PROPOSED PLAN
Kerr McGee Columbus, OU1
COLUMBUS, LOWNDES COUNTY, MISSISSIPPI
December 2018

This Proposed Plan is not to be considered a technical document but has been prepared to provide an abridged summary to the public.

You are Invited to Comment on this Proposed Cleanup for the

Kerr McGee Superfund Site, OU1 in Columbus, MS

INTRODUCTION

This **Proposed Plan** presents the U.S. Environmental Protection Agency's (EPA) Preferred Alternative and provides the rationale for a remedial action to address contaminated soils in a portion of the Pine Yard, Operable Unit 1 (OU1), at the Kerr McGee Columbus (Kerr McGee) **Superfund** Site (Site) located in Columbus, Mississippi (Figure 1). This Proposed Plan also includes summaries of other remedial alternatives evaluated in the 2018 **Focused Feasibility Study** (FFS). The purpose of this remedial action is to address unsaturated contaminated soils in the Pine Yard that do not serve as a primary source of groundwater contamination at the Site. Soils beneath the water table (saturated soils) containing **dense nonaqueous-phase liquid** (DNAPL) consisting of wood treating chemicals that are a primary source of groundwater contamination will be addressed by a separate remedial action as a separate Operable Unit (OU). A glossary defining key terms is provided in Appendix A at the end of this document; the key terms appear in bold the first time they are used.

EPA, the lead agency for Site activities, and the **Mississippi Department of Environmental Quality** (MDEQ), the support agency, are issuing this Proposed Plan as part of its public participation requirements under Section 117 (a) of the **Comprehensive Environmental Response, Compensation, and Liability Act of 1980** (CERCLA), as amended, 42 United States Code Section 9617, commonly known as Superfund, and the **National Oil and Hazardous Substances Pollution Contingency Plan** (NCP), as set forth in 40 Code of Federal Regulations Section 300.430 (f)(2).

This Proposed Plan summarizes and identifies key information that can be found in greater detail in the **Remedial Investigation** (RI) and FS documents, as well as other documents contained in the **Administrative Record** file for this Site. EPA and MDEQ encourage the public to review these documents to gain a more comprehensive understanding of the Site. The Administrative Record and **Information Repository** is located at the, Columbus-Lowndes Public Library at 314 N. Seventh Street, Columbus, Mississippi.

EPA, in consultation with MDEQ, will select a final remedy for OU1 after reviewing and considering all information submitted during the **public comment period**. EPA, in consultation with MDEQ, may modify this Preferred Alternative or select another alternative presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented in this Proposed Plan.

To ensure the community's concerns are being addressed, a public comment period lasting 30 calendar days will be held. During this time the public is encouraged to submit comments to EPA on this Proposed Plan. EPA

will also hold a public meeting to be held on December 13, 2018 at the Site at the **Genesis Dream Center** Columbus, MS. Comments can also be submitted through the mail, via facsimile, or email. Please see the text box entitled, "Community Involvement Coordination" for additional details on community participation.

Community Involvement Coordination		
Public Comment Period: **December 7, 2018-January 6, 2019** EPA will accept written comments on this Proposed Plan during the public comment period. You may submit written comments three (3) ways: **BY MAIL** Charles King U.S. EPA - Region 4 61 Forsyth Street, SW Atlanta, Georgia 30303-8960 **BY EMAIL** King.CharlesL@epa.gov **BY FACSIMILE** 404-562-8174 Addressed to Charles King	Attend the Public Meeting You are invited to attend a public meeting sponsored by EPA to hear about this Proposed Plan. At the meeting you will be able to voice your views about the cleanup. The meeting will be held: December 13, 2018 6-8 pm Location: **Genesis Dream Center** 1820 23rd Street North Columbus, MS 39701	Locations of Administrative Record and Information Repository Columbus-Lowndes Public Library 314 N. Seventh Street Columbus, Mississippi 39701 Phone: 662-329-5300 Hours: Monday-Tuesday 9.a.m. – 7p.m. Wednesday – Thursday 9 a.m. – 6 p.m. Friday 9.a.m. – 4 p.m. and Saturday 10 a.m. – 4 p.m.

SCOPE AND ROLE

The 90 acre Site consists of two primary areas, separated by 14th Avenue North: the Former Plant Area to the north and the Pine Yard to the south. Due to its size and complexity, the Site is expected to be divided into multiple operable units (OUs). The first OU will be OU1, defined as Unsaturated Soils in the areas of the Pine Yards with no groundwater contamination, and excluding NAPL contaminated soils. Possible future OUs could include: Pine Yard Saturated Soils and DNAPL; Former Plant Area – all media (soils, groundwater, NAPL); Soil and Sediment in adjacent properties and in ditches; Groundwater.

The Pine Yard property is zoned for mixed industrial/commercial use. Upon completion of remedial actions, the Greenfield Environmental Multistate Trust, LLC, Trustee of the Multistate Environmental Response Trust (Multistate Trust) intends to make the Pine Yard available for community-supported redevelopment. Pending completion of the redevelopment planning, the objective of the OU1 interim remedial action is to achieve conditions that would be protective for unrestricted use throughout portions of OU1, while other portions of the Site would be protective for industrial use. Figure 2 shows the portions of the Site identified for unrestricted use and industrial use in relation to OU1.

