

Health Consultation

A REVIEW OF SOIL DATA

MARION PRESSURE TREATING COMPANY

MARION, UNION PARISH, LOUISIANA

EPA FACILITY ID: LAD008473142

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

Agency for Toxic Substances and Disease Registry

Division of Health Assessment and Consultation

Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

A REVIEW OF SOIL DATA

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MARION, UNION PARISH, LOUISIANA

EPA FACILITY ID: LAD008473142

Prepared by:

Louisiana Department of Health and Hospitals
Office of Public Health
Section of Environmental Epidemiology and
Toxicology
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

I. INTRODUCTION

At the request of concerned residents around the Marion Pressure Treating Company Site, the Louisiana Department of Health and Hospitals/Office of Public Health/Section of Environmental Epidemiology and Toxicology (LDHH/OPH/SEET) has reviewed available soil data for the Marion Pressure Treating Company (MPTC) in Marion, Union Parish, Louisiana. The data examined in this health consultation includes data from soil samples collected and analyzed from June 2000, through September 2000 taken for the United States Environmental Protection Agency (EPA) Remedial Investigation/Feasibility Study (RIFS) [1]. This document serves as a review of possible pathways of human exposure by ingestion of and/or skin contact with contaminated soil. SEET will utilize this information to help decide what further public health actions, if any, are needed.

II. BACKGROUND AND STATEMENT OF ISSUES

From 1964 to 1989, the now-defunct Marion Pressure Treating Company (MPTC) used a creosote injection process to treat wood and wood products such as bridge pilings, railroad ties, fence posts and utility poles. The property on which it operated is now known as the MPTC site [1].

The MPTC site is a 10-acre tract of land in the city of Marion, Louisiana, in Union Parish along State Highway 551, approximately 0.5 miles north of the junction of State Highways 551 and 33 [Appendix A, Figure 1]. The site contaminants, however, have migrated off-site, so that possibly 22 acres of land off-site have been impacted. The site is mostly rural, bound to the north, east, and south by a pine forest, and to the west by State Highway 551.

Per 1990 U.S. census data, the city of Marion has a reported population of approximately 775 people. According to an EPA contractor, approximately 46 residences and 11 businesses are located within a 0.5 mile radius of the site. Most of the city's residents live within 1 mile of the site. No on-site residences have been identified [2].

On April 1, 2005, the Louisiana Department of Environmental Quality (LDEQ) conducted a site visit at the MPTC site. There is an 8-foot fence surrounding the site area. The entrance gate was locked and there were no signs of trespassing noted. Warning signs are posted alerting passersby to the contamination at the site, and identifying it as a Superfund site. Per LDEQ and EPA, there is little recreational value at the site, and it is not attractive to young children or other potential trespassers. Big Creek, a small surface water body with an intermittent flow, is approximately 500 feet east-southeast of the site. Big Creek empties into Bayou de Loutre, approximately 7.5 miles to the south. Recreational uses are unlikely within the reaches of Big Creek or the Unnamed Tributary near the MPTC site, as the depth of the water is very shallow, with many areas being completely dry. The MPTC site plan can be referenced in Appendix A, Figure 2.

Wood treatment facilities such as the MPTC are the largest source of creosote in the environment. Creosote is a synthetic chemical which contains many compounds, particularly polycyclic aromatic hydrocarbons (PAHs). Prior to a 1997 EPA removal action, the MPTC site consisted of an office building, two pressure retort cylinders, a wastewater treatment system, three creosote condensate tanks, a water cooling tank, a condenser and tank, a dismantled pump shed, and a closed surface impoundment. During the removal actions, areas of visibly contaminated soil were excavated and the majority of the process equipment was demolished and removed. Contaminated soil containing carcinogenic PAHs in excess of 100 milligrams per kilogram (mg/kg) was consolidated in the former process area (consolidation area) [1]. After consolidation, the contaminated soil was capped with clean soil and the consolidation area was fenced. Currently, the site consists of several structures remaining from past wood treating operations including the vacant office building, and abandoned tanker trailer, and a waste water treatment sump. Waste piles consisting of treated lumber and other debris are located at several locations throughout the wooded areas surrounding the site; the two most notable such piles are located at the south end of the site. The former operational boundary encompassed an area of approximately 10 acres. However, as mentioned, the area impacted by site operations is now estimated at approximately 22 acres.

EPA contractors collected environmental samples as part of the RIFS field activities. Samples were collected during a three-phase investigation that took place between June 2000, and September 2000. EPA collected 28,977 soil samples at varying depths from multiple onsite and offsite locations. Onsite soil samples were collected using a 100-foot square grid system, and were analyzed for semi-volatile organic compounds (SVOCs), including PAHs. Randomly selected grid samples were also analyzed for other contaminants including metals, pesticides, polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs) [1].

Judgmental samples were collected from several areas covered by the grid system. Judgmental samples are samples of a medium that are purposefully located based upon site-specific information. The judgmental areas sampled were downgradient from the two waste piles on the south end of the property, downgradient from the waste water treatment sump, and downgradient of the abandoned tanker truck. These soil samples were analyzed for SVOCs. Additional samples were taken from two locations in the closed impoundment, which is also located within the area covered by the grid. All closed impoundment samples were analyzed for SVOCs. The analytical results from soil samples collected from the judgmental areas were grouped along with samples collected from the grid [1].

Samples were also taken from the consolidation area, and were addressed separately because its surface included clean fill placed during the 1997 removal action; inclusion of this area could have biased the analysis. Samples were taken at six locations; from each of the four corners and

from two locations near the approximate center of the area (0 to 12 inches, and 1 to 3 feet). All samples from the consolidation area were analyzed for SVOCs including PAHs. Selected samples collected at depths greater than 3 feet were analyzed for volatile organic compounds (VOCs), metals, and PCDDs/PCDFs [1].

Background soil samples were collected during the site investigation. Soil was collected from three locations on the upland terrace east of the site and east of Big Creek. Two additional offsite locations were selected from an area 200 feet northwest of the MPTC site. All offsite samples were analyzed for metals and PCDDs/PCDFs [1].

SEET and ATSDR consider surface soil to be soil collected within the top few inches below ground surface (bgs) where human contact and exposure to contaminants are likely to occur. During the 2000 sampling event, EPA collected 10,506 soil samples from 0 to 6 inches at onsite and offsite locations, including judgmental samples and the consolidation area [1]. This health consultation exclusively analyzes surface soil data. Soil sampling locations are shown in Appendix A, Figure 3.

In September 2001, EPA released its proposed cleanup plan for public comment, conducting both an open house and a public meeting to gather the community's input into the cleanup decisions. In June 2002, EPA completed and released the Record of Decision for cleanup. Cleanup will consist of the excavation and treatment of surface and subsurface contaminated soils using onsite low temperature thermal desorption with offsite disposal of debris. This action will remove contaminants from the excavated soil, and treated soil will be returned to the MPTC site and used as backfill. Nonhazardous debris will be removed from the site and deposited in a subtitle D landfill. Hazardous debris prohibited in landfills will be removed from the site and incinerated. The site will be regraded and vegetated as appropriate. According to an assessment conducted by EPA and comments provided by town officials, the most likely future uses of the property would be for a park or recreation [3]. Per the EPA site manager, EPA continues to monitor the MPTC site to ensure that there is no immediate threat to human health or the environment. EPA will consider funding cleanup at this site in fiscal year 2006 [4].

III. DISCUSSION

SEET evaluated chemical contaminants in onsite and offsite surface soil from the MPTC site by comparing both average and maximum concentrations of chemical contaminants to health-based assessment comparison (HAC) values for non-cancer and cancer endpoints. Average concentrations are used for site locations where the sampling scheme is uniform; maximum concentrations are used in areas with no uniform sampling scheme. HAC values are media-specific concentrations of chemicals used by health assessors to select environmental contaminants for further evaluation. They are not used to predict health effects or to set clean-up levels. Contaminants with media concentrations above a HAC value do not necessarily represent

a health threat, but are selected for further evaluation. Contaminants with media concentrations below a HAC value are unlikely to be associated with illness and are not evaluated further.

Either ATSDR's Reference Media Evaluation Guides (RMEGs), ATSDR's Environmental Media Evaluation Guides (EMEGs), EPA Region 6 Medium Specific Screening Levels (MSSLs) or EPA Region III Risk Based Concentrations (RBCs) were used as HAC values. RMEGs are estimated contaminant concentrations that are unlikely to cause adverse noncancer health effects. They are calculated from EPA's reference dose (RfD), which is an estimate of daily exposures to contaminants that are unlikely to cause adverse noncancer health effects, even if exposure occurs over a lifetime. EMEGs are also estimated contaminant concentrations that are unlikely to cause adverse noncarcinogenic health effects; however, they are calculated by using ATSDR's minimal risk level (MRL), which is also an estimate of daily exposure to contaminants that are unlikely to cause adverse noncancer health effects. MSSLs and RBCs are both estimated contaminant concentrations in a media at which noncarcinogenic or carcinogenic health effects are unlikely. The cancer risk comparison values in this health consultation are based on EPA's chemical-specific cancer slope factors (SF), representing an estimated lifetime risk of one excess cancer in 10,000 (1×10^{-4}) people exposed for a lifetime, with an assumed exposure period of 15 years.

