks should be taken as necessary to replenish fluids and cool down core body temperature. Alternate workers as necessary to keep work going. Remove excess protective clothing and break in a shaded, cool area. Any worker exhibiting symptoms of heat stress will be prohibited from performing additional duties for the remainder of the day.

3.2.18.2 Cold Stress

The degree of coldness depends upon temperature, wind and wetness. When exposed to colder climates, the body loses heat faster than it can be generated. Prolonged exposures can rapidly use up the body's stored energy resulting in frostbite, trench foot, chilblains and hypothermia.

COLD STRESS	DEFINITION	SYMPTOMS OF EXPOSURE
Trench foot	Injury to the feet when immersed in water for prolonged period of time; wet feet lose heat and blood vessels constrict causing cells to die due to lack of oxygen	Reddening of skin, numbness, leg cramps, swelling, tingling pain, blisters or ulcers, bleeding under skin, gangrene (foot turns dark purple, blue or gray)
Chilblain	Exposures to temperature slightly above freezing to 60°F causing damage to capillary blood vessels in skin; damage is permanent and returns with additional exposures	Redness and itching mostly on cheeks, ears, fingers and toes, possible blistering, inflammation, possible ulceration (severe cases)
Frostbite	Injury caused by freezing of the skin (nose, ears, cheeks, chin, fingers or toes); can lead to amputation	Reduced blood flow to hands/feet numbness, tingling or stinging, aching, bluish or pale, waxy skin
Hypothermia	Body is losing heat faster than it can be generated producing an abnormally low body temperature, which impairs the brain and makes a person unable to think clearly or move well; is extremely dangerous because a person may not realize it is happening	Early symptoms - shivering, fatigue, loss of coordination, confusion and disorientation; Late symptoms – no shivering, blue skin, dilated pupils, slowed pulse and breathing and loss of consciousness

Control Measures: Workers should be acclimated to their environment, wear multiple layers of clothing, remove wet or damp clothing promptly and breaks should be taken as necessary to drink warm fluids and warm core body temperature. Alternate workers as necessary to keep work going. Any worker exhibiting symptoms of cold stress will be prohibited from performing additional duties for the remainder of the day.

3.2.18.3 Adverse Weather Conditions

Adverse weather conditions can include heavy rainfall, thunderstorm, lightning, hail, snow, tornado watch/warning, tropical storm or hurricane advisory to name a few. These types of weather conditions interfere with travel and field work. Workers who attempt to drive under these conditions put themselves at risk.

Control Measures: Follow local weather advisories and postpone work as necessary. Weather conditions can change rapidly while onsite. Carry NOAA weather radios when in the field to monitor changes in weather. Be prepared to use stop-work authority as necessary to address changes in weather. Plan your escape route in advance and be prepared to move to higher ground and/or evacuate. Never drive through flooded roads.

3.3 BIOLOGICAL HAZARDS AND CONTROLS

3.3.1 Insects and Mosquitoes

Insects and mosquitoes are prominent in just about any work location. Large ant beds as well as other insect nests such as hornets, wasps, yellow jackets and bees can be found as early as spring. They can reside in trees, high vegetative areas, holes within the ground or within piles of trash and debris.

Mosquitoes can carry infectious diseases such as West Nile virus and Zike virus, which can cause long-term debilitating illnesses, birth defects, or fatality. They are most active at dusk or dawn. Symptoms vary and can appear between 3-14 days after a bite.

- West Nile (mild symptoms): fever, headache, body aches, nausea, vomiting, and swollen lymph glands or skin rash on chest, stomach and back; symptoms may last for several days to a few weeks; occurs in up to 20% of people infected.
- West Nile (serious symptoms): high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis; symptoms may last for several weeks and neurological symptoms may be permanent; occurs in 1 out of 250 people infected.
- Zika: mild fever, skin rashes, muscle and joint pain, and conjunctivitis (pink eye) that usually last between 2-7 days; can cause severe birth defects in offspring of pregnant women.

Control Measures: PPM contracts a professional spraying company to spray for insect nests; however, workers should carry pest-control materials as necessary and keep extra cans of wasp, hornet, bee and ant spray as a secondary precaution. Workers required to carry allergy treatments such as an epinephrine injection (epipen) must keep this nearby at all times, and co-workers must know the location of this treatment should it be needed. To prevent mosquito bites, use insect repellant containing DEET, wear long-sleeved shirts and long pants and remove any standing water from buckets or barrels where mosquitoes can lay their eggs.

3.3.2 Ticks and Spiders

Spiders can be found in highly vegetative areas, in and around remediation systems and in other similar areas. Black widow spiders are commonly found inside well vaults, beneath a system in dark crevices and other similar dark spaces.


Black Widow


Brown Widow


Brown Recluse

Ticks can be encountered in highly vegetative areas with limited grounds keeping. Ticks are external parasites and there are more than 800 different species. Deer ticks carry Lyme disease, but <5% of all tick bites result in Lyme infection. Symptoms of Lyme infection include: flu-like illness with red skin rash that occurs within 3 weeks of bite. Rash should be circular and can increase daily. Symptoms of exposure should be reported immediately to the safety department and medical attention should be sought as necessary.

Control Measures: PPM contracts a professional spraying company to spray for spiders when also spraying for insects. Avoid placing hands and arms in dark spaces that cannot be seen. Use caution when opening well vaults or when working in other dark places. Do post-job body inspection and remove ticks immediately.

3.3.3 Rodents, Reptiles and Roaming Animals

The southeast U.S. is home to various species of venomous snakes. Venomous snakes will likely be found beneath piles of debris, near bodies of water or in high or heavily vegetative areas. They generally have a triangular-shaped head, elliptical pupils, and some have rattlers. A few common species of venomous snakes are identified below.


Southern Copperhead


Water Moccasin


E. Diamondback Rattler


Coral Snake

Facilities located nearby lakes, rivers, bayous, streams or that otherwise have ponds may have alligators present. Alligators will come out of the water and onto land surface to build nests for their eggs or to sunbathe. They are also known to lie beneath the water's surface in wait when they are preparing to attack and they may not be visible to workers.

Highly vegetative areas and areas with trash or debris can be home to rodents such as rats or mice. Remediation systems provide warmth in colder climates and it is not uncommon to find rodents and other animals within or around the unit.

Sites located in populated areas may have wandering animals. Pets may be trained to attack when approached, may have mange (parasitic skin diseases) or may carry other diseases.

Control Measures: When working in or around bodies of water, workers must be aware of any indicators of alligator presence, which require that workers immediately evacuate the area. General awareness and caution must be used when working in highly vegetative areas and workers must never place hands or other parts of body in an area that is not clearly visible.

Snake guards/chaps should be worn when working in suspected snake-infested areas. Workers must avoid wandering animals – they may appear to be a pet; however, they can carry diseases and they may bite or scratch.

3.3.4 Poison Plants

Heavily vegetative areas may have poisonous plants such as poison ivy, oak or sumac, which produce a poisonous sap called urushiol. Typically the first exposure to these plants may not result in any symptoms as this is classified as a "sensitization period". Future exposures to these plants will then produce bumps often mistaken for mosquito bites until they began to ooze. This is spread by scratching affected areas and touching other unaffected areas.

Control Measures: First line of defense is to be able to identify and avoid these plants. Weed killers should be used to minimize mowing and to eliminate exposure to poison ivy, oak or sumac. It should be noted that poisonous plants still thrive throughout the winter and they are more difficult to locate without their leaves. Workers should wear long-sleeved shirts and long pants tucked into boots when working in highly vegetative areas. Pre-medicated towelettes or lotions form a barrier on the skin and prevent adverse reactions. Rubbing alcohol can remove the oil resin up to 30 minutes after exposure, and antihistamines (non-drowsy) can also be taken post-exposure to minimize the reaction.

3.3.5 Bloodborne Pathogens

Sharps hazards come in various forms and may include hypodermic needles, cutting tools or equipment/machinery with sharp edges like box cutters, scissors, machinery blades, etc. Hypodermic needles are occasionally encountered at some jobsites. Needles may be used for insulin injections or drug use. Other sharps may become contaminated upon contact with infected sources. Life-threatening illnesses such as hepatitis or human immunodeficiency virus [HIV] (also referred to as bloodborne pathogens) may be transmitted via contaminated sharps so workers should be extremely cautious at all field locations. Also, bloodborne pathogens can be transmitted from an infected individual to another when providing first aid. All individuals and sharps must be treated as other potentially infectious materials (OPIM).

Control Measures: Never reach beneath the remediation system or stick hands in areas not clearly visible. Do a visual inspection before reaching for any component or item. Never recap a needle! Remove needles carefully using puncture-resistant gloves. Place them in plastic containers with a closed lid. Duct tape the lid before discarding. Drop off at community drop sites (where available). This type of waste is considered biohazardous waste; however, only healthcare facilities and medical waste industries are regulated. Be aware that the state of Florida requires disposal of this waste at established drop off locations, but all other states in which PPM has an office only recommend using these locations where available. Avoid contact with sharp edges of equipment/machinery, use cutting tools in accordance with manufacturer's guidelines, and always cut away from or perpendicular to the body. Use the concept of universal precautions for infection control. This concept is to treat all human blood and certain body fluids as if known to be infectious for HIV, hepatitis B, or other bloodborne pathogens.