SITE BACKGROUND

The Site is located on 2300 14th Avenue North in Columbus, Lowndes County, Mississippi. The Site covers approximately 90 acres and is generally bounded by US Highway 82 to the north, Moss Street and a railroad right-of-way to the east, Tuffy Lane to the south, and 21st Street North and 22nd Street North to the west, and the Pine Yard. The Kerr-McGee Chemical Corp. facility is closed and all structures on the property have been demolished or dismantled, with the exception of the former office and a building which houses the groundwater treatment system. Access to the Site is restricted by a fence that encloses the entire property.

Site History

The wood treating facility was originally developed and operated by T.J. Moss Tie Company. Construction of the plant began on August 15, 1928, and the plant was completed in February 1929. Kerr McGee Chemical Corp. (KMCC) acquired the Site in 1963 and continued wood treating operations until the facility was closed in 2003. Manufactured products included railroad wooden cross ties, switch ties, and preserved timbers. Preservatives used in the operation were primarily creosote, creosote coal tar solutions, and pentachlorophenol (PCP).

During wood treating operations, green lumber was received and sorted at the plant, and was later seasoned, either by natural air drying, which required the wood to be stacked in a drying yard for up to 12 months, or by artificial seasoning using the Boulton process. Wood that was allowed to dry naturally was stored in the green tie storage areas and in the Pine Yard. The Boulton drying process involved subjecting the green lumber to heated creosote under a vacuum, which boiled the sap water out of the wood. After seasoning, the wood was then pressure-treated in a cylinder, or retort. The pressure treating process involved filling a cylinder with a treating solution (e.g., creosote or PCP) and applying pressure to force the treating solution into the wood.

After treatment, the wood was placed on a drip track for drying. KMCC installed a drip pad adjacent to the retort to collect excess preservative, or “drippage”. KMCC reported that drippage collected on the drip pad was discharged to the production process oil/water separators. Treated lumber was supposed to remain on the drip track for 24 hours; however, former employees claimed that timbers were often taken on rail trams directly to the Pine Yard, immediately after coming out of the retort. Between 1992 and 1996, wood was stored throughout the facility, except for the northern portion of the Pine Yard.

In 2003, the volume of wood storage was significantly reduced and by 2004, no wood storage or manufacturing activities were apparent at the Site in aerial photographs. Structures were visible onsite through at least 2007, but all above-grade structures, other than the current office and operation and maintenance buildings, appeared to have been demolished by 2010.

Available documentation indicates the Pine Yard was used primarily for lumber and scrap metal storage. Historical aerial photographs suggest that between 1952 and 1959, the southern portion of the Pine Yard was used for storage of untreated lumber and the northern portion was used for storage of mixed untreated/treated lumber. Some treated wood storage took place in the southern portion of the Pine Yard in later stages of the plant operation. Former employees also said that some spray treatment operations were carried out in the Pine Yard and that on several occasions, KMCC brought in new gravel and crushed rock to place over stained soils at the Pine Yard. The RI data suggest that some waste dumping and/or process fluid (e.g., creosote, PCP solutions) spills may have also occurred in localized areas of the Pine Yard.

EPA placed the Site on the Superfund Program's National Priority List (NPL) in 2011. Tronox Inc. (KMCC's successor) resolved its environmental liabilities pursuant to a bankruptcy settlement approved by the Court in 2011, which established the Multistate Trust. In 2014, Anadarko Petroleum Corp. settled with the U.S. Department of Justice to resolve fraudulent conveyance claims related to KMCC's environmental liabilities. The settlements provided funding for EPA and the Multistate Trust to continue conducting assessments and cleanup work at the Site. The regulatory history for the Site is summarized in the 2018 Focused Feasibility Study (FFS) for OU-1.

Site Investigations

Multiple investigations have been conducted at the Site dating back to the 1988 Resource and Conservation Recovery Act (RCRA) facility investigation (RFI); The Multistate Trust began sampling in the Pine Yard as part of the RI Phase II investigation in 2016. A summary of the site investigations and removal actions completed prior to the Phase II investigation is included in Appendix A of the 2018 FFS.

The following table summarizes the characterization data that have been collected in the Pine Yard and adjacent properties during the Phase II RI.[1]

Sample Type	Number of Locations/ Samples Collected
Test Trenching	11 transects within the Pine Yard area 2 transects along east and west boundaries
TarGOST	41 locations
Soil Samples	127 locations
Groundwater Samples (2017 Event)	49 locations sampled in the alluvial groundwater 7 locations sampled in the Eutaw groundwater
Drainage Ditch Samples	6 locations
Surface Water Samples	3 locations

In addition, the Phase II RI included the following studies/surveys:

- A geophysical survey was conducted in the southern portion of the Pine Yard prior to intrusive investigation activities to identify any debris and structures (e.g., utilities, concrete footings) that could pose an obstacle to investigation and/or remedial actions.
- During the FFS and remedial design activities, subsurface soil and groundwater characteristic data were collected in the Pine Yard, including moisture content, grain size analyses, hydraulic conductivity, pH, oxidant demand, nitrate/nitrite, total organic carbon, and alkalinity.
- A mini-excavator was used to conduct shallow test trenching ("potholing") in portions of the Pine Yard to identify the presence and extent of shallow buried creosote material resulting from operations and buried waste material.
- A 24-hour aquifer test was conducted in the Pine Yard to evaluate groundwater drawdown extent at various pump rates and to collect data for potential dewatering during potential removal action(s).
- Soil samples representative of the buried waste material and creosote-contaminated soil/gravel encountered in the Pine Yard during the potholing activities were collected and subjected to the synthetic precipitation leaching procedure (SPLP) to evaluate potential leaching from soil/gravel to groundwater.