The scenario used to estimate exposure assumes that a trespasser or recreational visitor is an older child (age 6 to 18 years), weighing 43 kg (younger child) to 70 kg (adult). The assumed ingestion rate of soil was considered to be 100 mg (milligrams), 48 days per year for 10 years. The assumed skin surface available for contact with contaminated soil was 5,000 cm² (square centimeters), with a skin to soil adherence factor of 0.2 mg/cm² (milligrams per square centimeters), 48 days per year for 10-15 years. The skin to soil adherence factor is the amount of soil that adheres to the skin (based on skin surface area) when a dermal exposure occurs. Exposure rates were based on EPA's RIFS and HHRA (Human Health Risk Assessment) [1].

A. Environmental Contamination

Onsite Contamination

The definition of "onsite" in this health consultation is the area within the fence line on the MPTC site [see Appendix A, Figure 2]. This is the same figure used in the EPA RIFS.

Onsite Soil, Consolidation Area

Appendix B, Table 3 depicts the Toxic Equivalency Factors (TEFs) for PAHs detected in onsite soil samples taken at the consolidation area prior to capping. The overall carcinogenic potential of a mixture of PAHs is often expressed as the benzo(a)pyrene toxic equivalent (TEQ) concentration. The TEQ is an estimate of the pure benzo(a)pyrene concentration that would have the same carcinogenic potential as the mixture of PAHs in the sample. The available toxicological evidence indicate that there are no appreciable interactions between different PAH compounds; therefore, adding the effects of multiple PAHs is appropriate [5]. The total benzo(a)pyrene TEQ concentration is calculated by multiplying the maximum detected

concentration of each of the PAHs by its respective toxic equivalency factor. The product of each is then added to obtain a total benzo(a)pyrene TEQ concentration. The benzo(a)pyrene TEQ at the consolidation area (0.069 milligrams per kilogram (mg/kg)) did not exceed the EPA Region III Risk Based Concentration (RBC) of 0.087 mg/kg. Therefore, PAHs are not considered to be a COPC at the consolidation area.

Maximum concentrations of metals include arsenic (6.4 mg/kg), barium (60.4 mg/kg), beryllium (0.53 mg/kg), cobalt (7.4 mg/kg), manganese (377 mg/kg), nickel (4.4 mg/kg), and silver (0.53 mg/kg). All exceeded background levels for the MPTC site; however, none exceeded the EMEG or RMEG.

With regard to physical hazards, erosion has occurred on the eastern and western sides of the consolidation area, which was built during the removal action, threatening to undermine the integrity of the cap and surrounding internal fence. The liner covering the contaminated soil is exposed at several locations, and erosion could result in the further spread of contamination.

Onsite Soil, Closed Impoundment

The maximum concentration of benzo(a)pyrene TEQ for the closed impoundment was 0.024 mg/kg, well below the RBC of 0.087 mg/kg. PAHs were not retained as a COPC for this area.

Onsite Soil, East Waste Pile

Maximum concentrations of SVOCs include bis(2-ethylhexyl)phthalate (0.76 mg/kg), carbazole (5.6 mg/kg) and dibenzofuran (0.99 mg/kg). All exceeded background levels for the MPTC site; however, none exceeded the EMEG. The benzo(a)pyrene TEQ of 245.92 mg/kg for the east waste pile exceeded the RBC of 0.087 mg/kg. PAHs were retained as a COPC in this area.

Onsite Soil, Tanker Trailer

Carbazole was the only potential COPC found at the tanker trailer, at 0.59 mg/kg. It was above background for the MPTC site; however, it did not exceed the MSSL of 240 mg/kg. The benzo(a)pyrene TEQ of 0.098 mg/kg, exceeded the RBC of 0.087 mg/kg. PAHs were retained as a COPC in this area.

Onsite Soil, West Waste Pile

The maximum concentration of benzo(a)pyrene TEQ for the west waste pile was 0.104 mg/kg, exceeding the RBC of 0.087 mg/kg. PAHs were retained as a COPC for this area.

Onsite Soil, Structure near the Consolidation Area

The maximum concentration of benzo(a)pyrene TEQ was 0.005 mg/kg, below the RBC of 0.087 mg/kg. PAHs were not retained as a COPC for this area.

Onsite Soil, Shed

The maximum concentration of benzo(a)pyrene TEQ was 0.149 mg/kg, exceeding the RBC of 0.087 mg/kg. PAHs were retained as a COPC for this area.

Onsite Soil, Former Surface Impoundment

Select soil samples taken during the sampling event occurring from June 2000 through September 2000, were analyzed for poly-chlorinated dibenzo-p-dioxins/poly-chlorinated dibenzofurans (PCDDs/PCDFs). The overall mixture of these compounds is expressed as the 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (2,3,7,8-TCDD) TEQ concentration. The total 2,3,7,8-TCDD TEQ concentration is calculated by multiplying the maximum detected concentration of each of the PCDDs/PCDFs by its respective toxic equivalency factor. The product of each is then added to obtain a total 2,3,7,8-TCDD TEQ concentration. The total 2,3,7,8-TCDD TEQ concentration was equal to 7.4×10^{-5} , which exceeds the EMEG of 5×10^{-5} mg/kg.

Maximum concentrations of arsenic (11.7 mg/kg), carbazole (0.53 mg/kg), and dibenzofuran (0.55 mg/kg) were all above background levels found at the MPTC site, however, did not exceed the EMEG or MSSL. The benzo(a)pyrene TEQ of 14.42 mg/kg exceeded the RBC of 0.087 mg/kg and was also retained as a COPC for this area.

Onsite Soil, Above the Consolidation Area

The average concentration of benzo(a)pyrene TEQ was 1.06 mg/kg, exceeding the RBC of 0.087 mg/kg. PAHs were retained as a COPC for this area.

Onsite Soil, West of the Consolidation Area

Average concentrations of arsenic (2.85 mg/kg), 2-methylnaphthalene (1.19 mg/kg), biphenyl (4.5 mg/kg), carbazole (11 mg/kg), dibenzofuran (30 mg/kg), and naphthalene (4 mg/kg) were above background levels at the MPTC site. None of them exceeded their respective MSSL, EMEG or RMEG.

The benzo(a)pyrene TEQ was 11.03 mg/kg, drastically exceeding the RBC of 0.087 mg/kg, and was retained as a COPC for the area. The total 2,3,7,8-TCDD TEQ concentration equaled 3.9×10^{-6} mg/kg, which did not exceed the EMEG of 5×10^{-5} mg/kg. It was not retained as a COPC for the area.

Onsite Soil, East of the Consolidation Area

Average concentrations of arsenic (2.45 mg/kg), thallium (2.7 mg/kg), carbazole (0.78 mg/kg), 3 and/or 4 methylphenol (0.48 mg/kg), and bis(2-ethylhexyl)phthalate (0.57 mg/kg) were above background levels at the MPTC site. None of them exceeded their respective MSSL, EMEG or RBC.

The benzo(a)pyrene TEQ was 12.68 mg/kg, exceeding the RBC of 0.087 mg/kg, and was retained as a COPC for the area. The total 2,3,7,8-TCDD TEQ concentration equaled 8.1×10^{-6} mg/kg, which did not exceed the EMEG of 5×10^{-5} mg/kg. It was not retained as a COPC for the area.

Onsite Soil, Below the Consolidation Area

Arsenic was the only potential COPC found below the consolidation area, at 3.17 mg/kg. It was above background for the MPTC site. However, it was not retained as a COPC, because it did

not exceed the EMEG. The benzo(a)pyrene TEQ of 8.76 mg/kg, exceeded the RBC of 0.087 mg/kg. PAHs were retained as a COPC in this area. The total 2,3,7,8-TCDD TEQ concentration equaled 2.6×10^{-5} mg/kg, which did not exceed the MSSL of 5×10^{-5} mg/kg. It was not retained as a COPC for the area.

Offsite Contamination

The definition of “off-site” in this health consultation is the area outside of the fence line on the MPTC site [Appendix A, Figure 2]. This is the same figure used in the EPA RIFS.

Offsite Soil, Big Creek/East Ditch

Average concentrations of arsenic (4.4 mg/kg), barium (43.4 mg/kg), and dibenzofuran (0.41 mg/kg), were above background levels at the MPTC site. None of them exceeded their respective MSSL, EMEG, or RMEG.

The benzo(a)pyrene TEQ was 1.45 mg/kg, exceeding the RBC of 0.087 mg/kg, and was retained as a COPC for the area. The total 2,3,7,8-TCDD TEQ concentration equaled 5.6×10^{-5} mg/kg, exceeding the EMEG of 5×10^{-5} mg/kg. It was also retained as a COPC for the area.

Offsite Soil, Below the Southern Portion of the Fenceline

The average concentration of benzo(a)pyrene TEQ was 0.85 mg/kg, exceeding the RBC of 0.087 mg/kg. PAHs were retained as a COPC for this area.

Offsite Soil, West of the Fenceline

The average concentration of benzo(a)pyrene TEQ was 1.26 mg/kg, exceeding the RBC of 0.087 mg/kg. PAHs were retained as a COPC for this area.

Offsite Soil, North of the Fenceline

Average concentrations of copper (5.9 mg/kg) and dibenzofuran (0.995 mg/kg), were above background levels at the MPTC site. Neither of them exceeded their respective EMEG or MSSL. The benzo(a)pyrene TEQ was 3.34 mg/kg, exceeding the RBC of 0.087 mg/kg, and was retained as a COPC for the area. The total 2,3,7,8-TCDD TEQ concentration equaled 2.1×10^{-5} mg/kg, which did not exceed the MSSL of 5×10^{-5} mg/kg. It was not retained as a COPC for the area.

