Conceptual Site Model Technical Memorandum

Remedial Investigation/Feasibility Study

Colonial Creosote
Bogalusa, Washington Parish, Louisiana
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U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
405 State Highway 121 Bypass
Building C, Suite 100
Lewisville, Texas 75067
(972) 315-3922

500023280

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TABLE OF CONTENTS

Page

1. INTRODUCTION 1
1.1 PURPOSE 1
1.2 SCOPE 1

2. BACKGROUND 3
2.1 SITE HISTORY 3
2.2 SITE DESCRIPTION 3
2.2.1 Treatment Area 4
2.2.2 Reservoir 4
2.2.3 Settling Pond 4
2.2.4 Drying Area 4
2.2.5 Lumber Piles 5
2.2.6 Common Drainage Ditch 5
2.2.7 Yellow Branch Creek 5
2.3 PREVIOUS INVESTIGATIONS 5
2.3.1 Prior to CERCLA- and SARA-Authorized Investigations 5
2.3.2 2012 Site Inspection 7
2.3.3 2014 Expanded Site Investigation Addendum 7
2.3.4 2015 Hazard Ranking System Documentation Record 8
2.3.5 2015 National Priorities List 9

3. SITE CHARACTERISTICS 10
3.1 SURFACE FEATURES 10
3.2 DEMOGRAPHICS 10
3.3 METEOROLOGY AND CLIMATE 10
3.4 LAND USE 10
3.5 SOILS 11
3.5.1 Latonia Fine Sandy Loam 11
3.5.2 Myatt Fine Sandy Loam 11
3.5.3 Prentiss Fine Sandy Loam 11
3.6 SURFACE WATER 12
3.7 GEOLOGY AND HYDROGEOLOGY 12
3.7.1 Southern Hills Regional Aquifer System 12
3.7.2 Ground Water Withdrawals 12
3.8 ECOLOGICAL SETTING 13
3.9 WETLANDS 13
3.10 THREATENED AND ENDANGERED SPECIES 13

4. NATURE AND EXTENT OF CONTAMINATION 15
4.1 COMPARISON CRITERIA 16
4.1.1 Soil and Sediment 16
4.1.2 Surface Water 16
4.2 CHEMICALS OF POTENTIAL CONCERN 16
4.3 SOURCE 16

4.4 EXTENT OF CONTAMINATION 17
4.4.1 Soil 17
4.4.2 Sediment 21
4.4.3 Surface Water 23

5. CONTAMINANT FATE AND TRANSPORT 24
5.1.1 Surface Water Transport 24
5.1.2 Leaching to Ground Water 24
5.1.3 Ground Water Transport 24
5.1.4 Ground Water to Surface Water 24
5.1.5 Air Particulate Migration 24
5.1.6 Soil Vapor to Air 24

6. DATA GAPS 25

7. HUMAN HEALTH CONCEPTUAL EXPOSURE PATHWAY ANALYSIS 26
7.1 SOURCES OF SITE CHEMICALS 26
7.2 AFFECTED ENVIRONMENTAL MEDIA 26
7.3 CHEMICAL RELEASES AND TRANSPORT MECHANISMS 26
7.4 POTENTIALLY EXPOSED RECEPTORS 26
7.5 POTENTIALLY COMPLETE EXPOSURE PATHWAYS 26

8. ECOLOGICAL CONCEPTUAL EXPOSURE PATHWAY ANALYSIS 30
8.1 IDENTIFICATION OF EXPOSURE PATHWAYS 30
8.1.1 Direct Contact/Dermal Contact 30
8.1.2 Inhalation 31
8.1.3 Ingestion 31
8.1.4 Exposure to Subsurface Soil and Ground Water 32
8.1.5 Media of Concern 32
8.2 ASSESSMENT ENDPOINTS 32
8.3 SELECTION OF REPRESENTATIVE RECEPTORS 33
8.3.1 Aquatic Species 34
8.3.2 Terrestrial Species 35
8.3.3 Reptiles and Amphibians 37

9. REFERENCES 39

APPENDIX A: 1953 Aerial Photo
APPENDIX B: U.S. Geological Survey, Bogalusa East Quadrangle, Louisiana-Mississippi
APPENDIX C: Figure 7 from Site Inspection Report (15-Mile Surface Water Pathway Map)
APPENDIX D: Natural Resources Conservation Service, Web Soil Survey Map
APPENDIX E: Hydrogeologic Units in Louisiana
APPENDIX F: Sample Summary

LIST OF TABLES

Number	Title
1	Summary of Investigatory Samples Collected During the Site Inspection and Expanded Site Inspection Addendum
2	Summary of Treatment Area Sample Results
3	Summary of Reservoir Sample Results
4	Summary of Settling Pond Sample Results
5	Summary of Drying Area Sample Results
6	Summary of Lumber Piles Sample Results
7	Summary of Drainage Ditch Sediment Sample Results
8	Summary of Yellow Branch Sediment Sample Results
9	Summary of Surface Water Sample Results

LIST OF FIGURES

Number	Title
1	Site Location
2	Site Layout
3	Elevation Map
4	Arsenic in Sediment and Soil
5	Benz(a)anthracene in Sediment and Surface Soil
6	Benz(a)anthracene in Subsurface Soil
7	Benzo(a)pyrene in Sediment and Surface Soil
8	Benzo(a)pyrene in Subsurface Soil
9	Benzo(b)fluoranthene in Sediment and Surface soil
10	Benzo(b)fluoranthene in Subsurface Soil
11	Dibenzo(a,h)anthracene in Sediment and Surface Soil
12	Dibenzo(a,h)anthracene in Subsurface Soil
13	Indeno(1,2,3-cd)pyrene in Sediment and Surface Soil
14	Indeno(1,2,3-cd)pyrene in Subsurface Soil
15	Naphthalene in Sediment and Surface Soil
16	Naphthalene in Subsurface Soil
17	Preliminary Human Health Conceptual Site Model
18	Preliminary Ecological Conceptual Site Model

LIST OF ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AST	above-ground storage tank
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1986
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
COPC	chemicals of potential concern
CSM	conceptual site model
Dynamac	Dynamac Corporation
EA	EA Engineering, Science, and Technology, Inc., PBC
EPA	U.S. Environmental Protection Agency
ESI	Expanded Site Inspection
FS	Feasibility Study
HRS	Hazard Ranking System
LDEQ	Louisiana Department of Environmental Quality
LDWF	Louisiana Department of Wildlife and Fisheries
MSSL	Media-Specific Screening Level
NPL	National Priorities List
NRCS	U.S. Department of Agriculture, Natural Resource Conservation Service
PAH	polycyclic aromatic hydrocarbon
RECAP	Risk Evaluation/Corrective Action Program
RI	Remedial Investigation
RSL	Regional Screening Level
SARA	Superfund Amendments and Reauthorization Act of 1986
site	Colonial Creosote
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
USFWS	U.S. Fish and Wildlife Service

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1. INTRODUCTION

EA Engineering, Science, and Technology, Inc., PBC (EA) has been authorized by the U.S. Environmental Protection Agency (EPA), under Remedial Action Contract No. EP-W-06-004, Task Order 0141-RICO-A6Z7, to conduct a combined Remedial Investigation (RI) and Feasibility Study (FS) at the Colonial Creosote site (herein referred to as the site) located in Bogalusa, Louisiana. EA has prepared this Conceptual Site Model Technical Memorandum in accordance with: (1) specifications provided in the EPA Statement of Work, dated 28 April 2016 (EPA 2016a) and (2) the EPA-approved Work Plan dated 17 June 2016 (EA 2016).

1.1 PURPOSE

The purpose of this technical memorandum is to answer the principal study questions outlined below to the extent possible with the current dataset:

- What are the possible sources for contamination?
- What are the nature and extent of contamination?
- What are the potential migration pathways for transport of these contaminants?
- Are concentrations of site chemicals of potential concern (COPCs) significantly greater than background?
- What is the potential risk to human health and ecological receptors from exposure to site-related COPCs?

Principal study questions are used as a part of the data quality objectives process to ensure that the goal of the study has been met with defensible products and decisions (EPA 2006). The principal study questions listed above will be used in the development of the Sampling and Analysis Plan for the RI/FS.

1.2 SCOPE

The scope of this technical memorandum includes the following:

- Reviewing existing reports related to the site
- Compiling the available site datasets into a single cogent presentation
- Evaluating the site geology and hydrogeology, with definition of the various water-bearing zones
- Detailing the conceptual site model (CSM) that describes: (1) the source of contamination, (2) the nature and extent of contamination, (3) the primary migration

transport pathways, (4) likely human health and ecological exposure pathways, and (5) data gaps.

Information from the 2012 Site Inspection (Dynamac Corporation [Dynamac] 2012), the 2015 Expanded Site Inspection (ESI) Addendum (CSS-Dynamac 2015), the 2015 Hazard Ranking System (HRS) Documentation Record (EPA 2015), and additional documents, cited individually, were evaluated for this technical memorandum.

2. BACKGROUND

The site includes the property that was once used for operations of a creosote wood treatment plant (Figure 1). This section describes the history of the facility, provides a description of the site, and summarizes previous investigations that have been conducted at the site.

2.1 SITE HISTORY

The Colonial Creosoting Company, owned by American Creosote of Louisville, Kentucky, constructed a wood treatment plant on the site property in approximately 1911 (Dynamac 2012). Operations included bark removal, wood preserving, storage of materials (e.g., creosote), and storage of completed products (e.g., wood paving blocks, treated wood). The facility closed in 1953, and in March 1957, the property, including two office buildings but not the wood treatment plant, was sold to the owners of Lakeview Sand and Gravel Company, Inc. Removal of the wood treatment plant was intended by the Colonial Creosoting Company; however, records regarding the plant removal have not been located (Dynamac 2012).

In June 1988, Lakeview Sand and Gravel Company Inc. changed its name to Bogalusa Concrete to reflect the change in operations at the site from wood treatment to a batch concrete plant (Dynamac 2012). In July 1990, the title of the property was exchanged by Mr. Henderson (or his heirs) and Mr. Simmons with Associated Brokers for shares in Associated Brokers (Dynamac 2012). Bogalusa Concrete continued to operate at the site under a lease agreement with Associated Brokers until the concrete plant was abandoned in 2008 (Dynamac 2012). The property is currently still owned by Associated Brokers (Dynamac 2012).

2.2 SITE DESCRIPTION

The site is located in the southeast portion of Bogalusa, Washington Parish, Louisiana. The 32-acre facility property is bound on the west and northwest by a railroad spur for the Illinois Central Gulf Railroad and undeveloped land to the east and south (Figure 1). Residential communities are located between 0.2 to 0.5 miles to the east, south, and west of the site, and fisheries are located in downstream waters. The property is accessed from Hickory Avenue, whose west end abuts the northern corner of the property. The geographic coordinates measured approximately 500 feet north-northeast of the site's office building are latitude: 30° 46' 05" north and longitude: 89° 51' 50" west, Bogalusa East Quadrangle, Louisiana.

Most of the structural facilities associated with the former site operations have been removed. Remaining features onsite include the one vacant office building, one above-ground storage tank (AST), and a few partial structures associated with either the wood treatment facility, sand and gravel company, or concrete operations (Figure 2). Review of a 1953 aerial photo (Appendix A) and Sanborn maps, as discussed in the Site Inspection Report (Dynamac 2012), indicate that previously the following structures were on site:

- Two ASTs, each with a capacity of 160,000 gallons (as indicated above, one remains on site).

- Two steel treatment cylinders, each measuring 10 feet by 140 feet, located in the Treatment Area

- Various tramways that crossed the northeast portion of the facility property.

Review of the 1953 aerial photo and the Sanborn maps also provided the basis for the identification of the following areas of interest (Figure 2):

- Treatment Area
- Reservoir
- Settling Pond
- Drying Area
- Lumber Piles
- Common Drainage Ditch
- Yellow Branch Creek.

These areas of interest are further discussed in the sections below.

2.2.1 Treatment Area

The treatment area at one time contained two steel treatment cylinders for pressure treatment (Appendix A) as identified in the former structural features above. The cylinders were located in a concrete-bermed area. The concrete pit that was reported to have contained the pressure treatment vessels was backfilled with sand, soil, and gravel (Dynamac 2012).

2.2.2 Reservoir

The wood treatment facility contained a reservoir to hold water in the event of a fire onsite (Figure 2). This reservoir, which covered an area approximately 50 feet by 160 feet, has since been filled in. There is no evidence to indicate that the reservoir was lined or bermed. The area of the former reservoir now contains a vacant area with some metal debris.

2.2.3 Settling Pond

The wood treatment facility also contained a settling pond (Figure 2). The areal extent of the settling pond was approximately 200 feet by 50 feet. As for the reservoir, there is no evidence to indicate that the pond was lined or bermed. The pond is no longer visible and the area is now open with limited vegetation.

2.2.4 Drying Area

The use of the area between the settling pond, reservoir, and lumber piles (Figure 2) has been identified as a drying area for treated lumber (Dynamac 2012). Historical aerial photos and Sanborn maps indicate that this area included tracks, which were part of the tramway system that transported lumber to and from the treatment area and to the drying area.

2.2.5 Lumber Piles

The historical aerial photograph from 1953 depicts lumber piles on site (Appendix A). The stacks are not present in the 1959 aerial photograph, which is consistent with the estimated period when the wood treatment plant was removed (Dynamac 2012).

2.2.6 Common Drainage Ditch

A common drainage ditch that receives surface runoff and drainage from the facility is located along the eastern edge running downstream and eventually emptying into Yellow Branch Creek (Figure 2). A smaller drainage ditch runs along the western border of the site and connects with the common drainage ditch at the southern corner, north of Redwood Avenue. A small onsite drainage appears to run through the northeastern portion of the site around the former paving block mill and offsite down Long Avenue. These surface features are not visible on an elevation map with 2-foot contour spacing (Figure 3) or on a topographic map (Appendix B). The common drainage ditch, as presented on Figure 2, is based on figures from the Site Inspection Report (Dynamac 2012) and has not been field verified at this time.

Review of field photos provided in the Site Inspection Report (Dynamac 2012) suggest that the common drainage ditch is only a few feet in width with minimal water depth. The common drainage ditch may not contain surface water throughout the year.

2.2.7 Yellow Branch Creek

Surface runoff from the site eventually reaches the common drainage ditch (Figure 2). The common drainage ditch continues toward the western end of Redwood Avenue, where it continues southwest into the Yellow Branch Creek, a perennial surface water body. The Yellow Branch Creek flows to the southeast for 2.31 miles into the Dead River, which flows southeast for 0.86 miles into the Pearl River (Appendix C). Recreational and commercial fishing take place at these three waterbodies.

2.3 PREVIOUS INVESTIGATIONS

A number of site visits and other notable regulatory inspections occurred at the side prior to those conducted under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The 2012 Site Inspection and 2014 ESI Addendum were performed under the authority of CERCLA and SARA. The subsections below summarize the previous investigations at the site.

2.3.1 Prior to CERCLA- and SARA-Authorized Investigations

In March 1992, the Louisiana Department of Environmental Quality (LDEQ) Inactive and Abandoned Sites Division completed a Potential Hazardous Waste Site Primary Identification and Information form for the Colonial Creosote Company. The initial site visit was conducted on 2 February 1993. During interviews, the owner/operator indicated that the only remaining structures or former waste management units from Colonial Creosote Company operations were

two tanks (one used for water storage and the other with holes cut into the tank and unused); the pit for the pressure treating vessel that had been filled in with gravel approximately six years previously; and various office and storage buildings.

In April 1993, LDEQ completed a Phase I State Site Assessment report, recommending that the site proceed to a Phase II Site Assessment.

In November 1993, LDEQ inspectors conducted a preliminary site visit and collected four soil samples for on-site headspace analysis using an organic vapor monitor.

On 24 March 1994, sampling for the Phase II Site Assessment was conducted. Six soil samples were collected, including one sample located near and upgradient to the site entrance, one sample near the former pit, one sample near the tanks, and three samples in the drainage pathway from the site. Polycyclic aromatic hydrocarbon (PAH) concentrations exceeded EPA risk-based concentrations. It was therefore recommended that the site be transferred to the remedial section of LDEQ Inactive and Abandoned Sites Division for further evaluation and remediation.

No action was taken until July 1999, when a National Pollutant Discharge Elimination System Compliance Inspection was conducted for Bogalusa Concrete.

In August 1999, Bogalusa Concrete was notified that they needed to obtain a permit for the discharge of process water from their facility. The permit was received in June 2000 and reissued in July 2001.

Between 2002 and 2009, various divisions of LDEQ conducted numerous site visits, generally with no actions. A December 2004 visit from the LDEQ Stormwater Division identified that the facility needed an updated water quality permit, which was approved May 2006.

In August 2007, LDEQ responded to a complaint concerning runoff from the facility entering a highway ditch.

Site visits were conducted in December 2008 and June 2009, and the facility appeared to be inactive, which is consistent with the historical information that documented the facility's abandonment in 2008.

In April 2008, LDEQ completed a Hazardous Waste Site Cleanup Fund Prioritization System evaluation of the site.

On 12 August 2009, LDEQ requested that the facility provide a Site Investigation Work Plan to delineate the vertical and horizontal extent of potential contamination at the site. LDEQ files do not contain a response to this request.

On 10 March 2011, the Superfund Technical Assessment and Response Team conducted a reconnaissance visit of the site, accompanied by EPA and LDEQ personnel to assess current site conditions and to develop a sampling plan for future investigations at the site. A Preliminary Assessment report was submitted on 30 August 2011.

2.3.2 2012 Site Inspection

In 2012, Dynamac completed a Site Inspection at the site for EPA. Soil samples were collected from 14 locations from 0 to 2 feet below ground surface (bgs) to identify potential source material at the site. Surface water and sediment samples were collected from 10 locations to assess the potential migration of contamination in the surface water pathway. The sampling events took place on 20 and 21 March 2012.

Soil sampling was conducted within the following five regions: the former tramway tracks/settling pond, the railroad tie storage area, the general wood storage, the area north of the general wood storage, and the former fire water reservoir. A total of 15 samples, including 1 field duplicate, were collected and submitted for the analysis of Target Analyte List (TAL) metals (including mercury) and Target Compound List (TCL) semivolatile organic compounds (SVOCs).

Soil contamination was detected in numerous samples. In the five regions sampled, 1,1'-biphenyl, carbazole, dibenzofuran, and the following PAHs were detected at elevated concentrations: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, dibenz(a,h)anthracene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, 2-methylnapthalene, naphthalene, and pyrene. The estimated area of soil contamination was 5.87 acres. Discussion of the sample results is included in Section 4, Nature and Extent of Contamination.

Surface water and sediment sampling was conducted at six locations on the site, two in the drainage from the site to the receiving water body, and two in Yellow Branch Creek. A total of 11 surface water and 11 sediment samples, including 1 field duplicate for each matrix, were collected and submitted for the analysis of TAL metals (including mercury) and TCL SVOCs.

In the surface water samples, the only analyte detected at an elevated concentration was bis(2-ethylhexyl)phthalate in the sample collected at the probable point of surface water entry to the site.

Sediment samples collected along the on-site ditches that drain the site contained elevated concentrations of PAHs as also detected in source soil samples. These PAHs included benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, benz(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene. Elevated concentrations of di-n-octylphthalate were also detected in sediment samples. At the probable point of surface water entry, fluoranthene and pyrene were detected at elevated concentrations, indicating an observed release to the surface water migration pathway. Additional discussion of the sample results is included in Section 4, Nature and Extent of Contamination.

2.3.3 2014 Expanded Site Investigation Addendum

An ESI was conducted in December 2012 for EPA; however, the results are not included or discussed in this document. An ESI Addendum was conducted in May 2014 for EPA. The ESI

Addendum states, "due to the possibility of data of unknown quality collected during the ESI… samples were recollected [during the ESI Addendum] to ensure that data of known and documented quality would be used by EPA in their decision making process." Soil and sediment samples were recollected from on-site areas used for operation and waste disposal. Sediment samples were recollected on- and off-site to document if a release to wetlands has or is occurring. The ESI Addendum sampling event took place on 13 and 14 May 2014. Sample results were compared to Louisiana Risk Evaluation/Corrective Action Program (RECAP) 2003 standards and/or EPA Industrial Media-Specific Screening Levels (MSSLs).