A summary of completed and ongoing remedial actions for the Site can be found in the 2018 FFS.

VOLUNTARY ACTION

In July 2017, the EPA Superfund Task Force issued multiple recommendations with 5 overall goals:

- GOAL 1: Expediting Cleanup and Remediation
- GOAL 2: Re-invigorating Responsible Party Cleanup and Reuse
- GOAL 3: Encouraging Private Investment
- GOAL 4: Promoting Redevelopment and Community Revitalization
- GOAL 5: Engaging Partners and Stakeholders

One purpose of the recommendations was to identify an expedited timeframe on how the EPA could restructure the Superfund cleanup process, realign incentives of all involved parties, to promote expeditious cleanups and the revitalization of properties across the country.

By submitting a removal action workplan to address contaminated soil not in contact with groundwater, the Greenfield Multistate Trust with encouragement and oversight from MDEQ and EPA took advantage of the opportunity to expedite the cleanup and ultimately the reuse of a portion of the site (Pine Yard) that is expected to have the most immediate redevelopment interest/opportunities. These actions go directly to multiple goals of the Superfund Task Force.

With this Proposed Plan, EPA Region 4 and the MDEQ intend to ensure that CERCLA cleanup program goals are met by the voluntary actions being conducted in a portion of the Pine Yard in accordance with the removal action workplan. The OU1 Proposed Plan will incorporate the voluntary action into the overall Superfund cleanup strategy at the Site. EPA Region 4 and MDEQ are working together to make certain that adequate and timely cleanup of this voluntary removal action are conducted, consistent with reasonably anticipated future use, to ensure that the necessary environmental response actions are taken in accordance with applicable federal and state law and are protective of human health and the environment.

The Proposed Plan incorporated these necessary Superfund elements into the decision beyond the voluntary actions stated in the removal action work plan:

1. A site specific, EPA reviewed and approved Human Health Risk Assessment and conditionally approved Baseline Ecological Risk Assessment (BERA).
2. Finalized Cleanup Goals for surface soil (Residential and Industrial)
3. Evaluation of the remedies considered for addressing the risk identified at the site against the nine criteria defined under CERCLA. (including state and community acceptance)
4. The administrative record for this site is made available to the public to allow the reader the opportunity to have access to the materials, information and documents that provide the basis and support EPA's selection of a remedial action at the site.

SITE CHARACTERISTICS

The Pine Yard is approximately 44 acres of land bounded by U.S. Highway 82 to the north, by the railroad rights-of-way to the east, by 14th Avenue North to the south, and by private properties to the west. The Pine

Yard was used primarily for lumber and scrap metal storage and had few, if any, above or below ground structures. The Pine Yard is currently vacant and much of the northern end is wooded.

The Pine Yard is relatively flat. Much of the stormwater infiltrates into the ground surface, although some of the stormwater from areas at the perimeter of the Pine Yard runs off via sheet flow into surrounding City of Columbus drainage ditches and ultimately, to Luxapalila Creek. The City of Columbus storm drainage system brings a significant volume of stormwater from areas located to the north of the Site under Highway 82 in a culvert and through and around the Pine Yard in a series of storm drainage ditches. The City's ditches collect additional stormwater from an area north of 14th Avenue North, bounded on the west by the Brick Yard industrial area and North 20th Street and on the east by the railroad tracks east of the Pine Yard. South of 14th Avenue North, the drainage basin includes the east half of the Former Plant Area.

Drainage features at the Pine Yard include a man-made ditch with a southerly-to-easterly flow through the wetlands in the northern part of the Pine Yard. The City of Columbus storm drainage system brings water from north of US Highway 18 into this ditch on the north end of the Pine Yard, and the ditch exits the east side of the Pine Yard through a culvert located approximately 1,400 ft north of 14th Avenue North. Another City of Columbus storm drainage ditch flows south along the north half of the western Pine Yard property boundary before turning to the southwest, and then south, through the neighborhood located to the west of the Pine Yard, toward 14th Avenue North. Another shallow drainage swale is located along the west property boundary in the southern half of the Pine Yard. The northern half of this drainage swale flows to the north and the southern half of the drainage swale flows to the south.

As shown in Figure 3, approximately 6.5 acres of the southern end of the Pine Yard lie within the 100-year floodplain.