B. Pathway Analysis

To determine whether an individual would be exposed to contaminants of concern found in soil from the MPTC site, SEET evaluated the environmental and human components that lead to human exposure. An exposure pathway consists of five elements: a source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure, and a receptor population. ATSDR categorizes an exposure pathway as a completed or potential exposure pathway if the exposure pathway cannot be eliminated. Completed pathways require that the five elements exist and indicate that exposure to a contaminant has occurred in the past, is currently occurring, or will occur in the future. Potential pathways, however, require that at least one of the five elements is missing, but could exist. Potential pathways indicate that

exposure to a contaminant could have occurred in the past, could be occurring now, or could occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present.

An 8-foot fence surrounds the entire site, thus, preventing on-site accessibility. Off-site areas are heavily vegetated, remote, and inaccessible. A recent site visit conducted by the LDEQ documents that no activity or trespassing has occurred at the site, and that the site is unattractive to trespassers or recreational users; Big Creek and the Unnamed Tributary are shallow tributaries, and are often dry in many areas, therefore, eliminating recreational usage. As such, all current exposure pathways have been eliminated.

C. Exposure Analysis

Exposure to constituents in soil at the MPTC site through ingestion and dermal exposure routes were evaluated for the current and future trespasser and/or recreational visitor. Exposure doses were calculated for each of the contaminants of potential concern for two body weights of 43 kg and 70 kg on the basis of EPA's assumption that a trespasser or recreational visitor to Big Creek or the Unnamed Tributary would be between the ages of 6 to 18 with limited exposure to activities including hunting, hiking, wading or crayfish trapping [1].

Per the June 2002 Record of Decision for cleanup, the most likely future uses of the property would be for a park or recreation [3]. The proposed remediation is protective of human health for future uses as long as clean up is fully completed before conversion into a recreational land space.

Health Effects Evaluation

There are no completed or potential exposure pathways at the MPTC site, and exposure doses estimated for the COPCs identified in the soil are lower than the established health guideline values for these contaminants. Therefore, the COPCs identified in soil are unlikely to cause adverse health effects.

Cancer Health Effects Evaluation

There were three COPCs at the MPTC site that were evaluated for their cancer causing endpoints; arsenic, benzo(a)pyrene, and 2,3,7,8-TCDD. SEET estimated the cancer risk for all contaminants identified as acceptable risk level of one excess cancer in 10,000 (1×10^{-4}) persons exposed for a lifetime. On the basis of this information, arsenic, benzo(a)pyrene and 2,3,7,8-TCDD would have acceptable exposure dose concentrations of 6.66×10^{-5} milligrams per kilogram per day (mg/kg/day), 1.36×10^{-5} mg/kg/day, and 6.66×10^{-10} mg/kg/day, respectively. Estimated exposure doses for cancer risk were calculated for both ingestion and dermal exposure routes.

Estimated exposure doses for arsenic, benzo(a)pyrene and 2,3,7,8-TCDD (ingestion and dermal routes) at varied on-site and off-site locations, did exceed acceptable dose concentrations for cancer risk. However, all on-site locations are access restricted by an 8-ft fence, and all off-site locations are heavily vegetated, remote, inaccessible areas. SEET found no completed or

potential exposure pathways at the MPTC site as long as clean up is fully completed before conversion into a recreational land space. Exposure to contaminants in soil via incidental ingestion or dermal contact at the MPTC site is highly unlikely and not expected; as a result, no excess cancer risk is expected.

D. Child Health Considerations

SEET and ATSDR recognize that infants and children can be uniquely vulnerable to the effects of toxic chemicals; and that any such vulnerabilities demand special attention. Unique childhood vulnerabilities result, at least in part, from the fact that at birth many organs and body systems, including the lungs and the immune, endocrine, reproductive, and nervous systems, have not achieved structural or functional maturity; these organ systems continue to develop throughout childhood and adolescence. Children can also differ from adults in absorption, metabolism, storage, and excretion of toxicants, any of which could result in higher biologically effective doses to target organs. Children's exposures to toxicants may be more significant than adult's because children consume more food and liquids in proportion to their body weight than do adults. SEET evaluated the potential public health hazards to children who may trespass or recreate at the MPTC site. SEET found no public health hazard to children.

IV. CONCLUSIONS

Review of the data suggests that there is no current public health hazard. An 8-foot fence surrounds the entire site, thus, preventing on-site accessibility. Off-site areas are heavily vegetated, remote and inaccessible. A recent site visit conducted by the LDEQ documents that no activity or trespassing has occurred at the site, and that the site is unattractive to trespassers or recreational users; Big Creek and the Unnamed Tributary are shallow tributaries, and are often dry in many areas, therefore, eliminating recreational usage. As such, all exposure pathways have been eliminated as long as clean up is fully completed before conversion into a recreational land space. Per the EPA site manager, EPA continues to monitor the MPTC site to ensure that there is no immediate threat to human health or the environment. EPA will consider funding cleanup at this site in fiscal year 2006 [4].

V. RECOMMENDATIONS

Because some concentrations of arsenic, PAHs and 2,3,7,8-TCDD exceed health guideline values, and due to the erosion of the capped consolidation area, as part of prudent public health practice, SEET recommends that EPA ensure remediation of the MPTC site is conducted in a timely way.

VI. PUBLIC HEALTH ACTION PLAN

Past Actions

1. In December 2002, SEET released the public health assessment for the MPTC site.
2. In June 2003, SEET released the groundwater health consultation for the MPTC site.
3. In November 2003, SEET released the biota health consultation for the MPTC site.
4. In November 2005, SEET released the sediment health consultation for the MPTC site.

Future Actions

1. SEET will place this health consultation in the Marion community repository.

LIST OF ACRONYMS

ATSDR	Agency for Toxic Substances and Disease Registry
COPC	Contaminant of Potential Concern
ED	Exposure Dose
EMEGs	Environmental Media Evaluation Guides
EPA	Environmental Protection Agency
HAC	Health-based Assessment Comparison Values
HC	Health Consultation
HHRA	Human Health Risk Assessment
HpCDF	Heptachlorinated Dibenzofuran
HxCDD	Hexachlorinated Dibenzo-p-Dioxin
HxCDF	Hexachlorinated Dibenzofuran
kg	Kilogram
LDHH	Louisiana Department of Health and Hospitals
mg/kg	Milligrams per Kilogram
mg/kg/day	Milligrams per Kilogram per Day
MPTC	Marion Pressure Treating Company
MRL	Minimal Risk Level
MSSLs	Medium Specific Screening Levels
OCDD	Octachlorinated Dibenzo-p-Dioxin
OCDF	Octachlorinated Dibenzofuran
OPH	Office of Public Health
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PCDDs	Polychlorinated Dibenzo-p-Dioxins
PCDFs	Polychlorinated Dibenzofurans
PeCDD	Pentachlorinated Dibenzo-p-Dioxins
PeCDF	Pentachlorinated Dibenzofuran
pg/g	Picograms per Gram
PHA	Public Health Assessment
RBCs	Risk Based Concentrations
RfD	Reference Dose
RI/FS	Remedial Investigation/Feasibility Study
RMEGs	Reference Media Evaluation Guides
SEET	Section of Environmental Epidemiology and Toxicology
SF	Slope Factor
SVOCs	Semi-volatile Organic Compounds
TCDD	Tetrachlorinated Dibenzo-p-Dioxin
TCDF	Tetrachlorinated Dibenzofuran
TEFs	Toxic Equivalency Factors
TEQ	Toxic Equivalency Quotient
VOCs	Volatile Organic Compounds
WHO	World Health Organization

VII. REFERENCES

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CERTIFICATION

This Marion Pressure Treating Company Site, A Review of Soil Data, health consultation was prepared by the Louisiana Department of Health and Hospitals under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures at the time the health consultation was begun. Editorial review was completed by the Cooperative Agreement Partners.