Soil samples were collected from the following on-site locations: Treatment Area, Firewater Reservoir, Settling Pond, Drying Area, and Lumber Piles. These samples were collected from depth intervals between 0 and 16 feet bgs. A total of 33 soil samples, including background samples and field duplicates, were collected and submitted for the analysis of TCL SVOCs. Elevated concentrations of creosote-derived contaminants, including those above RECAP and/or MSSL levels, were observed in soil samples collected from the five locations. The following SVOCs were consistently detected at elevated concentrations: 1,1'-biphenyl, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, dibenzofuran, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, and naphthalene.

Sediment samples were collected from 11 locations along the common drainage ditch adjacent to, and downgradient of, the site, and Yellow Branch Creek, downstream from the probable point of entry. A total of 13 sediment samples, including background and field duplicates, were collected and submitted for the analysis of TCL SVOCs. Elevated concentrations of creosote-derived contaminants, including those above RECAP and/or MSSL risk levels, were observed in sediment samples from both the Common Drainage Ditch and Yellow Branch. The following SVOCs were consistently detected at elevated concentrations: acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)pyrene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene.

Of the contaminants detected on- and off-site, concentrations of the following SVOCs were detected above the RECAP and/or MSSL levels: 1,1-biphenyl, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, fluoranthene, fluorene, naphthalene, pyrene, and indeno(1,2,3-cd)pyrene.

2.3.4 2015 Hazard Ranking System Documentation Record

The results from the ESI Addendum were used by EPA to prepare a HRS Documentation Record for the site in 2015. The HRS is the principal mechanism that the EPA uses to place sites on the National Priorities List (NPL). The report documented the presence of contaminant source material in the common drainage ditch, treatment area, reservoir, settling pond, drying area, and lumber piles. Surface water migration pathways were documented to be of concern and the site score was 50. Any site scoring 28.5 or greater is eligible for the NPL.

2.3.5 2015 National Priorities List

The site was proposed for listing on the NPL on 16 March 2015 (Volume 80 Federal Register 15973) and was placed on the list effective 21 September 2015 (Volume 80 Federal Register 58623).

3. SITE CHARACTERISTICS

This preliminary site characterization summary will be revised as new information develops and details can be refined. The site characterization information currently known about the site is presented below.

3.1 SURFACE FEATURES

The site includes 32 acres of property. The terrain is relatively flat with forested areas located to the west, south, and east. Small bushes and trees are spread out across the former treatment facility area, with a road traveling diagonally across. Smaller gravel and dirt roads are located on the site. A discussion of anthropogenic features is included in Section 2.2.

3.2 DEMOGRAPHICS

The most recent census of Bogalusa, Louisiana was conducted by the U.S. Census Bureau in 2010. The population of Bogalusa at that time was 12,232, with 48.52 percent White and 48.45 percent Black or African American.

The U.S. Bureau Census Population Estimates Program produced estimates for the time period of 2010 to 2014 to reflect changes to the 2010 Census. The 2010 to 2014 estimate of households was 4,497 with an average size of 2.64 persons per household. The 2010 to 2014 per capita annual income was estimated to be $14,012, while the median household income was estimated to be $25,036 (U.S. Census 2015). The U.S. Bureau Census Population Estimates Program at the time also estimated that 35.6 percent of people in Bogalusa had an income below the poverty level.

3.3 METEOROLOGY AND CLIMATE

Historical meteorological data for Bogalusa are available from the Western Regional Climate Center, a partner with the National Oceanic and Atmospheric Administration. The average yearly precipitation is approximately 61 inches. The lowest temperature is observed in January, and the highest is observed in July. The average high temperature in January is 61 degrees Fahrenheit (°F) and the average low is 39°F, while the average high temperature in July is 92°F and the average low is 72°F (Western Regional Climate Center n.d.). The average relative humidity ranges between 60 percent in mid-afternoon to 90 percent at dawn (U.S. Department of Agriculture, Natural Resource Conservation Service [NRCS] 1997). During the summer, the sun shines approximately 70 percent of the time, while in winter the sun shines approximately 50 percent of the time (NRCS 1997). The climate of the site is classified as humid subtropical based on the Köppen-Geiger climate classification system.

3.4 LAND USE

Agriculture remains an important part of Washington Parish's economy, in addition to the production of timber and timber products. The land use in Washington Parish is primarily agricultural; 67 percent of the parish was used as woodland in 1985, with the remaining as

cropland, pasture, and areas of wetland (NRCS 1997). The major crops of Washington Parish include corn, soybeans, and wheat, with a limited extent of grain sorghum and oats.

The site is located within an industrial area of Bogalusa that is surrounded by residential and commercial areas (Figure 2). The former facility property is not currently being used for any activity. The area immediately south and west of the site is vegetated with mixed forest. To the east is a buffer of forests and fields that separate the site from residential neighborhoods. The closest residence is approximately 300 feet from the former facility boundary. To the north are railroad tracks and other industrial properties, including a paper mill and aggregate and wood storage areas.

3.5 SOILS

The information in this section was gathered from the Web Soil Survey (NRCS 2016a, 2016b), results of which are presented on a map in Appendix D. Three soil types have been identified at the site. The majority of the site underlying the area of former Colonial Creosote Company activities is Latonia fine sandy loam. The southwestern portion of the site is dominantly Myatt fine sandy loam. Minor portions of the site are Prentiss fine sandy loam.

3.5.1 Latonia Fine Sandy Loam

The northern half of the site is mostly made up of Latonia fine sandy loam, a deep, well drained, nearly level sandy loam with low fertility and low shrink-swell potential. A typical soil profile includes 4 inches of grayish brown fine sandy loam, underlain by 30 inches of yellowish brown sandy loam in the upper and middle parts and brownish yellow, mottled loamy sand in the lower part. From 34 to 60 inches is light gray, mottled sand.

3.5.2 Myatt Fine Sandy Loam

The southern half of the site is comprised mostly of Myatt fine sandy loam, a very deep, poorly drained, level sandy loam with low fertility and low shrink-swell potential. A typical soil profile includes 6 inches of dark gray fine sandy loam, underlain by 6 inches of gray mottled sandy loam. From 12 to 50 inches is gray, mottled sandy clay loam in the upper middle and mottled gray, light yellowish brown, and strong brown sandy clay loam in the lower part. From here to a depth of about 65 inches is gray, mottled sandy clay loam. Areas of Myatt fine sandy loam identified as “My” soils are frequently flooded for brief periods.

3.5.3 Prentiss Fine Sandy Loam

The lower part of the southern half of the site consists of Prentiss fine sandy loam, a deep, moderately well drained, level sandy loam with low fertility and low shrink-swell potential. A typical soil profile includes 6 inches of dark grayish brown fine sandy loam, underlain by 23 inches of yellowish brown, mottled sandy loam and loam. From here to a depth of about 62 inches is a fragipan, which is mottled yellowish brown, pale brown, light brownish gray, and strong brown loam in the upper part and is mottled yellowish brown, light gray, strong brown, and light yellowish brown sandy loam in the lower part. The fragipan limits the rooting depth and available water capacity.

3.6 SURFACE WATER

The Common Drainage Ditch, an ephemeral stream only a few feet wide, passes along the southern boundary of the former facility property. It drains to Yellow Branch Creek to the south and east, a freshwater perennial stream that is part of the Lower Pearl Watershed. Yellow Branch Creek flows to the southeast for 2.31 miles into Dead River, which flows southeast for 0.86 miles into the Pearl River. The Pearl River flows south towards the Gulf of Mexico and forms a portion of the boundary between the states of Louisiana and Mississippi.

Average flow rates for the Yellow Branch Creek and Dead River could not be located. The HRS documentation reports the Yellow Branch as a small to moderate stream (greater than 10 to 100 cubic feet per second) and the Dead River as a moderate to large stream (greater than 100 to 1,000 cubic feet per second) (EPA 2015). On 26 August 2016, the gauge height at station number 02489500 on the Pearl River near Bogalusa as 10.91 feet with a reported discharge of 5,280 cubic feet per second (U.S. Geological Survey 2016).

3.7 GEOLOGY AND HYDROGEOLOGY

Due to the fact that limited site-specific subsurface geologic data has been collected, the information included in this section is based on regional geology and will be refined when additional information becomes available.

3.7.1 Southern Hills Regional Aquifer System

The site is underlain by the Southern Hills Regional Aquifer System. The Southern Hills Regional Aquifer System extends throughout southeastern Louisiana including the entirety of ten parishes. The aquifer system also includes parts of southwestern Mississippi, all of ten counties and portions of four others. The Southern Hills Regional Aquifer System is designated by EPA as a sole-source aquifer. The EPA defines a sole-source aquifer as an underground water source that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas have no alternative drinking water source(s) that could physically, legally, and economically supply those who depend upon the aquifer for drinking water (EPA 2016b).

The Southern Hills Regional Aquifer System includes complexly interbedded sand, silt, and clay strata that dip and thicken towards the Gulf of Mexico. The recharge area includes counties in Mississippi and the northern parishes in Louisiana, including the entirety of Washington Parish. As many as 13 interdependent aquifer units that are known to coalesce or pinch out northward into fewer units have been identified (Buono 1983). The three major aquifer systems that compose the Southern Hills Regional Aquifer System are the Chicot Equivalent, Evangeline Equivalent, and Jasper Equivalent aquifer systems. The hydrogeologic units of Louisiana are presented in Appendix E.

3.7.2 Ground Water Withdrawals

In 2012, ground water withdrawals from the entire Southern Hills Aquifer System reached 320 million gallons per day. In Washington Parish, the withdrawal was 28 million gallons per day and primarily from the Jasper Equivalent Aquifer System (Louisiana Ground Water

Resources Commission 2012). Of the total withdrawals from ground water in Washington Parish, 14.26 million gallons per day are for public water supply and 12.35 million gallons per day are for industrial use (Sargent 2012). The majority of the public water supplier withdrawals are from the Bogalusa Water System, 12.11 million gallons per day (Sargent 2012). The majority of the industrial use is for paper products, 11.50 million gallons per day, (Sargent 2012).

3.8 ECOLOGICAL SETTING

The site is located in the Southern Pine Plains and Hills ecoregion on the Southeastern Plain (Daigle et al. 2006). The Southeastern Plain is made up of irregular plains, which are mostly tree-covered with a combination of cropland, pasture, woodland, and forest land cover. The Southern Pine Plains and Hills ecoregion covers what was historically rolling longleaf pine woodlands, encompassing creek and river bottoms with mixed loblolly pine-hardwood forests. Almost all of these longleaf pine forests have been replaced by mixed forests of recent incidental origin and slash and loblolly pine plantations. Other vegetation includes southern red oak, post oak, mockernut hickory, flowering dogwood, and some southern floodplain forest with cypress-gum swamp and bottomland hardwoods. The coastal plains of this ecoregion are moderately to deeply dissected by streams with low rolling hills and broad gently sloping ridges. Some cattle, horse, and hay ranches populate the ecoregion, as well as some poultry and dairy production (Griffith et al. 2006).

The southern half of the site is vegetated with mixed forest, while the northern half of the site consists of industrial areas that are partly overgrown by herbaceous and plant shrub-scrub communities. Aerial photos indicate that the site is crossed by gravel and compacted dirt roads that fragment existing habitat.

3.9 WETLANDS

The location of the probable point of entry of surface water drainage from the site into the Yellow Branch Creek is located in wetlands as designated by the National Wetlands Inventory maps. Emergent and forested wetlands that meet the definition of 40 Code of Federal Regulations Part 230.3 extend 1,500 feet from the probable point of entry to Yellow Branch Creek. Wetlands are also present surrounding Dead River and Pearl River. An estimated 29.7 miles of wetland frontage exist along the probable point of entry surface water flow pathway. There are over 10,000 acres of wetlands within a four-mile radius of the site, including 58 acres within 0.25 miles of the site and an additional 146 acres within 1 mile of the site.

3.10 THREATENED AND ENDANGERED SPECIES

Information regarding rare, threatened, and endangered species is from the U.S. Fish and Wildlife Service (USFWS) Environmental Conservation Online System (USFWS n.d.) and the State of Louisiana Department of Wildlife and Fisheries (LDWF) (LDWF n.d.).

There are 54 rare plant species that may be found in Washington Parish. The Louisiana quillwort (*Isoetes louisianesis*) is federally listed as endangered (USFWS n.d.). None of the

other plant species are listed as endangered or threatened by the State of Louisiana or the federal government.

There are 33 rare animals that may be found within Washington Parish. Three of these are federally listed as endangered: Gulf sturgeon (*Acipenser oxyrinchus desotoi*), ringed map turtle (*Graptemys oculifera*), and gopher tortoise (*Gopherus polyphemus*). Only the gopher tortoise population west of the Mobile and Tombigbee Rivers, which are located in Mississippi and Alabama, are under USFWS protection as a threatened species. The Alabama shad (*Alosa alabamae*), pearl darter (*Percina aurora*), and black pine snake (*Pituophis melanoleucus lodingi*) are candidate species for protection as endangered or threatened species. Currently, there is a restriction on the harvest of alligator snapping turtles (*Macrochelys temminckii*), and a ban on the harvest and possession of Gulf Coast mud salamanders (*Pseudotriton montanus*) and southern red salamanders (*Pseudotriton ruber*). The Louisiana black bear (*Ursus americanus luteolus*) had previously been on the Federal List of Endangered and Threatened Wildlife, but was removed from the list in March 2016 and is currently in recovery.

4. NATURE AND EXTENT OF CONTAMINATION

The following subsections regarding nature and extent of contamination include: (1) comparison criteria, (2) a discussion of historical data, (3) an identification of COPCs, (4) a discussion of potential source materials, and (5) an evaluation of nature and extent of contaminants based on existing data.

Data used in this nature and extent of contamination section are from the following sources:

- Site Inspection, Colonial Creosote, Hickory Avenue, Bogalusa, Washington Parish, Louisiana (Dynamac 2012)
- ESI Addendum for Colonial Creosote Bogalusa, Washington Parish, Louisiana (CSS-Dynamac 2015).

Generally, historical data are suitable for either: (1) qualitatively evaluating the nature and extent of contamination; or (2) definitively evaluating potential risk to human health and ecological receptors. Data quality assessment includes among other things, determining if data validation was performed, if samples were handled properly, if the sample location information is available, and if chain-of-custody records are available. Data were included in this report if a sample location and documentation of chain-of-custody records were available. Global Positioning System sample locations were available for both the Site Inspection and ESI Addendum investigations.

Table 1 includes in summary the number of samples separated media type, depth interval, and analysis. Appendix F includes a complete list of samples included in this report.

Table 1. Summary of Investigatory Samples Collected During the Site Inspection and Expanded Site Inspection Addendum

Matrix	Depth	Number of Samples per Analyte	
		SVOCs	Metals
Soil	0 to 2 feet	15	14
	2 to 4 feet	5	--
	3 to 5 feet	1	--
	4 to 6 feet	5	--
	6 to 8 feet	4	--
	8 to 9 feet	1	--
	8 to 10 feet	6	--
	10 to 11 feet	1	--
	10 to 12 feet	2	--
	12 to 14 feet	1	--
	14 to 15 feet	1	--
	14 to 16 feet	2	--
Sediment	0 to 6 inches	21	10
Surface Water	Not applicable	10	10

4.1 COMPARISON CRITERIA

To provide a basis for evaluating existing chemical concentration data, human health risk levels were identified as protective comparison values for chemical concentrations. Screening levels are based on conservative estimates of exposure and do not represent cleanup levels. Screening level exceedances do not automatically designate an area as contaminated nor do they trigger a response action. Rather, screening level exceedances suggest that further evaluation of the potential risks posed by site contamination is appropriate. The magnitude of exceedance is helpful in evaluating source areas, the nature and extent of contamination, and migration pathways.

EPA screening levels are based on an excess lifetime carcinogenic risk of 1 in 1,000,000 individuals (1×10^{-6}) or a non-carcinogenic hazard quotient of 0.1, unless otherwise indicated.

4.1.1 Soil and Sediment

Soil and sediment concentrations were compared to EPA Human Health Regional Screening Levels (RSLs) for residential soil (EPA 2016c). Although the EPA RSLs for residential soil were not specifically developed for exposure to sediment, these screening levels were used to provide a consistent basis for comparison.

4.1.2 Surface Water

Surface water concentrations were compared to the National Ambient Water Quality Criteria for Human Health Criteria for Consumption of Water and Organism (EPA 2016d), protective of human health.

4.2 CHEMICALS OF POTENTIAL CONCERN

Chemicals that were consistently detected above screening levels in soil, sediment, or surface water are considered COPCs for this site. Arsenic and the PAHs benz(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and naphthalene have been selected as the primary COPCs at this time. These chemicals are the most prevalent (in terms of screening level exceedance and magnitude), generally are co-located with other COPCs, and/or are likely to be present at the site. Other COPCs identified in the HRS report include 1,1'-biphenyl, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo(g,h,i)perylene, benzo(k)fluoranthene, carbazole, chrysene, fluoranthene, fluorene, phenanthrene, and pyrene.

A thorough understanding of the impacts from these primary COPCs across the site will provide a reliable picture of COPC distribution as known at this time. The list of COPCs will be refined as the investigation progresses, which may result in the identification of additional COPCs.

4.3 SOURCE

Source material is a media that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration to other media or for direct exposure

(EPA 1991). The EPA identifies source material as either a principal threat waste or a low-level threat waste.

- **Principal Threat Wastes** – Source materials that are considered highly toxic or highly mobile and that generally cannot be reliably contained or would present a significant risk to human health or the environment if exposure were to occur.

- **Low-level Threat Wastes** – Source materials that exhibit low toxicity and low mobility and can be reliably contained or would present only a low risk to human health or the environment if exposure were to occur.

Potential sources have not been adequately characterized to define their status as principal or low-level threat wastes. Waste status at the site will be determined after further investigation.

4.4 EXTENT OF CONTAMINATION

Data were reviewed in order to describe the nature and extent of contamination to soil, sediment, and surface water (EPA 1989a). Chemical concentrations are incorporated with physical characteristics, historical information regarding site activities, and other evidence to evaluate the nature and magnitude of contamination. Similar evidence is used to delineate the extent of contamination both horizontally and vertically.

No ground water, air, or tissue samples have been collected at this site. During the RI/FS, a determination will be made whether or not these media types should be sampled. Because soil protection of ground water screening criteria have been exceeded for a number of analytes, the collection of ground water samples during the RI/FS is recommended.

4.4.1 Soil

Discussions of the greatest contaminant impacts are included below. Figures 4 through 16 present a summary of the data.

Treatment Area

No surface samples have been collected in the Treatment Area. Two soil borings, with a total of four subsurface soil samples indicate the presence s of SVOCs. Benzo(a)pyrene, naphthalene, benz(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and dibenzofuran results exceed their respective screening levels more than 1,000 times. The table below provides a summary of Treatment Area samples with results from the analytes with the four highest magnitudes of exceedance. Elevated concentrations are likely associated with former wood treatment processes that were conducted in the area. Results indicate that the contamination has migrated into subsurface soils. The extent of horizontal and vertical delineation of contamination is currently unknown.

Table 2 summarizes results for samples for the analytes with the four highest magnitudes of exceedance.

Table 2. Summary of Treatment Area Sample Results

Sample Location	Depth bgs (feet)	Benzo(a)pyrene (RSL of 0.016 mg/kg)	Naphthalene (RSL of 3.8 mg/kg)	Benz(a)anthracene (RSL of 0.16 mg/kg)	Benzo(b)fluoranthene (RSL of 0.16 mg/kg)
A6Z9-026	4-6	246	32,200	684	301
A6Z9-027	6-8	949	111,000	2,960	1,220
A6Z9-027	8-10	87.3	3,000	223	108
A6Z9-026	8-10	30.7	2,090	84.3	34.5

Note:
bgs – below ground surface
EPA – U.S. Environmental Protection Agency
mg/kg – milligram(s) per kilogram
RSL – 2016 EPA Human Health Regional Screening Level for Residential Soil

Reservoir

One surface soil sample and three soil borings (six subsurface soil samples) have been collected at the reservoir area. Benzo(a)pyrene is the only analyte that exceeds the screening criteria by more than 100 times. Benz(a)anthracene, dibenz(a,h)anthracene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and naphthalene results exceed their respective screening levels more than 10 times. The table below provides a summary of samples with results from the analytes with the four highest magnitudes of exceedance. Elevated concentrations may be associated with residual contamination left in the bottom of the former reservoir that has since been filled in as suggested by results from sample location A6Z9-049. It is unknown if the elevated concentrations observed in the sample from 6-8 feet bgs are constrained in a limited area or are laterally continuous.

Table 3 summarizes results for samples for the analytes with the four highest magnitudes of exceedance.