The U.S. Fish and Wildlife Service National Wetlands Inventory "Wetlands Mapper" version 2 identifies a 5.66-acre area in the northeastern portion of the Pine Yard as a freshwater forested/shrub wetland. As part of the RI, Headwaters Inc. completed a survey to delineate the wetland boundaries in the Pine Yard. The Headwaters Inc. survey indicates that the northern portion of the Pine Yard contains a forested wetland and a forested upland with a man-made drainage ditch (which receives offsite stormwater drainage from the City of Columbus storm drainage system (Figure 3). The survey determined that 9.10 acres is forested wetland.

Geology/ Hydrology

The Pine Yard is underlain by two primary water-bearing units, the alluvial aquifer and the Eutaw formation. The shallowest water-bearing unit is the alluvial aquifer, an unconfined unit of unconsolidated alluvial sediment, consisting of a downward-coarsening sequence of interbedded clay, silt, sand, and gravel, to a depth of approximately 15 feet below ground surface (ft bgs). These materials were likely deposited by Luxapalila Creek, east of the Pine Yard; they are recharged by rainwater percolating through surface soils and by seepage from Luxapalila Creek. Groundwater in the alluvial aquifer is encountered at depths as shallow as 3 ft bgs in the Pine Yard.

The saturated zone of the alluvial aquifer in the Pine Yard is approximately 8 ft thick with the water table encountered between approximately 6 and 8 ft bgs with some seasonal water level fluctuations. The groundwater flow of the alluvial aquifer is southeasterly with a velocity of approximately 40 ft per year.

There are four public water supply wells operated by Columbus Light & Water approximately 200 to 750 ft to the east of the Pine Yard. These wells are situated at depths ranging from 885 to 915 ft bgs and are isolated from the shallower Pine Yard units by confining layers that are several hundred feet thick.

NATURE AND EXTENT OF CONTAMINATION

This section presents a summary of the nature and extent of contamination associated with OU1 based on the data and analyses presented in the RI Report. In addition, this section presents a summary of the findings of the baseline human health risk assessment (HHRA), which was submitted to EPA on April 4, 2018 and conditionally approved on June 20, 2018, and the draft baseline ecological risk assessment (BERA) generated in 2017, in relation to OU1. While the focus of this section is on OU1, a general description of the broader Pine Yard is included where necessary to provide context.

Sources and Distribution of COCs in OU1

Past operations in the Pine Yard included storage of treated and untreated wood, and some scrap metal storage. These activities are anticipated to have resulted in impacts to OU1 soils across a large portion of the Pine Yard. In localized areas where larger releases appear to have taken place, impacts extend deeper into the unsaturated zone and, at times, to below the groundwater table. Table 1-1 summarizes the chemicals present in OU1 soils at concentrations that represent a potential unacceptable risk to potential receptors under the anticipated future land use for the Pine Yard. The majority of COCs are associated with wood treating-related chemicals (primarily polycyclic aromatic hydrocarbons (PAHs) PAHs and PCP), although arsenic, chromium, carbazole, copper, dioxins/furans and mercury have also been detected at levels that may pose a potential human health and/or ecological risk in several soil samples from OU1.

PAHs, and benzo[a]pyrene in particular, are common urban contaminants and are frequently present along roadways and rail corridors. TEQdf is also a common urban contaminant frequently associated with combustion (e.g., aerial deposition associated with waste burning). Therefore, it is possible that some portion of the contamination in the Pine Yard is unrelated to past site activities. Most notably, a considerable volume of stormwater drains from Highway 82 and adjacent area, which may have been and continue to be a source of urban contaminants to the wetlands in the northeast end of the Pine Yard. Arsenic occurs naturally in soils from this region in Mississippi and was detected in background soil samples collected as part of the RI, typically at concentrations exceeding residential screening levels.

The majority of impacts to OU1 soils are confined to the surface (0 to 2 ft bgs) and are associated with treated wood storage. This pattern of impacts to surficial soils near storage areas is common to wood treatment sites in general, but is also common for areas adjacent to highways and rail corridors. These impacts typically occur as contaminated soils and/or thin layers of creosote only a few inches thick. The creosote layers and associated COPCs are subject to weathering processes including photodegradation, volatilization, and oxidation, and typically form an asphalt-like layer. These materials tend to have lower COPC concentrations than fresh creosote because of the weathering process and have relatively low permeability. As a result, the COCs associated with these materials typically do not migrate, and the materials do not represent a significant source of COC leaching to groundwater. Pine Yard operations are known to have included periodically spreading layers of gravel over the soil surface, burying the layers of asphalt-like creosote. As a result, these creosote layers are often observed as thin lenses in surface soils, typically at depths of less than 2 ft bgs,

although they have been observed at deeper depths in a few distinct areas of the Pine Yard. There are no principal threat wastes known to be present in OU1 soils.

There are localized areas where greater amounts of residual creosote, sheen, and/or heavily-stained soils are observed in unsaturated zone soils within OU1. These impacts often extend to several feet in depth and, in limited areas, to below the water table. OU1 does not include the DNAPL Source Area where DNAPL is present below the water table and represents a persistent contaminant sources to groundwater. This area will be evaluated as part of the OU-2 feasibility study. The RI has identified an area along the eastern property boundary of the Pine Yard where soil impacts occur throughout much of the unsaturated zone, but do not appear to be extensively present below the water table. This area is included in OU1.