4.0 EXPOSURE MONITORING

The tasks covered by this HASP are not anticipated to present inhalation hazards at or in excess of regulatory thresholds; therefore exposure monitoring will not be required for these activities. Ambient site conditions are monitored quarterly as a preventative measure. Employee exposures outside of these conditions will require the use of a separate, more stringent HASP.

4.1 TERMINOLOGY/DEFINITIONS

In order to determine existing or potential worker overexposures to hazardous or flammable substances, workers must first understand common exposure terminology. Some commonly used exposure terms are defined in the following table:

TERM	DEFINITION
Action Limit	Company-assigned exposure limit assigned to a chemical that is more stringent than the regulatory or recommended exposure limits.
Ceiling Limit	Maximum concentration of a chemical a worker can be exposed to at any point during a work shift. This is an instantaneous reading.
Flammability/Explosive Range	The concentration range (LEL-UEL) of a combustible or flammable material (gas/vapor) that will burn or explode when introduced to an ignition source.
Immediately Dangerous to Life and/or Health (IDLH)	Concentration of a chemical beyond which a worker will be capable of escaping death or permanent injury without help in less than 30 mins.
Lower Flammability/ Explosive Limit (LFL/LEL)	The lowest concentration of a gas/vapor needed to produce a fire or explosion when exposed to an ignition source.
Permissible Exposure Limit (PEL)/Threshold Limit Value (TLV)	OSHA's regulatory exposure limit is the PEL, whereas the TLV is used to represent other published recommended exposure limits (NIOSH or ACGIH).
Short-Term Exposure Limit (STEL)	Maximum concentration of a chemical a worker can be exposed to without adverse effects over a 15-minute period (unless otherwise noted) not to exceed 4 times per work shift with 1-hr rest intervals between exposures.
Time-Weighted Average (TWA)	Maximum concentration of a chemical a worker can be exposed to without any adverse effect. Based on an 8-hr day/40-hr week.
Upper Flammability/ Explosive Limit (UFL/UEL)	The highest concentration of a gas/vapor needed to produce a fire or explosion when exposed to an ignition source.

4.2 ESTABLISHING EXPOSURE AND FLAMMABILITY LIMITS

4.2.1 Exposure Limits

For any material that has an established regulatory or recommended exposure limit, PPM has established a more conservative action limit. It is the company's intention to take some form of action before a worker is exposed at regulatory or recommended levels. The exception to this concept applies only to contaminants with very low exposure limits and also to the detection capabilities of air monitoring equipment.

Action limits are established on a case-by-case basis and in accordance with general industry practice. When ambient air concentrations trigger action limits, engineering, administrative or work practice controls should be incorporated to eliminate the exposure or reduce worker exposures to an acceptable limit. When this cannot be achieved, workers will be required to upgrade personal protective equipment.

4.2.2 Flammability Limits

PPM has adopted general industry practice by setting its flammability action limits to be 10% of the regulatory limit. Since lower and upper explosive limits are provided as a percentage, PPM has additionally converted the flammability ranges of commonly encountered combustible and flammable materials into parts per million (ppm). Regardless of the volatile monitoring equipment used, workers will be able to determine when a given work environment is or becomes a flammable environment. Workers must also recognize that when working in environments in which chemical concentrations >UEL, as effective control measures are introduced the chemical concentration will again fall back into the flammability range and ignition sources must be eliminated until concentrations once again fall below the material's assigned LEL.

4.3 REGULATORY EXPOSURE LIMITS

Whenever an action, regulatory or recommended exposure limit is triggered, workers must be prepared to immediately report site conditions to management, to develop and implement alternative control measures, to evacuate the site when warranted and/or be prepared to upgrade personal protective equipment (i.e., wear respiratory protection). Workers must be aware that in order to wear respiratory protection, they must first be medically cleared by a physician, be fit-tested to a specific respirator and have received training in accordance with the procedures outlined within the company's Respiratory Protection program. To ascertain eligibility, workers must receive authorization from the safety department prior to using a respirator.

Action, regulatory, and/or recommended exposure limits assigned to routine chemicals commonly encountered by workers are outlined within the following table:

CONSTITUENT	TOXICITY					FIRE
	ACTION	PEL/TLV	STEL	CEILING	IDLH	LEL-UEL
Activated carbon	--	--	--	--	--	--
Alconox®[nuisance dust]	5	5	--	--	--	--
Aldrin[pesticide]	0.25	0.25	--	--	25	--
Aluminum[metal]	5	5	--	--	--	--
Aluminum Oxide[nuisance dust]	5	5	--	--	--	--
Analytix AN-754GH	--	--	--	--	--	--
Arsenic[metal]	0.01	0.01	--	--	5	--
Asbestos	0.1	0.1	1	--	--	--
Barium[metal]	0.5	0.5	--	--	--	--
Benzene	1	1	5	--	500	1,200-7,800
n-Butane	400	800	--	--	--	1,600-8,400
Cadmium[metal]	0.005	0.005	--	--	9	--
Calcium hydroxide[base]	5	5	--	--	--	--
Carbon dioxide[dry ice]	2,500	5,000†	30,000	--	40,000	--
Carbon tetrachloride	2	2†	--	25	200	--
Chloroform	2	2†	2 [60-min]	50	500	--
Chromium[metal]	0.5	0.5	--	--	250	--
Coal tar pitch volatiles[PAH]	0.2	0.2	--	--	80	--
Copper[metal]	1	1	--	--	100	--
DDT[pesticide]	1	1	--	--	500	--
Dieldrin[pesticide]	0.25	0.25	--	--	50	--

CONSTITUENT	TOXICITY					FIRE
	ACTION	PEL/TLV	STEL	CEILING	IDLH	LEL-UEL
Diesel	100[skin]	100[skin]	--	--	--	600-7,500
Dust [Total]	15	15	--	--	--	--
Dust [Respirable]	5	5	--	--	--	--
Dust [Portland Cement]	50	50	--	--	--	--
Endrin[pesticide]	0.1	0.1	--	--	2	--
Ethylbenzene	100	100†	125†	--	800	800-6,700
Gasoline	100	300†	500†	--	--	1,400-7,600
Heptachlor[pesticide]	0.5	0.5	--	--	35	--
Hexane	50	50†	--	--	1,100	1,100-7,500
Hydrochloric acid[HCl]	--	--	--	5	50	--
Hydrogen peroxide[30-50%]	1	1	--	--	75	--
Hydrogen sulfide[H_2S]	1	1	--	10	100	4,000-44,000
Iron[metal]	--	--	--	--	--	--
Isobutylene	--	--	--	--	--	1,800-9,600
Isopropyl alcohol	200	400†	500†	--	2,000	2,000-12,700
Kerosene	50	100	--	--	--	700-5,000
Lead[metal]	0.05	0.05	--	--	100	--
Lindane[pesticide]	0.5	0.5	--	--	50	--
Liquinox®	--	--	--	--	--	--
Lubricating oils[motor oil]	--	--	--	--	--	--
Magnesium[metal]	--	--	--	--	--	--
Mercury[metal/vapor]	0.1[skin]	0.1†[skin]	--	0.1†[skin]	10[skin]	--
Methane	--	--	--	--	--	5,000-15,000
Methylene chloride	25	25	125	--	2,300	13,000-23,000
MTBE	50	50	--	--	--	1,000-8,000
Muriatic acid[HCl]	--	--	--	5	50	--
Naphthalene[PAH]	10	10†	15†	--	250	900-5,900
Nitric acid	2	2†	4†	--	25	--
Oil[crude]	0.2[mg/m³]	0.2[mg/m³]	--	--	--	1,000-8,000
Ozone	0.05	0.1†	0.3†	0.1	5	--
PCB	0.5[skin]	0.5[skin]	--	--	5	--
Perchloroethylene[PERC]	25	25†	--	150[cap]	150	--
Phosphoric acid[H_3PO_4]	1	1†	3†	--	1,000	--
Potassium hydroxide[base]	2	2†	--	2	--	--
Propane	500	1,000	--	--	2,100	2,100-9,500
RegenOx A or B™	--	--	--	--	--	--
Selenium[metal]	0.2	0.2	--	--	1	--
Silver[metal]	0.01	0.01	--	--	10	--
Sodium carbonate[base]	--	--	--	--	--	--
Sodium hydroxide[base]	2	2	--	2†	10	--
Sulfuric acid[H_2SO_4]	1	1	15†	--	15	--
Tetrachloroethylene[PERC]	25	25†	--	150[cap]	150	--
Toluene	100	100†	150†	300	500	1,100-7,100
Trichloroethylene	50	50†	200†	200	1,000	8,000-10,500*
Vinyl chloride	1	1	--	5[15-min]	--	3,600-33,000
Xylene	100	100†	150†	--	900	1,100-7,000
Zinc[metal]	--	--	--	--	--	--

NOTES:
† - More protective OSHA PELs vacated by the 11th Circuit Court of Appeals in July 1992; however, OSHA can enforce under the General Duty Clause. PPM will adhere to these exposure limits to ensure worker health and wellbeing is maintained.
Diesel, dusts, heavy metals, bases/alkalis, Trap & Treat BOS-200, and PCBs are all measured as mg/m^3 – not ppm!
Asbestos is measured as number of fibers per unit air (f/cc); Portland cement is measured as million parts per cubic feet (mppcf).
Action limit and PEL are time-weighted averages over 8-hour work period. STEL is TWA over 4 15-min periods, with the exception of asbestos, which has a 30-minute excursion limit. Others are instantaneous readings.
PAHs - coal tar pitch volatile components of TPH-D include anthracene, benzo(a)pyrene, chrysene, phenanthrene and pyrene, all of which have the same permissible exposure and IDLH limits; therefore, all components lumped into one group. The only other regulated component of PAH is naphthalene which is a component of crude or refined oil and is listed separately from other PAHs.
Only the regulated pesticide components of EPA SWA-846 Methods 8080/8081 are included above.
Perchloroethylene (PCE) has a ceiling limit of 200 ppm for 5 minutes within any 3-hr period not to exceed 300 ppm but this has been capped at 150 ppm to match IDLH concentrations for this material. Trichloroethylene's flammability range is effective ≥77ºF.