Table 3. Summary of Reservoir Sample Results

Sample Location	Depth bgs (feet)	Benzo(a)pyrene (RSL of 0.016 mg/kg)	Benz(a)anthracene (RSL of 0.16 mg/kg)	Dibenz(a,h)anthracene (RSL of 0.016 mg/kg)	Benzo(b)fluoranthene (RSL of 0.16 mg/kg)
A6Z9-013	0-2	3.2	3.3	0.83	5.3
A6Z9-029	3-5	ND	ND	ND	0.136
A6Z9-029	8-10	ND	ND	ND	ND
A6Z9-030	2-4	3.24	1.65	0.674	6.3
A6Z9-030	4-6	ND	ND	ND	ND
A6Z9-049	6-8	6.18	10.7	ND	7.24
A6Z9-049	8-10	ND	ND	ND	ND

Note:
bgs – below ground surface
EPA – U.S. Environmental Protection Agency
mg/kg – milligram(s) per kilogram
ND – nondetectable, sample result below detection limit
RSL – 2016 EPA Human Health Regional Screening Level for Residential Soil

Settling Pond

No surface samples have been collected from the surface of the former settling pond. Two soil borings (four subsurface soil samples) have been collected from this area. Benzo(a)pyrene and benz(a)anthracene results exceed the screening criteria by more than 1,000 times. Benzo(b)fluoranthene, dibenz(a,h)anthracene, naphthalene, and indeno(1,2,3-cd)pyrene results exceed their respective screening levels more than 100 times. The table below provides a summary of samples with results from the analytes with the four highest magnitudes of exceedance. Elevated concentrations may be associated with residual contamination left in the bottom of the former settling that has since been filled. Concentrations appear to decrease with depth; however the deepest samples collected have concentrations above screening criteria.

Table 4 summarizes results for samples for the analytes with the four highest magnitudes of exceedance.

Table 4. Summary of Settling Pond Sample Results

Sample Location	Depth bgs (feet)	Benzo(a)pyrene (RSL of 0.016 mg/kg)	Benz(a)anthracene (RSL of 0.16 mg/kg)	Benzo(b)fluoranthene (RSL of 0.16 mg/kg)	Dibenz(a,h)anthracene (RSL of 0.016 mg/kg)
A6Z9-031	4-6	75.9	179	91	7.73
A6Z9-031	8-10	16.4	36.9	21.1	1.48 J
A6Z9-032	10-11	7.46	19.3	9.98	0.485
A6Z9-032	14-16	3.63	9.55	4.94	0.251

Note:
bgs – below ground surface
EPA – U.S. Environmental Protection Agency
mg/kg – milligram(s) per kilogram
RSL – 2016 EPA Human Health Regional Screening Level for Residential Soil

Drying Area

Four surface soil samples and two soil borings (four subsurface soil samples) have been collected from the Drying Area. Benzo(a)pyrene and benz(a)anthracene results exceed the screening criteria by more than 100 times. Dibenz(a,h)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene results exceed their respective screening levels more than 10 times. The table below provides a summary of samples with results from the analytes with the four highest magnitudes of exceedance. Elevated concentrations may be associated with residual contamination left behind after the area was used to dry treated wood. Impacts may be associated with runoff, but additional information is needed to characterize the nature and extent of contamination.

Table 5 summarizes results for samples for the analytes with the four highest magnitudes of exceedance.

Table 5. Summary of Drying Area Sample Results

Sample Location	Depth bgs (feet)	Benzo(a)pyrene (RSL of 0.016 mg/kg)	Benz(a)anthracene (RSL of 0.16 mg/kg)	Dibenz(a,h)anthracene (RSL of 0.016 mg/kg)	Benzo(b)fluoranthene (RSL of 0.16 mg/kg)
A6Z9-001	0-2	0.22	0.19 LJ	ND	0.34
A6Z9-002	0-2	6.6	5.7	1.5	8.8
A6Z9-003	0-2	0.37	0.26	0.09 LJ	0.49
A6Z9-004	0-2	0.28	0.25 J	0.079 LJ	0.31
A6Z9-034	8-9	11.1	25.1	1.29 J	14.1
A6Z9-034	10-12	2.74	5.77	0.262	2.9
A6Z9-035	4-6	0.118	ND	ND	0.225
A6Z9-035	14-15	ND	ND	ND	ND

Note:
bgs – below ground surface
EPA – U.S. Environmental Protection Agency
mg/kg – milligram(s) per kilogram
ND – nondetectable, sample result below detection limit
RSL – EPA Human Health Regional Screening Level for Residential Soil

Lumber Piles

Nine surface soil samples and two soil borings (two subsurface soil samples) have been collected from the area that once stored lumber piles (includes the area identified in the ESI Addendum as the railroad tie piles). Benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene results exceed the screening criteria by more than 100 times. Indeno(1,2,3-cd)pyrene, benz(a)anthracene, arsenic, and benzo(k)fluoranthene results exceed their respective screening levels more than 10 times. For arsenic, exceedances of the screening criteria ranged from approximately 5 to 50 times, with higher concentrations observed in the samples collected from the western portion. It should be noted that none of the subsurface samples were analyzed for metals; therefore the nature and extent of metals contamination from all of the areas requires delineation.

Of these four locations, only the northern-most sample had elevated concentrations of benz(a)anthracene and indeno(1,2,3-cd)pyrene. The sample collected north of the Lumber Piles area also had elevated concentrations of benz(a)anthracene and indeno(1,2,3-cd)pyrene. Therefore, concentrations of benz(a)anthracene and indeno(1,2,3-cd)pyrene seem to be localized to the northern part of the Lumber Piles area.

Concentrations of benzo(a)pyrene and benzo(b)fluoranthene were highest in the surface soil samples collected from the northern part of the Lumber Piles area. The surface soil samples collected to the east and south did not contain elevated levels of benzo(a)pyrene and benzo(b)fluoranthene.

Table 6 summarizes results for samples for the analytes with the four highest magnitudes of exceedance.

Table 6. Summary of Lumber Piles Sample Results

Sample Location	Depth bgs (feet)	Benzo(a)pyrene (RSL of 0.016 mg/kg)	Benzo(b)fluoranthene (RSL of 0.16 mg/kg)	Dibenz(a,h)anthracene (RSL of 0.016 mg/kg)	Indeno(1,2,3-cd)pyrene (RSL of 0.16 mg/kg)
A6Z9-005	0-2	ND	ND	ND	ND
A6Z9-006	0-2	ND	0.079 LJ	ND	ND
A6Z9-007	0-2	ND	ND	ND	ND
A6Z9-008	0-2	0.66	0.76	ND	0.23 LJ
A6Z9-009	0-2	5.1	8.2	1.4	3.4
A6Z9-010	0-2	ND	ND	ND	ND
A6Z9-011	0-2	0.24	0.32	ND	0.13 LJ
A6Z9-012	0-2	ND	ND	ND	ND
A6Z9-014	0-2	5.3	8.5	1.7	3.2
A6Z9-037	2-4	0.84	2.08	0.162	0.645
A6Z9-038	2-4	18.9	41.6	2.4	14.5

Note:
bgs – below ground surface
EPA – U.S. Environmental Protection Agency
mg/kg – milligram(s) per kilogram
ND – nondetectable, sample result below detection limit
RSL – 2016 EPA Human Health Regional Screening Level for Residential Soil

4.4.2 Sediment

Discussions of the greatest contaminant impacts are included below. Figures 4, 5, 7, 9, 11, 13, and 15 present a summary of the data.

Common Drainage Ditch

Seventeen sediment samples were collected from the common drainage ditch and site drainage ditches. The results of these samples are discussed in this subsection. Benzo(a)pyrene, dibenz(a,h)anthracene, and benzo(b)fluoranthene results exceed the screening criteria by more than 100 times. Indeno(1,2,3-cd)pyrene, arsenic, and benz(a)anthracene results exceed their respective screening levels more than 10 times.

Concentrations of PAHs in sediment decrease towards the Yellow Branch, as further discussed in the subsection below.

Table 7 summarizes samples results for the analytes with the four highest magnitudes of exceedance.

Table 7. Summary of Drainage Ditch Sediment Sample Results

Sample Location	Depth bgs (inches)	Benzo(a)pyrene (RSL of 0.016 mg/kg)	Dibenz(a,h)anthracene (RSL of 0.016 mg/kg)	Benzo(b)fluoranthene (RSL of 0.16 mg/kg)	Indeno(1,2,3-cd)pyrene (RSL of 0.16 mg/kg)
A6Z9-015	0-6	1.5	0.31	2.3	0.91
A6Z9-016	0-6	1.5	0.35	2	1.1
A6Z9-017	0-6	0.5	0.11 LJ	0.78	0.31
A6Z9-018	0-6	0.97	0.25 LJ	1.1	0.64
A6Z9-019	0-6	0.9	0.18 LJ	1.2	0.51
A6Z9-020	0-6	0.24	ND	0.36	0.16 LJ
A6Z9-021	0-6	ND	ND	0.12 LJ	ND
A6Z9-022	0-6	0.33	ND	0.51	0.22 LJ
A6Z9-041	0-6	ND	ND	0.156	ND
A6Z9-042	0-6	4.43	0.887	5.5	4.4
A6Z9-043	0-6	4.57	0.615	8.38	3.28
A6Z9-044	0-6	3.52	0.575	5.36	3.18
A6Z9-020	0-6	2.56	0.279	4.93	1.21
A6Z9-050	0-6	11.4	1.62	18.2	11.9
A6Z9-051	0-6	11.4	1.85	16.2	10.3
A6Z9-052	0-6	4.47	0.504	7.79	2.4
A6Z9-053	0-6	2.93	0.306	4.92	1.3

Note:
bgs – below ground surface
EPA – U.S. Environmental Protection Agency
mg/kg – milligram(s) per kilogram
ND – nondetectable, sample result below detection limit
RSL – 2016 EPA Human Health Regional Screening Level for Residential Soil

Yellow Branch

Two locations were sampled in the Yellow Branch Creek, once during the SI and once during the ESI Addendum. Benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and benz(a)anthracnene results in sediment collected in 2015 from the probable point of entry contained concentrations more than ten times the respective screening criteria.

Table 8 summarizes samples results for the analytes with the four highest magnitudes of exceedance.

Table 8. Summary of Yellow Branch Sediment Sample Results

Sample Location	Depth bgs (inches)	Benzo(a)pyrene (RSL of 0.016 mg/kg)	Benzo(b)fluoranthene (RSL of 0.16 mg/kg)	Dibenz(a,h)anthracene (RSL of 0.016 mg/kg)	Benz(a)anthracene (RSL of 0.16 mg/kg)
2012 Site Inspection					
A6Z9-023	0-6	ND	ND	--	ND
A6Z9-024	0-6	0.13 LJ	0.17 LJ	--	0.13 LJ
2015 Expanded Site Inspection Addendum					
A6Z9-023	0-6	ND	ND	ND	ND
A6Z9-024	0-6	1.78	2.83	0.196	1.69

Note:
-- Data unavailable
bgs – below ground surface
EPA – U.S. Environmental Protection Agency
mg/kg – milligram(s) per kilogram
ND – nondetectable, sample result below detection limit
RSL – 2016 EPA Human Health Regional Screening Level for Residential Soil

4.4.3 Surface Water

Ten surface water samples were collected during the SI from the drainage ditches and Yellow Branch Creek. Arsenic, manganese, and bis(2-ethylhexyl)phthalate were the only analytes detected above screening criteria. Table 9 summarizes results of analytes that exceed screening criteria. It should be noted that metals can be associated with turbid samples and the elevated concentrations may not be an indication of dissolved concentration levels.

Table 9. Summary of Surface Water Sample Results

Sample Location	Arsenic (NAWQ of 0.018 µg/L)	Manganese (NAWQ of 50 µg/L)	Bis(2-ethylhexyl)phthalate (NAWQ of 0.32 µg/L)
A6Z9-015	52.3	2,400	25
A6Z9-016	3	ND	ND
A6Z9-017	3.7	ND	ND
A6Z9-018	2.1	496	ND
A6Z9-019	7.9	1,100	ND
A6Z9-020	15.2	6,370	ND
A6Z9-021	7.3	1,440	ND
A6Z9-022	50.6	13,800	ND
A6Z9-023	15	238	ND
A6Z9-024	1.8	82.5	ND

Note:
µg/L – microgram per liter
NAWQ – National Ambient Water Quality Criteria – Consumption of Water and Organism
ND – nondetectable, sample result below detection limit

5. CONTAMINANT FATE AND TRANSPORT

The nature and extent of contamination is combined with source identification and physical characteristic information to evaluate migration pathways. The following migration pathways are or may be present and further site evaluation will be necessary to definitively conclude those that may be present.

5.1.1 Surface Water Transport

As surface water moves across the site either through drainage pathways or during flood events, surface water contact with source materials may transport contaminants.

5.1.2 Leaching to Ground Water

As water percolates through vadose zone soil to the underlying ground water, it may carry dissolved phase constituents. Additionally, source material in contact with ground water may leach directly to ground water.

5.1.3 Ground Water Transport

As ground water migrates laterally through the saturated zone, it may carry dissolved phase constituents.

5.1.4 Ground Water to Surface Water

Ground water may emanate as surface water at various points (e.g., gaining streams) around the site.

5.1.5 Air Particulate Migration

Generally soil is not considered mobile because ground cover or vegetation often precludes migration. However, a portion of the site contains no or very limited vegetation. It may be possible for high wind events to carry fine-grained surface materials and particulates from source areas.

5.1.6 Soil Vapor to Air

Volatile organic compounds in soil may migrate from the soil to ambient air, where they may then be transported in the atmosphere.

6. DATA GAPS

The site has not been fully characterized to the extent necessary to adequately evaluate potential risks to human health and the environment. The nature of impacted media contains many data gaps including the presence or absence of volatile organic compounds, polychlorinated biphenyls, polychlorinated dibenzo-p-dioxins, and polychlorinated dibenzofurans. The extent of contamination at the site requires further delineation for SVOCs and metals in many areas. Therefore, additional investigatory activities are necessary in order to delineate the source areas and the lateral and vertical extent of contamination.

7. HUMAN HEALTH CONCEPTUAL EXPOSURE PATHWAY ANALYSIS

This section presents the preliminary human health CSM and summarizes information on sources of site chemicals, affected environmental media, chemical release and transport mechanisms, potentially exposed receptors, and potentially complete exposure pathways for each receptor. Figure 17 presents the preliminary CSM.

7.1 SOURCES OF SITE CHEMICALS

Section 4 summarizes the nature and extent of contamination at the site. As shown in Figure 17, media of concern that may contain sources for chemical exposure may include surface soil, subsurface soil, sediment, surface water, ground water, and air. Residual soil source areas are a result of historical site activities. The identification and characterization of residual source areas are a potential data gap that may be filled by future investigatory activities.

7.2 AFFECTED ENVIRONMENTAL MEDIA

Residual soil source area(s) may have resulted in chemical releases to soil (e.g., vadose zone), sediment, surface water, ground water, and air. Further information regarding chemical releases is a potential data gap that may be filled by future investigatory activities.

7.3 CHEMICAL RELEASES AND TRANSPORT MECHANISMS

Figure 17 summarizes the chemical release and transport mechanisms for the detected chemicals.

7.4 POTENTIALLY EXPOSED RECEPTORS

The site is located in an industrial area and is surrounded by a mix of residential and commercial/industrial land use. Commercial/industrial workers are therefore considered potential receptors under current and future use scenarios. Trespassers may access the site at any time and have also been identified as potential receptors under current and future use scenarios. Redevelopment of the site would likely require excavation, construction, and/or regrading activities. Given the site's location in an area of mixed industrial/residential use, it is possible that future redevelopment of the site may include residential use. Therefore, construction workers and residents have been identified as potential future receptors at the site.

7.5 POTENTIALLY COMPLETE EXPOSURE PATHWAYS

According to EPA guidance (1989b), a complete exposure pathway consists of four elements:

- A source and mechanism of chemical release;
- A retention or transport medium (or media in cases involving transfer of chemicals);
- A point of potential human contact with the contaminated medium (referred to as the "exposure point"); and

- An exposure route (such as ingestion) at the exposure point.

If any of these elements are missing, then the exposure pathway is considered incomplete. For example, if receptor contact with the source or transport medium does not occur, then the exposure pathway is considered incomplete and is not quantitatively evaluated. Similarly, if human contact with an exposure medium is not possible, the exposure pathway is considered incomplete and is not evaluated.

The preliminary human health CSM (Figure 17) summarizes information on sources of COPCs, affected environmental media, COPC release and transport mechanisms, potentially exposed receptors, and potential exposure pathways for each receptor. Potentially complete exposure pathways are designated by a "C" in the preliminary CSM. Incomplete exposure pathways are designated by an "I." Because some of these pathways are based on hypothetical-future exposure, they are considered potentially complete, but may not actually be complete for receptors in the future.

Exposure routes for each receptor associated with the potentially complete exposure pathways are described in the following sections for the following potential receptors:

- Commercial/Industrial Worker
- Construction Worker
- Trespasser
- Resident.

Commercial/Industrial Worker Exposure

The following exposure pathways for surface soil are potentially complete for the commercial/industrial worker scenario:

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of chemicals adsorbed to windblown soils released to outdoor air
- Inhalation of chemicals volatilized from soil to outdoor air.

The following exposure pathways for subsurface soil are potentially complete for the commercial/industrial worker scenario:

- Inhalation of chemicals volatilized from soil to outdoor air
- Inhalation of indoor air vapors from soil vapor intrusion.

The following exposure pathways for surface water and sediment are potentially complete for the commercial/industrial worker scenario:

- Incidental ingestion of sediment and surface water in the common drainage ditch and wetland areas

- Dermal contact with sediment and surface water in the common drainage ditch and wetland areas.

The following exposure pathways for ground water are potentially complete for the commercial/industrial worker scenario:

- Ingestion of ground water
- Dermal contact with ground water
- Inhalation of chemicals volatilized from ground water
- Inhalation of indoor air vapors from ground water vapor intrusion.

Trespasser Exposure

The following exposure pathways for surface soil are potentially complete for the trespasser scenario:

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of chemicals adsorbed to windblown soils released to outdoor air
- Inhalation of chemicals volatilized from soil to outdoor air.

The following exposure pathways for surface water and sediment are potentially complete for the trespasser scenario:

- Ingestion of fish from Yellow Branch Creek
- Incidental ingestion of sediment and surface water
- Dermal contact with sediment and surface water.

Construction Worker Exposure

The following exposure pathways for surface and subsurface soil are potentially complete for the construction worker scenario:

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of chemicals adsorbed to windblown soils in outdoor air
- Inhalation of chemicals volatilized from soil to outdoor air.

The following exposure pathways for surface water and sediment are potentially complete for the construction worker scenario:

- Incidental ingestion of sediment and surface water in the common drainage ditch and wetland areas

- Dermal contact with sediment and surface water in the common drainage ditch and wetland areas.

The following exposure pathways for ground water are potentially complete for the construction worker scenario:

- Ingestion of ground water
- Dermal contact with ground water
- Inhalation of chemicals volatilized from ground water into a construction trench.

Residential Exposure

The following exposure pathways for surface and subsurface soil are potentially complete for the residential scenario:

- Incidental ingestion of soil
- Dermal contact with soil
- Ingestion of homegrown produce in contact with soil
- Inhalation of chemicals adsorbed to windblown soils released to outdoor air
- Inhalation of chemicals volatilized from soil to outdoor air
- Inhalation of indoor air vapors from soil vapor intrusion.

The following exposure pathways for surface water and sediment are potentially complete for the residential scenario:

- Ingestion of fish from Yellow Branch Creek
- Incidental ingestion of sediment and surface water
- Dermal contact with sediment and surface water.

The following exposure pathways for ground water are potentially complete for the residential scenario:

- Ingestion of ground water
- Dermal contact with ground water
- Inhalation of chemicals volatilized from ground water during domestic use
- Inhalation of indoor air vapors from ground water vapor intrusion.

8. ECOLOGICAL CONCEPTUAL EXPOSURE PATHWAY ANALYSIS

Figure 18 presents the ecological CSM, including potential exposure pathways evaluated for ecological receptors. These were divided into exposures for aquatic and terrestrial habitats. The CSM illustrates both potential and quantifiable pathways through which receptors may be exposed to COPCs. The *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA 1997) provides guidance for designing and conducting technically defensible ecological risk assessments for the Superfund program.

8.1 IDENTIFICATION OF EXPOSURE PATHWAYS

Exposure routes link chemicals in exposure media to ecological receptors. The following sections describe the major exposure routes. Ecological receptors potentially present at the site include plants, terrestrial invertebrates, wildlife (birds, mammals, etc.), and aquatic and benthic organisms. The following sections identify the major routes of exposure and their applicability to each of these receptor groups.

