PPM

# PHASE II ENVIRONMENTAL SITE ASSESSMENT REPORT

## MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

## LEFLEUR'S BLUFF FESTIVAL GROUNDS JACKSON, MISSISSIPPI FACILITY I.D. NO. 10428

PPM PROJECT NO. 341904-EAII
CONTRACT NO. LTF-032
WORK ORDER NO. 1875-1

MARCH 5, 2003

PPM Consultants, Inc.

# PHASE II ENVIRONMENTAL SITE ASSESSMENT

FOR

LEFLEUR'S BLUFF FESTIVAL GROUNDS
JACKSON, MISSISSIPPI
FACILITY I.D. NO. 10428

PREPARED FOR:

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
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PPM PROJECT NO. 341904-EAII

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# EXECUTIVE SUMMARY

PPM Consultants, Inc. was retained by the Mississippi Department of Environmental Quality (MDEQ) to conduct a Phase II Environmental Site Assessment (ESA) at the proposed LeFleur's Bluff festival grounds property located on Jefferson Street, Jackson, Hinds County, Mississippi. The work is being performed under the auspices of MDEQ's USTfields Program funded by EPA Region IV. The 45-acre property is currently being considered for development by the City of Jackson under a brownfields initiative. The purpose of the Phase II ESA was to determine if soil and/or groundwater in the vicinity of former underground storage tank (UST) areas had been impacted by motor fuels previously stored in the tanks. In addition, PPM conducted limited research to determine if USTs were still present at the site since MDEQ tank closure records were incomplete.

The site is owned by the City of Jackson, and historical data indicates that the City has had facilities on this property dating back to the early 1900s. Former activities included vehicle storage and maintenance operations. A portion of the site appears to have been used as a landfill, along with motor fuel storage for fueling city-owned vehicles.

PPM researched available MDEQ records, conducted site reconnaissance, and interviewed city employees in an attempt to establish a history of the fueling operations and closure status of the USTs. It appears that tanks were located in four separate areas at the site, designated as Areas 1 through 4 by PPM in this report for clarity. According to available data sources, the USTs were removed from these areas during several separate events over a period of years. One of the areas was listed as a leaking UST (LUST) facility based on the presence of petroleum hydrocarbon concentrations in groundwater above MDEQ levels in samples collected during one of the tank removal projects conducted in 1995. Overexcavation of soils was also conducted in at least one area at the site. Based on interview remarks, historical records, and findings from subsurface exploration activities, all tanks in the areas investigated appear to have been removed.

During the assessment, PPM installed 13 soil borings and ten piezometers using Direct-Push Technology (DPT) to a general depth of 5 feet below the depth at which saturated soil conditions were encountered (16 to 24 feet). Selected soil and groundwater samples were analyzed for petroleum hydrocarbon constituents, additives, and lead. Site lithology was extremely heterogeneous, consisting of silts, clays, and sands at widely varying depths. Soils at the site appeared to consist entirely of fill material from earlier landfilling activities. Broken shards of glass, wood, ceramic pipe, wire, brick, and other debris was present in many of the borings, at depths as great as 20 feet in some locations. Saturated soil conditions were encountered at average depths of 14 feet, though thin saturated zones were encountered at other intervals in the fill material. Static groundwater levels in the piezometers were measured at depths of 12.81 to 20.04 feet. Groundwater flow could not be determined due to the significant variations in groundwater levels, likely caused by the fill material at the site resulting in perched water conditions at various depths.

For discussion purposes, PPM compared the soil and groundwater analytical results to the following standards:

- MDEQ-UST Branch action levels for soil and groundwater (benzene, toluene, ethylbenzene, and total xylenes [BTEX] only)
- MDEQ-UST Branch Tier I Risk Based Screening Levels (RBSLs) for soil and groundwater (Polynuclear Aromatic Hydrocarbons [PAH] only)
- MDEQ Tier I Target Remedial Goal (TRG) Table for soil and groundwater (lead only). The Brownfields Program in Mississippi uses this standard.