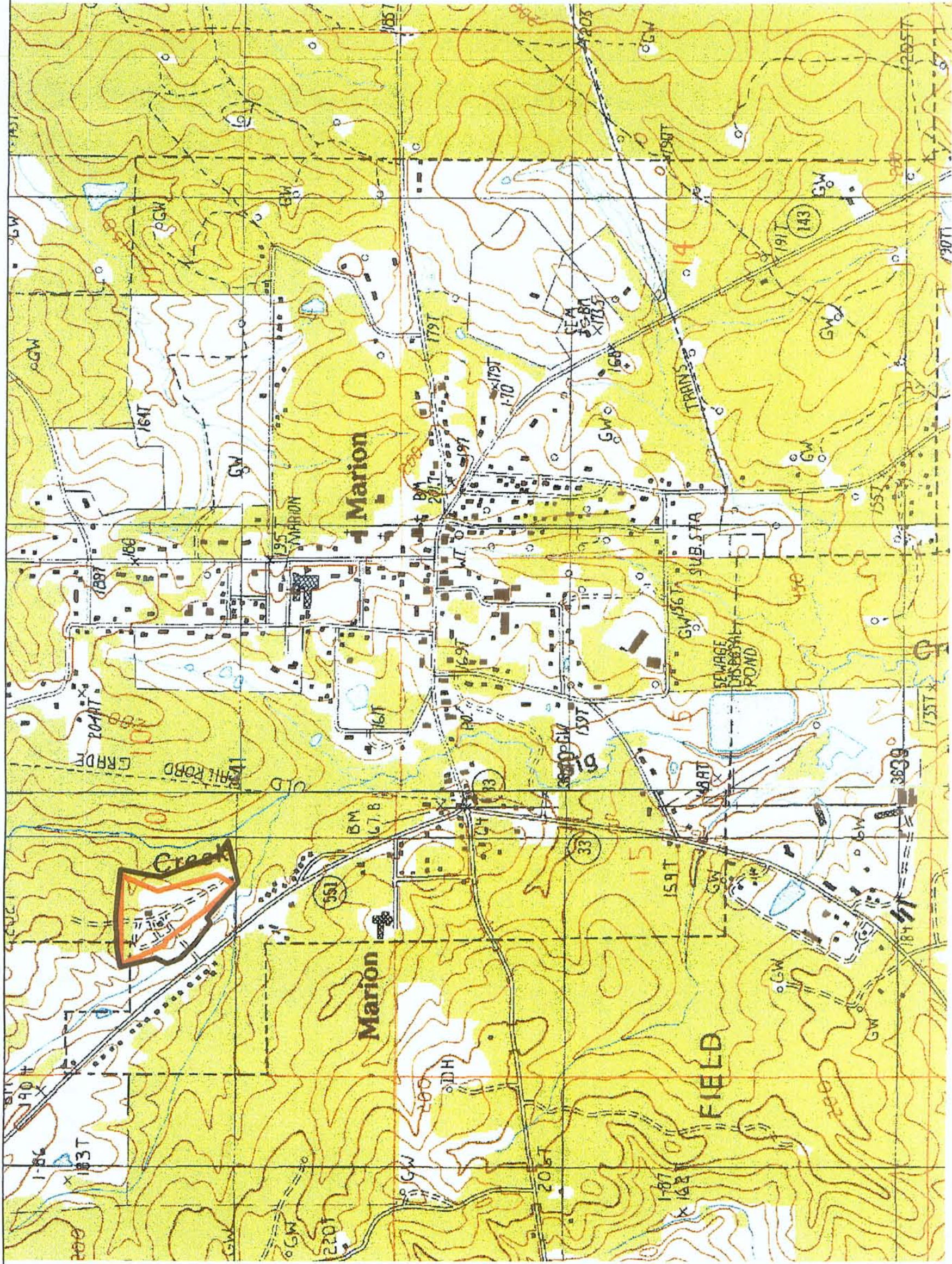
Technical Project Officer, Cooperative Agreement Team (CAT), Superfund and Program Assessment Branch (SPAB), Division of Health Assessment and Consultation (DHAC), ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.



Team Leader, CAT, SPAB, DHAC, ATSDR

APPENDIX A: FIGURES 1, 2 & 3



Quadrangle Location



0 50 100 Miles
State Location Map

LEGEND

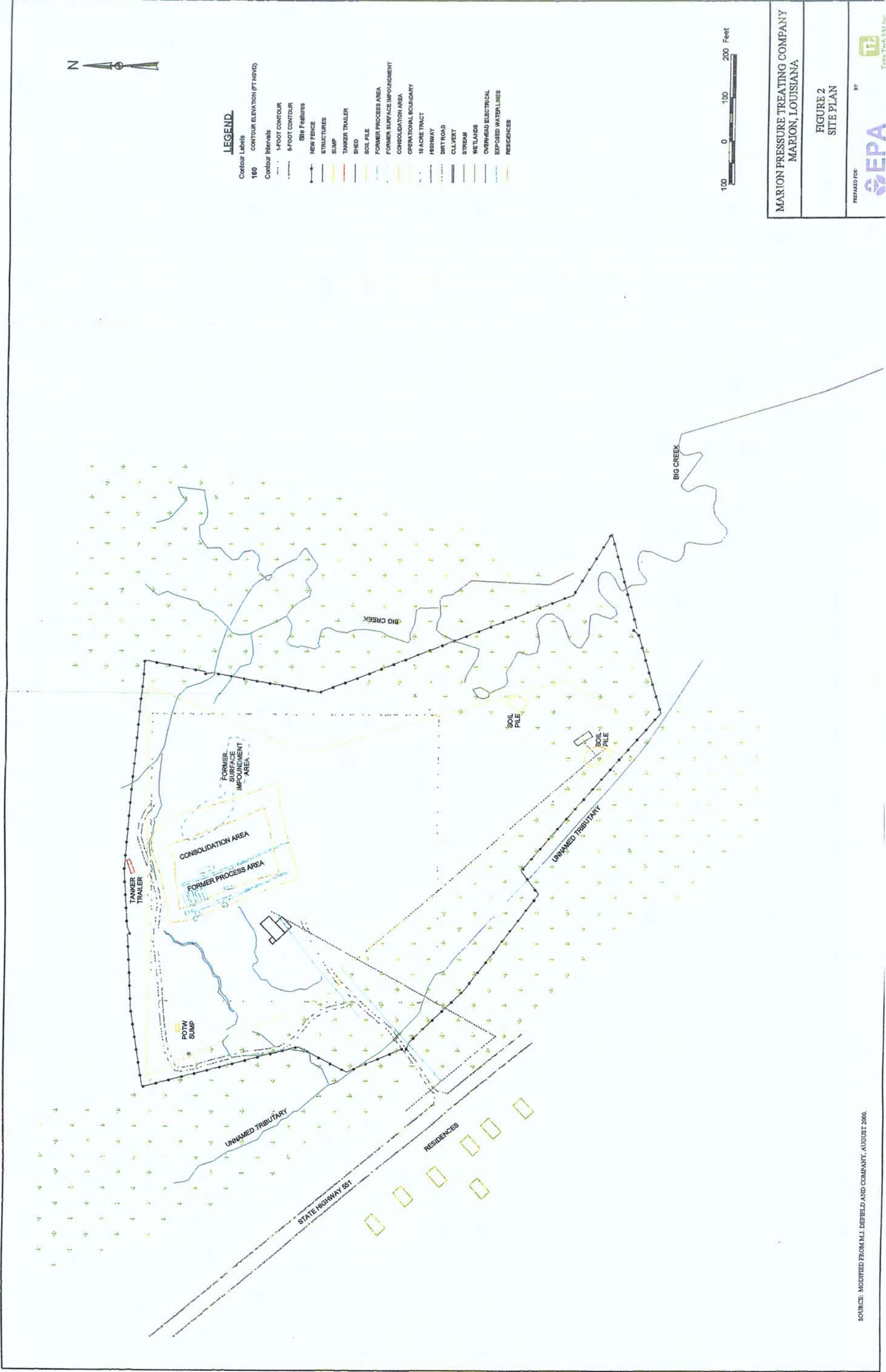
- Site Features
- NEW FENCE
- OPERATIONAL BOUNDARY