8.1.1 Direct Contact/Dermal Contact

Plants, invertebrates, aquatic and benthic organisms, and wildlife may be exposed to environmental media through direct contact. Plants may absorb chemicals from surface soil via their roots. They may also absorb chemicals from air or airborne particles through their leaves. Absorption through the roots is expected to be the most significant pathway. Absorption of chemicals from air or airborne particles is expected to be an insignificant pathway (EPA 2005, U.S. Army Center for Health Promotion and Preventive Medicine [CHPPM] 2004); although this pathway may be re-evaluated if data from the RI indicate that significant airborne contamination is present. It is also possible that deep rooting plants may come into direct contact with ground water; however, additional information is required from the RI regarding depth to ground water before this pathway can be considered complete. Plants are known to uptake metals and some organics; however, uptake of hydrophobic and/or large molecular weight compounds by plants is limited. Based on this information, direct exposure to surface soil is considered a complete and significant pathway for plants (Figure 18).

Aquatic and benthic organisms may be exposed to chemicals in sediment and surface water through direct contact. Chemicals may be absorbed from water or sediment through the skin and gills. This exposure pathway is considered to be complete and significant for both media (Figure 18).

For soil invertebrates, direct contact with soil is identified as a significant exposure pathway as these organisms live in constant contact with the soil. The invertebrates may also be exposed to chemicals in air through direct contact; however, this exposure is not significant in relation to exposure from soil. Chemicals may be absorbed from soil through the skin. Therefore, for soil invertebrates this exposure pathway is considered to be complete and significant for soil (Figure 18).

Wildlife may be exposed to chemicals in air, soil, sediment, or water via direct contact during foraging or burrowing. However, absorption and uptake through this contact is likely to be insignificant, as shown by example calculations in EPA guidance (EPA 2005). Most wildlife are equipped with protective outer coverings such as fur, feathers, or scales that prevent or limit the dermal absorption of chemicals from environmental media (CHPPM 2004). EPA guidance identifies that, in most cases, dermal exposures are likely to be less significant than exposures through ingestion and their evaluation involves considerable uncertainty (EPA 2005). This guidance provides example calculations for an example species showing that less than 0.2 percent of the total chemical dose to wildlife is likely to come from dermal contact. This exposure route is considered complete but insignificant for wildlife (Figure 18).

8.1.2 Inhalation

Inhalation is a potentially complete pathway for both terrestrial invertebrates and wildlife. These animals may inhale chemicals that have volatilized or which are adsorbed to airborne particulates. Currently, it is unclear whether volatile compounds are present at the site in sufficiently high concentrations to cause significant exposures. Similarly, it is unclear whether the suspension of airborne particulates occurs with sufficient duration or frequency to result in significant inhalation exposures. EPA guidance indicates that, in general, inhalation pathways are likely to be insignificant compared to ingestion pathways (EPA 2005). This guidance states that most chemicals inhaled with dust are trapped in mucus membranes and ingested; therefore, their impact is captured through analysis of incidentally ingested soil. It also provides example calculations showing that less than 0.1 percent of the total risk to wildlife is likely to come from inhalation. Finally, a large number of assumptions are required for quantification of inhalation exposures, leading to significant uncertainties. Based on this information, inhalation exposures are considered to be a complete but insignificant exposure pathway for the site (Figure 18).

8.1.3 Ingestion

The most significant exposure route for wildlife is ingestion of chemicals in contaminated media (EPA 2005). Wildlife may ingest chemicals in environmental media by drinking surface water or by incidentally ingesting soil and sediment while grooming or foraging. Exposure to site-related contaminants from the ingestion of surface water is considered an insignificant pathway compared to other exposures due to the ephemeral nature of waterbodies onsite. As discussed above, chemicals may bioaccumulate in the tissue of plants and animals. Therefore, wildlife may also ingest chemicals in plants and animals that they consume as food. Herbivores may be exposed to chemicals that have bioaccumulated in plant tissue. Carnivores may be exposed to chemicals that have accumulated in prey. Omnivores may be exposed to chemicals in both plant and animal food items. The site is expected to support a range of wildlife that spans several trophic levels and feeding guilds. This includes both primary and secondary consumers, and species which consume plants, invertebrates, small birds and mammals, and fish or aquatic organisms. Ingestion of chemicals in soil, sediment, and food are considered complete and potentially significant exposure pathways (Figure 18).

8.1.4 Exposure to Subsurface Soil and Ground Water

For aquatic and terrestrial receptors, exposure to ground water and subsurface soil are considered incomplete pathways. Aquatic receptors are expected to receive most of their exposure in the top 1 foot of sediments and terrestrial receptors in the top 1 foot of the surface soil. However, subsurface soil and ground water contamination may contaminate surface media, which ecological receptors will be exposed to, via exfiltration and seeps. The subsurface soil and ground water are considered sources but not exposure media.

8.1.5 Media of Concern

The expected media of concern include site surface and subsurface soil; site ground water, surface soil and sediment in the forest and wetland areas at the site; surface soil, subsurface soil, and sediment in the former impoundments and Common Drainage Ditch; and surface water in the Yellow Branch Creek. Complete, significant exposure pathways for receptors are expected to be limited to exposure to surface soil, sediment, surface water, and terrestrial and aquatic food chains.

8.2 ASSESSMENT ENDPOINTS

EPA (1998) guidance stresses the importance of ecologically significant endpoints. As EPA indicates, “Assessment endpoints are explicit expressions of the actual environmental value that are to be protected, operationally defined by an ecological entity and its attributes” (EPA 1998, U.S. Army Biological Technical Assistance Group 2002). The selection of assessment endpoints is based on the fundamental knowledge of local ecology. Assessment endpoints typically relate to an effect on a population or community. Survival of a specific species of insect is an example of a population level assessment endpoint. Community level assessment endpoints could include survival of benthic invertebrates or maintenance of multiple populations of birds.

Based on the CSM, ecological receptors may be exposed to COPCs from food, surface water, soil, and sediment. Based on the identified ecological receptors, habitats, and the above observations, the following ecological assessment endpoints are defined:

1. Protection of **terrestrial plant** survival, growth, and reproduction from adverse effects of COPCs in soil.

2. Protection of **wetland and aquatic plants** survival, growth, and reproduction from adverse effects of COPCs in sediment and surface water.

3. Protection of **soil invertebrates** exposed to COPCs in soil from adverse effects on survival, growth, and reproduction.

4. Protection of **aquatic and benthic communities** (e.g., fish and crustaceans) exposed to COPCs in sediment, surface water, and food from adverse effects on survival, growth, and reproduction.

5. Protection of **herbivorous mammals** to ensure that ingestion of COPCs in soil, sediment, and food do not have adverse effects on survival, growth, and reproduction.

6. Protection of **herbivorous birds** to ensure that ingestion of COPCs in soil, sediment, and food do not have adverse effects on survival, growth, and reproduction.

7. Protection of **insectivorous mammals** to ensure that ingestion of COPCs in soil and food do not have adverse effects on survival, growth, and reproduction.

8. Protection of **insectivorous birds** to ensure that ingestion of COPCs in soil and food do not have adverse effects on survival, growth, and reproduction.

9. Protection of **piscivorous mammals** to ensure that ingestion of COPCs in sediment and food do not have adverse effects on survival, growth, and reproduction.

10. Protection of **piscivorous birds** to ensure that ingestion of COPCs in sediment and food do not have adverse effects on survival, growth, and reproduction.

11. Protection of **predatory mammals** to ensure that ingestion of COPCs in soil and food do not have adverse effects on survival, growth, and reproduction.

12. Protection of **predatory birds** to ensure that ingestion of COPCs in soil and food do not have adverse effects on survival, growth, and reproduction.

13. Protection of **reptiles and amphibians** to ensure that ingestion of COPCs through contact with soil, sediment, and food does not have adverse effects on survival, growth, and reproduction.

EPA guidance (EPA 1999) specifies that the goal is to protect the above receptor groups from population impacts. The use of individuals to assess impacts is a highly conservative estimator of potential impacts on populations. This is a source of uncertainty that may lead to the overestimation of risks.

8.3 SELECTION OF REPRESENTATIVE RECEPTORS

Specific receptor groups and representative receptor species are selected to represent each of the ecological resource categories identified above. Selection of representative receptor species is based primarily on several factors: (1) the likelihood of a species to use the site, (2) the potential for exposure to site-related contaminants based on the feeding habits and life history of the organisms/guild represented by the receptor species, (3) the availability of life history and exposure information for the selected receptor species, and (4) the availability of toxicity information for the representative receptor species. The rationale for use of representative receptor species is summarized below. In cases where available toxicity data are of a general nature, communities or trophic levels were selected for evaluation as a whole. Although currently it does not appear to be the case, if it is determined that a protected species exists at the site in subsequent stages of the RI/FS, a suitable surrogate species will be identified and used as a representative receptor throughout the risk evaluation. When evaluating risk to a protected

species via a surrogate, it is important that the individual be protected. The representative receptor groups are summarized below.

8.3.1 Aquatic Species

Wetland and Aquatic Plants

These receptors are exposed to chemical contaminants by direct contact with sediments and surface waters; these are the only complete exposure pathways identified (Figure 18). The roots of wetland and aquatic plants are in continuous contact with bottom sediments and active uptake of contaminants by roots can occur. Stems and other immersed tissues could uptake contaminants from surface water through stomata. There are limited benchmarks available for surface water exposure to plants (Suter and Tsao 1996, Efroymson et al. 1997). Wetland and aquatic plants can be assumed to be protected in the event that no phytoxicity data are available if it can be shown that surface water concentrations meet water quality benchmarks. No other exposure pathways are complete, because root systems are not deep enough to penetrate to subsurface layers or ground water. The transfer of particulates from air to the surface of the plant is expected but this is not likely to be a route of exposure because of the relatively impermeable nature of plant cell walls.

Based on the general nature of available plant toxicity data, no specific plant species are selected for evaluation. Instead, the assessments evaluate the potential for adverse effects to wetland and aquatic plant communities.

Aquatic and Benthic Organisms

These receptors are exposed to chemical contaminants by direct contact with and ingestion of sediment and surface water, as well as consumption of fish and benthos (Figure 18). Exposure to ground water and subsurface soil are also incomplete pathways, because these organisms live in the bottom sediments or within surface waters. Because of the aquatic nature of these receptors, exposure to airborne particulates is also an incomplete pathway.

The toxicity data used in the risk assessment are designed to evaluate the potential for adverse effects to aquatic and benthic organisms. Therefore, individual species are not selected for evaluation, and the assessments evaluate the potential for adverse effects to the overall aquatic and benthic populations.

Herbivorous Wildlife

Herbivorous birds and mammals are exposed to chemical contaminants from surface water, sediment, and vegetative matter, chiefly during foraging. These receptors are exposed to contaminants via direct contact with and ingestion of surface water and sediment and the ingestion of food (plant tissue). All of these represent complete pathways, but only the incidental ingestion of sediment and the consumption of food will be considered significant (Figure 18).

The raccoon (*Procyon lotor*) is selected as the mammalian receptor species for evaluating potential adverse effects to small mammals from the ingestion of plants. The raccoon has a varied diet that can include significant amounts of plant food items (EPA 1993). Therefore, the raccoon is selected as the indicator species for the evaluation of potential adverse effects to mammals from feeding at the site.

The Canada goose (*Branta canadensis*) is selected as the representative receptor species to evaluate the potential for adverse effects to herbivorous birds from the ingestion of chemicals in plant material. Birds can be more sensitive to certain contaminants, such as dichlorodiphenyltrichloroethane (Sample et al. 1996), and it is therefore more conservative to include an avian receptor. The Canada goose is selected as a representative receptor species because its diet is mostly comprised of plant material (EPA 1993) and this species can be an important part of the diet of predatory mammals.

Piscivorous Wildlife

Piscivorous birds and mammals are exposed to chemical contaminants chiefly during foraging and feeding. These receptors are exposed to contaminants via direct contact with surface water and sediment as well as the ingestion of food (fish and benthos), surface water, and sediment. All of these represent complete pathways, but only the incidental ingestion of sediment and the consumption of food will be considered significant (Figure 18). To identify potentially impacted piscivorous species groups, the feeding guilds of the mammals, invertebrates, and birds known to occur in the study area were reviewed. Those identified as having the greatest potential to be adversely affected are selected for detailed evaluation.

The raccoon (*Procyon lotor*) is selected as the mammalian receptor species for evaluating potential adverse effects to small mammals from the ingestion of fish and benthic and aquatic invertebrates. The raccoon has a varied diet that can include over 60 percent aquatic or benthic food items (EPA 1993). Therefore, the raccoon is selected as the indicator species for the evaluation of potential adverse effects to mammals from feeding at the site.

The great blue heron (*Ardea herodias*) is selected as the avian receptor species for evaluating potential adverse effects to birds from the ingestion of fish, amphibians, and crayfish from the area. The great blue heron is selected for evaluation, because a large proportion of the diet is comprised of fish (including game fish) and larger aquatic invertebrates, and this heron may forage in the areas bordering these sites. In some areas, game fish (such as large-mouth bass) can comprise one-quarter of a heron's diet (Cottam and Uhler 1945).

8.3.2 Terrestrial Species

Terrestrial Plants

Complete exposure pathways have been identified for plants, which may be exposed to chemicals at the site through direct contact with soil (Figure 18). Based on the general nature of available plant toxicity data, no specific plant species are selected for evaluation. Instead, the assessments evaluate the potential for adverse effects to terrestrial plant communities and crops.

Soil Invertebrates

Complete exposure pathways for soil invertebrates include direct contact with soil and the ingestion of soil and food (Figure 18). The site is expected to provide habitat for a range of invertebrates, including earthworms and arthropods. The earthworm was selected as the representative receptor species for soil invertebrates. Earthworms are an ideal receptor because they are in constant contact with the soil, have a significant lipid content that may accumulate chemicals, and do not have an exoskeleton; as such, they represent a precautionary estimate of exposure.

Herbivorous Wildlife

Herbivorous birds and mammals are exposed to chemical contaminants from soil and vegetative matter, chiefly during foraging. These receptors are exposed to contaminants via direct contact with soil, ingestion of food (plant tissue), and incidental ingestion of soil. All of these represent complete pathways but only the ingestion of soil and food are considered significant (Figure 18).

The white-footed mouse (*Peromyscus leucopus*) was selected as the representative receptor species to evaluate the potential for adverse effects to herbivorous mammals. The white-footed mouse is an appropriate receptor species because it is likely to occur at the site, it is a potential food source for other animals, and has a life history similar to that of many other small mammals. Also, sufficient data are available for this species to support quantitative evaluation of food web exposures.

The song sparrow (*Melospiza melodia*) was selected as the representative receptor species to evaluate the potential for adverse effects to herbivorous birds. Song sparrows are an appropriate representative receptor because they are expected to be present at the site and have a life history similar to that of many other songbirds. Also, sufficient data are available for this species to support quantitative evaluation of food web exposures.

Insectivorous Wildlife

Insectivorous birds and mammals are exposed to chemical contaminants chiefly during foraging and feeding. These receptors are exposed to contaminants via direct contact with soil and airborne dust, ingestion of food (animal tissue), incidental ingestion of soil, and inhalation of airborne dust. All of these represent complete pathways but only the ingestion of soil and food are considered significant (Figure 18).

The American robin (*Turdus migratorius*) was selected as the representative receptor species to evaluate the potential for adverse effects to insectivorous birds. American robin is an appropriate receptor because it occurs in a wide range of habitat types, is expected to be present at the site, feeds primarily on invertebrates, and has a life history similar to that of many other passerine birds. Also, sufficient data are available for this species to support quantitative evaluation of food web exposures.

The southern short tailed shrew (*Blarina carolinensis*) was selected as the representative receptor species to evaluate the potential for adverse effects to insectivorous mammals. The shrew is an

appropriate receptor species because it is a potential food source for other animals, is likely to occur around the site, and has a life history similar to that of many other small mammals. Also, sufficient data are available for this species to support quantitative evaluation of food web exposures.

Predatory Wildlife

Predatory birds and mammals are exposed to chemical contaminants from soil, airborne particulates, and prey. These receptors are exposed to contaminants via direct contact with soil and airborne dust, ingestion of food (animal tissue), incidental ingestion of soil, and inhalation of airborne dust. All of these represent complete pathways but only ingestion of soil and food are considered significant (Figure 18). Because these organisms are commonly not herbivorous, direct and indirect exposure to contaminants in plant tissue is not a complete pathway. The consumption of fish and benthos is also not a major exposure pathway for predatory wildlife. Predatory species identified as having the greatest potential to be adversely affected are selected for detailed evaluation.

The red fox (*Vulpes vulpes*) was selected as the representative receptor for predatory mammals because it is expected to be present at the site, feeds primarily on small mammals, has a high potential for exposure due to bioaccumulation though the food chain, and is a valuable component to ecosystem structure by regulating the abundance, reproduction, distribution, and recruitment of lower trophic level prey (EPA 1999). Also, sufficient data are available for this species to support quantitative evaluation of food web exposures.

The red-tailed hawk (*Buteo jamaicensis*) was selected as the representative receptor for predatory birds because it is likely to be present at the site. The red-tailed hawk is selected as a suitable representative for a predatory bird receptor, because it feeds predominantly on small mammals (such as mice, shrews, voles, rabbits, and squirrels). Also, sufficient data are available for this species to support quantitative evaluation of food web exposures.

8.3.3 Reptiles and Amphibians

Reptiles and amphibians are exposed to chemical contaminants from surface water, sediment, soil, airborne dust, and prey. These receptors are exposed to contaminants via direct contact with and ingestion of sediment, surface water, airborne dust, and soil as well as ingestion of food (prey tissue). All of these represent complete pathways but only the ingestion of food and the ingestion of and direct contact with sediment and soil are considered significant (Figure 18). Although oral dose toxicity data are largely unavailable for these taxa, some toxicological information for amphibians and reptiles is available. Immersion and dermal absorption may also be available and are appropriate pathways for evaluation of, or in conjunction with, oral dose data particularly for amphibians. Amphibians can be assumed to be protected in the event that no amphibian toxicity data (e.g., lethal concentration 50 data) for specific contaminants can be found; if it can be shown that surface water concentrations meet water quality benchmarks; and if sediment concentrations are protective of benthic invertebrates.

The American bullfrog (*Rana catesbeiana*) was selected as the representative receptor for amphibians because it is likely to be present at the site, given its home range and habitat needs.

Also, there are sufficient data available to support quantitative evaluation of food web exposures. Bullfrogs are carnivorous and eat a wide variety of food items including small mammals, fish, snakes, birds, insects, and tadpoles. This amphibian is a common prey item of piscivorous wildlife.

The glossy crayfish snake (*Regina rigida*) was selected as the representative receptor for reptiles because the site is well within its range and it utilizes wetlands and aquatic habitats (Willson n.d.) so it is possible individuals would use the habitat provided by the site. Like all snakes, the glossy crayfish snake is carnivorous but the species primarily feeds on crayfish (Willson n.d.).