A hydrocarbon sheen was observed in saturated soils in borings B1-1 and B3-1. Laboratory analysis of soil samples revealed the presence of lead at concentrations exceeding the MDEQ Tier 1 TRG action level of 400 parts per million (ppm) in one soil boring only (Area 4). Methyl-tertiary-butyl-ether (MTBE), ethyl tertiary butyl ether (ETBE), and fuel ethanol were below detection limits (BDL) in all samples. Tertiary amyl methyl ether (TAME) was BDL in all samples collected, with the exception of one boring in Area 2, which revealed a concentration at 0.040 ppm at a depth of 11-12 feet. MTBE, ETBE, TAME, and fuel ethanol are all additives for gasoline, and the MDEQ has not established an action limit for these constituents at this time. PAH constituents were detected in two of the four samples analyzed (B3-1-4 and B3-5-3, both in Area 3) above the Tier I RBSLs for the following constituents:

- Anthracene
- Fluoranthene
- Pyrene
- Benzo (a) anthracene
- Chrysene
- Benzo (ghi) perylene
- Benzo (a) pyrene
- Dibenzo (a,h) anthracene

Groundwater sampling was first conducted on December 5, 2002. A hydrocarbon sheen (gasoline) was detected in B2-1/PZ2-1. Lead concentrations in groundwater were detected above the TRG action limit of 0.015 ppm in seven of the nine piezometers sampled, at concentrations ranging from 0.016 ppm to 0.603 ppm. However, it should be noted that piezometers are difficult to develop properly and the groundwater was highly turbid at the time of sampling. Excessive turbidity can result in elevated lead concentrations, which may not be representative of the actual dissolved concentrations in the groundwater. Dissolved PAH concentrations were below the MDEQ action limits in groundwater samples collected from the three piezometers analyzed for this parameter. MTBE results ranged from BDL to 0.050 ppm; ETBE and TAME results were all BDL; and ethanol results ranged from BDL to 0.010 ppm. The MDEQ has not established an action limit for these additives at this time. BTEX concentrations were below the

MDEQ-UST Branch action level of 18 ppm in all samples collected except for piezometer PZ2-2 (19.01 ppm).

Due to the excessive turbidity in the piezometers at the time of sampling, PPM attempted to resample the piezometers PZ1-1, PZ1-3, PZ1-4, PZ1-5 and PZ2-2 on January 31 and February 3 as approved by the MDEQ. The piezometers were micropurged and screened for turbidity prior to sampling. Free product (diesel) was measured at a thickness of 0.37 feet in B3-1/PZ3-1 and was not sampled during this event. Lead concentrations in piezometers PZ1-1, PZ1-3, PZ1-4, PZ1-5 and PZ2-2 were BDL during this event, which indicates that the groundwater turbidity present during the first sampling event resulted in false-positive dissolved lead concentrations.

Based on findings from the investigation, PPM concluded the following:

- Historical documentation, interview remarks from City of Jackson employees, field observations, and results of subsurface exploration indicate that all tanks in the areas investigated have been removed.

- All four former UST areas show some evidence of petroleum hydrocarbon impact associated with a release of motor fuels.

- BTEX concentrations in soil and groundwater in Area 1 (former gasoline tank) were well below the MDEQ-UST Branch action levels established for these media. However, lead concentrations in the soil were elevated in one of the borings installed in this area, and dissolved lead concentrations were above the TRG in all four piezometers. These concentrations are attributed to the high turbidity, as dissolved lead concentrations were BDL during the second sampling event after the piezometers were purged.

- BTEX concentrations in soil in Area 2 (former gasoline tank) were well below the established MDEQ-UST Branch action level of 100 ppm. However, lead concentrations in the soil were elevated in several of the borings installed in this area, but below the TRG of 400 ppm. Also, dissolved BTEX concentrations in the groundwater were above the action level of 18 ppm in one of the piezometers.