Any constituent not otherwise specified above that is anticipated as part of company-related processes in which workers have the potential to be exposed must be immediately reported to the safety department and will require a site-specific HASP. This HASP will be generated and issued by the safety department and requires a 1-week advanced notice.

4.4 MONITORING EQUIPMENT AND CALIBRATION

Because PPM works with a variety of chemicals, not all constituents can be detected with one universal monitoring device. Some monitoring equipment can provide instantaneous readings, while others require laboratory analysis (wet method analysis). In addition, each monitoring device has its advantages and disadvantages. Some commonly used monitoring devices used by PPM include the following:

- **Organic vapor analyzers (OVA)**. This monitoring device is used to detect volatile and semi-volatile substances. Some OVAs used by the company include MiniRAE 2000 PGM 7600, GasTech®, RKI Eagle® photoionization detector (PID), and Micro FID® flame ionization detector (FID). The advantage of this monitoring device is that it is a direct-read instrument and provides instantaneous readings. Some disadvantages of this equipment are that it generally does not provide readings less than 1 ppm, it does not give percent LEL or provide oxygen content. OVAs generally detect a group of chemicals and do not indicate which compound is being detected.

- **Ozone meters**. This monitoring device is used to detect ozone gas and is also a direct-read instrument. The ozone meter used by some offices within the company is the EcoSensor Ozone Sensor A-21ZX. It is chemical-specific but has some interference from other oxidizing gases.

- **PortaSens II gas detector**. The monitoring device is a portable, direct-read gas leak detector that has the ability to measure a variety of different gases by simply inserting a gas-specific sensor. This instrument is lightweight and can measure gases such as acetylene, ammonia, carbon monoxide, fluorine, formaldehyde, hydrogen, hydrogen chloride, hydrogen cyanide, hydrogen peroxide, hydrogen sulfide, oxygen, ozone, phosgene, and sulfur dioxide. For a composite list of gases, refer to the manufacturer's website.

To ensure it is in good working order, air monitoring equipment must be calibrated in accordance with manufacturer recommendations for each monitoring device. Workers must be aware that each office utilizes different monitoring equipment; therefore, readings from instruments calibrated with methane may not be the same as readings from instruments calibrated with hexane. Be sure to use the instrument's conversion tables as provided by the manufacturer when warranted. In addition, some metals can produce toxic

gases when burned or exposed to open flames; therefore, the safety data sheet should be referenced when working with metal-contaminated soils.

4.5 SAMPLE COLLECTION

To appropriately determine exposures, samples must be collected within the breathing zone (shoulder level) of the worker, subcontractor or other affected pedestrian when relevant to site concentrations and location of these concentrations in relation to the general public. It should be noted that there may be times in which samples must be collected at the source (i.e., inside manhole) for technical purposes. These concentrations must be identified and reported as separate readings not indicative of worker exposures. Additional precautions must be taken to prevent impact to worker breathing zone during the sample collection when at or near the contaminant source. Depending on the concentrations in this given area or when impact to worker breathing zone cannot otherwise be avoided, respiratory protection may be required.

4.6 MONITORING FREQUENCY AND DOCUMENTATION

As indicated previously, exposure monitoring is not required for tasks covered under this safety plan; however, ambient air monitoring is conducted as a preventive measure. All sites with a remediation system are monitored to ensure the system is functioning properly. Instantaneous samples are collected in various positions inside and around the system, monitoring wells, and/or sparge points. If at any point a regulatory threshold hold limit is triggered, the employee must immediately evacuate the area and contact the Project Manager, Office Manager, and safety department.

All monitoring areas, concentrations, sample collection times and/or notations (i.e., change in site conditions, contaminant source readings, etc.) must be documented using the company's Ambient Air/Safety Supply Checklist for dual- and single-phase vacuum systems, air sparge systems, and ozone systems. Forms must be completed fully and returned to the safety department for review upon completion of the project.

5.0 PERSONAL PROTECTIVE EQUIPMENT

While the use of protective clothing/equipment provides protection against chemical and physical hazards, there are additional disadvantages associated with its usage. Personal protective equipment can be heavy, bulky and uncomfortable, slow down the work process and/or increase the degree of heat stress put on a worker. Therefore, the use of personal protective equipment is always a last resort. Only when other alternatives such as engineering, administrative or work practice controls fail to eliminate or reduce a hazard to an acceptable level will the use of protective clothing and equipment become a consideration.

5.1 PROTECTIVE CLOTHING AND EQUIPMENT

5.1.1 Head Protection

In accordance with 29 CFR 1910.135, the company provides head protection from impact and penetration hazards posed by falling objects, projectiles, and shock/burn hazards posed by contact with electricity. While OSHA requires that head protection be provided, it is the American National Standards Institute (ANSI) that sets criteria for head protection. ANSI Z89.1-2014 separates protective helmets into different types and categories as follows:

HARD HAT TYPES	
Type I – hard hat that provides protection from impact to the top of the head only	Type II – hard hat that provides protection from impact to the top and sides of the head

CLASSIFICATION	PROTECTION PROVIDED	
Class G [Formerly Class A]	G – General; intended to reduce the force of impact of falling objects and reduce the danger of contact with exposed low-voltage electrical conductors; proof-tested at 2,200 volts of electrical charge	
Class E [Formerly Class B]	E – Electrical; intended to reduce the force of impact of falling objects and reduce the danger of contact with exposed high-voltage electrical conductors; proof-tested at 20,000 volts	
Class C [Formerly Class C]	C – Conductive; intended to reduce the force of impact of falling objects, but offer no electrical protection	

PPM's preference for hard hat selection is ANSI Z89.1-1997 approved Type II, Class E hard hat with ratchet suspension; however, Type I and Class G hard hats are permitted for use. PPM prohibits the use of Class C hard hats because they provide no protection against electrical hazards.

5.1.2 Eye and Face Protection

In accordance with 29 CFR 1910.133, the company requires each affected employee to use appropriate eye and/or face protection when exposed to hazards from particulates, flying particles (projectiles), molten metal, liquid chemicals, chemical gases, vapors, or fumes, metal shavings, and/or potentially injurious light radiation. PPM requires the use of safety glasses with side-shield protection for all outdoors field activities. Workers are permitted to use prescriptive lenses so long as side-shield protectors are used. Safety glasses may be upgraded to goggles or face shields when mixing chemicals, when dealing with chemical splash hazards, or when working in extremely dusty environments that cannot otherwise be addressed through the use of controls. Face shields may also be required when working with projectiles. Eye and face protection must be ANSI Z87.1-2010 approved.

5.1.3 Hand Protection

In accordance with 29 CFR 1910.138, the company requires workers to use appropriate hand protection when their hands are exposed to hazards such as those from skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, and harmful temperature extremes. PPM bases this selection on an evaluation of the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards/potential hazards identified. The following gloves are recommended for typical company tasks:

§ Nitrile gloves – good for working with oil and grease and can also protect against some dry chemicals; they are disposable and easy to use; this is the most commonly used glove provided by the company

- Neoprene, vinyl [PVC] and rubber gloves – also good for working with chemicals such as janitorial or cleaning products, fuels, oils and grease; can be purchased as disposable or reusable; neoprene is preferred when working with acids or bases

- Butyl or laminate gloves – good for working with ketones
- Latex gloves – good for working with bloodborne pathogens such as viral and bacterial agents; nitrile gloves will work as well so latex is not commonly provided by the company

- Cotton or leather gloves – good for material handling of heavy and abrasive objects; leather is sturdy and can resist splinters from wood products and provides some protection against heat
- Cut-resistant gloves – good when working with sharp or cutting objects; there are various brands of cut-resistant gloves including Kevlar®, Magid® and Ansell®

Hand protection must be ANSI/ISEA 105-2011 approved. *Note: ISEA is the International Safety Equipment Association*.