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FIGURES

Legend

Colonial Creosote Company Facility Boundary

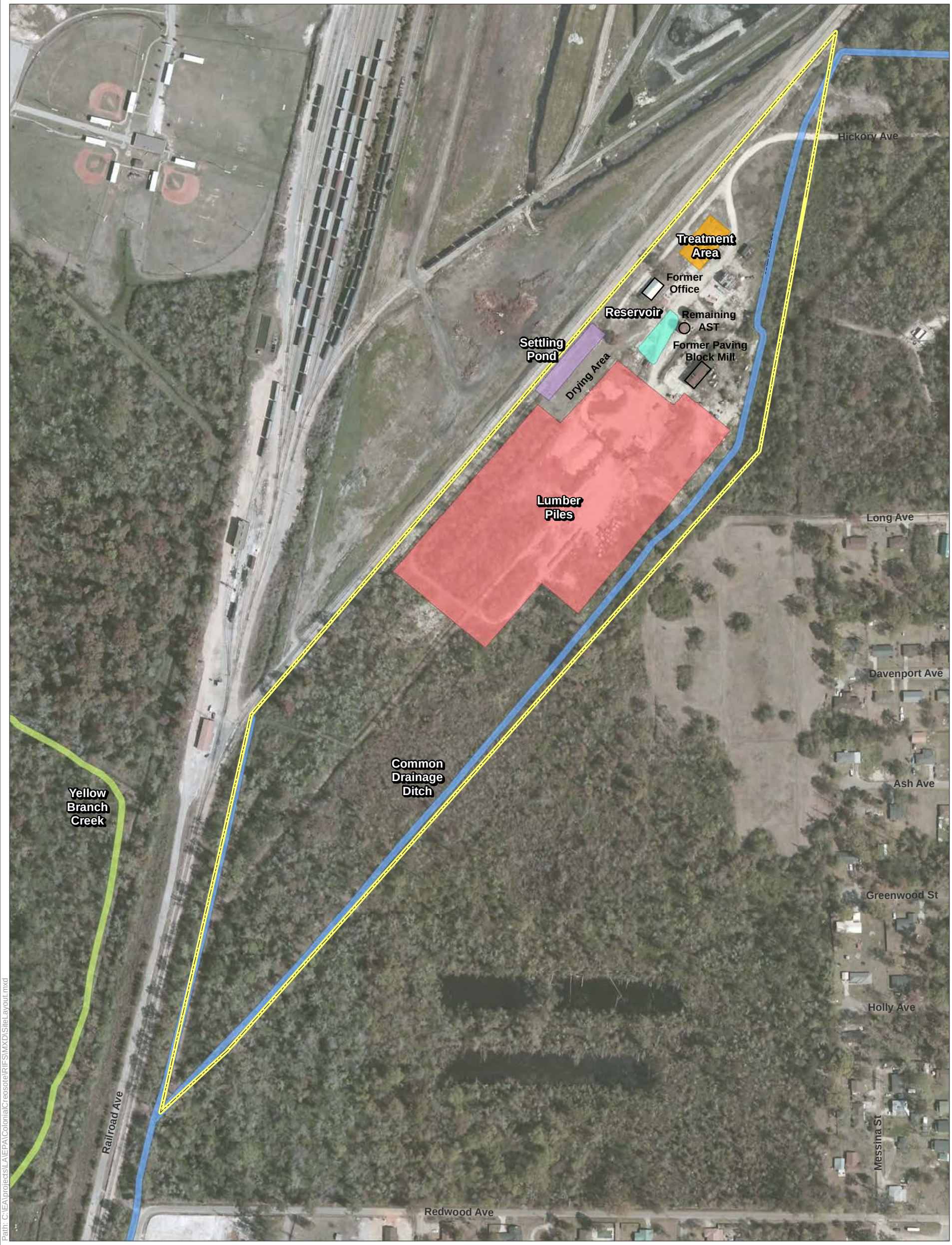
Data Sources: Esri 2006, 2016; USDA 2015

0 500 1,000 2,000
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 1.
Site Location

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\SiteLocation.mxd



Legend

- Former Facility Boundary

Exposure Areas

- Common Drainage Ditch
- Lumber Piles
- Reservoir
- Settling Pond
- Treatment Area
- Yellow Branch Creek

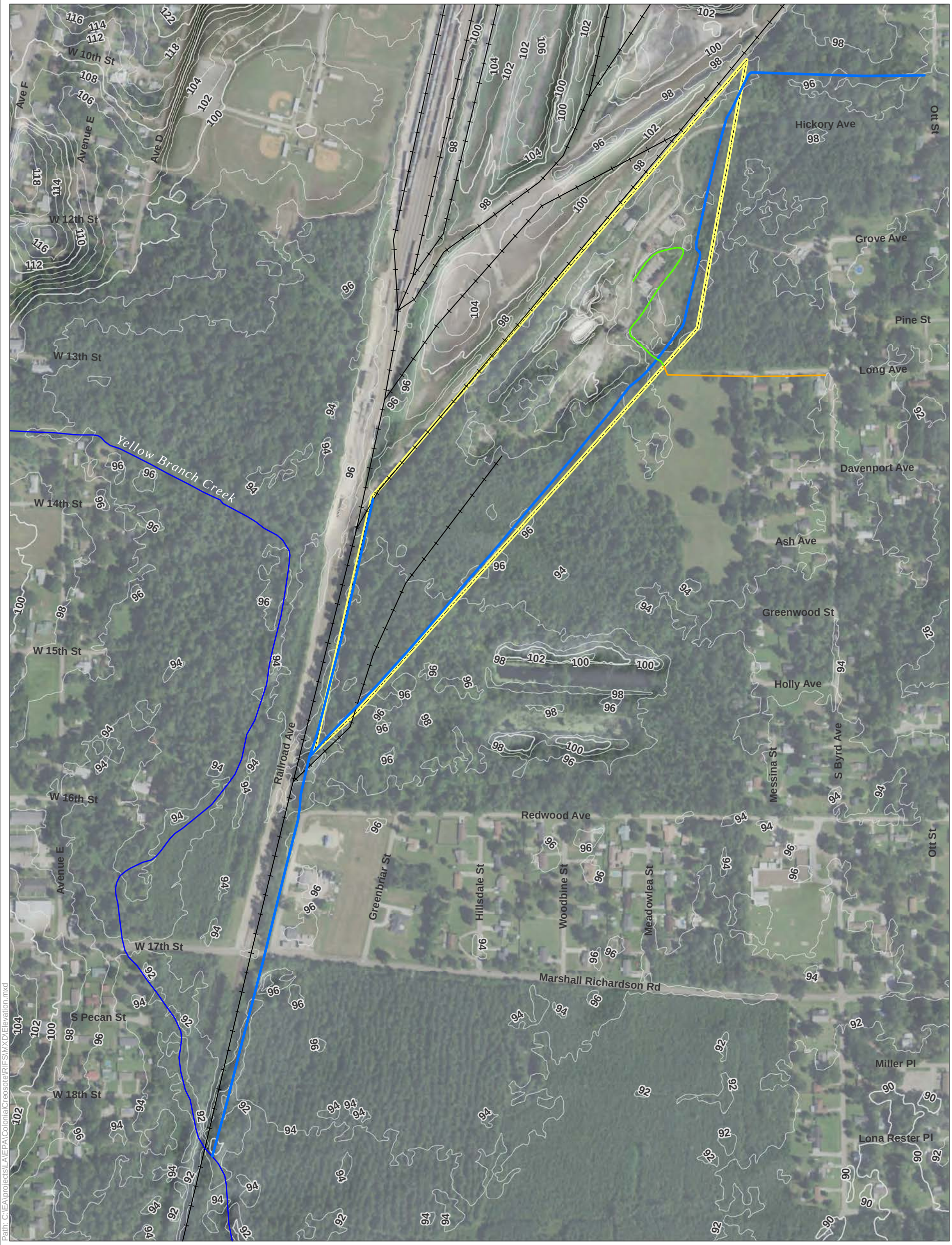
Data Sources: Esri 2006, 2016; USDA 2015

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 2.
Site Layout

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\SiteLayout.mxd



Legend

- Elevation Contours (2ft)
- Elevation Contours (10ft)
- Rail Line
- Stream
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Former Facility Boundary

Data Sources: Esri 2006, 2016; USDA 2015

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 3.
Elevation Map

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Elevation.mxd

Acronyms
bgs - below ground surface
EPA - U.S. Environmental Protection Agency
ft - foot or feet
in - inch or inches
Data Sources
Esri 2006, 2016
USDA 2015
USFWS 2016

CC-0019
0-6 in: 1.5J

CC-0036
0-2 ft: 2.5J

CC-0037
0-2 ft: 3.2J

CC-0013
0-6 in: 47.5J

CC-0009
0-2 ft: 3.6

CC-0015
0-6 in: 5.4J

CC-0001
0-2 ft: 2.1

CC-0005
0-2 ft: 1.5

CC-0002
0-2 ft: 3.9

CC-0004
0-2 ft: 1.9

CC-0006
0-2 ft: 4.4

CC-0003
0-2 ft: 0.64

CC-0007
0-2 ft: 2.1

CC-0011
0-2 ft: 33.2

CC-0008
0-2 ft: 0.94

CC-0012
0-2 ft: 9.1

CC-0025
0-6 in: 2.1J

CC-0010
0-2 ft: 2.8

CC-0017
0-6 in: 8.8J

CC-0021
0-6 in: 9J

CC-0023
0-6 in: 4.7J

CC-0027
0-6 in: 5

CC-0029
0-6 in: 1.6

CC-0031
0-6 in: 0.46LJ

Hickory Ave
Grove Ave
Pine St
Long Ave
Davenport Ave
Ash Ave
Byrd Ave
Greenwood St
Holly Ave
Bascom Rd
Messina St
S Byrd Ave
Ott St
Redwood Ave
Marshall Richardson Rd
Miller Pl
Lona Rester Pl
Cora Williams Rd
W 12th St
Ave D
W 14th St
W 15th St
W 16th St
W 18th St
Yellow Branch
Railroad Ave
Greenbriar St
Hillsdale St
Woodbine St
Meadowlea St
Avenue E
S Pecan St

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_LT2.mxd

The arsenic EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 0.68 milligrams per kilogram.

Legend

Arsenic Concentrations (0-2 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria
- Exceeds 10 times the screening criteria

Sample Identification
Depth: Concentration in Milligrams per Kilogram

- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 4.
Arsenic in Sediment and Soil

Acronyms
bgs - below ground surface
EPA - U.S. Environmental Protection Agency
ft - foot or feet
in - inch or inches
Data Sources
Esri 2006, 2016
USDA 2015
USFWS 2016

CC-0233-HRS
0-2 ft: 26.2

CC-0200-HRS
0-6 in: 0.119U

CC-0019
0-6 in: 1.1

CC-0036
0-2 ft: 3.3

CC-0201-HRS
0-6 in: 3.5

CC-0037
0-2 ft: 3.6

CC-0202-HRS
0-6 in: 2.09

CC-0009
0-2 ft: 2.8

CC-0013
0-6 in: 1.1

CC-0015
0-6 in: 1

CC-0001
0-2 ft: 0.19LJ

CC-0005
0-2 ft: 0.18U

CC-0002
0-2 ft: 5.7

CC-0004
0-2 ft: 0.25J

CC-0006
0-2 ft: 0.19U

CC-0003
0-2 ft: 0.26

CC-0007
0-2 ft: 0.2U

CC-0011
0-2 ft: 0.12LJ

CC-0008
0-2 ft: 1.6

CC-0012
0-2 ft: 0.2U

CC-0025
0-6 in: 0.23U

CC-0010
0-2 ft: 0.21U

CC-0203-HRS
0-6 in: 1.96

CC-0017
0-6 in: 0.33

CC-0021
0-6 in: 0.72

CC-0208-HRS
0-6 in: 6.94

CC-0207-HRS
0-6 in: 4.76

CC-0209-HRS
0-6 in: 2.01
CC-0210-HRS
0-6 in: 1.51

CC-0023
0-6 in: 0.14LJ
CC-0206-HRS
0-6 in: 1.15

CC-0027
0-6 in: 0.22LJv

CC-0029
0-6 in: 0.3U

CC-0204-HRS
0-6 in: 0.109U

CC-0031
0-6 in: 0.13LJ

CC-0205-HRS
0-6 in: 1.69

Hickory Ave
Grove Ave
Pine St
Long Ave
Davenport Ave
Ash Ave
Byrd Ave
Greenwood St
Holly Ave
Bascom Rd
Messina St
S Byrd Ave
Ott St
Redwood Ave
Marshall Richardson Rd
Miller Pl
Lona Rester Pl
Cora Williams Rd
W 12th St
Ave D
W 14th St
W 15th St
W 16th St
W 18th St
Avenue E
S Pecan St
Yellow Branch
Railroad Ave
Greenbriar St
Hillsdale St
Woodbine St
Meadowlea St

The benz(a)anthracene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 0.16 milligrams per kilogram.

Legend

Benz(a)anthracene Concentrations (0-2 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria
- Exceeds 10 times the screening criteria
- Exceeds 100 times the screening criteria

Sample Identification
Depth: Concentration in Milligrams per Kilogram

- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 5.
Benz(a)anthracene in Sediment and Surface Soil

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_LT2.mxd

Acronyms
bgs - below ground surface
EPA - U.S. Environmental Protection Agency
ft - foot or feet
Data Sources
Esri 2006, 2016
USDA 2015
USFWS 2016

A6Z9-025
2-4 ft: 0.103
6-8 ft: 0.123U

A6Z9-060
2-4 ft: 0.0978U
4-6 ft: 0.0955U
6-8 ft: 0.0939U
8-10 ft: 0.124U
10-12 ft: 0.0966U
12-14 ft: 0.102U
14-16 ft: 0.101U

A6Z9-026
4-6 ft: 684
8-10 ft: 84.3

A6Z9-027
6-8 ft: 2,960
8-10 ft: 223

A6Z9-034
8-9 ft: 25.1
10-12 ft: 5.77

A6Z9-049
6-8 ft: 10.7
8-10 ft: 0.0943U

A6Z9-031
4-6 ft: 179
8-10 ft: 36.9

A6Z9-030
2-4 ft: 1.65
4-6 ft: 0.0922U

A6Z9-035
4-6 ft: 0.0995U
14-15 ft: 0.0962U

A6Z9-029
3-5 ft: 0.0939U
8-10 ft: 0.0963U

A6Z9-032
10-11 ft: 19.3
14-16 ft: 9.55

A6Z9-037
2-4 ft: 0.374

A6Z9-038
2-4 ft: 13.5

Hickory Ave
Ave D
W 12th St
Grove Ave
Pine St
Long Ave
Davenport Ave
W 14th St
Ash Ave
Byrd Ave
Greenwood St
W 15th St
Yellow Branch
Holly Ave
Bascom Rd
Messina St
S Byrd Ave
W 16th St
Redwood Ave
Ott St
Avenue E
Railroad Ave
Greenbriar St
Hillsdale St
Woodbine St
Meadowlea St
W 17th St
Marshall Richardson Rd
S Pecan St
Miller Pl
W 18th St
Lona Rester Pl
Cora Williams Rd

The benz(a)anthracene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 0.16 milligrams per kilogram.

Legend

Benz(a)anthracene Concentrations (2-16 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria
- Exceeds 10 times the screening criteria
- Exceeds 100 times the screening criteria
- Exceeds 1,000 times the screening criteria

Sample Location
Depth: Concentration in milligrams per kilogram

- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 6.
Benz(a)anthracene in Subsurface Soil

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_GT2.mxd

Acronyms
bgs - below ground surface
EPA - U.S. Environmental Protection Agency
ft - foot or feet
in - inch or inches
Data Sources
Esri 2006, 2016
USDA 2015
USFWS 2016

CC-0233-HRS
0-2 ft: 27.9

CC-0200-HRS
0-6 in: 0.119U

CC-0019
0-6 in: 0.97

CC-0036
0-2 ft: 3.2

CC-0201-HRS
0-6 in: 4.43

CC-0037
0-2 ft: 5.3

CC-0202-HRS
0-6 in: 4.57

CC-0009
0-2 ft: 5.1

CC-0013
0-6 in: 1.5

CC-0015
0-6 in: 1.5

CC-0001
0-2 ft: 0.22

CC-0005
0-2 ft: 0.18U

CC-0002
0-2 ft: 6.6

CC-0004
0-2 ft: 0.28

CC-0006
0-2 ft: 0.19U

CC-0003
0-2 ft: 0.37

CC-0007
0-2 ft: 0.2U

CC-0011
0-2 ft: 0.24

CC-0008
0-2 ft: 0.66

CC-0012
0-2 ft: 0.2U

CC-0025
0-6 in: 0.23U

CC-0010
0-2 ft: 0.21U

CC-0203-HRS
0-6 in: 3.52

CC-0017
0-6 in: 0.5

CC-0021
0-6 in: 0.9

CC-0208-HRS
0-6 in: 11.4

CC-0207-HRS
0-6 in: 11.4

CC-0209-HRS
0-6 in: 4.47
CC-0210-HRS
0-6 in: 2.93

CC-0023
0-6 in: 0.24
CC-0206-HRS
0-6 in: 2.56

CC-0027
0-6 in: 0.33

CC-0029
0-6 in: 0.3U

CC-0204-HRS
0-6 in: 0.109U

CC-0031
0-6 in: 0.13LJ

CC-0205-HRS
0-6 in: 1.78

Hickory Ave
Grove Ave
Pine St
Long Ave
Davenport Ave
Ash Ave
Byrd Ave
Greenwood St
Holly Ave
Bascom Rd
Messina St
S Byrd Ave
Ott St
Redwood Ave
Marshall Richardson Rd
Miller Pl
Lona Rester Pl
Cora Williams Rd
W 12th St
Ave D
W 14th St
W 15th St
W 16th St
W 18th St
Avenue E
S Pecan St
Railroad Ave
Greenbriar St
Hillsdale St
Woodbine St
Meadowlea St
Yellow Branch

The benzo(a)pyrene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 0.016 milligrams per kilogram.

Legend

Benzo(a)pyrene Concentrations (0-2 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria
- Exceeds 10 times the screening criteria
- Exceeds 100 times the screening criteria
- Exceeds 1,000 times the screening criteria

Sample Identification
Depth: Concentration in Milligrams per Kilogram

- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 7.
Benzo(a)pyrene in Sediment and Surface Soil

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_LT2.mxd

Acronyms
bgs - below ground surface
EPA - U.S. Environmental Protection Agency
ft - foot or feet
Data Sources
Esri 2006, 2016
USDA 2015
USFWS 2016

A6Z9-025
2-4 ft: 0.0961U
6-8 ft: 0.123U

A6Z9-060
2-4 ft: 0.0978U
4-6 ft: 0.0955U
6-8 ft: 0.0939U
8-10 ft: 0.124U
10-12 ft: 0.0966U
12-14 ft: 0.102U
14-16 ft: 0.101U

A6Z9-026
4-6 ft: 246
8-10 ft: 30.7

A6Z9-027
6-8 ft: 949
8-10 ft: 87.3

A6Z9-034
8-9 ft: 11.1
10-12 ft: 2.74

A6Z9-049
6-8 ft: 6.18
8-10 ft: 0.0943U

A6Z9-031
4-6 ft: 75.9
8-10 ft: 16.4

A6Z9-030
2-4 ft: 3.24
4-6 ft: 0.0922U

A6Z9-035
4-6 ft: 0.118
14-15 ft: 0.0962U

A6Z9-029
3-5 ft: 0.0939U
8-10 ft: 0.0963U

A6Z9-032
10-11 ft: 7.46
14-16 ft: 3.63

A6Z9-037
2-4 ft: 0.84

A6Z9-038
2-4 ft: 18.9

Hickory Ave
Grove Ave
Pine St
Long Ave
Davenport Ave
Ash Ave
Byrd Ave
Greenwood St
Holly Ave
Bascom Rd
Messina St
S Byrd Ave
Redwood Ave
Ott St
Greenbriar St
Hillsdale St
Woodbine St
Meadowlea St
Marshall Richardson Rd
Miller Pl
Lona Rester Pl
Cora Williams Rd
W 12th St
Ave D
W 14th St
W 15th St
W 16th St
W 17th St
W 18th St
Avenue E
S Pecan St
Railroad Ave
Yellow Branch

The benzo(a)pyrene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 0.016 milligrams per kilogram.

Legend

Benzo(a)pyrene Concentrations (2-16 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria
- Exceeds 10 times the screening criteria
- Exceeds 100 times the screening criteria
- Exceeds 1,000 times the screening criteria

Sample Location
Depth: Concentration in Milligrams per Kilogram

- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 8.
Benzo(a)pyrene in Subsurface Soil

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_GT2.mxd

Acronyms
bgs - below ground surface
EPA - U.S. Environmental Protection Agency
ft - foot or feet
in - inch or inches
Data Sources
Esri 2006, 2016
USDA 2015
USFWS 2016

CC-0233-HRS
0-2 ft: 31.4

CC-0200-HRS
0-6 in: 0.156

CC-0019
0-6 in: 1.1

CC-0036
0-2 ft: 5.3

CC-0201-HRS
0-6 in: 5.5

CC-0037
0-2 ft: 8.5

CC-0202-HRS
0-6 in: 8.38

CC-0009
0-2 ft: 8.2

CC-0013
0-6 in: 2.3

CC-0015
0-6 in: 2

CC-0001
0-2 ft: 0.34

CC-0005
0-2 ft: 0.18U

CC-0002
0-2 ft: 8.8

CC-0004
0-2 ft: 0.31

CC-0006
0-2 ft: 0.079LJ

CC-0003
0-2 ft: 0.49

CC-0007
0-2 ft: 0.2U

CC-0011
0-2 ft: 0.32

CC-0008
0-2 ft: 0.76

CC-0012
0-2 ft: 0.2U

CC-0025
0-6 in: 0.12LJ

CC-0010
0-2 ft: 21U

CC-0203-HRS
0-6 in: 5.36

CC-0017
0-6 in: 0.78

CC-0021
0-6 in: 1.2

CC-0208-HRS
0-6 in: 16.2

CC-0207-HRS
0-6 in: 18.2

CC-0209-HRS
0-6 in: 7.79
CC-0210-HRS
0-6 in: 4.92

CC-0023
0-6 in: 0.36
CC-0206-HRS
0-6 in: 4.93

CC-0027
0-6 in: 0.51

CC-0029
0-6 in: 0.3U

CC-0204-HRS
0-6 in: 0.109U

CC-0031
0-6 in: 0.17LJ

CC-0205-HRS
0-6 in: 2.83

Hickory Ave
Grove Ave
Pine St
Long Ave
Davenport Ave
Ash Ave
Byrd Ave
Greenwood St
Holly Ave
Bascom Rd
Messina St
S Byrd Ave
Ott St
Redwood Ave
Marshall Richardson Rd
Miller Pl
Lona Rester Pl
Cora Williams Rd
W 12th St
Ave D
W 14th St
W 15th St
W 16th St
W 18th St
Yellow Branch
Railroad Ave
Greenbriar St
Hillsdale St
Woodbine St
Meadowlea St
Avenue E
S Pecan St

The benzo(b)fluoranthene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 0.16 milligrams per kilogram.