- BTEX concentrations in soil and groundwater in Area 3 (former diesel tank) were well below the established MDEQ-UST Branch action levels. However, eight PAH constituents were detected in the soil in this area above the Tier I RBSLs. Lead concentrations in the soil were elevated in several of the borings installed in this area, and the lead concentrations may be at levels that could constitute a hazardous waste. Free product (diesel) was present in the boring installed near the former diesel dispenser at a thickness of 0.37 feet.

- BTEX concentrations in soil and groundwater in Area 4 (former diesel tank) were well below the established MDEQ-UST Branch action levels. However, lead

concentrations in the soil were elevated, and may constitute a hazardous waste. Some of the elevated dissolved lead concentration in the groundwater present above the Tier I TRG during the first sampling event may be attributed to high turbidity, however, a permanent piezometer was not installed in this location to allow verification during the resampling effort. It is likely that groundwater in this area is impacted by lead above Tier I TRG levels, as the 20.1 ppm lead concentration found during the first sampling event would not likely be entirely caused by excessive turbidity.

- Petroleum hydrocarbon impact appears to be defined in each of the areas investigated. However, the extent of lead impact in soil has not been defined.

- It could not be determined within the scope of this investigation if the elevated lead concentrations in soil at the site can be directly attributed to releases of motor fuels from the former UST systems, from fill material placed at the site, or from some other point source. While lead was common in gasoline prior to 1978 and can cause soil and groundwater impact, the long-term historical usage of the site as a landfill and automotive repair facility could have contributed to the lead concentrations found during this investigation.

Providing recommendations for the next course of action at this time is difficult until cleanup goals for soil and groundwater are established by the MDEQ. Due to the presence of elevated lead concentrations in soil and groundwater, these cleanup goals need to be established within the overall framework of findings from all subsurface activities conducted at the site to date, and should extend beyond the scope of this USTfields initiative. No matter what the source, the lead impact present at the site must be considered along with the petroleum hydrocarbon impact when it comes to evaluating remedial alternatives.

If lead were not an issue, the petroleum hydrocarbon concentrations found at the site could likely be remediated through excavation and on-site land farming. While the vertical extent of impact to a depth of 20 feet BGS may present some excavation difficulties, the overall volume of impacted media may be limited. Although laboratory analysis did not indicate any significant hydrocarbon impact to soil, soil impact is likely based on the presence of free product and sheen in several of the borings. If groundwater recharge into the excavation is minimal, excavation could be effective at remediating the groundwater as well, since all of the impacted area could be accessed. Before any excavation is conducted, a determination would have to be made as to whether lead is present in soils at levels that would constitute a hazardous waste. Additional soil sampling and analysis for TCLP-lead should be conducted prior to any remedial efforts.

A second alternative would be to conduct a detailed risk assessment at the site to establish Site-Specific Target Levels (SSTLs) for soil and groundwater. However, even if the risk

assessment resulted in higher cleanup levels, it is likely that some engineering controls (surface capping, etc.) would be required to minimize the general public's exposure from the impacted soil and groundwater. This is of particular importance given the proposed commercial use of the property.

# 1.0 INTRODUCTION

PPM Consultants, Inc. was retained by the Mississippi Department of Environmental Quality (MDEQ) to conduct a Phase II Environmental Site Assessment (ESA) at the proposed LeFleur's Bluff Festival Grounds property located on Jefferson Street, Jackson, Hinds County, Mississippi. The 45-acre property is currently being considered for development by the City of Jackson under a Brownfields initiative. The Phase II ESA is being conducted under an USTfields grant awarded to the MDEQ by the Region IV EPA. The purpose of the Phase II ESA was to determine if soil and or groundwater in the vicinity of former underground storage tank (UST) areas had been impacted by motor fuels previously stored in the tanks. In addition, PPM conducted limited research to determine if USTs were still present at the site since MDEQ tank closure records were incomplete.