5.1.4 Foot Protection

In accordance with 29 CFR 1910.136, the company requires workers to use protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, sharp edges, slippery surfaces, and unlevel walking/working surfaces. PPM requires ASTM F2412/F2413-approved steel-toed footwear for all field sites. *Exception: Rubber boots or other footwear may be used when workers collect samples within body of water or when workers are required to enter a boat*. Composite-toed shoes are permitted when they meet the ASTM testing requirements for compressive strength.

5.1.5 Skin Protection and Visibility

Typical PPM jobsites warrant level D protective clothing, which consists of long pants and short or long-sleeved shirt. Other clothing may be required based on the hazard exposure and is outlined below:

- Fire-retardant clothing – required by clients within the oil and gas industry to access their facility
- High visibility clothing – reflective, high visibility company-provided t-shirts or DOT Class II/III reflective high visibility safety vests are required when working in/nearby active traffic and when working on/nearby roadway right-of-way

Special considerations may require that full-body protective suits such as Tyvek®, Saranex™, or Tychem® be worn. The need for this type of equipment requires pre-planning by the safety department and management and must be discussed during the proposal phase of a project. Skin protection must be ANSI 103-2010 approved.

5.1.6 Hearing Protection

Preservation of hearing is of utmost importance. Most of the hearing lost cannot ever be recovered. Through the aging process, workers will be prone to natural hearing loss. Therefore, it is the company's responsibility to distinguish between natural and work-related hearing loss and to ensure that workers exposed to noise levels ≥85 dB are provided with hearing protection. The most common form of hearing protection provided to workers is the earplug. Earplugs come in various shapes and sizes and are relatively inexpensive so they can be tailored to the comfort

preferences of the individual. Workers who do not respond well to the use of earplugs will be provided canal caps or ear muffs upon verbal request to the safety department. Hearing protection must be ANSI S12.68-2007 approved.

5.1.7 Respiratory Protection

In accordance with 29 CFR 1910.134, the company provides respiratory protection when workers are exposed to hazardous materials at triggered regulatory threshold limits. Only those workers who have been medically cleared by a physician are permitted to wear respiratory equipment. Workers that have been medically cleared must also be fit-tested prior to respirator use. Documentation must be received by the safety department before a worker is approved for respiratory use.

Because workers are not required to work with extremely hazardous materials, with unknowns or within oxygen-deficient environments, supplied-air respiratory equipment is not applicable to current company processes. PPM purchases a variety of National Institute for Occupational Safety and Health (NIOSH)-approved air-purifying half-mask and full-face respirators to be worn when ambient chemical concentrations trigger company-assigned action limits. It should be noted that because most field work is conducted in outdoor, open environments, respiratory protection is generally not required.

5.1.8 Electrical Protective Equipment

Insulating equipment such as rubber insulating blankets, rubber insulating matting, rubber insulating covers, rubber insulating line hose, rubber insulating gloves, and rubber insulating sleeves is required when working on or near energized equipment and/or devices. Insulating equipment must be capable of withstanding, without failure, the voltages that may be imposed upon it. Insulating equipment must be proof-tested and inspected in accordance with the provisions outlined within 29 CFR 1910.137. Use of damage or defective insulating equipment is strictly prohibited!

5.1.9 Life Saving Equipment

In accordance with 29 CFR 1926.106, employees working over or near water, where the danger of drowning exists, must be provided a U.S. Coast-Guard-approved life jacket or buoyant work vest. Where applicable, ring buoys with at least 90 feet of line must be provided and readily available for emergency rescue operations. The distance between ring buoys cannot exceed 200 feet. In addition, at least one life-saving skiff must be immediately available at locations where employees are working over or adjacent to water.

5.2 OTHER PROTECTIVE AIDS

Protective equipment can be used in a number of ways to draw attention to the worker or work area, to isolate the work area from unauthorized persons and/or traffic, or to identify the hazard(s) posed by the activity. Common examples of protective equipment used by PPM include, but are not limited to the following:

- Signs, posters, labels
- Cones, barricades, caution tape
- Heavy equipment/machinery or company vehicles
- Steel plate covers or wood for monitoring wells and/or holes
- First aid kit
- Flashing lights
- Flag extensions on cones for greater visibility
- Portable 10 or 20-lb ABC fire extinguishers

- § Lockout/tagout devices
- § Handheld eyewash bottles

5.3 PROJECT-SPECIFIC PPE REQUIREMENTS

Depending on the degree of the hazard(s) posed by field tasks, various levels of protective clothing and equipment may be required. Protective clothing and/or equipment required by routine tasks covered by this HASP are outlined further in the table below. Protective clothing and/or equipment not otherwise covered by this plan will require a site-specific HASP. Contact the HSD for further instructions.

FIELD TASK	PROTECTIVE CLOTHING/EQUIPMENT										
	STEEL-TOED SHOES[1]	SAFETY GLASSES[2]	HIGH VISIBILITY SHIRT VEST[3]	GLOVES[4]	HEARING PROTECTOR[5]	HARD HAT (CLASS E)[6]	GOGGLES/FACE SHIELD[7]	RESPIRATOR (APR)[8]	HARNESS/LANYARD	FLOTATION DEVICES/BUOYS	FIRE RETARDANT CLOTHING[9]
Asbestos inspections or sampling	X	X	X	X				X			
Carbon change-out	X		X	X	X	X	X	X	X		
Compliance audits/visual inspections[Phase 1]	X	X	X								
Groundwater sampling	X	X	X	X							
Mobile vacuum event	X	X	X	X	X						
Mobile ozone	X	X	X	X	X						
Operation and maintenance of system	X	X	X	X	X						
Any work over or near water body		X		X			X			X	
Any work performed at oil and gas facility, terminals, or other similar property	X	X		X	X	X					X

Notes:
1 – Steel-toed boots/shoes or equivalent ANSI-approved composite-toe footwear
2 – Safety glasses must be equipped with side-shield protection; prescription lenses are permitted if equipped with side-shield protection
3 – DOT Class II or III high visibility clothing or safety vests with exposure to traffic and/or mobile equipment
4 – Nitrile gloves for petroleum contamination; Kevlar®/leather gloves for cutting hazards; other chemical-resistant gloves needed for more stringent chemical hazards
5 – Ear plugs, canal caps or ear muffs when noise levels ≥85 dB
6 – Class E hard hats required for protection against electrical hazards
7 – Safety glasses must be upgraded to goggles or face shield when working with or mixing powders or when working with liquids that present a splash hazard
8 – Air-purifying respirator (half-mask or full-face) required for all asbestos sample collections and when chemical threshold limits are triggered and control measures are ineffective
9 – Fire-retardant clothing is a client-specific requirement; clients within the oil and gas industry generally require fire-retardant clothing

5.4 REDUCTION OF PROTECTIVE CLOTHING AND EQUIPMENT

The use of protective clothing and equipment is mandatory at all times during the course of a project except when inside a designated break area. A break area will be assigned by the Site Safety Officer during the pre-entry safety briefing. The break area must be:

- § Located a minimum of 50 feet away from the work zone
- § Located where ambient concentrations are not > chemical detection limit
- § Located out of the way of vehicular traffic and must not hinder any functions of other businesses

The break area must be clearly designated by posting cones, barricades, or caution tape. Affected personnel and subcontractors must be informed of the break area during the pre-work safety briefing. Only when inside the break area may protective clothing and/or equipment be

removed. If the conditions noted above cannot be met, the safety department must be contacted. Variances may be granted based on certain site conditions.

6.0 SITE ACCESS, CONTROL, AND DECONTAMINATION

6.1 SITE ACCESS

Typical PPM jobsites occur in areas open and accessible to the general public. However, when working at unguarded gated facilities, workers must secure appropriate means of site access from the client. This can include a coordinated effort to meet the client at a designated date and time, or acquiring keys to the facility from the client. *Note: Personnel and/or subcontractors are prohibited from climbing or crawling beneath site fencing to secure site access.*

6.2 DESIGNATED WORK ZONES

Due to the nature of tasks covered within this plan, it is unnecessary to designate work zones for this type of work. Because typical jobsites occur in areas accessible to the general public, the immediate work area must be clearly marked and isolated from unauthorized personnel as indicated in the following section.

6.3 AUTHORIZED PERSONNEL

Only authorized personnel are permitted within the exclusion zone. An authorized person is considered to be any individual who has a relevant role or function in relation to the project, participates in onsite safety briefings, and signs the HASP acknowledgement form. Facility managers, client, agency representatives, and law enforcement or regulatory officials may refuse to participate in planned safety meetings or HASP review. As this situation arises, all equipment and job tasks should be temporarily halted to allow for onsite inspection and monitoring by these individuals. When unauthorized persons exit the exclusion zone, all site activities may resume.