Legend

Benzo(b)fluoranthene Concentrations (0-2 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria
- Exceeds 10 times the screening criteria
- Exceeds 100 times the screening criteria

Sample Identification
Depth: Concentration in Milligrams per Kilogram

- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 9.
Benzo(b)fluoranthene in Sediment and Surface Soil

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_LT2.mxd

Acronyms
bgs - below ground surface
EPA - U.S. Environmental Protection Agency
ft - foot or feet
Data Sources
Esri 2006, 2016
USDA 2015
USFWS 2016

A6Z9-025
2-4 ft: 0.106J
6-8 ft: 0.123U

A6Z9-060
2-4 ft: 0.0978U
4-6 ft: 0.0955U
6-8 ft: 0.0939U
8-10 ft: 0.124U
10-12 ft: 0.0966U
12-14 ft: 0.102U
14-16 ft: 0.101U

A6Z9-026
4-6 ft: 301
8-10 ft: 34.5

A6Z9-027
6-8 ft: 1,220
8-10 ft: 108

A6Z9-034
8-9 ft: 14.1
10-12 ft: 2.9

A6Z9-031
4-6 ft: 91
8-10 ft: 21.1

A6Z9-049
6-8 ft: 7.24
8-10 ft: 0.0943U

A6Z9-035
4-6 ft: 0.225
14-15 ft: 0.0962U

A6Z9-030
2-4 ft: 6.3
4-6 ft: 0.0922U

A6Z9-032
10-11 ft: 9.98
14-16 ft: 4.94

A6Z9-029
3-5 ft: 0.136
8-10 ft: 0.0963U

A6Z9-037
2-4 ft: 2.08

A6Z9-038
2-4 ft: 41.6

Hickory Ave
Grove Ave
Pine St
Long Ave
Davenport Ave
Ave D
W 12th St
W 14th St
W 15th St
W 16th St
W 17th St
W 18th St
Yellow Branch
Ash Ave
Byrd Ave
Greenwood St
Holly Ave
Bascom Rd
Messina St
S Byrd Ave
Redwood Ave
Ott St
Avenue E
Railroad Ave
Greenbriar St
Hillsdale St
Woodbine St
Meadowlea St
Marshall Richardson Rd
S Pecan St
Miller Pl
Lona Rester Pl
Cora Williams Rd

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_GT2.mxd

The benzo(b)fluoranthene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 0.16 milligrams per kilogram.

Legend

Benzo(b)fluoranthene Concentrations (2-16 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria
- Exceeds 10 times the screening criteria
- Exceeds 100 times the screening criteria
- Exceeds 1,000 times the screening criteria

Sample Location
Depth: Concentration in Milligrams per Kilogram

- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

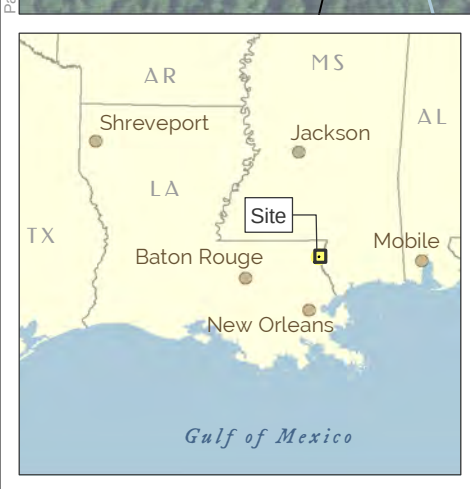
Figure 10.
Benzo(b)fluoranthene in Subsurface Soil

Acronyms
bgs - Below ground surface
EPA - U.S. Environmental Protection Agency
ft - foot or feet
in - inch or inches
Data Sources
Esri 2006, 2016
USDA 2015
USFWS 2016

CC-0233-HRS 0-2 ft: 3.47
CC-0200-HRS 0-6 in: 0.119U
CC-0019 0-6 in: 0.25LJ
CC-0036 0-2 ft: 0.83
CC-0201-HRS 0-6 in: 0.887
CC-0037 0-2 ft: 1.7
CC-0202-HRS 0-6 in: 0.615
CC-0009 0-2 ft: 1.4
CC-0013 0-6 in: 0.31
CC-0015 0-6 in: 0.35
CC-0001 0-2 ft: 0.2U
CC-0005 0-2 ft: 0.18U
CC-0002 0-2 ft: 1.5
CC-0004 0-2 ft: 0.079LJ
CC-0006 0-2 ft: 19U
CC-0003 0-2 ft: 0.09LJ
CC-0007 0-2 ft: 0.2U
CC-0011 0-2 ft: 0.17U
CC-0008 0-2 ft: 0.33U
CC-0012 0-2 ft: 0.2U
CC-0025 0-6 in: 0.23U
CC-0010 0-2 ft: 0.21U
CC-0203-HRS 0-6 in: 0.575
CC-0021 0-6 in: 0.18LJ
CC-0017 0-6 in: 0.11LJ
CC-0208-HRS 0-6 in: 1.85
CC-0207-HRS 0-6 in: 1.62
CC-0209-HRS 0-6 in: 0.504
CC-0210-HRS 0-6 in: 0.306
CC-0023 0-6 in: 0.21U
CC-0206-HRS 0-6 in: 0.279
CC-0027 0-6 in: 0.27U
CC-0204-HRS 0-6 in: 0.109U
CC-0205-HRS 0-6 in: 0.196

Hickory Ave
Ave D
W 12th St
Grove Ave
Pine St
Long Ave
Davenport Ave
W 14th St
Ash Ave
Byrd Ave
Yellow Branch
Greenwood St
W 15th St
Holly Ave
Bascom Rd
Messina St
S Byrd Ave
W 16th St
Redwood Ave
Ott St
Avenue E
Railroad Ave
Greenbriar St
Hillsdale St
Woodbine St
Meadowlea St
Marshall Richardson Rd
S Pecan St
Miller Pl
W 18th St
Lona Rester Pl
Cora Williams Rd

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_LT2.mxd



The dibenz(a,h)anthracene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 0.016 milligrams per kilogram.

Legend

Dibenz(a,h)anthracene Concentrations (0-2 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria
- Exceeds 10 times the screening criteria
- Exceeds 100 times the screening criteria

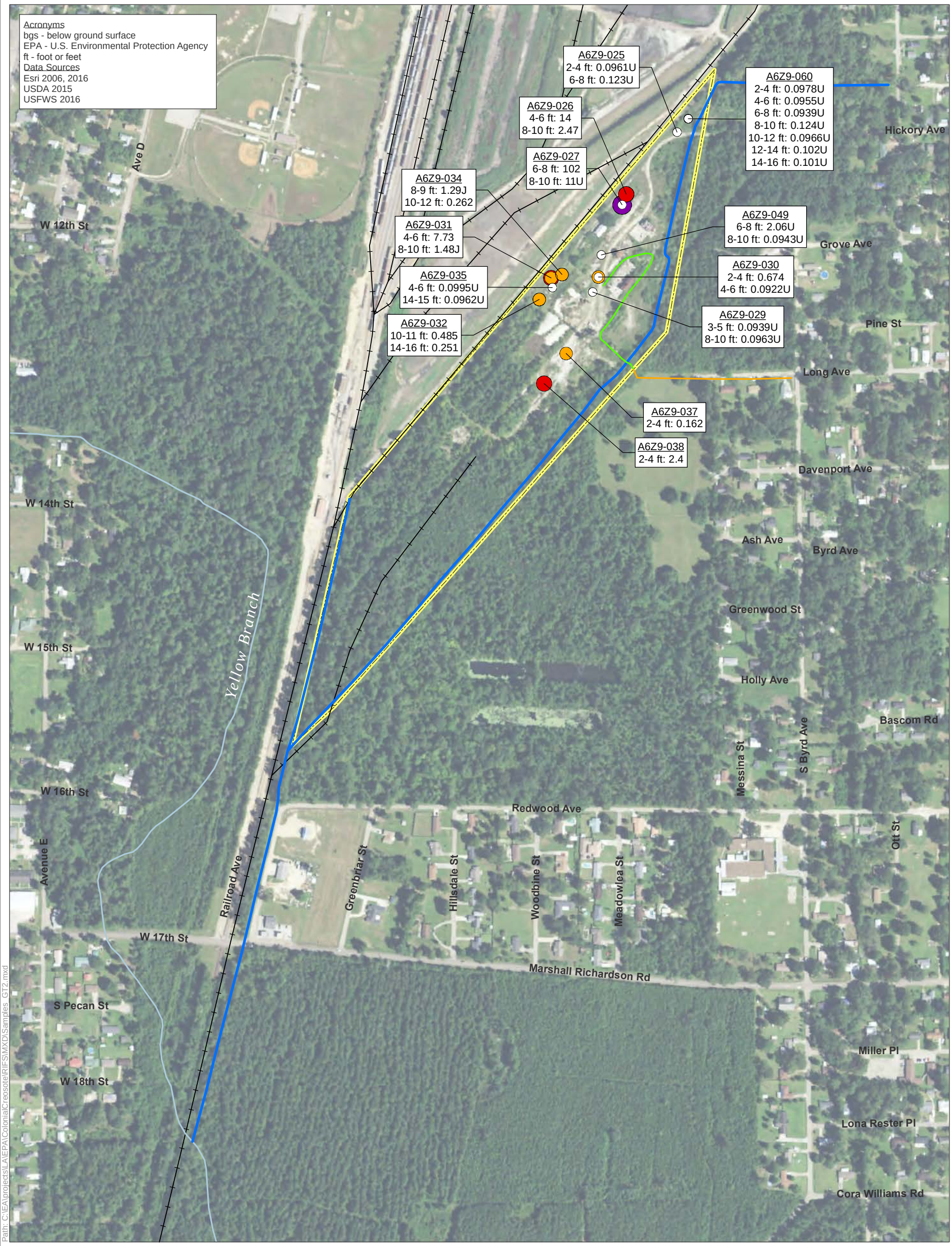
Sample Identification
Depth: Concentration in Milligrams per Kilogram

- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 11.
Dibenz(a,h)anthracene in Sediment and Surface Soil



The dibenz(a,h)anthracene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 0.016 milligrams per kilogram.

Legend

Dibenz(a,h)anthracene Concentrations (2-16 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds 10 times the screening criteria
- Exceeds 100 times the screening criteria
- Exceeds 1,000 times the screening criteria

Sample Location
Depth: Concentration in Milligrams per Kilogram

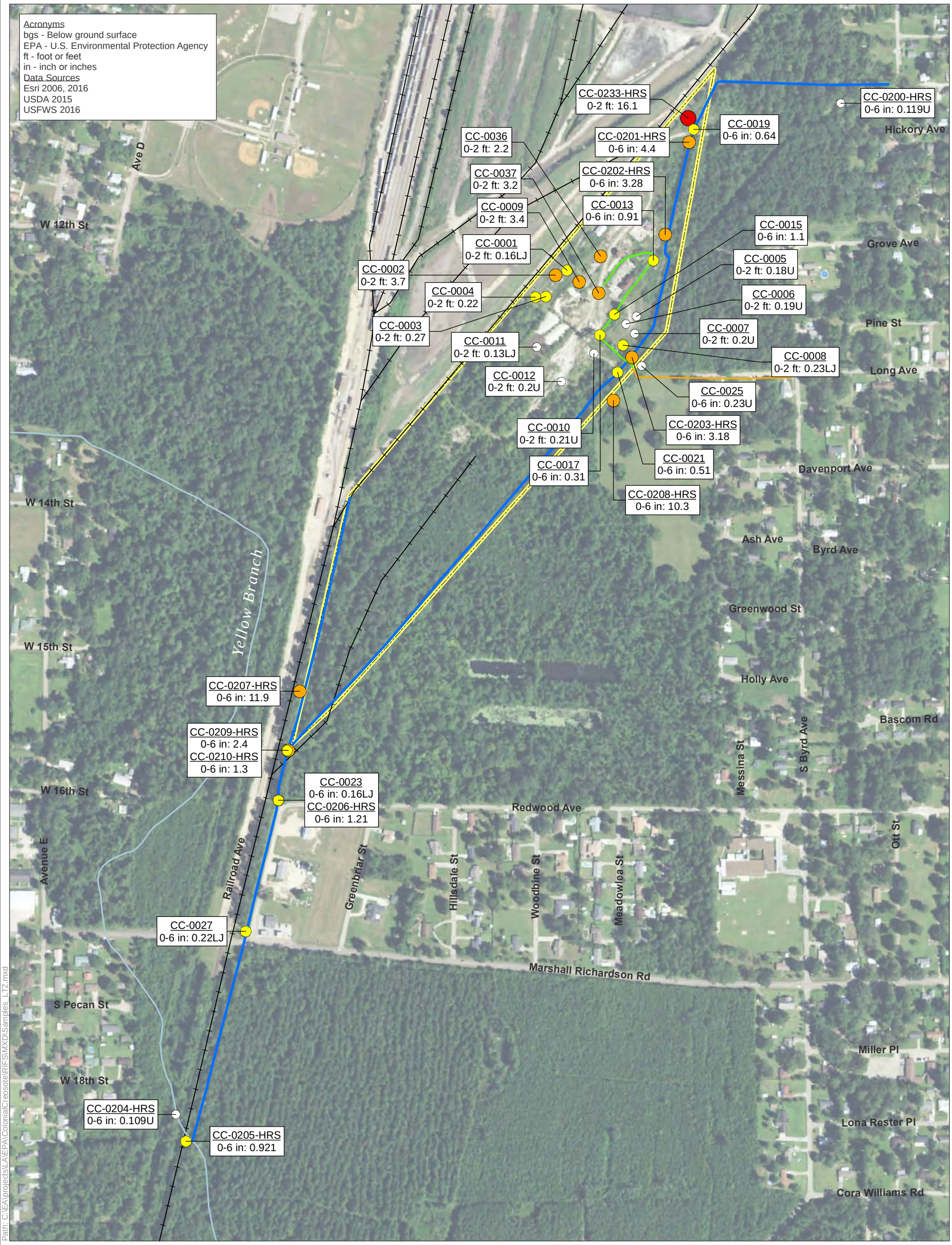
- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 12.
Dibenz(a,h)anthracene in Subsurface Soil

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_GT2.mxd



The indeno(1,2,3-cd)pyrene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 0.16 milligrams per kilogram.

Legend

Indeno(1,2,3-cd)pyrene Concentrations (0-2 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria
- Exceeds 10 times the screening criteria
- Exceeds 100 times the screening criteria

Sample Identification
Depth: Concentration in Milligrams per Kilogram

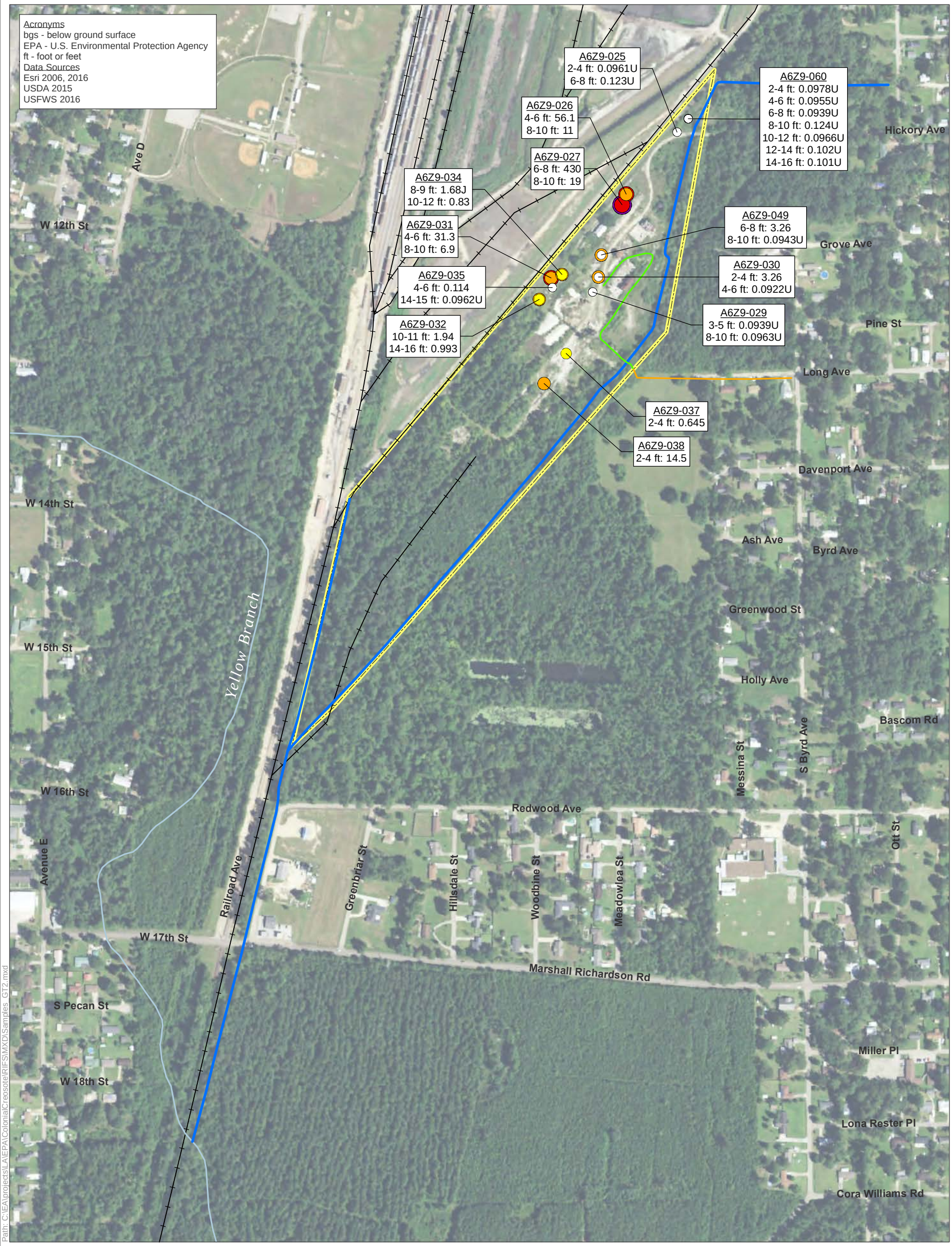
- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 13.
Indeno(1,2,3-cd)pyrene in Sediment and Surface Soil

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_LT2.mxd



The indeno(1,2,3-cd)pyrene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 0.16 milligrams per kilogram.