OU1 Depth zones

For the purpose of the OU1 FFS, three depth-based zones of soil contamination have been defined:

- Zone 1—Debris and impacted material present on the ground surface. These materials were identified in six relatively small and localized areas within the Pine Yard.
- Zone 2—Impacted surface soils (0 to 2 ft bgs) most commonly associated with weathered creosote that is similar to asphalt, but also with localized areas where COC concentrations are present above health-based screening levels and/or debris is present.
- Zone 3—Soils in the unsaturated zone below Zone 2 (2 to approximately 8 ft bgs) where visible contamination is present.

Zone 1 was addressed under a voluntary action by the Multistate Trust. Figure 4 summarizes the extent of Zones 2 and 3 to be addressed under the OU1 removal action, which encompasses the area and volumes summarized below.

ZONE	AREA (ACRES)	VOLUME (CUBIC YARDS)
2	13	41,513
3	1	13,497

The following summarizes key observations with respect to the distribution of contamination in Zones 2 and 3.

Zone 2

Zone 2 spans the depth interval of 0 to 2 ft bgs. The 0 to 2-ft increment takes into consideration both the potential exposures and the available Pine Yard data. The inclusion of soils up to 2 ft allows for contact with soils that may be disturbed during activities such as gardening, outdoor maintenance, or landscaping accounted for in the HHRA.

Three data sets were considered in establishing the lateral extent of Zone 2:

- Historical Aerial Photographs: Historical aerial photographs were reviewed to evaluate the extent of the Pine Yard that was used for wood storage and related activities that potentially may have contributed to contamination of soils. This area represents an outer bound of the potential lateral extent of Zone 2 soils.

- Soil Sample Data: Chemical concentrations exceed one or more of the health-based screening levels in 75 of the 106 surface soil samples that have been collected from the Pine Yard. The majority of these exceedances occur within the footprint of historical activities evident in aerial photographs.
- Pothole Data: As part of the Phase II RI, a backhoe was used to dig potholes to a depth of 4 to 8 ft bgs on transects throughout the Pine Yard. Visual observation of the potholes revealed that thin, asphalt-like layers of creosote are present in surface soils in the northern and central portions of the Pine Yard, consistent with impacts from storage of treated wood and subsequent burial by gravel placed by plant operators. Additional pothole data collected in the southern portion of the Pine Yard during March 2018 confirmed that impacts to soils are generally less frequent in this area.

Justification for Determining that Contaminated Soils in OU1 DO NOT Contain a RCRA Listed Waste

In accordance with the EPA Management of Remediation Waste Under RCRA (EPA530-F-98-026), the Superfund Division of EPA has determined that the Pine Yard soil/material are not listed RCRA hazardous waste and will only be designated as hazardous based on characteristics identified by representative sampling.

This determination is based on EPA's independent review of the anecdotal process knowledge information provided by former workers suggesting that wood treating operations were conducted in the Pine Yard and process and knowledge and information provided by Tronox (including manifest and other facility generated documentation) which indicate that no listed RCRA waste was generated in the Pine Yard. In addition, a review of historical photos from 1955 to 2010 clearly show that at least one rail road tracks and some soil has been removed from the Pine Yard. Based on statements in the site's HRS Package and sampling conducted at that time, it appears that soil that was removed from the Pine Yard under the RCRA program by Kerr McGee before the facility closed down was handled and disposed as a non-listed waste.

The EPA agrees with the Multistate Trust's good-faith determination that the necessary documentation regarding the source of the contamination in the Pine Yard is unavailable or inconclusive.

Zone 3

Zone 3 includes impacted soils in the unsaturated zone that extend from below Zone 2 (>2 ft bgs) to the groundwater table (typically 8 ft bgs). At this time, the only area of Zone 3 impacted soils has been identified along the eastern Pine Yard property boundary in the approximate north-to-south center of the Pine Yard (Figure 4), where pothole data and boring logs revealed the presence of impacted soils and debris at or near the ground surface and extending to near the groundwater table. Additional soils may be excavated from Zone 3 if visible contamination is present at the base of the Zone 2 excavation.

SUMMARY OF SITE RISKS

A baseline **human health** risk **assessment** (HHRA) was conducted to estimate the risks and hazards associated with the current and future effects of contaminants on human health and the environment. A **baseline ecological risk assessment** (BERA) was also conducted to assess the risks posed to ecological receptors due site- related contamination. The purpose of the baseline HHRA and SLERA is to identify potential cancer risks and noncancer health hazards and ecological effects caused by hazardous substance exposure in the absence of any actions to control or mitigate these exposures under current (vacant) and future site uses (residential and industrial). The HHRA and BERA are summarized in the FFS Report.

In the HHRA, cancer and non-cancer health hazard estimates are based on reasonable maximum exposure (RME) scenarios. The estimates were developed by taking into account various health protective estimates about the concentrations, frequency and duration of an individual's exposure to chemicals selected as chemicals of potential concern (CPOCs), as well as the toxicity of these contaminants.