# 2.0 BACKGROUND

The site consists of an approximate 45-acre tract located between the Pearl River and Jefferson and Pascagoula Streets, and is owned by the City of Jackson. Historical data indicates that the City of Jackson has had facilities on this property dating back to the early 1900s. Former activities included vehicle storage and maintenance operations. A portion of the site appears to have been used as a landfill, along with motor fuel storage for fueling city-owned vehicles.

PPM researched available MDEQ records, conducted site reconnaissance, and interviewed city employees in an attempt to establish a history of the fueling operations and closure status of the USTs. It appears that tanks were located in four separate areas at the site, designated as Areas 1 through 4 by PPM in this report for clarity. Based on interview remarks from long-time City of Jackson employees, gasoline was stored in Areas 1, 2 and 4, and diesel fuel in Area 3. As shown in **Figure 1, Site Layout, (Appendix A, Figures)** Areas 1, 2, and 3 are located in the same general vicinity. Area 4 is located approximately 1,000 feet to the west adjacent to the foundation of the former police car maintenance garage. According to available data sources, the USTs were removed from these areas during several separate events over a period of years. One of the areas was listed as a leaking UST (LUST) facility based on the presence of petroleum hydrocarbon concentrations in groundwater above MDEQ levels in samples collected during one of the tank removal projects conducted in 1995. Over-excavation of soils was also conducted in at least one area at the site. Based on interview remarks, historical records, and findings from subsurface exploration activities, all tanks in the areas investigated appear to have been removed.

# 3.0 SCOPE OF WORK

The assessment was conducted in accordance with the scope of work approved in PPM's Phase II Environmental Site Assessment Proposal dated September 27, 2002, and included:

- Installation of 13 soil borings using Direct-Push Technology (Geoprobe): five in Area 1 (gasoline tank); two in Area 2 (gasoline tank); five in Area 3 (diesel tank); and one in Area 4 (gasoline tank),
- Collection of soil samples at continuous intervals
- Field screening of soil samples with a hydrocarbon analyzer
- Installation of ten 1-inch ID piezometers with surface completion
- Collection of groundwater samples from each of the piezometers
- Laboratory analyses of selected soil and groundwater samples for benzene, toluene, ethylbenzene, total xylenes (BTEX) and methyl-tertiary-butyl-ether (MTBE), ethyl tertiary butyl ether (ETBE), tertiary amyl methyl ether (TAME), and fuel ethanol per EPA Method 8260; Polynuclear Aromatic Hydrocarbons (PAH) per EPA Method 8270, and Lead per Method 200.7(d).
- Completion of a site survey and groundwater elevation survey
- Preparation of a report of findings

The original scope of work included the installation of eight borings, but the scope was expanded to 13 borings per approval from the MDEQ due to the presence of four separate UST areas and extent of impact noted in the soil borings.

# 4.0 INVESTIGATIVE METHODOLOGY

## 4.1 SOIL BORINGS

Fieldwork for the assessment was conducted on November 20 and 21, 2002, in accordance with PPM's approved QA/QC plan. Thirteen probe borings were advanced by Walker Hill Environmental, Inc using Direct-Push Technology (DPT). The borings were installed in four separate UST areas at the site, designated as Areas 1 through 4. In general, the borings were installed to a depth of 5 feet below the depth at which saturated soil conditions were encountered. Soil boring depths ranged from 16 to 24 feet below ground surface (BGS). Cuttings generated during advancement of the soil borings were placed on plastic sheeting at the site. Boring locations are shown in **Figure 2, Soil Boring/Piezometer Locations**

**(Areas 1, 2, and 3)**, and in **Figure 3, Soil Boring/Groundwater Sampling Location (Area 4), Appendix A.**

## 4.2 SOIL SAMPLING AND FIELD SCREENING

Each probe boring was sampled at continuous 4-foot intervals from ground surface to depth of boring completion using a 1.5-inch inside diameter (I.D.) Macro-Core sampler with 48-inch plastic sleeves. The sampling device consists of a 51.25-inch stainless-steel sampling tube, cutting shoe, and drive head. Each sample tube was lined with 48-inch clear disposable plastic tubes. Plastic sample tubes were then opened with a clean cutting blade in order to remove soil from the tube. Samples were removed from the tube at discrete 2-foot intervals and containerized in clean prepared glass jars for laboratory analysis and in plastic bags for screening purposes. New disposable tubes were used at each sampling interval.