6.4 STOP-WORK AUTHORITY

The SSO has full stop-work authority and should use this authority under the following conditions:

- When a hazardous condition, unsafe behavior or other safety concern is noted
- When a near-miss or incident is reported
- When an unauthorized individual enters the designated work zone
- When lightning or other signs of inclement weather is noted within the area
- When a contaminant action limit is triggered
- When unexpected conditions arise that could warrant changes to safety procedures and/or scope of work

6.5 GENERAL SITE CONTROL AND SAFETY PRECAUTIONS

The following denotes simple procedures for maintaining site control and worker safety:

- Designated parking and pedestrian walkways in areas a reasonable distance away from active work area
- Use buddy system whenever feasible
- Perform pre-job inspection to establish appropriate baselines and to visually inspect for obstacles, clearances, etc.
- Avoid smoking on the jobsite unless within authorized areas (i.e., break areas when deemed appropriate by the SSO for smoking)
- Use appropriate safety devices (i.e., cones, barricades, etc.) to clearly identify work zones and break areas
- Prevent unauthorized entry and use stop-work authority as necessary

- Perform post-job inspection to ensure all materials have been removed from the site; pay close attention to the vehicles to ensure animals or person(s) are not located beneath the vehicle and that all cab and toolbox doors have been secured

6.6 DECONTAMINATION PROCEDURES

In order to prevent the spread of contamination from impacted work zones, monitoring equipment, sampling equipment, and/or workers, decontamination must take place. Decontamination is defined as the removal or reduction of contaminants. Decontamination procedures vary based on the degree of site contamination as well as the contaminant(s) involved, and this process must take place within the contamination reduction zone. As impacted workers and equipment exit the exclusion zone, they must be decontaminated using appropriate detergent solutions. Disposal protective clothing must be discarded in garbage bags or lined containers for proper disposal.

Typical company functions require a low level of decontamination which involves the cleaning of bailers, purge materials and/or other similar equipment as samples are collected in various areas of a jobsite. Most chemicals in which workers are exposed are classified as skin and eye irritants; therefore, it is important for workers to remove contaminated clothing as soon as possible, flush eyes for a minimum of 20 minutes and use alconox®/liquinox® solution to wash impacted skin.

7.0 EMERGENCY RESPONSE

7.1 ALARMS AND ONSITE NOTIFICATIONS

To compensate for unexpected conditions and/or changes in existing site conditions, each jobsite must have an effective communication system in place. Workers are notified of emergencies through various forms of effective communication consisting of the following:

- Verbal communication – is generally the most effective form of communication for the majority of all job-related tasks associated with a project
- Hand communication – hand signals are used in place of verbal communication under the following conditions:
  - When noise levels become elevated due to heavy equipment operation or other similar measures that prevent workers from hearing verbal communications
  - When equipment operator's line of vision is obstructed
  - Under any situation deemed necessary by the SSO
- Continuous horn blast of vehicle or air horn – used in lieu of verbal and hand communications due to:
  - Large, dispersed work zones or multiple work areas that prevent overall effectiveness of other forms of communication
  - Multiple site distractions that inhibit immediate worker attention
  - Elevated noise levels that inhibit immediate worker attention

  One continuous blast is to be used so as not to confuse workers with other equipment sounds.

7.2 PERSONNEL ASSESSMENT AND EVACUATION

Once an alarm has been triggered, workers must be evacuate the work zone and meet in the designated area assigned during the pre-entry safety briefing. This location is determined by the SSO based on distance from existing hazards and verification that it is upwind of any chemical hazard source. Site evacuation is warranted under the following conditions:

- When ambient air concentrations meet or exceed an established action limit assigned for a constituent
- When new hazards not otherwise addressed within this safety plan are encountered
- When subcontractor, field personnel, clients, or regulatory officials violate the safety provisions outlined within this plan
- Upon client or regulatory agency request
- Under any condition the SSO deems unsafe

When evacuation is warranted, all field personnel and subcontractors will meet at the designated area for a preliminary head count, which is conducted by the SSO. Further provisions will be discussed at that time.

7.3 INCIDENT, NEAR-MISS, AND HAZARD RECOGNITION REPORTING

Incidents, near-misses or other noted hazards must be reported promptly to the safety department so that each case can be further investigated to determine the root-cause of the event in order to prevent future recurrences. An incident is defined as an occurrence that results in worker injury or property damage. Examples of an incident include but are not limited to the following:

- Auto-related accident regardless of fault
- Contact with overhead utility
- Chemical spill or release
- Slips, trips, or falls or other work-related injury/illness

A near-miss is defined as an unplanned event that did not result in injury, illness or damage but had the potential to do so. Unexpected hazards may arise from unsafe acts or conditions or changes in site conditions. Incidents, near-misses and hazards must be reported to the safety department immediately once the site has been secured. The site is considered secured once all leaks have been properly contained, and the area has been evacuated and further isolated to prevent unauthorized entry. All reports must be made to the District Manager or can be made to the safety department directly. In addition, all reports must be documented using the Incident, Near-Miss and Hazard Recognition Report.

7.4 INJURY REPORTING AND CASE MANAGEMENT

Any incident that results in injury must be reported immediately to the HSD. Reported injuries or illnesses that warrant medical care must be managed by the safety department. In order to achieve this, all cases are evaluated for medical necessity. Whenever possible, workers are sent to the company's pre-established occupational medicine clinics that specialize in work-related injury care. Workers are permitted to seek medical attention (911) without prior company consent only when the injury appears to be life-threatening or when the injury requires immediate medical attention and contact with designated company officials cannot be achieved.

Workers who seek medical attention without company consent will be required to pay for their own medical care out-of-pocket. This provision also applies to follow up care when an injury/illness does not get better. Workers must additionally report changes in medical condition to the HSD, and additional medical evaluations must be coordinated by the company.

7.5 GENERAL MEDICAL CARE AND FIRST AID

It is company policy that all field workers be trained in adult CPR and first aid. Workers who have received this level of training should be prepared to administer care for minor injuries. Certified workers may additionally be called upon to provide care to more seriously injured persons while waiting for additional medical attention. If the victim is conscious, workers must indicate that they are certified and they must additionally obtain consent prior to administering care. Consent is implied when the victim is unconscious. Some general emergency care provisions are outlined below (not all-inclusive):

HAZARD CATEGORY	HAZARD	RESPONSE
Chemical	Inhalation	Move worker to fresh air. If vomiting, dizzy or groggy, seek medical attention immediately. Administer CPR if certified.
	Dermal/Contact	Remove contaminated clothing and flush affected area with soap/water for ~20 minutes. Seek medical care if pain persists.
	Ingestion	Seek immediate medical attention. Do not give fluids to an unconscious person. Do not induce vomiting.
	Eye	Flush with copious amounts of water for ~20 minutes. Seek medical attention if pain persists.
Physical	Heat stress	Apply warm, moist heat and pressure to reduce pain in legs/ abdomen. Give electrolyte drinks by mouth, if conscious. Remove excess clothing and attempt to cool core body temperature promptly using cold water. Medical attention is warranted for extreme heat stress.
	Cold stress	Remove any wet clothing immediately and bundle in extra clothing and/or blankets. Drink warm fluids, if conscious. Attempt to warm core body temperature using heater or other methods. Medical attention is warranted for extreme cold stress.
Physical	Sprain/strain	Use combination heat/cold therapies to reduce swelling and apply pain relief. Take an over-the-counter naproxen sodium (Aleve) or ibuprofen (Advil) for pain and inflammation. Seek medical attention if pain persists for more than a few days.
	Tingling/ numbness	Generally an indication of swelling but can lead to permanent nerve damage. Take an over-the-counter naproxen sodium (Aleve) or ibuprofen (Advil) for pain and inflammation. Seek medical attention if symptoms persist.
	Cuts/lacerations	Apply pressure to wound for blood to clot and use bandages to cover wound. Antibiotic creams can prevent infection. Seek medical attention for deep cuts that require stitches.
	Ringing in ears	Symptom of hearing loss, which will require medical testing to determine if this is a temporary or permanent hearing loss.
Biological	Needle stick	Immediately remove needle. Squeeze the area to extract blood from the wound. Seek immediate medical care and carry the needle with you to the medical clinic.
	Insect/spider/ tick/animal bite	Immediately remove insect or tick and pay close attention over the next few days for symptoms of delayed illness. Seek medical attention if noted. Seek medical attention for black/brown widow and brown recluse spider bites as well as animal bites.
	Poison plants	Pay attention for evidence of allergic reaction (itching, redness and irritation) and seek medical attention if over-the-counter remedies prove ineffective or if affected area spreads.

***Caution**: Individuals with heart problems, on a "low sodium" diet, or who otherwise have blood pressure issues and work in hot environments should consult a physician for proper alternative care when working under these conditions.*

7.6 HAZARDOUS SUBSTANCE RELEASE

In the event that hazardous substances migrate from the work zone and potentially endanger unprotected personnel or the community, the area will be isolated and the spill contained and cleaned by authorized personnel. On-site activities will cease until the release is brought under control and the site is returned to its previous condition or otherwise poses no additional harm to site personnel. All hazardous materials must be containerized and labeled until it can be profiled and disposed in accordance with regulatory requirements at an approved landfill. Workers should reference the SDS for additional information.