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund human health risk assessment estimates the "baseline risk." This is an estimate of the likelihood of health problems occurring if no cleanup action were taken at a site. To estimate the baseline risk at a Superfund site, EPA undertakes a four-step process:

Step 1: Analyze Contamination

Step 2: Estimate Exposure

Step 3: Assess Potential Health Dangers

Step 4: Characterize Site Risk

In **Step 1**, EPA looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies helps EPA to determine which contaminants are most likely to pose the greatest threat to human health.

In **Step 2**, EPA considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, EPA calculates a "reasonable maximum exposure" (RME) scenario, which portrays the highest level of human exposure that could reasonably be expected to occur.

In **Step 3**, EPA uses the information from Step 2 combined with information on the toxicity of each chemical to assess potential health risks. EPA considers two types of risk: cancer risk and non-cancer risk. The likelihood of any kind of cancer resulting from a Superfund site is generally expressed as an upper bound probability; for example, a "1 in 10,000 chances." In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, EPA calculates a "hazard index." The key concept here is that a "threshold level" (measured usually as a hazard index of less than 1) exists below which non-cancer health effects are no longer predicted.

In **Step 4**, EPA determines whether site risks are great enough to cause health problems for people at or near the Superfund site. The results of the three previous steps are combined, evaluated and summarized. EPA adds up the potential risks from the individual.

The BERA found that there are ecological risks in the terrestrial portion of the Pine Yard. Contaminant concentrations in these surface soils also were predicted to pose a potential risk to human receptors. The EPA expects that the remediation of soils to address human health risks will also address excess ecological risks in OU1 soils. However, there is still uncertainty about ecological risks in the wetlands portions of the Pine Yard and those areas are outside of the scope of OU1 and will be addressed in a subsequent operable unit.

Human Health Risk Assessment

A four-step human health risk assessment process was used for assessing site-related cancer risks and noncancer health hazards. The four-step process is comprised of: Analyze Contamination, Estimate Exposure, Assess Potential Health Dangers, Characterize Site Risk (see adjoining box "What is Risk and How is it Calculated").

COPCs were selected by comparing the maximum detected concentrations of each analyses with residential and industrial soil Regional Screening Levels (RSLs). The majority of COPCs in the Pine Yard are associated with wood treating-related chemicals (primarily PAHs, PCP chromium, and dioxins (TEQdf)), although arsenic and carbazole have also been detected above their respective RSLs. Risks and hazards from groundwater, vapor intrusion, sediment and surface water are not presented in this Proposed Plan and will be part of future decisions regarding the Site. The current (vacant) and future (residential and industrial/ commercial) land use scenarios included the following exposure pathways and populations based on data collected in Zones 2 and 3 of OU1:

- Trespasser (current, future)— ingestion, dermal contact and inhalation of soil particles and vapors from surface soil.
- Residents (future)—incidental ingestion of and dermal contact with surface soil a, inhalation of particulates and volatile compounds in outdoor air.
- Outdoor workers (future)— ingestion, dermal contact and inhalation of soil particles and vapors from surface soil.
- Indoor workers (future)— ingestion, dermal contact, and inhalation of soil particles and vapors from surface soils.
- Construction workers (future)—ingestion, dermal contact and inhalation of soil particles and vapors from both surface and subsurface soil.

Conclusions of the HHRA

The HHRA was submitted to EPA and MDEQ on April 4, 2018, and was conditionally approved on June 20, 2018. Potentially exposed populations evaluated are future residents, workers, and construction workers, and current and future trespassers. The following receptors and exposure pathways were quantitatively evaluated for the Pine Yard and are applicable to OU1:

- Residents (future)—incidental ingestion of surface soil5, dermal contact with surface soil, and inhalation of particulates and volatile compounds in outdoor air.
- Outdoor workers (future)—incidental ingestion of surface soil, dermal contact with surface soil, and inhalation of particulates and volatile compounds in outdoor air.
- Indoor workers (future)—incidental ingestion of surface soil.
- Construction workers (future)—incidental ingestion of soil, dermal contact with soil, and inhalation of particulates and volatiles in outdoor air. (Exposure to the surface and subsurface soil increments were evaluated separately for construction workers.)
- Trespasser (current, future)—incidental ingestion of soil and dermal contact with surface soil.

The COPCs evaluated in the HHRA were selected by comparing maximum detected concentrations in soil to risk-based screening levels (inorganic and organic chemicals) and, where available, background sample concentrations (inorganic chemicals only). Risks associated with the COPCs were quantified in the HHRA.

Exposures were quantified by estimating potential chemical intake (dose), associated with each potential exposure pathway. Exposure point concentrations (EPCs) were calculated and represent the chemical concentration that a receptor could contact over the exposure period. Exposure parameters that defined the frequency, duration, and magnitude of potential contact with soil were used to estimate dose under a reasonable maximum exposure (RME) scenario. Cancer slope factors and inhalation unit risks were used to quantify the toxicity of carcinogens. Reference doses and reference concentrations were used to quantify noncancer toxicity.

The following table summarizes the excess lifetime cancer risks (ELCR) and noncancer hazard indices applicable for OU1 by receptor group.