Soil samples collected from each sampling interval were preserved on ice for analytical testing. Disposable gloves were worn during sample handling and changed between each sample acquisition. Sampling equipment was decontaminated between each use by thoroughly washing in phosphate-free detergent, followed by a rinse with isopropyl alcohol and distilled water.

Soil samples were retained in 4-ounce glass containers for laboratory analysis. Soil samples were hand-packed into the containers, sealed, labeled, placed on ice and delivered to A&E Analytica Environmental Laboratories, Inc. to in Ashville, Alabama. A subsample of each split-spoon core was retained for headspace analysis. Headspace analyses consisted of half-filling clean glass jars with soil and covering the jars with aluminum foil and lids. Vapors were allowed to equilibrate in each jar for approximately 15 minutes after being shaken for at least 15 seconds. A headspace reading was then obtained by inserting the probe tip of a hydrocarbon analyzer through the aluminum foil. After each reading, the instrument was allowed to return to background concentrations in the ambient air.

## 4.3 PIEZOMETER INSTALLATION

PPM installed ten 1-inch inside-diameter (ID) piezometers at the site to depths ranging from 17.4 to 24.0 feet. Although the original scope of work included collection of groundwater samples from temporary piezometers or downhole sampling devices, the MDEQ requested that the piezometers be converted to permanent piezometers to facilitate future monitoring and to eliminate the costs and time associated with returning to the site to install additional piezometers at a later date. The piezometers were installed in selected borings to determine groundwater flow direction at the site and to delineate the horizontal extent hydrocarbon impact.

Each piezometer was constructed of 1-inch I.D., Schedule 40, flush-threaded PVC casing and screen. Piezometer screen was factory-slotted to a width of 0.010 inch. Each piezometer was constructed with 9.0 to 10.0 feet of casing above 10 to 15 feet of slotted

piezometer screen. Screened intervals were backfilled with 20/40 processed, piezometer-rounded, silica sand to 1-foot above each piezometer screen. One-half inch bentonite pellets were used to form an impermeable seal of approximately 2-feet in thickness, above the sandpack. The remaining annular space of each piezometer was grouted to 4 inches below the surface with a bentonite concrete mixture and completed with protective manhole covers and cement. The piezometers were developed by manual bailing, and were then allowed to stabilize a minimum of seven days prior to sampling.

Construction details of each of the piezometers are shown in **Appendix B, Geologic Boring Logs/Piezometer Construction Logs**. Piezometer locations are shown in **Figure 2, Soil Boring/Piezometer Locations (Areas 1, 2, and 3),** and in **Figure 3, Soil Boring/Groundwater Sampling Location (Area 4),** in **Appendix A.**

## 4.4 GROUNDWATER SAMPLING

The piezometers were allowed to stabilize after installation and were purged of three to five piezometer volumes prior to sampling on December 5, 2002. However, samples collected on December 5, 2002 had high turbidity resulting in elevated concentrations of lead. During the January 31 and February 3, micropurging techniques were utilized to maintain low turbidity. Groundwater samples were collected using disposable, polyethylene bailers to avoid cross-contamination during the sampling process. A duplicate sample was collected from PZ1-1 and denoted as DW on the chain-of-custody. Disposable nitrile gloves were worn during the sampling process. The groundwater was transferred from the bailers into 40-milliliter glass vials containing hydrochloric acid and 1-liter amber bottles, labeled, and immediately placed on ice inside coolers and delivered with proper chain-of-custody forms to an independent testing laboratory.