7.7 REGULATORY, CLIENT, OR OTHER AGENCY NOTIFICATIONS

In the event of an emergency, all reporting must be made to your direct project or office manager and/or safety department. Other required client, regulatory or other agency notifications will be made by management within appropriate reporting deadlines.

8.0 WASTE MANAGEMENT

Under normal conditions associated with the remediation process, groundwater monitoring wells are purged of impacted groundwater and as part of the investigation process, impacted soils are stored within containers until these wastes can be profiled and disposed an approved landfill. Other chemicals may be ordered for maintenance or to otherwise facilitate the remediation process. It is the company's objective to ensure all containers are in good condition and labeled appropriately so as to prevent any release of contaminated materials from these containers until it can be appropriately disposed.

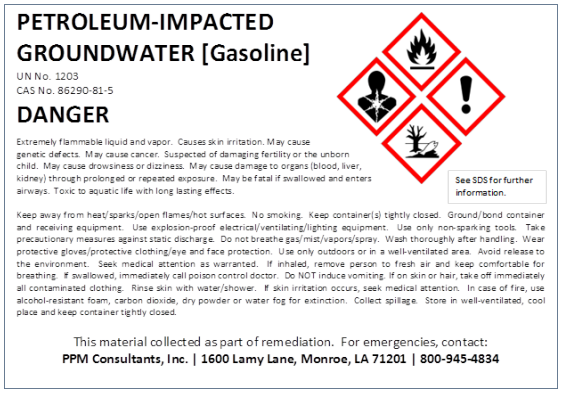
8.1 CONTAINER LABELING

All containers used by the company must be appropriately labeled – even when a waste is in accumulation or a material is still in use. Containers are defined by the company as any bucket, bottle, barrel, drum, jar, tote, can, box, crate, tank, or other similar means used to contain, store, and/or transport materials. Containers may be movable or stationary and can vary in weight and dimension; however, common containers used by the company include drums, totes, buckets, soil bags or super sacks.

8.1.1 Hazardous Material/Waste Labeling

Any hazardous material or waste container(s) must be labeled in accordance with 29 CFR 1910.1200 using a globally harmonized system (GHS) for chemical classification and labeling. Tags using the same GHS-format should be used for soil bags and super sacks. Each label must contain six required elements, which include the following:

- § Product identifier – should match the product name on the safety data sheet
- § Signal word – "danger" (severe) or "warning" (less severe)
- § Hazard statements – phrase assigned to a hazard class used to describe the nature of the product's hazards
- § Precautionary statements – a measure to minimize or prevent adverse effects results from exposure
- § Supplier identification – name, address and telephone number of the manufacturer or supplier*
- § Pictograms – graphical symbols used to convey specific hazard information visually



**Note: Hazardous materials ordered by PPM must have the manufacturer or supplier information posted on the containers; however, materials generated as part of the remediation process must identify PPM as the emergency contact.*

The GHS labeling system will supersede the HMIS labeling system previously used by the company. In general, HMIS labels may still be used in conjunction with, or as a component of, the GHS labeling system. The international requirements for HMIS labeling are similar to those developed by the American Coatings Association with the exception that the degree of hazard severity as indicated by the numbering system is reversed (example: under the old system the higher the number, the higher the hazard severity; under international GHS requirements, the lower the number, the higher the hazard severity). Therefore, workers may continue to see HMIS labels as part of the GHS labeling system when used by other companies; however, PPM will discontinue the use of HMIS labels moving forward.

8.1.2 Nonhazardous Material/Waste Labeling

Containers of nonhazardous materials and/or wastes must also be labeled. They will be labeled using the same labeling system as addressed within the previous section; however, workers should expect these labels to be less detailed since these materials are not likely to pose hazards. Continued use of this labeling system will permit workers to identify the contents of any container used by the company.

Once materials have been deemed as a waste, then non-hazardous waste labels must additionally be affixed to the container(s) so long as the material is truly considered to be a nonhazardous substance. Verbiage for this label template has been modified to meet the needs of the company, and workers are required to complete the label in accordance with the following requirements:

- § Generator – PPM must never be identified as the generator; wastes are generated on behalf of the client and therefore, must have the client's name.
- § Contact – PPM will be considered the contact; this will enable clients with multiple subcontractors to identify which of their contractors is generating the waste.
- § Phone – Provide PPM's phone number in case of emergency (800-945-4834).
- § Contents – Identify the material being stored within the container.
- § Start date – Indicate the date that the material is first placed inside the container; if the container will be accumulating, worker must still provide a date and must also indicate that it is in accumulation.

8.2 CONTAINER STORAGE AND DISPOSAL

In accordance with company policy, all wastes must be stored within fenced remediation systems, behind buildings or in other inconspicuous areas so as not to be disturbed by unauthorized individuals. Wastes must also be profiled and disposed within 90 days of task completion. Drums that are in accumulation may reside onsite for a period no greater than 365 days. Materials in accumulation must be profiled and disposed at least once per calendar year to ensure container integrity. Variances to this policy must be approved by the District Manager or safety department in advance.

8.3 CONTAINER INSPECTIONS

Containers stored at sites with a remediation system undergo routine visual inspections. Inspections occur on a quarterly basis to ensure that container integrity is maintained and that there is no evidence of leakage, excessive rusting, bulging or other forms of container damage that could result in a release. Inspections are documented and retained by the safety department. Evidence of container damage is promptly addressed.

9.0 PERSONNEL/CONTRACTOR SAFETY REVIEW

This HASP and any corresponding JSA(s) must be outlined during a safety briefing that is to be held by the SSO. This safety briefing shall occur prior to the start of the project and consists of an entire review of all relevant sections of this safety plan as it relates to all phases of the project. Affected company personnel, subcontractors, clients, and/or regulators assigned to the project must participate in the safety briefing to gain access to the work zone. Changes or additions in site personnel will require an additional safety briefing be conducted with all affected person(s) to permit site access. Participants of the safety briefing will be required to sign a form to acknowledge they have received safety instructions and agree to abide by the provisions outlined within the HASP and JSA. *Note: Because the tasks covered by this written plan are so repetitive, this HASP and all corresponding JSAs must be reviewed with personnel on an annual basis. The safety briefing is held as part of the company's annual 8-HR HAZWOPER refresher*.

10.0 CONTRACTOR SUPERVISION

Subcontractors must abide by all safety procedures outlined within this plan, or they will be required to leave the premises until these procedures are implemented. Subcontractors will be permitted to operate under a separate safety plan as long as it meets the minimum requirements established by this HASP, has been reviewed and approved by the HSD in advance of the project's start date, and does not other otherwise conflict with the provisions of this HASP.

Subcontractors may not initiate work without the authorization of PPM, and all subcontracted work must be performed under the supervision of a PPM representative. Managers and field workers must coordinate schedules with the subcontractor(s) in advance of the project. All field processes must be shut down when a PPM representative leaves the jobsite unless otherwise approved by the District Manager; however, notations must be made within the HASP when this exception is granted.

Subcontractors must provide advanced notification when bringing additional chemicals not otherwise covered by this safety plan onto the jobsite. A safety data sheet must be provided to the HSD for review/approval before any chemical will be permitted onsite. If approved, any additional hazards, preventive measures, and emergency response procedures associated with the introduction of these substances must be incorporated into this HASP prior to the start of the project.

11.0 CONFINED SPACE

Confined space is defined by OSHA as any space that is "large enough and so configured that an employee can bodily enter and perform assigned work, has limited or restricted means for entry or exit, and is not designed for continuous employee occupancy." In accordance with this definition, PPM will not be conducting any field-related task that can be defined as confined space entry. PPM personnel have not been adequately trained for confined space entry; therefore, in the event site conditions warrant this type of work, a qualified contractor will be hired for this task.

12.0 LIST OF ABBREVIATIONS

ACM	asbestos-containing material
ANSI	American National Standards Institute
BGS	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CFR	Code of Federal Regulations
CHMM	Certified Hazardous Materials Manager
CO/CO_2	carbon monoxide/dioxide
CSP	Certified Safety Professional
dB	decibel
DEET	N,N-diethyl-meta-toluamide
DOT	Department of Transportation
fc	foot-candle
FID	flame ionization detector
GFCI	ground fault circuit interrupter
GHS	Globally Harmonized System of Chemical Classification and Labeling
GVWR	gross vehicle weight rating
HASP	health and safety plan
HEPA	high efficiency particulate air
HIV	human immunodeficiency virus
HMIS	hazardous materials information system
HSD	Health and Safety Director
HSSE	health, safety, security and environmental
IDLH	immediately dangerous to life and/or health
JSA	job safety analysis
kV	kilo volt
LEL	lower explosive limit
LFL	lower flammability limit
MTBE	methyl-tertiary butyl ether
NCHRP	National Cooperative Highway Research Program
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
O_2/O_3	oxygen/ozone
ORC	oxygen release compound
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
PACM	presumed asbestos-containing material
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
P.E.	Professional Engineer
PEL	permissible exposure limit
P.G.	Professional Geologist
PIC	Principal-in-Charge
PID	photo-ionization detector
PPM	PPM Consultants, Inc.
ppm	parts per million
SDS	safety data sheet
SS	Safety Supervisor
SSO	Site Safety Officer
STEL	short-term exposure limit
SVOC	semi-volatile organic compound
TPH	total petroleum hydrocarbon
TLV	threshold limit value
TWA	time-weighted average
UEL	upper explosive limit
UFL	upper flammability limit
VOC	volatile organic compound
UST	underground storage tank

EMERGENCY MEDICAL FACILITIES

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

EMERGENCY MEDICAL FACILITY

Medical Facility:

In cases of incidents or near-misses, the Health and Safety Director (HSD) must be verbally contacted immediately once any spills/releases have been contained and appropriately isolated. Incidents resulting in injury or illness must be reported immediately to the HSD for further instruction and injury case management. 911 should be called for life-threatening cases or cases requiring immediate attention. Be prepared to administer CPR and first aid care only if you have been trained to do so, acquire consent from injured worker (unless unconscious in which consent is implied), and training is up-to-date.