Legend

Indeno(1,2,3-cd)pyrene Concentrations (2-16 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria
- Exceeds 10 times the screening criteria
- Exceeds 100 times the screening criteria
- Exceeds 1,000 times the screening criteria

Sample Location
Depth: Concentration in Milligrams per Kilogram

- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 14.
Indeno(1,2,3-cd)pyrene in Subsurface Soil

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_GT2.mxd

Acronyms
bgs - below ground surface
EPA - U.S. Environmental Protection Agency
ft - foot or feet
in - inch or inches
Data Sources
Esri 2006, 2016
USDA 2015
USFWS 2016

CC-0233-HRS
0-2 ft: 0.621

CC-0200-HRS
0-6 in: 0.337

CC-0036
0-2 ft: 0.41

CC-0201-HRS
0-6 in: 0.148

CC-0037
0-2 ft: 0.2UJ

CC-0202-HRS
0-6 in: 0.251

CC-0009
0-2 ft: 0.093LJ

CC-0001
0-2 ft: 0.2U

CC-0005
0-2 ft: 0.18U

CC-0002
0-2 ft: 0.27J

CC-0004
0-2 ft: 4.5

CC-0006
0-2 ft: 19U

CC-0003
0-2 ft: 0.2U

CC-0007
0-2 ft: 0.2U

CC-0011
0-2 ft: 0.17U

CC-0008
0-2 ft: 29

CC-0012
0-2 ft: 0.2U

CC-0010
0-2 ft: 21U

CC-0203-HRS
0-6 in: 0.575

CC-0208-HRS
0-6 in: 0.166

CC-0207-HRS
0-6 in: 0.204

CC-0209-HRS
0-6 in: 0.217
CC-0210-HRS
0-6 in: 0.215

CC-0206-HRS
0-6 in: 0.129

CC-0204-HRS
0-6 in: 0.0609J

CC-0205-HRS
0-6 in: 0.115

Hickory Ave
Ave D
W 12th St
Grove Ave
Pine St
Long Ave
Davenport Ave
W 14th St
Ash Ave
Byrd Ave
Yellow Branch
Greenwood St
W 15th St
Holly Ave
Bascom Rd
Messina St
S Byrd Ave
W 16th St
Redwood Ave
Ott St
Avenue E
Railroad Ave
Greenbriar St
Hillsdale St
Woodbine St
Meadowlea St
Marshall Richardson Rd
S Pecan St
Miller Pl
W 18th St
Lona Rester Pl
Cora Williams Rd

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_LT2.mxd

The naphthalene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 3.8 milligrams per kilogram.

Legend

Naphthalene Concentrations (0-2 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria

Sample Identification
Depth: Concentration in Milligrams per Kilogram

- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 15.
Naphthalene in Sediment and Surface Soil

Acronyms
bgs - below ground surface
EPA - U.S. Environmental Protection Agency
ft - foot or feet
Data Sources
Esri 2006, 2016
USDA 2015
USFWS 2016

A6Z9-025
2-4 ft: 0.765
6-8 ft: 0.124

A6Z9-060
2-4 ft: 0.0489U
4-6 ft: 0.0478U
6-8 ft: 0.047U
8-10 ft: 0.0619U
10-12 ft: 0.0483U
12-14 ft: 0.051U
14-16 ft: 0.0504U

A6Z9-026
4-6 ft: 32,200
8-10 ft: 2,090

A6Z9-027
6-8 ft: 111,000
8-10 ft: 3,000

A6Z9-034
8-9 ft: 0.359
10-12 ft: 30.5

A6Z9-031
4-6 ft: 1,330
8-10 ft: 297

A6Z9-049
6-8 ft: 74.8
8-10 ft: 0.393

A6Z9-030
2-4 ft: 0.249
4-6 ft: 0.0518

A6Z9-035
4-6 ft: 0.0632
14-15 ft: 0.0481U

A6Z9-029
3-5 ft: 0.133
8-10 ft: 0.0482U

A6Z9-032
10-11 ft: 191
14-16 ft: 46.3

A6Z9-037
2-4 ft: 0.0538U

A6Z9-038
2-4 ft: 0.337

Hickory Ave
Grove Ave
Pine St
Long Ave
Davenport Ave
Ave D
W 12th St
W 14th St
W 15th St
W 16th St
W 17th St
W 18th St
Yellow Branch
Ash Ave
Byrd Ave
Greenwood St
Holly Ave
Bascom Rd
Messina St
S Byrd Ave
Redwood Ave
Ott St
Avenue E
Railroad Ave
Greenbriar St
Hillsdale St
Woodbine St
Meadowlea St
Marshall Richardson Rd
S Pecan St
Miller Pl
Lona Rester Pl
Cora Williams Rd

The naphthalene EPA Residential Soil Regional Screening Level at 1 x 10^{-6} Cancer Risk is 3.8 milligrams per kilogram.

Legend

Naphthalene Concentrations (2-16 ft bgs)

- Does not exceed screening criteria or result is below the detection limit.
- Exceeds screening criteria
- Exceeds 10 times the screening criteria
- Exceeds 100 times the screening criteria
- Exceeds 1,000 times the screening criteria

Sample Location
Depth: Concentration in Milligrams per Kilogram

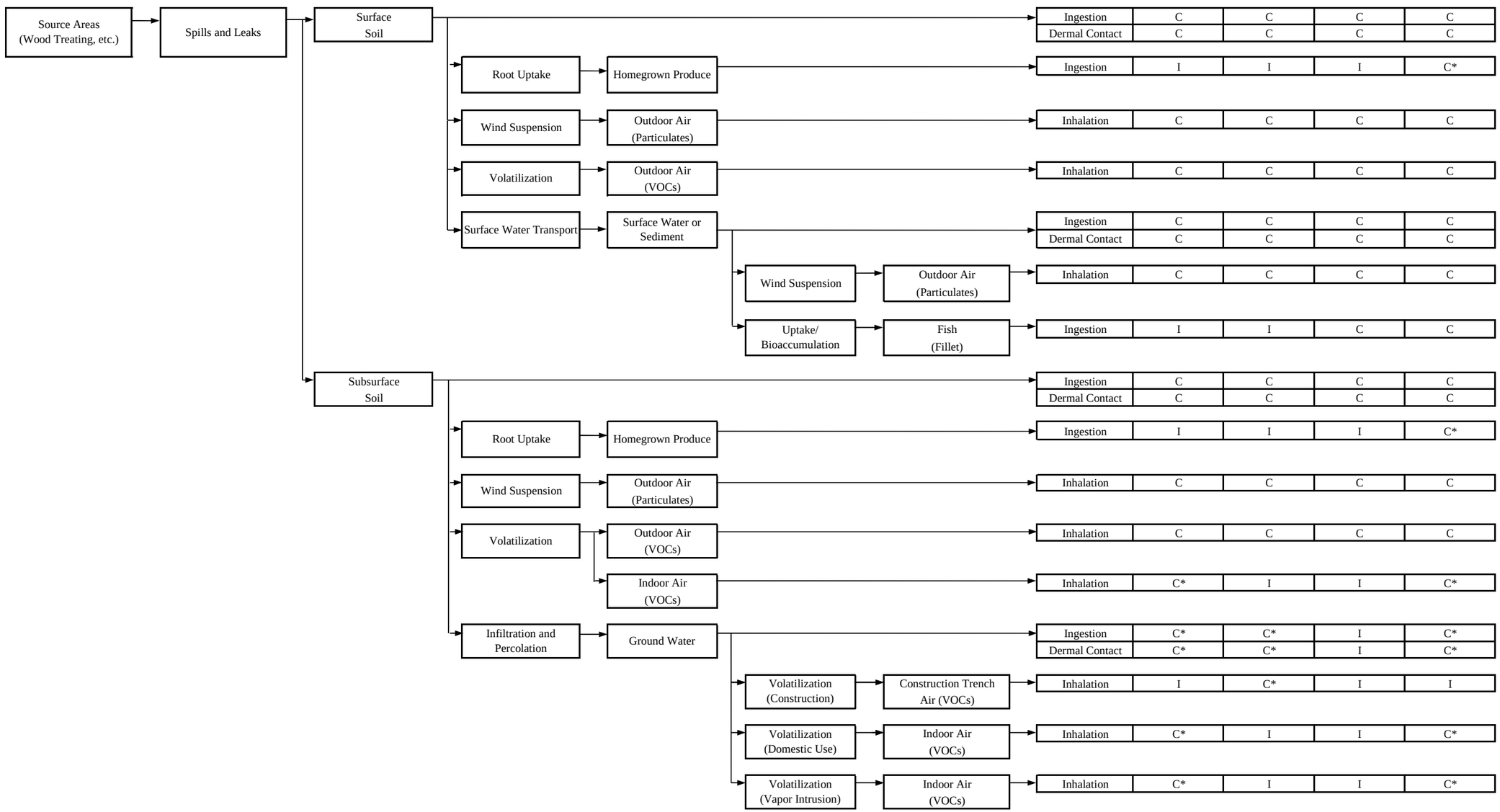
- Rail Line
- StreamRiver
- Common Drainage
- Off-Property Drainage
- On-Property Drainage
- Site Boundary

0 100 200 400
Feet

Remedial Investigation/Feasibility Study
Colonial Creosote
Bogalusa, Washington Parish, Louisiana

Figure 16.
Naphthalene in Subsurface Soil

Path: C:\EA\projects\LA\EPA\ColonialCreosote\RIFS\MXD\Samples_GT2.mxd



EXPLANATION

I	Incomplete or negligible exposure pathway
C	Potentially complete exposure pathway
VOC	Volatile organic compound
*	This pathway is not currently complete, but is considered a potentially complete exposure pathway.

Figure 17 Preliminary Human Health Conceptual Site Model

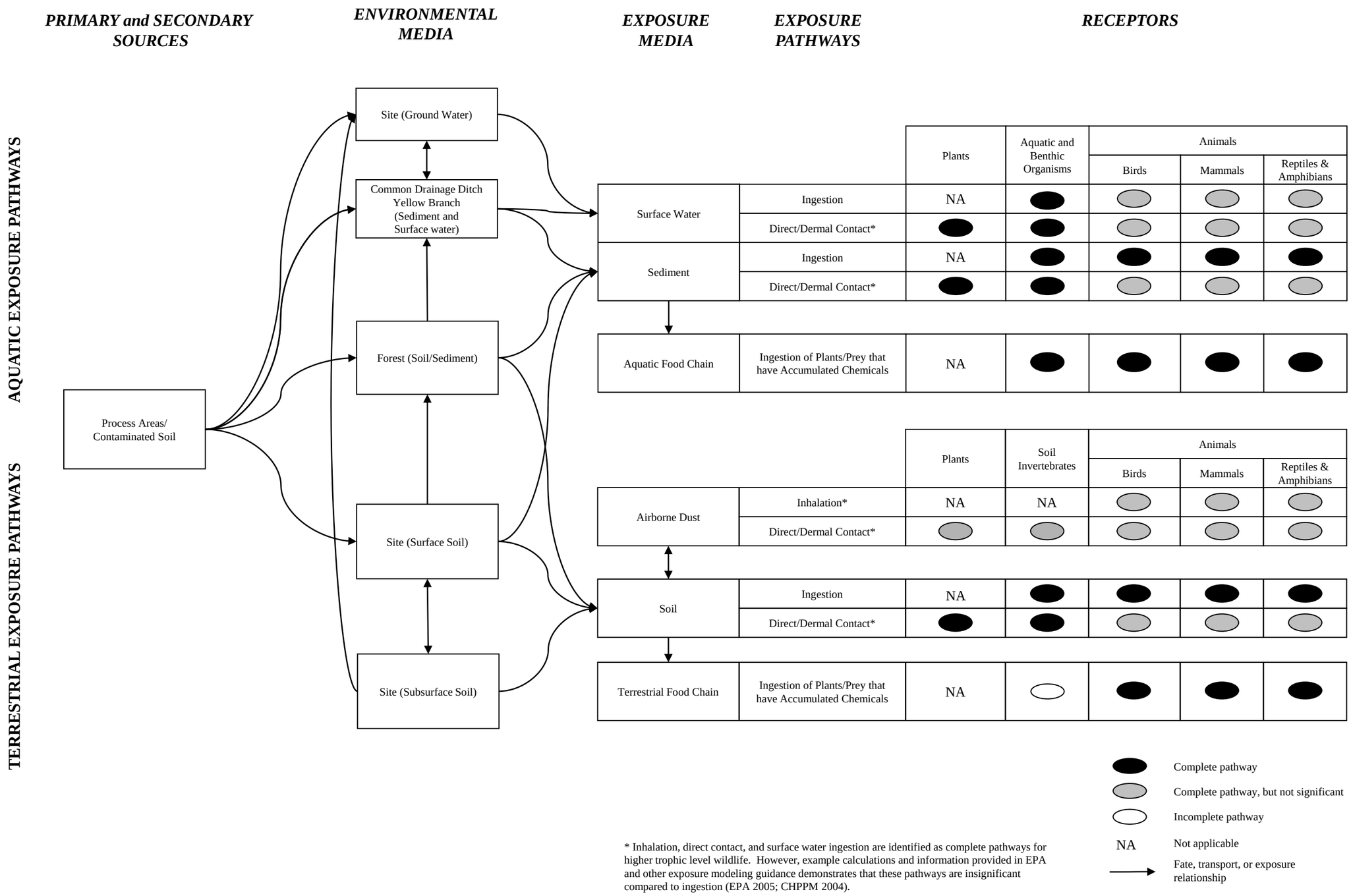


Figure 18 Preliminary Ecological Conceptual Site Model

APPENDIX A

1953 Aerial Photograph

1953 Aerial Photograph

APPENDIX B

U.S. Geological Survey

Bogalusa East Quadrangle

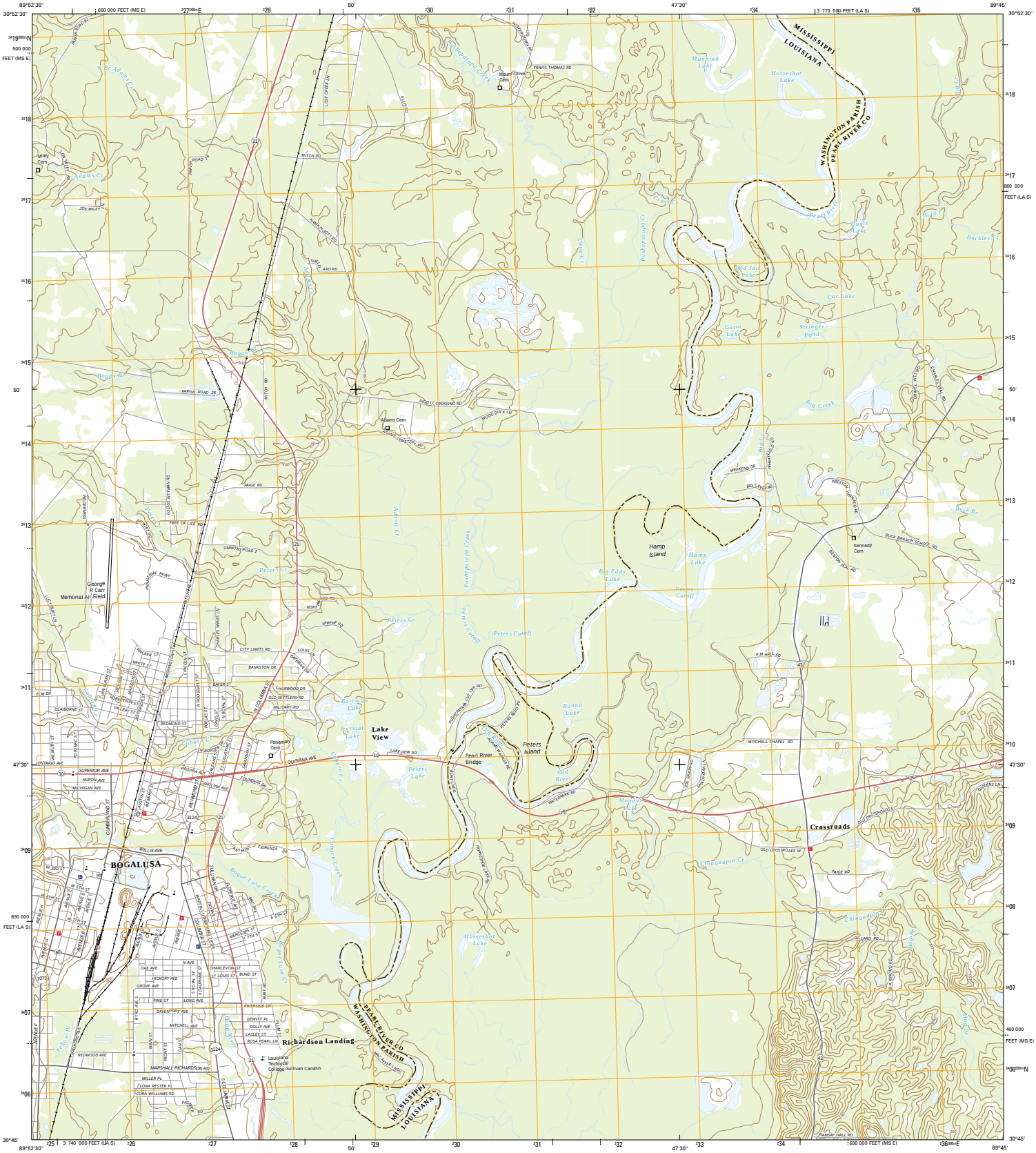
Louisiana-Mississippi

7.5-Minute Series

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

BOGALUSA EAST QUADRANGLE
LOUISIANA-MISSISSIPPI
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 16R
10 000-foot ticks: Louisiana Coordinate System of 1983 (south zone), Mississippi Coordinate System of 1983 (east zone)

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, August 2013
Roads.....HERE, ©2013 - 2014
Names.....GNIS, 2015
Hydrography.....National Hydrography Dataset, 2013
Contours.....National Elevation Dataset, 2008
Boundaries.....Multiple sources; see metadata file 1972 - 2015
Public Land Survey System.....BLM, 2015

0° 46'
14 MILS
1° 28'
26 MILS
MN
GN
UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
BV
Grid Zone Designation
16R

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

LOUISIANA
QUADRANGLE LOCATION

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 State Line
2 Angie
3 Fords Creek
4 Bogalusa West
5 White Sand
6 Sun
7 Henleyfield
8 McNeill

BOGALUSA EAST, LA-MS
2015

MSN 7148301698744 1
MGA REF NO. USGSX24K69406

APPENDIX C

Figure 7 from Site Inspection Report (Dynamac 2012)

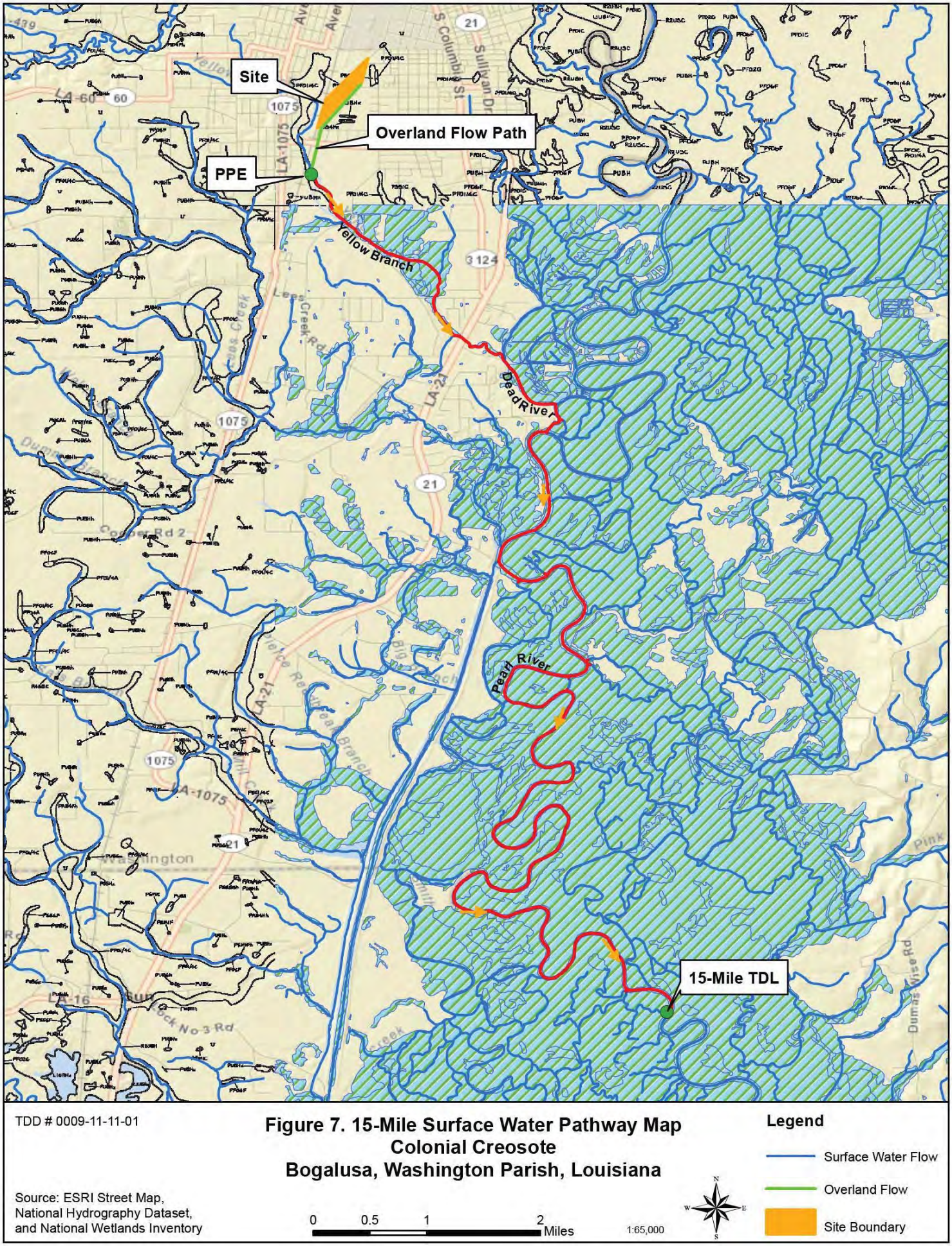


FIGURE SOURCE: Dynamac Corporation. 2012. *Site Inspection Colonial Creosote Hickory Avenue Bogalusa, Washington Parish, Louisiana*. 7 September.