## 4.5 LABORATORY ANALYSIS

Soil and groundwater samples were analyzed by A&E Analytica Environmental Laboratories, Inc. in Ashville, Alabama. Analyses included benzene, toluene, ethylbenzene, total xylenes (BTEX) and methyl-tertiary-butyl-ether (MTBE), ethyl tertiary butyl ether (ETBE), tertiary amyl methyl ether (TAME), and fuel ethanol per EPA Method 8260; and Polynuclear Aromatic Hydrocarbons (PAH) per EPA Method 8270, and Lead per Method 200.7(d). This entire suite of analytical parameters was not conducted on every sample collected, as PPM used discretion and professional judgment to determine which analyses to perform based on former tank contents, field findings, and budgetary limitations.

## 4.6 GROUNDWATER ELEVATION SURVEY

Site groundwater depth and flow direction were determined through a groundwater elevation survey. Results of the elevation survey were used to determine the primary direction of dissolved petroleum hydrocarbon migration at the site.

Elevations were obtained from the top of each permanent piezometer casing using conventional survey equipment. A reference elevation of 250 feet above mean sea level (amsl) was established for the facility using the Jackson Quadrangle, Mississippi, 7.5-minute USGS topographic map. Groundwater depths were measured using an interface probe at the same point on the piezometer casing from which the elevation was obtained. The piezometer casing elevations and groundwater depths were used to calculate the groundwater elevations and flow direction at the site. Results of the groundwater elevation survey conducted on January 25, 2003, are summarized in **Table 1, Groundwater Elevation Survey Data** in **Appendix C, Tables**. Groundwater elevations are shown in **Figure 4, Groundwater Elevation Map, January 25, 2003 (Areas 1, 2, and 3), Appendix A.**

# 5.0 FINDINGS

## 5.1 SITE GEOLOGY

Subsurface lithology was identified from visual inspection of soils encountered during advancement of the soil borings. Site lithology was extremely heterogeneous, consisting of silts, clays, and sands at widely varying depths. Soils at the site appeared to consist entirely of fill material from earlier landfilling activities. Broken shards of glass, wood, ceramic pipe, wire, brick, and other debris were present in many of the borings, at depths as great as 20 feet in some locations. Auger refusal due to subsurface obstructions was common. Saturated soil conditions were encountered at average depths of 14 feet, though thin saturated zones were encountered at other intervals in the fill material. Site lithology is depicted in the boring logs in **Appendix B**.

## 5.2 SITE GROUNDWATER OCCURRENCE

Groundwater was generally encountered during drilling in at depths of 13.0 to 22.0 feet BGS. Static groundwater levels were measured at depths of 12.81 to 20.04 feet in the piezometers. Groundwater flow could not be determined due to the significant variations in groundwater levels. It is likely that the fill material at the site has resulted in perched water conditions at various depths. Groundwater elevation data is shown in **Table 1, Groundwater Elevation Survey Data, (Appendix B)** and in **Figure 4, Groundwater Elevation Map January 25, 2003, (Areas 1, 2, and 3), Appendix A.**

## 5.3 HYDROCARBON FUEL ADDITIVE AND LEAD DELINEATION

### 5.3.1 Soil

For discussion purposes, PPM compared the soil and groundwater analytical results to the following standards:

- MDEQ-UST Branch action levels for soil and groundwater (BTEX only)

- MDEQ-UST Branch Tier I Risk Based Screening Levels (RBSLs) for soil and groundwater (PAH only)

- MDEQ Tier I Target Remedial Goal (TRG) Table for soil and groundwater (lead only). The Brownfields Program in Mississippi uses this standard.