Site Name:	31st Street Texaco			Project Number:	460102-CAPD
Address:	3100 12th Avenue North	City, State:	Birmingham, AL	Zip:	35234

Name of Hospital:	UAB University Hospital			Phone:	(205) 934-3411
Address:	1802 6th Avenue South	City, State:	Birmingham, AL	Zip:	35233
Directions and Map:	See attached (next page)	Distance:	2.8 mi	Time:	8 min

SAFETY DATA SHEETS

INCIDENT/NEAR-MISS AND HAZARD RECOGNITION REPORT

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

INCIDENT/NEAR-MISS AND HAZARD RECOGNITION REPORT

A near-miss is a potential hazard or incident that has not resulted any personal injury or property damage. Unsafe working conditions, short-cuts or unsafe worker behaviors, improper use of equipment, use of malfunctioning equipment, or failure to implement HSSE protocols (to name a few) can lead to work-related incidents or injuries. It is the responsibility of all workers to report unsafe acts/conditions or incidents as they occur. All incidents, near-misses, or other recognized hazards must be reported to the Health and Safety Director using this form.

1. GENERAL INFORMATION

Name of person reporting [print]: _____ Date reported: _____

Title/position of person reporting: _____ Office location: _____

Office manager: _____ Type of event: ☐ Incident ☐ Near-miss ☐ Hazard report

2. DESCRIPTION OF INCIDENT, NEAR-MISS, OR HAZARD REPORTED

Type of hazard: ☐ Chemical hazard ☐ Physical hazard ☐ Biological hazard ☐ Other hazard

If an incident, indicate all that apply: ☐ Injury/illness ☐ Property damage ☐ Neither ☐ Other [describe below]

Describe the incident, near-miss or hazard in detail. Be descriptive when reporting incidents and near-misses outlining the actions leading up to and including the event. Attach photos, sketches, etc. when possible.

Describe all actions taken to bring the event to full closure.

Provide recommendations for corrective action/improvement.

INCIDENT LOG

PPM CONSULTANTS

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

INCIDENT LOG

2019

PPM Project No.: _____ Site Name: _____

Site Address: _____ City, State: _____ Zip: _____

Date of Incident: _____ Time of Incident: _____ Time Work Started: _____

TIME (Military)	PERSON CONTACTED (Name & Title/Position)	DESCRIPTION OF ACTION TAKEN (Describe in detail what was said, observed, actions taken, etc.)

(Note: If more space is warranted, use another page of the Incident Log. Be sure to re-complete the top portion of the form providing client and site information and label as page 2, etc. as needed.)

Page _____ of _____

AMBIENT AIR MONITORING AND SAFETY SUPPLY CHECKLIST
(DPVE/SVE/AIR SPARGE SYSTEM)

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

AMBIENT AIR_SAFETY SUPPLY CHECKLIST – DPVE/SVE/AIR SPARGE

2019

Site Name: _____ Project No.: _____ Date: _____

Instrument Make: _____ Model: _____ Serial No.: _____

Instrument Detection Limit: _____ Calibrated: ☐ Yes ☐ No Calibration Gas: _____

Time of Arrival: _____ ☐ AM ☐ PM Time of Departure: _____ ☐ AM ☐ PM

Technician [Print Name]: _____ Tech Signature: _____

Petroleum contamination will consist primarily of gasoline (volatile) and/or diesel (semi-volatile). Overexposures can produce headaches, dizziness, nausea, vomiting, and irritation of respiratory passages if inhaled. Contact can result in skin/eye irritations. Gasoline contains benzene, a known carcinogen, and is extremely flammable. Worker exposure limits for gasoline are assigned as follows:

Gasoline Action Limit = 100 ppm **[Use caution/increase monitoring frequency]**
Gasoline STEL Limit = 500 ppm **[Shut down system/evacuate area immediately]**

Ambient petroleum air readings are to be collected inside the fence (around the unit) within the breathing zone of workers and at a distance of 20 feet from the unit.

AMBIENT AIR CHECK ☐ Section N/A, system not operating during quarter

Collection Time	Petroleum Conc. Inside Fence (ppm)	Ambient Petro 20' N (ppm)	Ambient Petro 20' S (ppm)	Ambient Petro 20' E (ppm)	Ambient Petro 20' W (ppm)	Petro detected at 20'? If so, measure again at 50' (ppm)

SAFETY SUPPLY CHECK ☐ Section N/A, system not operating during quarter and no site visit made

Safety Equipment	Condition			Equipment Replaced		Comments
	Good	Damaged	Missing	Y	N	
Chemical-resistant apron	☐	☐	☐	☐	☐	
Chemical-resistant gloves	☐	☐	☐	☐	☐	
Safety glasses/goggles	☐	☐	☐	☐	☐	
Earplugs	☐	☐	☐	☐	☐	
Eyewash station or bottle	☐	☐	☐	☐	☐	
Locks and tags for LOTO	☐	☐	☐	☐	☐	
SDSs for onsite contaminants	☐	☐	☐	☐	☐	
Fire extinguisher (20 lb.)	☐	☐	☐	☐	☐	
First aid kit	☐	☐	☐	☐	☐	
CPR mouthpiece barrier	☐	☐	☐	☐	☐	
Biohazard trash bag	☐	☐	☐	☐	☐	
Safety toolbox	☐	☐	☐	☐	☐	

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

AMBIENT AIR_SAFETY SUPPLY CHECKLIST – DPVE/SVE/AIR SPARGE

2019

Site Name: _____ Project No.: _____ Date: _____

Signage/Postings and Other Safety Checks	Response		Signage/Postings and Other Safety Checks	Response	
	Y	N		Y	N
LOTO instructions on control panel	☐	☐	Annual fire ext. inspection current	☐	☐
Fence locked and in good condition	☐	☐	Monthly fire ext. inspection current	☐	☐
Authorized personnel sign posted	☐	☐	Labels on all drums or containers	☐	☐
No smoking sign posted	☐	☐	Labels legible/readable	☐	☐
High voltage sign posted	☐	☐	Labels complete and dated correctly	☐	☐
Corrosive sign posted (if applicable)	☐	☐	Drums/containers in good condition	☐	☐
Emergency contact sign posted	☐	☐	Housekeeping good	☐	☐
Emergency contacts up-to-date	☐	☐	Other	☐	☐

AMBIENT AIR MONITORING AND SAFETY SUPPLY CHECKLIST
(PERMANENT AND MOBILE OZONE SYSTEM)

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

AMBIENT AIR_SAFETY SUPPLY CHECKLIST – PERMANENT AND MOBILE OZONE SYSTEM

2019

Site Name: _____ Project No.: _____ Date: _____

Instrument Make: _____ Model: _____ Serial No.: _____

Instrument Detection Limit: _____ Calibrated: ☐ Yes ☐ No Calibration Gas: _____

Time of Arrival: _____ ☐ AM ☐ PM Time of Departure: _____ ☐ AM ☐ PM

Tech Name [Print]: _____ [Signature]: _____

Ozone is a pale blue gas injected into the subsurface as a form of site remediation for petroleum contamination. Most workers can detect ozone at 0.01 ppm in air due to its sharp odor, which somewhat resembles chlorine bleach. Exposures at 0.1 to 1 ppm can produce headaches, burning of the eyes and irritation of respiratory passages. Ozone can be destructive to organic materials such as latex, plastics and animal lung tissue even at low concentrations in air. Ozone is an oxidizer, which means it is incompatible with many chemicals and generates heat/releases oxygen as part of its chemical reaction which with combustible materials can produce fires. Once exposed to ambient conditions, ozone readily converts from O_3 to O_2; however, worker overexposures may still occur and workers should keep face away from sparge points, monitoring wells or the trailer when opening lids or doors until the area can be properly ventilated. Worker exposure limits for ozone are assigned as follows:

Ozone Action Limit = 0.05 ppm **[Use caution/increase monitoring frequency]**
Ozone Ceiling Limit = 0.1 ppm **[Shut down system/evacuate area immediately]**

Ambient ozone air readings are to be collected at the wellhead (of active sparge wells and nearby monitoring wells) within the breathing zone of workers and at a distance of 20 feet from the well. Remove monitoring well lids and well caps slowly as pressure can create a splash hazard. Keep ozone sensor at waist level as you approach any ozone equipment or monitoring well and back away if concentrations approach the action or ceiling limit.