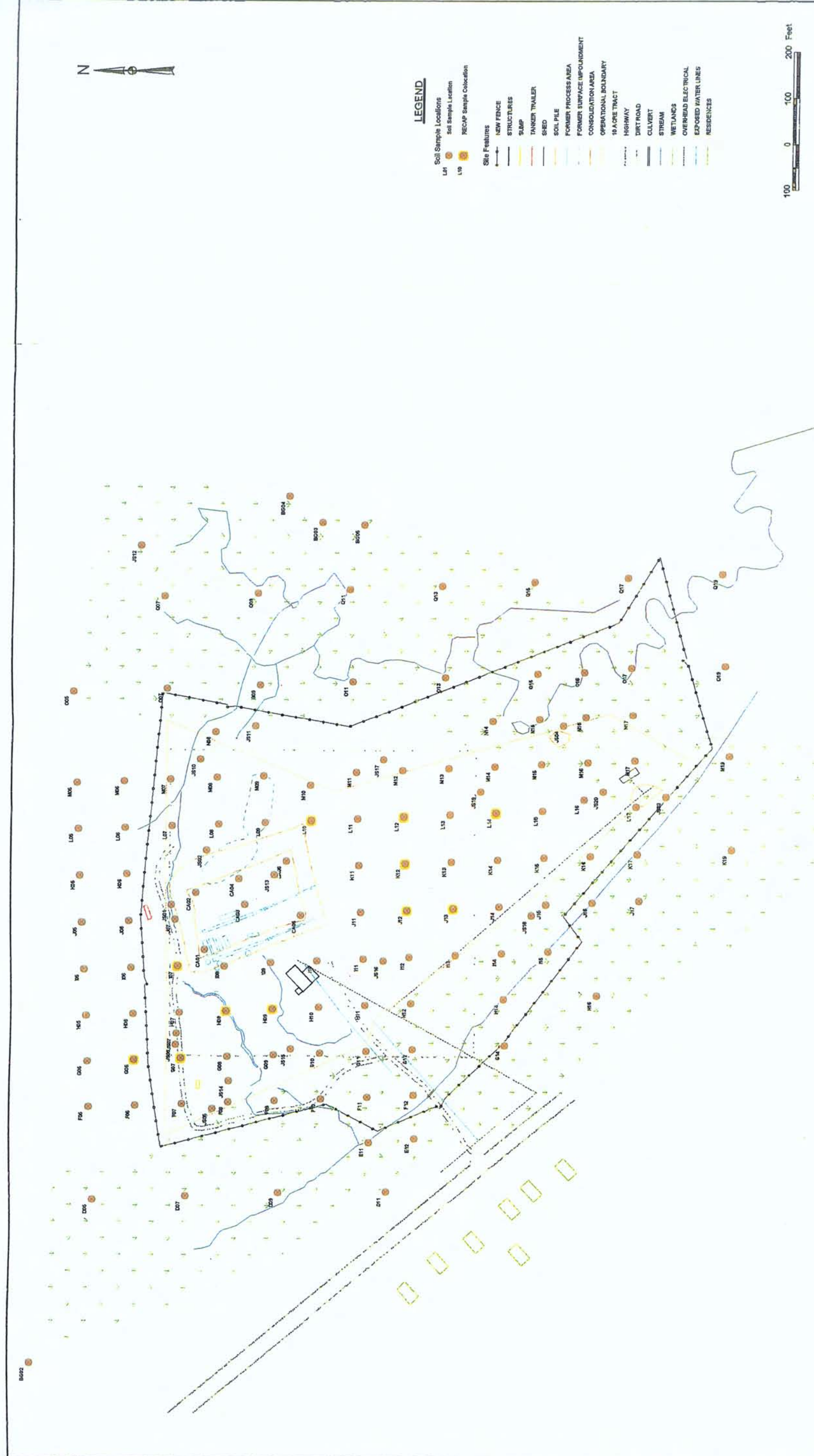
500 0 500 1000 Feet

MARION PRESSURE TREATING COMPANY
MARION, LOUISIANA

FIGURE 1
AREA/VICINITY MAP

SOURCE: MODIFIED FROM UNITED STATES GEOLOGIC SOCIETY, MARION WEST AND MARION EAST, LOUISIANA QUADRANGLES, REVISED 1988





LEGEND

- Soil Sample Locations**
- L10 Soil Sample Location
 - L10 RECAP Sample Collection
- Site Features**
- NEW FENCE
 - STRUCTURES
 - SLUMP
 - TANKER TRAILER
 - SHED
 - SOIL PILE
 - FORMER PROCESS AREA
 - FORMER SURFACE IMPOUNDMENT
 - CONSOLIDATION AREA
 - OPERATIONAL BOUNDARY
 - 10 ACRE TRACT
 - HIGHWAY
 - DIRT ROAD
 - CULVERT
 - STREAM
 - WETLANDS
 - OVERHEAD ELECTRICAL
 - EXPOSED WATER LINES
 - RESIDENCES



MARION PRESSURE TREATING COMPANY
MARION, LOUISIANA

FIGURE 3
SOIL SAMPLING LOCATIONS

APPENDIX B: TABLES

Table 1. Contaminants of Potential Concern Detected in Onsite Soil Samples (0-6 inches) East of the Consolidation Area, Marion Pressure Treating Company, Union Parish, Louisiana (June – September 2000).

Contaminants of Potential Concern	Average Concentration Detected (mg/kg) ¹	Background (mg/kg)	Comparison Values	
			(mg/kg)	Source
Metals:				
Arsenic	6.4	2.3 – 8.9	20	EMEG ² (child)
Barium	60.4	40.1	4000	RMEG ³
Beryllium	0.53	0.45	100	RMEG
Cobalt	7.4	7	500	EMEG (child)
Manganese	377	328	3000	RMEG (child)
Nickel	4.4	1.7	1000	RMEG (child)
Silver	0.53	0.44	300	RMEG (child)

¹ mg/kg - milligrams per kilogram

² EMEG = Environmental Media Evaluation Guide [9]

³ RMEG = Reference Dose Media Evaluation Guide [9]

Table 2. Contaminants of Potential Concern Detected in Onsite Soil (0-6 inches) in the East Waste Pile, Marion Pressure Treating Company, Union Parish, Louisiana (June – September 2000).

Contaminants of Potential Concern	Average Concentration Detected (mg/kg) ¹	Background (mg/kg)	Comparison Values	
			(mg/kg)	Source
Semi-Volatiles:				
Bis(2Ethylhexyl)phthalate	0.76	0.36	3,000	EMEG ²
Carbazole	5.6	0.36	24	MSSL ³
Dibenzofuran	0.995	0.36	150	MSSL

¹ mg/kg - milligrams per kilogram

² EMEG = Environmental Media Evaluation Guide [9]

³ MSSL = Medium Specific Screening Level [7]

Table 3. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Onsite Soil Samples (0-6 inches) in the East Waste Pile, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Acenaphthene	3300	0.001	3.3
Acenaphthylene	37000	0.001	37
Anthracene	36000	0.001	36
Dibenzo(a,h)anthracene	22000	5	110000
Benzo(a)pyrene	120000	1	120000
Benzo(a)anthracene	83000	0.1	8300
Benzo(b)fluoranthene	160000	0.1	1600
Benzo(k)fluoranthene	120000	0.1	1200
Indeno(1,2,3-cd)pyrene	41000	0.1	4100
Benzo(g,h,i)perylene	32000	0.01	320
Chrysene	120000	0.01	120
Fluorene	8200	0.001	8.2
Fluoranthene	31000	0.001	31
Phenanthrene	2900	0.001	2.9
Pyrene	170000	0.001	170
Benzo(a)pyrene Toxic Equivalent			245928.4

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 4. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Onsite Soil Samples (0-6 inches) Onsite Tanker Trailer, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Anthracene	2400	0.001	2.4
Benzo(a)pyrene	53	1	53
Benzo(a)anthracene	88	0.1	8.8
Benzo(b)fluoranthene	140	0.1	14
Benzo(k)fluoranthene	130	0.1	13
Indeno(1,2,3-cd)pyrene	43	0.1	4.3
Chrysene	190	0.01	1.9
Fluorene	230	0.001	0.23
Fluoranthene	110	0.001	0.11
Phenanthrene	300	0.001	0.3
Pyrene	150	0.001	0.15
Benzo(a)pyrene Toxic Equivalent			98.19

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 5. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Onsite Soil Samples (0-6 inches) in the West Waste Pile, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Anthracene	76	0.001	.076
Benzo(a)pyrene	67	1	67
Benzo(a)anthracene	70	0.1	7
Benzo(b)fluoranthene	160	0.1	16
Benzo(k)fluoranthene	120	0.1	12
Indeno(1,2,3-cd)pyrene	79	0.1	.79
Benzo(g,h,i)perylene	49	0.01	.49
Chrysene	130	0.01	1.3
Fluoranthene	110	0.001	.11
Pyrene	150	0.001	.15
Benzo(a)pyrene Toxic Equivalent			104.91

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 6. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Onsite Soil Samples (0-6 inches) at the Shed, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Anthracene	65	0.001	.065
Benzo(a)pyrene	76	1	76
Benzo(a)anthracene	110	0.1	11
Benzo(b)fluoranthene	310	0.1	31
Benzo(k)fluoranthene	210	0.1	21
Indeno(1,2,3-cd)pyrene	74	0.1	7.4
Benzo(g,h,i)perylene	51	0.01	.51
Chrysene	190	0.01	1.9
Fluoranthene	170	0.001	.17
Pyrene	270	0.001	.27
Benzo(a)pyrene Toxic Equivalent			149.315

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 7. Contaminants of Potential Concern Detected in Onsite Soil (0-6 inches) at the Former Surface Impoundment, Marion Pressure Treating Company, Union Parish, Louisiana (June – September 2000).

Contaminants of Potential Concern	Maximum Concentration Detected (mg/kg) ¹	Background (mg/kg)	Comparison Values	
			(mg/kg)	Source
Metals:				
Arsenic	11.7	1.3 – 8.9	20	EMEG ²
Semi-Volatiles:				
Carbazole	0.53	0.36	240	MSSL ³
Dibenzofuran	0.55	0.36	150	MSSL

¹ mg/kg - milligrams per kilogram

² EMEG= Environmental Medium Evaluation Guide [9]

³ MSSL = Medium Specific Screening Level [7]

Table 8. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Onsite Soil Samples (0-6 inches) Former Surface Impoundment, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Maximum Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Acenaphthene	940	0.001	.94
Acenaphthylene	870	0.001	.87
Anthracene	2700	0.001	2.7
Dibenzo(a,h)anthracene	1000	5	5000
Benzo(a)pyrene	5200	1	5200
Benzo(a)anthracene	5300	0.1	530
Benzo(b)fluoranthene	19000	0.1	1900
Benzo(k)fluoranthene	14000	0.1	1400
Indeno(1,2,3-cd)pyrene	3500	0.1	350
Benzo(g,h,i)perylene	1900	0.01	1.9
Chrysene	8900	0.01	8.9
Fluorene	820	0.001	.82
Fluoranthene	10000	0.001	10
Phenanthrene	2300	0.001	2.3
Pyrene	15000	0.001	15
Benzo(a)pyrene Toxic Equivalent			14423.43

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 9. Average Poly-chlorinated dibenzo-p-dioxins / poly-chlorinated dibenzofurans (PCDDs / PCDFs) Concentrations Detected in Onsite Soil (0-6 inches) Former Surface Impoundment, Marion Pressure Treating Company, Union Parish, Louisiana (June – September 2000).