RME Excess Lifetime Cancer Risk and Noncancer Hazards

Receptor	ELCR soil and outdoor air	Hazard Index soil and outdoor air [a]
Resident	**2×10^{-3}**	**100**
Outdoor Worker	**4×10^{-4}**	**9**
Indoor Worker	**2×10^{-4}**	**4**
Construction Worker (Surface)	5×10^{-5}	**30**
Construction Worker (Subsurface)	2×10^{-6}	0.6
Trespasser	6×10^{-5}	**4**

Notes:

In line with EPA guidance (USEPA 1989 RAGS A), all ELCR and HIs are shown to one significant digit.

[a] Risks to child resident

Bold indicates a lifetime cancer risk above 1 x 10–4 and noncancer hazard index above 1.

Contaminants of concern (COCs) were identified in accordance with EPA Region 4 guidance for HHRA. Table 1-3 presents COCs by receptor group for the Pine Yard. The primary drivers for risks associated with exposure to surface soil and particulates and volatile chemicals emitted from surface soil into outdoor air for both cancer and noncancer risk are TEQdf and benzo[a]pyrene. The findings of the HHRA indicate that there is no unacceptable risk to a construction worker exposed to subsurface soils in the Pine Yard.

Basis for Action

It is the lead agency's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Table 1-3. Summary of Soil COCs by Receptor

COC	Resident	Outdoor Worker	Indoor Worker	Construction Worker (Surface)	Construction Worker (Subsurface)	Trespasser
TEQdf	**X**	**X**	**X**	**X**		**X**
Benzo[a]pyrene	**X**	**X**	X	**X**		
Benzo[a]anthracene	X	X	X			
Benzo[b]fluoranthene	X	X	X			
Benzo[k]fluoranthene	X					
Dibenzo[a,h]anthracene	X	X	X			
Indeno[1,2,3-cd]pyrene	X					
Dibenzofuran	X					
Chrysene	X					
Fluoranthene	X					
Naphthalene	X	X				
Carbazole	X					
Pyrene	X					
2-Methylnaphthalene	X					
1,1'-Biphenyl	X					
Pentachlorophenol	X	X	X			
Arsenic	X	X	X			

Notes:
Bolded Xs indicate chemicals that are primary COCs (≥5% contribution to cumulative risk).
COCs are identified for scenarios with a cumulative ELCR >1E-04 or HI>1.

COC = chemical of concern
ELCR = excess lifetime cancer risk
HI = hazard index
TEQdf = toxicity equivalent concentrations for dioxins and furans

REMEDIAL ACTION OBJECTIVES

Before developing cleanup alternatives for a Superfund site, EPA establishes remedial action objectives (RAOs) to protect human health and the environment. RAOs are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARS), to-be-considered (TBC) guidance, and site-specific, risk-based levels.

The HHRA demonstrated that the COCs at OU1, toxicity equivalent concentrations of dioxins and furans (TEQdf) and benzo[a] pyrene, pose a risk to human health through ingestion of and dermal contact with surface soil, inhalation of soil particulates and inhalation of volatile compounds in indoor air. The following RAOs were developed based on the current land use as industrial/commercial property and future potential land use as residential property:

- Reduce or eliminate the human exposure threat via inhalation, incidental ingestion, and dermal adsorption to contaminated site soils to levels protective of current land and anticipated future use.
- Prevent unacceptable risk to humans from exposure to soil with concentrations of COCs above health-based criteria
- Prevent/minimize the migration of site contaminants off site through stormwater runoff or wind dispersion of fugitive dust.

PRELIMINARY REMEDIATION GOALS

In general, preliminary remedial goals (PRGs) are used to develop the long-term contaminant concentrations needed to be achieved to meet RAOs by the remedial alternatives. These goals must comply with ARARs (or the basis for a waiver must be provided) and result in residual risk levels that fully satisfy the CERCLA requirements for the protection of human health and the environment. PRGs are based on ARARs, risk-based concentrations if standards are not available or not sufficiently protective, or background concentrations of contamination. PRGs may be further modified through the evaluation of alternatives and the remedy selection process. PRGs were identified as Removal Action Levels (RALs) in Table 2-3 of the FFS, (shown below).

Table 2-3. Surface Soil COCs and RALs for Residential and Industrial/Commercial Land Use

	Residential		Industrial/Commercial	
COC	RAL (mg/kg)	Basis	RAL (mg/kg)	Basis
TEQdf	5.0E-05	nc	2.3E-04	nc
Benzo[a]pyrene	1.1E-01	c	2.1E+01	c
Benz[a]anthracene	1.1E+00	c	2.1E+02	c
Benzo[b]fluoranthene	1.1E+00	c	2.1E+02	c
Benzo[k]fluoranthene	1.1E+01	c	--	--
Dibenz[a,h]anthracene	1.1E-01	c	2.1E+01	c
Indeno[1,2,3-cd]pyrene	1.1E+00	c	--	--
Dibenzofuran	7.3E+01	nc	--	--
Chrysene	1.1E+02	c	--	--
Fluoranthene	2.4E+03	nc	--	--
Naphthalene	3.8E+00	c	1.7E+02	c
Carbazole	2.4E+01	c	--	--
Pyrene	1.8E+03	nc	--	--
2-Methylnaphthalene	2.4E+02	nc	--	--
1,1'-Biphenyl	4.7E+01	nc	--	--
Pentachlorophenol	1.0E+00	c	4.0E+01	c
Arsenic	8.7E+00	b	8.7E+00	b

Notes:

Cancer RALs are based on a target excess lifetime cancer risk of 1 x 10-6. Noncancer RALs are based on a target hazard index of 1.