AMBIENT AIR CHECK ☐ Permanent system ☐ Mobile event ☐ Section N/A, system not operating during quarter

Well ID	Collection Time	Ozone Conc. at Wellhead (ppm)	Ambient Ozone 20' N (ppm)	Ambient Ozone 20' S (ppm)	Ambient Ozone 20' E (ppm)	Ambient Ozone 20' W (ppm)	Ozone detected at 20'? If so, measure again at 50' (ppm)

Additional notes/comments:

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

AMBIENT AIR_SAFETY SUPPLY CHECKLIST – PERMANENT AND MOBILE OZONE SYSTEM

2019

Site Name: _____ Project No.: _____ Date: _____

Well ID	Collection Time	Ozone Conc. at Wellhead (ppm)	Ambient Ozone 20' N (ppm)	Ambient Ozone 20' S (ppm)	Ambient Ozone 20' E (ppm)	Ambient Ozone 20' W (ppm)	Ozone detected at 20'? If so, measure again at 50' (ppm)

SAFETY SUPPLY CHECK ☐ Section N/A, system not operating during quarter and no site visit made

Safety Equipment	Condition			Equipment Replaced		Comments
	Good	Damaged	Missing	Y	N	
Chemical-resistant apron	☐	☐	☐	☐	☐	
Chemical-resistant gloves	☐	☐	☐	☐	☐	
Safety glasses/goggles	☐	☐	☐	☐	☐	
Earplugs	☐	☐	☐	☐	☐	
Eyewash station or bottle	☐	☐	☐	☐	☐	
Locks and tags for LOTO	☐	☐	☐	☐	☐	
SDSs for onsite contaminants	☐	☐	☐	☐	☐	
Fire extinguisher (20 lb.)	☐	☐	☐	☐	☐	
First aid kit	☐	☐	☐	☐	☐	
CPR mouthpiece barrier	☐	☐	☐	☐	☐	
Biohazard trash bag	☐	☐	☐	☐	☐	
Safety toolbox	☐	☐	☐	☐	☐	

Signage/Postings and Other Safety Checks	Response		Signage/Postings and Other Safety Checks	Response	
	Y	N		Y	N
LOTO instructions on control panel	☐	☐	Annual fire ext. inspection current	☐	☐
Fence locked and in good condition	☐	☐	Monthly fire ext. inspection current	☐	☐
Authorized personnel sign posted	☐	☐	Labels on all drums or containers	☐	☐
No smoking sign posted	☐	☐	Labels legible/readable	☐	☐
High voltage sign posted	☐	☐	Labels complete and dated correctly	☐	☐
Corrosive sign posted (if applicable)	☐	☐	Drums/containers in good condition	☐	☐
Emergency contact sign posted	☐	☐	Housekeeping good	☐	☐
Emergency contacts up-to-date	☐	☐	Other	☐	☐

AMBIENT AIR MONITORING AND SAFETY SUPPLY CHECKLIST
(PERMANENT AND MOBILE OZONE/HYDROGEN PEROXIDE SYSTEM)

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

AMBIENT AIR_SAFETY SUPPLY CHECKLIST – PERMANENT AND MOBILE OZONE/HYD PEROXIDE SYSTEM

2019

Site Name: _____ Project No.: _____ Date: _____

Instrument Make: _____ Model: _____ Serial No.: _____

Instrument Detection Limit: _____ Calibrated: ☐ Yes ☐ No Calibration Gas: _____

Time of Arrival: _____ ☐ AM ☐ PM Time of Departure: _____ ☐ AM ☐ PM

Tech Name [Print]: _____ [Signature]: _____

Ozone (O_3) is a pale blue gas and hydrogen peroxide (H_2O_2) is a colorless liquid, both of which are injected into the subsurface as a form of site remediation for petroleum contamination. Most workers can detect ozone at 0.01 ppm in air due to its sharp odor, which somewhat resembles chlorine bleach. Exposures of both substances in excess of regulatory limits can produce headaches, severe burning of the eyes/skin, and irritation of respiratory passages. Ozone can be destructive to organic materials such as latex, plastics and animal lung tissue even at low concentrations in air. Both substances are oxidizers, which means they are incompatible with many chemicals and generate heat/release oxygen as part of their chemical reaction which, when combined with combustible materials, can produce fires. In order to avoid splash hazards and/or potential ambient overexposures, workers should keep face away from sparge points, monitoring wells or the trailer when opening lids or doors until the area can be properly ventilated. Worker exposure limits are assigned as follows:

Ozone	Hydrogen Peroxide (30%)	Response
Action Limit = 0.05 ppm TWA	Action Limit = 1 ppm TWA	Use caution/increase monitoring frequency
Ceiling Limit = 0.1 ppm	IDLH Limit = 75 ppm	Shut down system/evacuate area immediately

Ambient air readings are to be collected at the wellhead (of active sparge wells and nearby monitoring wells) within the breathing zone of workers and at a distance of 20 feet from the well. Remove monitoring well lids and well caps slowly as pressure can create a splash hazard. Keep sensors at waist level as you approach any O_3/H_2O_2 equipment or monitoring well and back away if concentrations approach the action or ceiling limit.

AMBIENT AIR CHECK ☐ Permanent system ☐ Mobile event ☐ Section N/A, system not operating during quarter

Well ID	Collection Time	O_3/H_2O_2 Conc. at Wellhead (ppm)	Ambient O_3/H_2O_2 Conc. 20' N (ppm)	Ambient O_3/H_2O_2 Conc. 20' S (ppm)	Ambient O_3/H_2O_2 Conc. 20' E (ppm)	Ambient O_3/H_2O_2 Conc. 20' W (ppm)	O_3/H_2O_2 detected at 20'? If so, measure again at 50' (ppm)

Additional notes/comments:

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

AMBIENT AIR_SAFETY SUPPLY CHECKLIST – PERMANENT AND MOBILE OZONE/HYD PEROXIDE SYSTEM

2019

Site Name: _____ Project No.: _____ Date: _____

Well ID	Collection Time	O_3/H_2O_2 Conc. at Wellhead (ppm)	Ambient O_3/H_2O_2 Conc. 20' N (ppm)	Ambient O_3/H_2O_2 Conc. 20' S (ppm)	Ambient O_3/H_2O_2 Conc. 20' E (ppm)	Ambient O_3/H_2O_2 Conc. 20' W (ppm)	O_3/H_2O_2 detected at 20'? If so, measure again at 50' (ppm)

SAFETY SUPPLY CHECK ☐ Section N/A, system not operating during quarter and no site visit made

Safety Equipment	Condition			Equipment Replaced		Comments
	Good	Damaged	Missing	Y	N	
Chemical-resistant apron	☐	☐	☐	☐	☐	
Chemical-resistant gloves	☐	☐	☐	☐	☐	
Safety glasses/goggles	☐	☐	☐	☐	☐	
Earplugs	☐	☐	☐	☐	☐	
Eyewash station or bottle	☐	☐	☐	☐	☐	
Locks and tags for LOTO	☐	☐	☐	☐	☐	
SDSs for onsite contaminants	☐	☐	☐	☐	☐	
Fire extinguisher (20 lb.)	☐	☐	☐	☐	☐	
First aid kit	☐	☐	☐	☐	☐	
CPR mouthpiece barrier	☐	☐	☐	☐	☐	
Biohazard trash bag	☐	☐	☐	☐	☐	
Safety toolbox	☐	☐	☐	☐	☐	

Signage/Postings and Other Safety Checks	Response		Signage/Postings and Other Safety Checks	Response	
	Y	N		Y	N
LOTO instructions on control panel	☐	☐	Annual fire ext. inspection current	☐	☐
Fence locked and in good condition	☐	☐	Monthly fire ext. inspection current	☐	☐
Authorized personnel sign posted	☐	☐	Labels on all drums or containers	☐	☐
No smoking sign posted	☐	☐	Labels legible/readable	☐	☐
High voltage sign posted	☐	☐	Labels complete and dated correctly	☐	☐
Corrosive sign posted (if applicable)	☐	☐	Drums/containers in good condition	☐	☐
Emergency contact sign posted	☐	☐	Housekeeping good	☐	☐
Emergency contacts up-to-date	☐	☐	Other	☐	☐

HASP ACKNOWLEDGMENT FORM

HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROGRAM

HASP ACKNOWLEDGEMENT FORM

2019

This HASP was derived specifically for hazards associated with groundwater monitoring, system operation and maintenance, compliance audits, Phase I environmental site assessments, compliance audits, mobile vacuum events and other similar non-intrusive field tasks. I have read, understood, and agree to perform all field activities as outlined within this HASP as discussed in the pre-job safety briefing. I recognize that any additional hazards or changes in site conditions would require immediate reporting to the site safety officer and amendments to this written plan may be required.

PERSON REVIEWING HASP:

Name [Print]: _____ Signature: _____ Date: _____

ATTENDEES

Name [Print]	Signature	Date