A hydrocarbon sheen was observed in saturated soils in borings B1-1 and B3-1. Laboratory analysis of soil samples revealed the presence of lead at concentrations exceeding the MDEQ Tier 1 TRG action level of 400 parts per million (ppm) in one soil boring only: B4-1-4 at a depth of 15-16 feet (Area 4). MTBE, ETBE, and fuel ethanol were below detection limits (BDL) in all samples. TAME was BDL in all samples collected, with the exception of B-2-2-3 (Area 2), which revealed a concentration at 0.040 ppm at a depth of 11-12 feet. MTBE, ETBE, TAME, and fuel ethanol are all additives for gasoline, and the MDEQ has not established an action limit for these constituents at this time. PAH constituents were detected in two of the four samples analyzed (B3-1-4 and B3-5-3, both in Area 3) above the Tier I RBSLs for the following constituents:

- Anthracene
- Fluoranthene
- Pyrene
- Benzo (a) anthracene
- Chrysene
- Benzo (ghi) perylene
- Benzo (a) pyrene
- Dibenzo (a,h) anthracene

Analytical results are summarized in **Tables 2A, Soil Analytical Summary (PAH) and 2B, Soil Analytical Summary (BTEX, Additives, and Lead), Appendix B** and are depicted in **Figures 5, Benzene/BTEX/Lead Concentrations in Soil (Areas 1, 2, and 3) and 7, Benzene/BTEX/Lead Concentrations in Groundwater (Areas 1, 2, and 3), Appendix A.** Laboratory analytical results are included in **Appendix D, Soil Analytical Reports.**

### 5.3.2 Groundwater

Groundwater sampling was conducted on December 5, 2002. A hydrocarbon sheen (gasoline) was detected in B2-1/PZ2-1. Lead concentrations in groundwater were detected above the TRG action limit of 0.015 ppm in seven of the nine piezometers sampled, at concentrations ranging from 0.011 ppm to 0.603 ppm. However, it should be noted that piezometers are difficult to develop and the groundwater was highly turbid at the time of sampling. Excessive turbidity can result in elevated lead concentrations which may not be representative of the actual dissolved concentrations in the groundwater. Dissolved PAH concentrations were below the MDEQ action limits in groundwater samples collected from the three piezometers analyzed for this parameter. MTBE results ranged from BDL to

0.050 ppm; ETBE and TAME results were all BDL; and ethanol results ranged from BDL to 0.010 ppm. The MDEQ has not established an action limit for these additives at this time. BTEX concentrations were below the MDEQ-UST Branch action level of 18 ppm in all samples collected except for piezometer PZ2-2 (19.01 ppm).

Due to the excessive turbidity in the piezometers at the time of sampling, PPM attempted to resample the piezometers PZ1-1, PZ1-3, PZ1-4, PZ1-5 and PZ2-2 on January 31 and February 3 as approved by the MDEQ. The piezometers were micropurged and screened for turbidity prior to sampling. Free product (diesel) was measured at a thickness of 0.37 feet in B3-1/PZ3-1 and was not sampled during this event. Lead concentrations in piezometers PZ1-1, PZ1-3, PZ1-4, PZ1-5 and PZ2-2 were BDL during this event, which indicates that the groundwater turbidity present during the first sampling event resulted in false-positive dissolved lead concentrations.

Hydrocarbon and lead concentrations are summarized in **Tables 3A, Groundwater Analytical Summary (PAH)** and **3B, Groundwater Analytical Summary (BTEX, Additives, and Lead), Appendix B** and are depicted on **Figures 6, Benzene/BTEX/Lead Concentrations in Groundwater (Areas 1, 2, and 3)** and **7, Benzene/BTEX/Lead Concentrations in Groundwater (Area 4), Appendix A**. Complete laboratory results are included in **Appendix E, Groundwater Analytical Reports**.

## 6.0 CONCLUSIONS

Based on findings from the investigation, PPM presents the following conclusions:

- Historical documentation, interview remarks from City of Jackson employees, field observations, and results of subsurface exploration indicate that all tanks in the areas investigated have been removed.

- All four former UST areas show some evidence of petroleum hydrocarbon impact associated with a release of motor fuels.