APPENDIX D

National Resources Conservation Service

Web Soil Survey

Soil Map—Washington Parish, Louisiana

Map Scale: 1:8,310 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 400 800 1600 2400

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington Parish, Louisiana
Survey Area Data: Version 11, Sep 28, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 22, 2010—Jun 2, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Washington Parish, Louisiana (LA117)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
Lt	Latonia fine sandy loam	33.5	11.7%
Mt	Myatt fine sandy loam, 0 to 1 percent slopes	53.4	18.6%
My	Myatt fine sandy loam, frequently flooded	121.4	42.4%
Pr	Prentiss fine sandy loam, 0 to 1 percent slopes	16.1	5.6%
Ps	Prentiss fine sandy loam, 1 to 3 percent slopes	4.1	1.4%
Sh	Savannah fine sandy loam, 3 to 8 percent slopes	8.8	3.1%
St	Stough fine sandy loam, 0 to 2 percent slopes	49.4	17.2%
Totals for Area of Interest		**286.7**	**100.0%**

APPENDIX E

Hydrogeologic Units of Louisiana

System	Series	Stratigraphic unit		Hydrogeologic unit							
				Northern Louisiana	Central and southwestern Louisiana			Southeastern Louisiana			
				Aquifer or confining unit	Aquifer system or confining unit	Aquifer or confining unit: Lake Charles area	Aquifer or confining unit: Rice growing area	Aquifer system or confining unit[1]	Aquifer or confining unit[2]: Baton Rouge area	Aquifer or confining unit[2]: St. Tammany, Tangipahoa, and Washington Parishes	Aquifer or confining unit[2]: New Orleans area and lower Mississippi River Parishes[3]
Quaternary	Holocene	Red River alluvial deposits Mississippi River alluvial deposits		Red River alluvial aquifer or surficial confining unit Mississippi River alluvial aquifer or surficial confining unit	Units absent			Mississippi River alluvial aquifer or surficial confining unit	Mississippi River alluvial aquifer or surficial confining unit	Units absent	
	?										
	Pleistocene	Northern Louisiana terrace deposits Unnamed Pleistocene deposits		Upland terrace aquifer or surficial confining unit	Chicot aquifer system or surficial confining unit	"200-foot" sand	Upper sand unit	Chicot equivalent aquifer system or surficial confining unit	Shallow sands Upland terrace aquifer "400-foot" sand "600-foot" sand	Upland terrace aquifer Upper Ponchatoula aquifer	Gramercy aquifer Norco aquifer Gonzales-New Orleans aquifer "1200-foot" sand
						"500-foot" sand "700-foot" sand	Lower sand unit				
Tertiary	Pliocene	Fleming Formation	Blounts Creek Member	Aquifers in Pliocene-Miocene sediments are absent in this area	Evangeline aquifer or surficial confining unit			Evangeline equivalent aquifer system or surficial confining unit	"800-foot" sand "1,000-foot" sand "1,200-foot" sand "1,500-foot" sand "1700-foot" sand	Lower Ponchatoula aquifer Kentwood aquifer Big Branch aquifer Abita aquifer Covington aquifer Slidell aquifer	
	?										
	Miocene	Fleming Formation	Castor Creek Member		Castor Creek confining unit			Unnamed confining unit			
		Fleming Formation	Williamson Creek Member Dough Hills Member Carnahan Bayou Member		Jasper aquifer system or surficial confining unit	Williamson Creek aquifer Dough Hills confining unit Carnahan Bayou aquifer		Jasper equivalent aquifer system or surficial confining unit	"2,000-foot" sand "2,400-foot" sand "2,800-foot" sand	Tchefuncte aquifer Hammond aquifer Amite aquifer Ramsay aquifer Franklinton aquifer	
		Fleming Formation	Lena Member		Lena confining unit			Unnamed confining unit			
	?										
	Oligocene	Catahoula Formation			Catahoula aquifer			Catahoula equivalent aquifer system or surficial confining unit	Catahoula aquifer		
		Vicksburg Group, undifferentiated		Vicksburg-Jackson confining unit	No freshwater occurs in deeper units						
	Eocene	Jackson Group, undifferentiated									
		Claiborne Group	Cockfield Formation	Cockfield aquifer or surficial confining unit							
		Claiborne Group	Cook Mountain Formation	Cook Mountain aquifer or surficial confining unit							
		Claiborne Group	Sparta Sand	Sparta aquifer or surficial confining unit							
		Claiborne Group	Cane River Formation	Cane River aquifer or surficial confining unit							
		Claiborne Group	Carrizo Sand	Carrizo-Wilcox aquifer or surficial confining unit							
	?										
	Paleocene	Wilcox Group, undifferentiated									
		Midway Group, Undifferentiated		Midway confining unit							

[1] The interval containing the four aquifer systems is called the Southern Hills aquifer system.
[2] Clay units separating aquifers in southeastern Louisiana are discontinuous, unnamed, and not listed herein.
[3] The interval containing the four aquifers is called the New Orleans aquifer system.

Louisiana Department of Transportation and Development —
U.S. Geological Survey Water Resources Cooperative Program

Hydrogeologic units in Louisiana. (Modified from Lovelace and Lovelace, 1995)

SOURCE: Sargent, P. 2012. Water Use in Louisiana, 2010. State of Louisiana, Department of Transporation and Development Water Resources Special Report No. 17 (Revised). Public Works and Water Resources Division. In cooperation with the U.S. Geological Survey. Baton Rouge. December.

APPENDIX F

Sample Summary

APPENDIX F SAMPLE SUMMARY

Data Source	Sample ID	Location	Location Description	Matrix	Latitude	Longitude	Depth
2012 Site Inspection	CC-0001	A6Z9-001	Tram tracks/settling pond 1	Soil	30.7665208	-89.8652435	0-2 ft
2012 Site Inspection	CC-0002	A6Z9-002	Tram tracks/settling pond 2	Soil	30.7664603	-89.8654149	0-2 ft
2012 Site Inspection	CC-0003	A6Z9-003	Tram tracks/settling pond 3	Soil	30.7661926	-89.8655592	0-2 ft
2012 Site Inspection	CC-0004	A6Z9-004	Tram tracks/settling pond 4	Soil	30.7661852	-89.8657152	0-2 ft
2012 Site Inspection	CC-0005	A6Z9-005	Railroad tie storage 1	Soil	30.7659263	-89.8642429	0-2 ft
2012 Site Inspection	CC-0006	A6Z9-006	Railroad tie storage 2	Soil	30.7658337	-89.8643976	0-2 ft
2012 Site Inspection	CC-0007	A6Z9-007	Railroad tie storage 3	Soil	30.7657091	-89.8642720	0-2 ft
2012 Site Inspection	CC-0008	A6Z9-008	Railroad tie storage 4	Soil	30.7655676	-89.8644411	0-2 ft
2012 Site Inspection	CC-0009	A6Z9-009	General wood storage 1	Soil	30.7663731	-89.8650686	0-2 ft
2012 Site Inspection	CC-0010	A6Z9-010	General wood storage 2	Soil	30.7654677	-89.8648696	0-2 ft
2012 Site Inspection	CC-0011	A6Z9-011	General wood storage 3	Soil	30.7655563	-89.8657037	0-2 ft
2012 Site Inspection	CC-0012	A6Z9-012	General wood storage 4	Soil	30.7651180	-89.8653490	0-2 ft
2012 Site Inspection	CC-0013	A6Z9-015	Site Ditch, north	Sediment	30.7666297	-89.8639807	0-6 in
2012 Site Inspection	CC-0014	A6Z9-015	Site Ditch, north	Surface Water	30.7666297	-89.8639807	
2012 Site Inspection	CC-0015	A6Z9-016	Site ditch. central site	Sediment	30.7659540	-89.8645617	0-6 in
2012 Site Inspection	CC-0016	A6Z9-016	Site ditch, central site	Surface Water	30.7659540	-89.8645617	
2012 Site Inspection	CC-0017	A6Z9-017	Site ditch, at discharge to common ditch	Sediment	30.7656982	-89.8647760	0-6 in
2012 Site Inspection	CC-0018	A6Z9-017	Site ditch, at discharge to common ditch	Surface Water	30.7656982	-89.8647760	
2012 Site Inspection	CC-0019	A6Z9-018	Common ditch, upgradient	Sediment	30.7682752	-89.8633715	0-6 in
2012 Site Inspection	CC-0020	A6Z9-018	Common ditch, upgradient	Surface Water	30.7682752	-89.8633715	
2012 Site Inspection	CC-0021	A6Z9-019	Common ditch, below off-site drainage	Sediment	30.7652258	-89.8645288	0-6 in
2012 Site Inspection	CC-0022	A6Z9-019	Common ditch. below off-site drainage	Surface Water	30.7652258	-89.8645288	
2012 Site Inspection	CC-0023	A6Z9-020	Common ditch at discharge from site	Sediment	30.7598783	-89.8695627	0-6 in
2012 Site Inspection	CC-0024	A6Z9-020	Common ditch at discharge from site	Surface Water	30.7598783	-89.8695627	
2012 Site Inspection	CC-0025	A6Z9-021	Off-site drainage into common ditch	Sediment	30.7653015	-89.8641776	0-6 in
2012 Site Inspection	CC-0026	A6Z9-021	Off-site drainage into common ditch	Surface Water	30.7653015	-89.8641776	
2012 Site Inspection	CC-0027	A6Z9-022	Drainage from site to Yellow branch	Sediment	30.7582305	-89.8700636	0-6 in
2012 Site Inspection	CC-0028	A6Z9-022	Drainage from site to Yellow branch	Surface Water	30.7582305	-89.8700636	
2012 Site Inspection	CC-0029	A6Z9-023	Upgradient Yellow Branch	Sediment	30.7581370	-89.8719651	0-6 in
2012 Site Inspection	CC-0030	A6Z9-023	Upgradient Yellow Branch	Surface Water	30.7581370	-89.8719651	
2012 Site Inspection	CC-0031	A6Z9-024	Yellow Branch at PPE	Sediment	30.7558799	-89.8710147	0-6 in
2012 Site Inspection	CC-0032	A6Z9-024	Yellow Branch at PPE	Surface Water	30.7558799	-89.8710147	
2012 Site Inspection	CC-0033	A6Z9-006	Railroad tie storage 2 - Duplicate	Soil	30.7658337	-89.8643976	0-2 ft
2012 Site Inspection	CC-0034	A6Z9-016	Site ditch, central site - Duplicate	Sediment	30.7659540	-89.8645617	0-6 in
2012 Site Inspection	CC-0035	A6Z9-017	Site ditch, at discharge to common ditch - Duplicate	Surface Water	30.7656982	-89.8647760	
2012 Site Inspection	CC-0036	A6Z9-013	Firewater reservoir area	Soil	30.7666915	-89.8647544	0-2 ft
2012 Site Inspection	CC-0037	A6Z9-014	North of general wood storage	Soil	30.7662290	-89.8647859	0-2 ft

APPENDIX F SAMPLE SUMMARY

Data Source	Sample ID	Location	Location Description	Matrix	Latitude	Longitude	Depth
2015 ESI Addendum	CC-0200-HRS	A6Z9-041	Common Drainage, upgradient, 0-6 in	Sediment	30.7685850	-89.8612180	0-6 in
2015 ESI Addendum	CC-0201-HRS	A6Z9-042	Common Drainage, in wetlands north, 0-6 in	Sediment	30.7681160	-89.8634380	0-6 in
2015 ESI Addendum	CC-0202-HRS	A6Z9-043	Common Drainage, in wetlands center, 0-6 in	Sediment	30.7669540	-89.8638030	0-6 in
2015 ESI Addendum	CC-0203-HRS	A6Z9-044	Common Drainage, in wetlands south, 0-6 in	Sediment	30.7654120	-89.8643150	0-6 in
2015 ESI Addendum	CC-0204-HRS	A6Z9-023	Upgradient, Yellow Branch, 0-6 in	Sediment	30.7559310	-89.8711190	0-6 in
2015 ESI Addendum	CC-0205-HRS	A6Z9-024	Downgradient, Yellow Branch, 0-6 in	Sediment	30.7555930	-89.8709750	0-6 in
2015 ESI Addendum	CC-0206-HRS	A6Z9-020	Common ditch discharge to off-site ditch, 0-6 in	Sediment	30.7598783	-89.8695627	0-6 in
2015 ESI Addendum	CC-0207-HRS	A6Z9-050	Common Drainage, in wetlands south, 0-6 in	Sediment	30.7612500	-89.8692280	0-6 in
2015 ESI Addendum	CC-0208-HRS	A6Z9-051	Common Drainage, in wetlands south, 0-6 in	Sediment	30.7648720	-89.8645930	0-6 in
2015 ESI Addendum	CC-0209-HRS	A6Z9-052	Common Drainage, in wetlands south, 0-6 in	Sediment	30.7605060	-89.8694090	0-6 in
2015 ESI Addendum	CC-0210-HRS	A6Z9-053	Common Drainage, in wetlands south, 0-6 in	Sediment	30.7605070	-89.8694240	0-6 in
2015 ESI Addendum	CC-0211-HRS	A6Z9-032	Boring, settling pond, south, 10-11 ft	Soil	30.7661648	-89.8656588	10-11 ft
2015 ESI Addendum	CC-0212-HRS	A6Z9-032	Boring, settling pond, south, 14-16 ft	Soil	30.7661648	-89.8656588	14-16 ft
2015 ESI Addendum	CC-0213-HRS	A6Z9-035	Boring, drying area, south, 4-6 ft	Soil	30.7663126	-89.8654648	4-6 ft
2015 ESI Addendum	CC-0214-HRS	A6Z9-035	Boring, drying area, south, 14-15 ft	Soil	30.7663126	-89.8654648	14-15 ft
2015 ESI Addendum	CC-0215-HRS	A6Z9-031	Boring, settling pond, north, 4-6 ft	Soil	30.7664328	-89.8654822	4-6 ft
2015 ESI Addendum	CC-0216-HRS	A6Z9-031	Boring, settling pond, north, 8-10 ft	Soil	30.7664328	-89.8654822	8-10 ft
2015 ESI Addendum	CC-0217-HRS	A6Z9-029	Boring, firewater reservoir, south, 3-5 ft	Soil	30.7662481	-89.8648777	3-5 ft
2015 ESI Addendum	CC-0218-HRS	A6Z9-029	Boring, firewater reservoir, south, 8-10 ft	Soil	30.7662481	-89.8648777	8-10 ft
2015 ESI Addendum	CC-0219-HRS	A6Z9-034	Boring, drying area, north, 8-9 ft	Soil	30.7664737	-89.8653211	8-9 ft
2015 ESI Addendum	CC-0220-HRS	A6Z9-034	Boring, drying area, north, 10-12 ft	Soil	30.7664737	-89.8653211	10-12 ft
2015 ESI Addendum	CC-0221-HRS	A6Z9-049	(Extra Boring) Reservoir north, 6-8 ft	Soil	30.7667159	-89.8647444	6-8 ft
2015 ESI Addendum	CC-0222-HRS	A6Z9-049	(Extra Boring) Reservoir north, 8-10 ft	Soil	30.7667159	-89.8647444	8-10 ft
2015 ESI Addendum	CC-0223-HRS	A6Z9-037	Boring, lumber pile area, north, 2-4 ft	Soil	30.7654781	-89.8652736	2-4 ft
2015 ESI Addendum	CC-0224-HRS	A6Z9-030	Boring, firewater reservoir, center, 2-4 ft	Soil	30.7664365	-89.8647889	2-4 ft
2015 ESI Addendum	CC-0225-HRS	A6Z9-030	Boring, firewater reservoir, center, 4-6 ft	Soil	30.7664365	-89.8647889	4-6 ft
2015 ESI Addendum	CC-0226-HRS	A6Z9-026	Boring, treatment unit area, north, 4-6 ft	Soil	30.7674777	-89.8643651	4-6 ft
2015 ESI Addendum	CC-0227-HRS	A6Z9-026	Boring, treatment unit area, north, 8-10 ft	Soil	30.7674777	-89.8643651	8-10 ft
2015 ESI Addendum	CC-0228-HRS	A6Z9-027	Boring, treatment, south, 6-8 ft	Soil	30.7673465	-89.8644314	6-8 ft
2015 ESI Addendum	CC-0229-HRS	A6Z9-027	Boring, treatment, south, 8-10 ft	Soil	30.7673465	-89.8644314	8-10 ft
2015 ESI Addendum	CC-0230-HRS	A6Z9-038	Boring, lumber pile area, south, 2-4 ft	Soil	30.7651023	-89.8656024	2-4 ft
2015 ESI Addendum	CC-0231-HRS	A6Z9-025	Boring, north of process area (former Bkg sample), 2-4 ft	Soil	30.7682526	-89.8636151	2-4 ft
2015 ESI Addendum	CC-0232-HRS	A6Z9-025	Boring, north of process area (former Bkg sample), 6-8 ft	Soil	30.7682526	-89.8636151	6-8 ft
2015 ESI Addendum	CC-0233-HRS	A6Z9-060	Background boring, north of process area, 0-2 ft	Soil	30.7684180	-89.8634470	0-2 ft
2015 ESI Addendum	CC-0234-HRS	A6Z9-060	Background boring, north of process area, 2-4 ft	Soil	30.7684180	-89.8634470	2-4 ft
2015 ESI Addendum	CC-0235-HRS	A6Z9-060	Background boring, north of process area, 4-6 ft	Soil	30.7684180	-89.8634470	4-6 ft
2015 ESI Addendum	CC-0236-HRS	A6Z9-060	Background boring, north of process area, 6-8 ft	Soil	30.7684180	-89.8634470	6-8 ft

APPENDIX F SAMPLE SUMMARY

Data Source	Sample ID	Location	Location Description	Matrix	Latitude	Longitude	Depth
2015 ESI Addendum	CC-0237-HRS	A6Z9-060	Background boring, north of process area, 8-10 ft	Soil	30.7684180	-89.8634470	8-10 ft
2015 ESI Addendum	CC-0238-HRS	A6Z9-060	Background boring, north of process area, 10-12 ft	Soil	30.7684180	-89.8634470	10-12 ft
2015 ESI Addendum	CC-0239-HRS	A6Z9-060	Background boring, north of process area, 12-14 ft	Soil	30.7684180	-89.8634470	12-14 ft
2015 ESI Addendum	CC-0240-HRS	A6Z9-060	Background boring, north of process area, 14-16 ft	Soil	30.7684180	-89.8634470	14-16 ft
2015 ESI Addendum	CC-0250-HRS	A6Z9-020	Common ditch discharge to off-site ditch, 0-6 in, duplicate of CC-206-HRS	Sediment	30.7598783	-89.8695627	0-6 in
2015 ESI Addendum	CC-0251-HRS	A6Z9-053	Common Drainage, in wetlands south, 0-6 in, duplicate of CC-210-HRS	Sediment	30.7605070	-89.8694240	0-6 in
2015 ESI Addendum	CC-0252-HRS	A6Z9-032	Boring, settling pond, south, 10-11 ft, duplicate of CC-211-HRS	Soil	30.7661648	-89.8656588	10-11 ft
2015 ESI Addendum	CC-0253-HRS	A6Z9-049	(Extra Boring) Reservoir north, 6-8 ft, duplicate of CC-221-HRS	Soil	30.7667159	-89.8647444	6-8 ft
2015 ESI Addendum	CC-0254-HRS	A6Z9-026	Boring, treatment unit area, north, 4-6 ft, duplicate of CC-226-HRS	Soil	30.7674777	-89.8643651	4-6 ft