Contaminants of Concern	Maximum Conc. Detected (pg/g) ¹	Toxic Equivalency Factor ²	Product ³	Concentration (mg/kg) ⁴
1,2,3,4,7,8,9-HpCDF	2.2	0.01	.022	2.2E-8
1,2,3,4,7,8-HxCDF	2.2	0.1	.022	2.2E-8
1,2,3,4,7,8,-HxCDD	2.2	0.1	0.22	2.2E-8
1,2,3,6,7,8-HxCDF	0.93	0.1	.093	9.3E-8
1,2,3,7,8,9-HxCDF	0.81	0.1	.081	8.1E-8
2,3,4,6,7,8-HxCDF	1.9	0.1	.19	1.9E-7
2,3,7,8-TCDF	0.41	0.1	.041	4.1E-8
2,3,7,8-TCDD	0.29	1	0.29	2.9E-7
TCDD	0.74	1	0.74	7.4E-7
TCDF	6.7	0.1	0.67	6.7E-7
HpCDD	3520	0.01	35.2	3.5E-5
HxCDF	60.9	0.1	6.09	6E-6
HxCDD	147	0.1	14.7	1.4E-5
OCDF	70.8	0.0001	.0070	7E-9
OCDD	12100	0.0001	1.21	1.2E-6
PeCDF	14.3	0.5	7.15	7.1E-6
1,2,3,7,8-PeCDF	1.7	0.05	.085	8.5E-8
2,3,4,7,8-PeCDF	0.71	0.5	.355	3.5E-7
PeCDD	7.4	1	7.4	7.4E-6
1,2,3,7,8-PeCDD	1.2	1	1.2	1.2E-6
TOXIC EQUIVALENT				7.4E-5
ATSDR's Environmental Media Evaluation Guide (EMEG)				5 E-5

¹ pg/g – picograms per gram

² source – World Health Organization (WHO) [10]

³ product – (average concentration detected) (TEF)

⁴ mg/kg – milligrams per kilogram

Table 10. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Onsite Soil Samples (0-6 inches) Above the Consolidation Area, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Acenaphthene	50	0.001	.05
Acenaphthylene	118	0.001	.118
Anthracene	463.3	0.001	.463
Dibenzo(a,h)anthracene	75	5	375
Benzo(a)pyrene	348.3	1	348.3
Benzo(a)anthracene	508.3	0.1	50.83
Benzo(b)fluoranthene	1377.5	0.1	137.75
Benzo(k)fluoranthene	1152.3	0.1	115.23
Indeno(1,2,3-cd)pyrene	256.6	0.1	25.66
Benzo(g,h,i)perylene	191.1	0.01	1.91
Chrysene	1030.3	0.01	10.30
Fluorene	49.25	0.001	.049
Fluoranthene	379.7	0.001	.379
Phenanthrene	85.6	0.001	.085
Pyrene	750.4	0.001	.750
Benzo(a)pyrene Toxic Equivalent			1066.87

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 11. Contaminants of Potential Concern Detected in Onsite Soil Samples (0-6 inches) West of the Consolidation Area, Marion Pressure Treating Company, Union Parish, Louisiana (June – September 2000).

Contaminants of Potential Concern	Average Concentration Detected (mg/kg) ¹	Background (mg/kg)	Comparison Values	
			(mg/kg)	Source
Metals:				
Arsenic	2.85	2.3 – 8.9	0.39	EMEG ²
Semi-Volatiles:				
2-MethylNaphthalene	1.19	0.36	3000	EMEG (child)
Biphenyl	4.5	0.36	3000	RMEG ³ (child)
Carbazole	11	0.36	240	MSSL ⁴
Dibenzofuran	30	0.36	150	MSSL
Naphthalene	4	0.36	1000	RMEG

¹ mg/kg - milligrams per kilogram

² EMEG = Environmental Media Evaluation Guide [9]

³ RMEG = Reference Dose Media Evaluation Guide [9]

⁴ MSSL = Medium Specific Screening Level [7]

Table 12. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Onsite Soil Samples (0-6 inches) West of the Consolidation Area, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Acenaphthene	10555.85	0.001	10.55
Acenaphthylene	790.57	0.001	0.790
Anthracene	8482.22	0.001	8.482
Dibenzo(a,h)anthracene	1306.5	5	6532.5
Benzo(a)pyrene	2942.9	1	2942.9
Benzo(a)anthracene	842.3	0.1	84.23
Benzo(b)fluoranthene	7529.0	0.1	752.9
Benzo(k)fluoranthene	3417	0.1	341.7
Indeno(1,2,3-cd)pyrene	1462.7	0.1	146.27
Benzo(g,h,i)perylene	1384.11	0.01	13.84
Chrysene	10119	0.01	101.19
Fluorene	7307.12	0.001	7.307
Fluoranthene	36900	0.001	36.9
Phenanthrene	26893.3	0.001	26.89
Pyrene	29705.36	0.001	29.70
Benzo(a)pyrene Toxic Equivalent			11036.14

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 13. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Onsite Soil Samples (0-6 inches) East of the Consolidation Area, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Acenaphthylene	1080	0.001	1.08
Anthracene	953.3	0.001	0.953
Dibenzo(a,h)anthracene	1440	5	7200
Benzo(a)pyrene	3432.5	1	3432.5
Benzo(a)anthracene	3843.3	0.1	384.33
Benzo(b)fluoranthene	6424.6	0.1	642.46
Benzo(k)fluoranthene	5439.8	0.1	543.98
Indeno(1,2,3-cd)pyrene	3973.3	0.1	397.33
Benzo(g,h,i)perylene	2646.6	0.01	26.46
Chrysene	5366.7	0.01	53.66
Fluoranthene	2610	0.001	2.61
Pyrene	3930.2	0.001	3.93
Benzo(a)pyrene Toxic Equivalent			12689.2

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 14. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Onsite Soil Samples (0-6 inches) Below the Consolidation Area, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Acenaphthene	4686.77	0.001	4.6867
Acenaphthylene	626.10	0.001	0.6261
Anthracene	17053	0.001	17.05
Dibenzo(a,h)anthracene	914.86	5	4574.3
Benzo(a)pyrene	2294.91	1	2294.91
Benzo(a)anthracene	5047.87	0.1	504.78
Benzo(b)fluoranthene	6185.75	0.1	618.57
Benzo(k)fluoranthene	4492.45	0.1	449.24
Indeno(1,2,3-cd)pyrene	1764.79	0.1	176.47
Benzo(g,h,i)perylene	1445.81	0.01	14.45
Chrysene	6289.02	0.01	62.89
Fluorene	8348	0.001	8.348
Fluoranthene	10182.19	0.001	10.182
Phenanthrene	12032.82	0.001	12.032
Pyrene	13004.55	0.001	13.004
Benzo(a)pyrene Toxic Equivalent			8761.53

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 15. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Offsite Soil Samples (0-6 inches) Big Creek / East Ditch, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Dibenzo(a,h)anthracene	193.3	5	966.5
Benzo(a)pyrene	278.3	1	278.3
Benzo(a)anthracene	226.8	0.1	22.68
Benzo(b)fluoranthene	765.6	0.1	76.56
Benzo(k)fluoranthene	609	0.1	60.9
Indeno(1,2,3-cd)pyrene	396.6	0.1	39.66
Benzo(g,h,i)perylene	225.6	0.01	2.25
Chrysene	339.6	0.01	3.39
Fluorene	343.3	0.001	0.343
Fluoranthene	468	0.001	0.468
Phenanthrene	690	0.001	0.69
Pyrene	520	0.001	0.52
Benzo(a)pyrene Toxic Equivalent			1452.26

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 16. Average Poly-chlorinated dibenzo-p-dioxins / poly-chlorinated dibenzofurans (PCDDs / PCDFs) Concentrations Detected in Offsite Soil (0-6 inches) in Big Creek / East Ditch, Marion Pressure Treating Company, Union Parish, Louisiana (June – September 2000).

Contaminants of Concern	Average Conc. Detected (pg/g) ¹	Toxic Equivalency Factor ²	Product ³	Concentration (mg/kg) ⁴
1,2,3,4,6,7,8-HpCDF	16	0.01	.16	1.6E-7
1,2,3,4,6,7,8-HpCDD	336.05	0.01	3.36	3.36E-6
1,2,3,4,7,8,9-HpCDF	2.5	0.01	.025	2.5E-8
1,2,3,4,7,8-HxCDF	1.4	0.1	.14	1.4E-7
1,2,3,4,7,8-HxCDD	1.59	0.1	.159	1.59E-7
1,2,3,6,7,8-HxCDF	.605	0.1	.0605	6.05E-8
1,2,3,6,7,8-HxCDD	8	0.1	.8	8E-7
1,2,3,7,8,9-HxCDF	.29	0.1	.029	2.9E-8
1,2,3,7,8,9-HxCDD	4.8	0.1	.48	4.8E-7
2,3,4,6,7,8-HxCDF	1.08	0.1	.108	1.08E-7
2,3,7,8-TCDF	.31	0.1	.031	3.1E-8
2,3,7,8-TCDD	0.17	1	0.17	1.7E-7
TCDD	0.63	1	0.63	6.3E-7
TCDF	3.8	0.1	.38	3.8E-7
HpCDF	74.25	0.01	.7425	7.42E-7
HpCDD	2418	0.01	24.18	2.4E-5
HxCDF	25.4	0.1	2.54	2.54E-6
HxCDD	126.25	0.1	12.62	1.26E-5
OCDF	62	0.0001	.0062	6.2E-9
OCDD	6780	0.0001	.678	6.78E-7
PeCDF	6.85	0.5	3.42	3.42E-6
1,2,3,7,8-PeCDF	.73	0.05	.0365	3.65E-8
2,3,4,7,8-PeCDF	.275	0.5	.1375	1.37E-7
PeCDD	5.05	1	5.05	5.05E-6
1,2,3,7,8-PeCDD	.465	1	.465	4.65E-7
TOXIC EQUIVALENT			56.40	5.62E-5
ATSDR's Environmental Media Evaluation Guide (EMEG)				5 E-5

¹ pg/g – picograms per gram

² source – World Health Organization (WHO) [10]

³ product – (average concentration detected) (TEF)