- **Area 1:** BTEX concentrations in soil and groundwater in Area 1 (former gasoline tank) were well below the MDEQ-UST Branch action levels established for these media. However, lead concentrations in the soil were elevated in one of the borings installed in this area, and dissolved lead concentrations were above the TRG in all four piezometers. These concentrations are attributed to the high turbidity, as dissolved lead concentrations were BDL during the second sampling event after the piezometers were purged.

- **Area 2:** BTEX concentrations in soil in Area 2 (former gasoline tank) were well below the established MDEQ-UST Branch action level of 100 ppm. However, lead concentrations in the soil were elevated in several of the borings installed in this

area, but below the TRG of 400 ppm. Also, dissolved BTEX concentrations in the groundwater were above the action level of 18 ppm in piezometerPZ2-2.

- **Area 3:** BTEX concentrations in soil and groundwater in Area 3 (former diesel tank) were well below the established MDEQ-UST Branch action levels. However, eight PAH constituents were detected in the soil in this area above the Tier I RBSLs. Lead concentrations in the soil were elevated in several of the borings installed in this area and may be at levels which constitute a hazardous waste. Free product (diesel) was present in the boring installed near the former diesel dispenser at a thickness of 0.37 feet.

- **Area 4:** BTEX concentrations in soil and groundwater in Area 4 (former diesel tank) were well below the established MDEQ-UST Branch action levels. However, lead concentrations in the soil were elevated, and may constitute a hazardous waste. Some of the elevated dissolved lead concentration in the groundwater present above the Tier I TRG during the first sampling event may be attributbed to high turbidity, however, a permanent piezometer was not installed in this location to allow verification during the re-sampling effort. It is likely that groundwater in this area is impacted by lead above Tier I TRG levels, as the 20.1 ppm lead concentration found during the first sampling event would not likely be entirely caused by excessive turbidity.

- Petroleum hydrocarbon impact appears to be defined in each of the areas investigated. However, the extent of lead impact in soil has not been defined.

- It could not be determined within the scope of this investigation if the elevated lead concentrations in soil at the site are directly attributed to releases of motor fuels from the former UST systems, from fill material placed at the site, or from some other point source. While lead was common in gasoline prior to 1978 and can cause soil and groundwater impact, the long-term historical usage of the site as a landfill and automotive repair facility could have contributed to the lead concentrations found during this investigation.

## 7.0 RECOMMENDATIONS

Providing recommendations for the next course of action at this time is difficult until cleanup goals for soil and groundwater are established by the MDEQ. Due to the presence of elevated lead concentrations in soil and groundwater, these cleanup goals need to be established within the overall framework of findings from all subsurface activities conducted at the site to date, and should extend beyond the scope of this USTfields initiative. No matter what the source, the lead impact present at the site must be considered along with the petroleum hydrocarbon impact when it comes to evaluating remedial alternatives.

If lead were not an issue, the petroleum hydrocarbon concentrations found at the site could likely be remediated through excavation and onsite land farming. While the vertical extent of impact to a depth of 20 feet BGS may present some excavation difficulties, the overall volume of impacted media may be limited. Although laboratory analysis did not indicate any significant hydrocarbon impact to soil, soil impact is likely based on the presence of free product and sheen in several of the borings. If groundwater recharge into the excavation is minimal, excavation could be effective at remediating the groundwater as well, since all of the impacted area could be accessed. Before any excavation is conducted, a determination would have to be made as to whether lead is present in soils at levels that would constitute a hazardous waste. Additional soil sampling and analysis for TCLP-lead should be conducted prior to any remedial efforts.

A second alternative would be to conduct a detailed risk assessment at the site to establish Site-Specific Target Levels (SSTLs) for soil and groundwater. However, even if the risk assessment resulted in higher cleanup levels, it is likely that some engineering controls (surface capping, etc.) would be required to minimize the general public's exposure (proposed future commercial land use) to the impacted soil and groundwater.