⁴ mg/kg – milligrams per kilogram

Table 17. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Offsite Soil Samples (0-6 inches) Below the Southern Portion of the Fenceline, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Acenaphthylene	64	0.001	.064
Anthracene	140	0.001	.14
Dibenzo(a,h)anthracene	98	5	490
Benzo(a)pyrene	220	1	220
Benzo(a)anthracene	150	0.1	15
Benzo(b)fluoranthene	630	0.1	63
Benzo(k)fluoranthene	310	0.1	31
Indeno(1,2,3-cd)pyrene	270	0.1	27
Benzo(g,h,i)perylene	220	0.01	2.2
Chrysene	270	0.01	2.7
Fluoranthene	170	0.001	.17
Pyrene	270	0.001	.27
Benzo(a)pyrene Toxic Equivalent			851.54

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 18. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Offsite Soil Samples (0-6 inches) West of the Fenceline, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Acenaphthene	77.1	0.001	.0771
Acenaphthylene	82.5	0.001	.0825
Anthracene	207.5	0.001	.2076
Dibenzo(a,h)anthracene	144.75	5	723.75
Benzo(a)pyrene	350.96	1	350.96
Benzo(a)anthracene	248.4	0.1	24.84
Benzo(b)fluoranthene	579.86	0.1	57.986
Benzo(k)fluoranthene	575.07	0.1	57.507
Indeno(1,2,3-cd)pyrene	438.88	0.1	43.88
Benzo(g,h,i)perylene	226.7	0.01	2.267
Chrysene	408.85	0.01	4.088
Fluorene	66.65	0.001	.0666
Fluoranthene	348	0.001	.348
Phenanthrene	204.4	0.001	.2044
Pyrene	538.5	0.001	.5385
Benzo(a)pyrene Toxic Equivalent			1266.8

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 19. Average Polycyclic Aromatic Hydrocarbons (PAHs) Concentrations Detected in Offsite Soil Samples (0-6 inches) North of the Fenceline, Marion Pressure Treating Company, Union Parish, Louisiana, (June – September 2000).

Contaminants of Concern	Average Concentration Detected (ug/kg) ¹	Toxic Equivalency Factor (TEF) ²	Product ³
Acenaphthene	416.3	0.001	.4163
Acenaphthylene	190	0.001	.19
Anthracene	395.85	0.001	.395
Dibenzo(a,h)anthracene	190	5	950
Benzo(a)pyrene	1505.75	1	1505.75
Benzo(a)anthracene	2338.4	0.1	233.84
Benzo(b)fluoranthene	3085	0.1	308.5
Benzo(k)fluoranthene	2057	0.1	205.7
Indeno(1,2,3-cd)pyrene	912.6	0.1	91.26
Benzo(g,h,i)perylene	1095	0.01	10.95
Chrysene	3100.6	0.01	31.006
Fluorene	427.75	0.001	.427
Fluoranthene	2960.4	0.001	2.96
Phenanthrene	835.4	0.001	.8354
Pyrene	3428.3	0.001	3.4283
Benzo(a)pyrene Toxic Equivalent			3345.65

¹ ug/kg – micrograms per kilogram

² source – ATSDR Toxicological Profile for PAHs [5]

³ product = (average concentration detected) (TEF)

Table 20. Calculated Estimated Exposure Doses for Benzo(a)pyrene and 2,3,7,8-TCDD for Noncancer Health Effects for Individuals with a Bodyweight of 43 & 70 Kilograms; Based on Ingestion of Onsite Soil from Marion Pressure Treating Company, Union Parish, Louisiana.

Exposure Area	Benzo(a)pyrene		2,3,7,8-TCDD	
	43 kg	70 kg	43 kg	70 kg
Consolidation Area	NA **	NA	NA	NA
Closed Impoundment	NA	NA	NA	NA
East Waste Pile	8 E-4	4.9 E-4	NA	NA
Tanker Trailer	3.1 E-7	1.9 E-7	NA	NA
Wastewater Pump	NA	NA	NA	NA
West Waste Pile	3.3 E-7	2.0 E-7	NA	NA
Structure near the Consolidation Area	NA	NA	NA	NA
Shed	4.8 E-7	2.9 E-7	NA	NA
Former Surface Impoundment	4.6 E-5	2.8 E-5	2.4 E-10	1.4 E-10
Above Consolidation Area	3.4 E-6	2.1 E-6	NA	NA
West of the Consolidation Area	3.5 E-5	2.2 E-5	NA	NA
East of the Consolidation Area	4.1 E-5	2.5 E-5	2.6 E-11	1.4 E-11
Below the Consolidation Area	2.8 E-5	1.7 E-5	8.4 E-11	1.4 E-11

** Not Applicable: Contaminant was not retained for calculation of estimated exposure dose because it did not exceed its respective health based comparison value.

Table 21. Calculated Estimated Exposure Doses for Benzo(a)pyrene and 2,3,7,8-TCDD for Noncancer Health Effects for Individuals with a Bodyweight of 43 & 70 Kilograms; Based on Dermal Contact with Onsite Soil from Marion Pressure Treating Company, Union Parish, Louisiana.

Exposure Area	Benzo(a)pyrene		2,3,7,8-TCDD	
	43 kg	70 kg	43 kg	70 kg
Consolidation Area	NA**	NA	NA	NA
Closed Impoundment	NA	NA	NA	NA
East Waste Pile	9.7 E-4	6 E-4	NA	NA
Tanker Trailer	3.8 E-7	2.3 E-7	NA	NA
Wastewater Pump	NA	NA	NA	NA
West Waste Pile	4.1 E-7	2.5 E-7	NA	NA
Structure near the Consolidation Area	NA	NA	NA	NA
Shed	5.9 E-7	3.6 E-7	NA	NA
Former Surface Impoundment	5.7 E-5	3.5 E-5	6.7 E-11	4.1 E-11
Above Consolidation Area	4.2 E-6	2.5 E-6	NA	NA
West of the Consolidation Area	4.3 E-5	2.6 E-5	NA	NA
East of the Consolidation Area	5 E-5	3 E-5	7.4 E-12	4.5 E-12
Below the Consolidation Area	3.4 E-5	2.1 E-5	2.3 E-11	1.4 E-11

Table 22. Calculated Estimated Exposure Doses for Benzo(a)pyrene and 2,3,7,8-TCDD for Noncancer Health Effects for Individuals with a Bodyweight of 43 & 70 Kilograms; Based on Ingestion of Offsite Soil from Marion Pressure Treating Company, Union Parish, Louisiana.

Exposure Area	Benzo(a)pyrene		2,3,7,8-TCDD	
	43 kg	70 kg	43 kg	70 kg
Big Creek/East Ditch	4.7 E-6	2.9 E-6	1.8 E-10	1.0 E-10
Below the Southern Portion of the Fenceline	2.7 E-6	1.7 E-6	NA	NA
West of the Fenceline near the Unnamed Tributary	4.1 E-6	2.5 E-6	NA	NA
North of the Fenceline	1 E-5	6.6 E-6	6.8 E-11	2.8 E-11

Table 23. Calculated Estimated Exposure Doses for Benzo(a)pyrene and 2,3,7,8-TCDD for Noncancer Health Effects for Individuals with a Bodyweight of 43 & 70 Kilograms; Based on Dermal Contact with Offsite Soil from Marion Pressure Treating Company, Union Parish, Louisiana.

Exposure Area	Benzo(a)pyrene		2,3,7,8-TCDD	
	43 kg	70 kg	43 kg	70 kg
Big Creek/East Ditch	4.7 E-6	2.9 E-6	1.8 E-10	1.0 E-10
Below the Southern Portion of the Fenceline	2.7 E-6	1.7 E-6	NA	NA
West of the Fenceline near the Unnamed Tributary	4.1 E-6	2.5 E-6	NA	NA
North of the Fenceline	1 E-5	6.6 E-6	6.8 E-11	2.8 E-11

** Not Applicable: Contaminant was not retained for calculation of estimated exposure dose because it did not exceed its respective health based comparison value.

Table 24. Calculated Estimated Exposure Doses for Benzo(a)pyrene and 2,3,7,8-TCDD for Cancer Health Effects for Individuals with a Bodyweight of 43 & 70 Kilograms; Based on Ingestion of Onsite Soil from Marion Pressure Treating Company, Union Parish, Louisiana.

Exposure Area	Benzo(a)pyrene		2,3,7,8-TCDD	
	43 kg	70 kg	43 kg	70 kg
Consolidation Area	NA**	NA	NA	NA
Closed Impoundment	NA	NA	NA	NA
East Waste Pile	5.8 E-3	3.5 E-3	NA	NA
Tanker Trailer	2.3 E-6	1.3 E-6	NA	NA
Wastewater Pump	NA	NA	NA	NA
West Waste Pile	2.4 E-6	1.4 E-6	NA	NA
Structure near the Consolidation Area	NA	NA	NA	NA
Shed	3.5 E-6	2.1 E-6	NA	NA
Former Surface Impoundment	3.3 E-4	2.0 E-4	3.6 E-5	2.1 E-5
Above Consolidation Area	2.4 E-5	1.5 E-5	NA	NA
West of the Consolidation Area	2.5 E-4	1.6 E-4	NA	NA
East of the Consolidation Area	2.9 E-4	1.8 E-4	3.9 E-6	2.1 E-6
Below the Consolidation Area	2.0 E-4	1.2 E-4	1.2 E-5	6.3 E-6

Table 25. Calculated Estimated Exposure Doses for Benzo(a)pyrene and 2,3,7,8-TCDD for Cancer Health Effects for Individuals with a Bodyweight of 43 & 70 Kilograms; Based on Dermal Contact with Onsite Soil from Marion Pressure Treating Company, Union Parish, Louisiana.

Exposure Area	Benzo(a)pyrene		2,3,7,8-TCDD	
	43 kg	70 kg	43 kg	70 kg
Consolidation Area	NA**	NA	NA	NA
Closed Impoundment	NA	NA	NA	NA
East Waste Pile	1.0 E-2	6.5 E-3	NA	NA
Tanker Trailer	4.6 E-6	2.6 E-6	NA	NA
Wastewater Pump	NA	NA	NA	NA
West Waste Pile	4.5 E-6	2.7 E-6	NA	NA
Structure near the Consolidation Area	NA	NA	NA	NA
Shed	6.4 E-6	3.9 E-6	NA	NA
Former Surface Impoundment	6.2 E-6	3.8 E-4	1.5 E-5	9.3 E-6
Above Consolidation Area	4.6 E-5	2.8 E-5	NA	NA
West of the Consolidation Area	4.8 E-4	2.9 E-4	NA	NA
East of the Consolidation Area	5.5 E-4	3.3 E-4	1.6 E-6	1.0 E-6
Below the Consolidation Area	3.8 E-4	2.3 E-4	5.3 E-6	3.2 E-6

** Not Applicable: Contaminant was not retained for calculation of estimated exposure dose because it did not exceed its respective health based comparison value.

Table 26. Calculated Estimated Exposure Doses for Benzo(a)pyrene and 2,3,7,8-TCDD for Cancer Health Effects for Individuals with a Bodyweight of 43 & 70 Kilograms; Based on Ingestion of Offsite Soil from Marion Pressure Treating Company, Union Parish, Louisiana.

Exposure Area	Benzo(a)pyrene		2,3,7,8-TCDD	
	43 kg	70 kg	43 kg	70 kg
Big Creek/East Ditch	3.4 E-5	2.1 E-5	2.7 E-5	1.5 E-5
Below the Southern Portion of the Fenceline	1.9 E-5	1.2 E-5	NA	NA
West of the Fenceline near the Unnamed Tributary	2.9 E-5	1.8 E-5	NA	NA
North of the Fenceline	7.3 E-5	4.8 E-5	1.0 E-5	4.2 E-6

Table 27. Calculated Estimated Exposure Doses for Benzo(a)pyrene and 2,3,7,8-TCDD for Cancer Health Effects for Individuals with a Bodyweight of 43 & 70 Kilograms; Based on Dermal Contact with Offsite Soil from Marion Pressure Treating Company, Union Parish, Louisiana.

Exposure Area	Benzo(a)pyrene		2,3,7,8-TCDD	
	43 kg	70 kg	43 kg	70 kg
Big Creek/East Ditch	6.3 E-5	3.8 E-5	1.1 E-5	7.1 E-6
Below the Southern Portion of the Fenceline	3.7 E-5	2.2 E-5	NA	NA
West of the Fenceline near the Unnamed Tributary	5.4 E-5	3.3 E-5	NA	NA
North of the Fenceline	1.4 E-4	8.9 E-5	4.3 E-6	2.6 E-6

*** Not Applicable: Contaminant was not retained for calculation of estimated exposure dose because it did not exceed its respective health based comparison value.

APPENDIX C: CALCULATIONS

Table 1. Equation Variables for Soil Ingestion Dose, Marion Pressure Treating Company, Union Parish, Louisiana.

Variable	Value used
C = Concentration in soil	Chemical-specific (mg/kg)
IR = Ingestion rate	100 mg/day
CF = Conversion factor	10^{-6} kg/mg
EF = Exposure frequency	2 days/week x 26 weeks/yr; 365 days/yr
ED=Exposure Duration	10 years
BW = Body weight	43 kg & 70 kg

The soil ingestion non-cancer risk can be estimated as follows:

$$ID_s = [(C) (IR) (EF) (CF)] / (BW)$$

Where:

ID_s = soil ingestion non-cancer risk (mg/kg/day)

C = contaminant concentration (mg/kg)

IR = soil ingestion rate (mg/day)

EF = exposure factor (unitless) = (exposure frequency) (exposure duration) / (exposure time)

BW = body weight (kg)

CF = conversion factor (10^{-6} kg/mg); is required to convert the soil contaminant concentration from mg/kg soil to mg/mg soil

Table 2. Equation Variables for Soil Ingestion Cancer Risk, Marion Pressure Treating Company, Union Parish, Louisiana.

Variable	Value Used
C = Concentration in Soil	Chemical-specific (mg/kg)
IR = Ingestion Rate	100 mg/day
CF = Conversion Factor	10^{-6} kg/mg
EF = Exposure Frequency	2 days/week x 26 weeks/yr; 365 days/yr
ED = Exposure Duration	15 years
ET = Exposure Time	365 days/yr X 15 years
BW = Body Weight	43 kg & 70 kg
SF = Cancer Slope Factor	Chemical specific (mg/kg/day) ⁻¹ benzo(a)pyrene = $7.3 \text{ mg/kg/day}^{-1}$ 2,3,7,8-TCDD = $1.50 \text{ E}+05 \text{ mg/kg/day}^{-1}$ [11] arsenic = $1.5 \text{ mg/kg/day}^{-1}$

The soil ingestion cancer risk can be estimated as follows:

$$ID_s = [(C) (IR) (EF) (CF) / (BW)] * (SF)$$

Where:

ID_s = Soil ingestion cancer risk (mg/kg/day)

C = Contaminant concentration (mg/kg)

IR = Soil ingestion rate (mg/day)

EF = Exposure factor (unitless) = (exposure frequency) (exposure duration) / (exposure time)

BW = Body weight (kg)

CF = Conversion factor (10^{-6} kg/mg); is required to convert the soil contaminant concentration from mg/kg soil to mg/mg soil

SF = Cancer slope factor (mg/kg/day)⁻¹

Table 3. Equation Variables for Soil Dermal Non-Cancer Risk, Marion Pressure Treating Company, Union Parish, Louisiana.

Variable	Value Used
C = Concentration in Soil	Chemical-specific (mg/kg)
CF = Conversion Factor	10^{-6} kg/mg
SA = Surface Area	5000 cm ²
AF = Soil to Skin Adherence Factor	0.2 mg/cm ²
ABS = Absorption Factor	(unitless) Arsenic = 0.03 SVOCs = 0.1 PAHs = 0.13 2,3,7,8-TCDD = 0.03
EF = Exposure Frequency	2 days/week x 26 weeks/yr; 365 days/yr
ED = Exposure Duration	10 years
BW = Body Weight	43 kg & 70 kg
AT = Averaging Time	3650 days

The soil dermal non-cancer risk can be estimated as follows:

$$DD_s = [(C) (CF) (SA) (AF) (ABS) (EF) (ED)] / [(BW) (AT)]$$

Where:

DD_s = Soil dermal non-cancer risk (mg/kg/day)

C = Contaminant concentration (mg/kg)

CF = Conversion factor (10^{-6} kg/mg); is required to convert the soil contaminant concentration from mg/kg soil to mg/mg soil

SA = Surface area (cm²) = the amount of skin surface available for contact with soil

AF = Soil to skin adherence factor (mg/cm²) = the amount of COPC in soil, that transfers to the skin when a dermal (skin) exposure occurs

ABS = Absorption factor (unitless)

EF = Exposure factor (unitless) = (exposure frequency) (exposure duration) / (exposure time)

BW = Body weight (kg)

AT = Averaging time (days)

Table 4. Equation Variables for Soil Dermal Cancer Risk, Marion Pressure Treating Company, Union Parish, Louisiana.

Variable	Value Used
C = Concentration in Soil	Chemical-specific (mg/kg)
CF = Conversion Factor	10^{-6} kg/mg
SA = Surface Area	5000 cm ²
AF = Soil to Skin Adherence Factor	0.2 mg/cm ²
ABS = Absorption Factor	(unitless) Arsenic = 0.03, SVOCs = 0.1 PAHs = 0.13, 2,3,7,8-TCDD = 0.03
EF = Exposure Frequency	2 days/week x 26 weeks/yr; 365 days/yr
ED = Exposure Duration	15 years
ET = Exposure Time	365 days/yr X 15 years
BW = Body Weight	43 kg & 70 kg
AT = Averaging Time	3650 days
SF = Cancer Slope Factor	Chemical specific (mg/kg/day) ⁻¹ benzo(a)pyrene = 7.3 mg/kg/day ⁻¹ 2,3,7,8-TCDD = 1.50 E+05 mg/kg/day ⁻¹ [11] arsenic = 1.5 mg/kg/day ⁻¹

The soil dermal cancer risk can be estimated as follows:

$$DD_s = [(C) (CF) (SA) (AF) (ABS) (EF)] / [(BW) (AT)] * (SF)$$

Where:

DD_s = Soil dermal cancer risk (mg/kg/day)

C = Contaminant concentration (mg/kg)

CF = Conversion factor (10^{-6} kg/mg); is required to convert the soil contaminant concentration from mg/kg soil to mg/mg soil

SA = Surface area (cm²)= the amount of skin surface available for contact with soil

AF = Soil to skin adherence factor (mg/cm²) = the amount of COPC in soil, that transfers to the skin when a dermal

(skin) exposure occurs

ABS = Absorption factor (unitless)

EF = Exposure factor (unitless) = (exposure frequency) (exposure duration) / (exposure time)

BW = Body weight (kg)

AT = Averaging time (days)

SF = Cancer slope factor (mg/kg/day)⁻¹