For non-residential soil, the lower of the industrial/commercial and construction worker RALs are shown.

-- = chemical is not a COC under industrial/commercial land use scenario

b = background

c = cancer basis

nc = noncancer basis

COC = chemical of concern

RAL = removal action level (preliminary remedial goals)

TEQdf = toxicity equivalent concentration for dioxins and furans

The PRGs for TEQdfs correspond to a non-cancer target hazard of 1, which is consistent with EPA's policy for dioxins that specifies that non-cancer toxicity criteria for TCDD will be used to develop site-specific risk-based clean up levels at Superfund Sites.

PRGs for benzo(a)pyrene correspond to an excess lifetime cancer risk of 1×10^{-6} or a non-cancer hazard of 1 for residential and commercial/industrial soils.

SUMMARY OF REMEDIAL ALTERNATIVES

As stated in 40 CFR 300.430(a)(1)(i)) the national goal of the remedy selection process is to select remedies that are protective of human health and the environments, that maintain protection over time, and that minimize untreated waste. EPA generally shall consider the following expectations in developing appropriate remedial alternatives:

- EPA expects to use treatment to address the principal threats posed by a site, wherever practicable.
- EPA expects to use engineering controls, such as containment, for waste that poses a relatively low long-term threat or where treatment is impracticable.
- EPA expects to use a combination of methods, as appropriate, to achieve protection of human health and the environment.
- EPA expects to use institutional controls, such as water use and deed restrictions to supplement engineering controls as appropriate for short- and long-term management to prevent or limit exposure to hazardous substances, pollutants or contaminants.
- EPA expects to consider using innovative technology when such technology offers the potential for comparable or superior treatment performance or implementability, fewer or lesser adverse impacts than other available approaches, or lower costs for similar levels of performance than demonstrated technologies.
- EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site.

CERCLA Section 121(b)(1), 42 U.S.C. Section 9621(b)(1) requires that each selected site remedy be protective of human health and the environment, be cost-effective, comply with other statutory laws, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility, or volume of the hazardous substances.

After identifying and considering numerous potential treatment technologies four remedial alternatives for the soil response action have been retained are summarized below. More detailed descriptions of the remedial alternatives can be found in the FFS report. Capital costs are those expenditures that are required to construct a remedial alternative. Operational and Maintenance (O&M) costs are those post-construction costs necessary to ensure or verify the continued effectiveness of a remedial alternative and are estimated on an annual basis. Indirect costs are the project and construction management costs necessary for the management of the remedial action as well as costs associated with institutional controls. Present value is the amount of money which, if invested in the current year, would be sufficient to cover all the costs over time associated with a project, calculated using a discount rate of seven percent and a 30-year time interval. Construction time is the time required to construct and implement the alternative and does not include the

time required to design the remedy, negotiate performance of the remedy with the responsible parties, or procure contracts for design and construction.

Because hazardous substance will be left behind at levels that do not allow for unlimited use and unrestricted exposure, five-year reviews will be required for each alternative, as required by CERCLA 121(c) and the NCP [40 C.F.R. §300.430(f)(4)(ii)].

Alternative 1 - No Action

Estimated Capital Cost: $0
Estimated Annual Operation and Maintenance Cost: $105,000
Indirect Costs: $75,000
Net Present Value: $180,000
Estimated Construction Timeframe: 0 year
Estimated Time to Achieve RAOs: Greater than 30 years

The NCP requires that a "No Action" alternative be developed as a baseline for comparing other remedial alternatives. No remedial action or monitoring would be performed under this alternative. The No Action alternative provides for an assessment of the environmental conditions if no remedial actions are implemented.

Alternative 2 - Removal and Offsite Disposal

Estimated Capital Cost: $8,371,000
Estimated Annual Operation and Maintenance Cost: $90,000
Indirect Costs: $1,431,000
Net Present Value: $9,892,000
Estimated Construction Timeframe: 6 to 9 months
Estimated Time to Achieve RAOs: Approximately 1 year

This alternative includes the following main elements:

- Excavation of Zone 2 soils with COC concentrations that exceed PRGs and excavation of Zone 3 soils where visible contamination is present. Figure 4 presents the estimated extent of Zone 2 impacted soils and the estimated extent of known Zone 3 impacted soils.
- To the extent practicable, excavated soils with no visible evidence of contamination will be segregated from visibly-contaminated soils and analyzed to determine if these soils are suitable for use as Beneficial Reuse Materials as specified in Section 4.1.1 of the approved OU1 Removal Action Work Plan (Integral 2018b) within the areas of the Pine Yard identified for potential future industrial/commercial use. Excavation areas within OU1 that have been identified for potential future residential use will be backfilled only with imported soils that meet the criteria for Imported Backfill Material as specified in Section 4.1.1 of the approved OU1 Removal Action Work Plan.
- Offsite disposal of excavated contaminated soils determined by EPA to not contain RCRA hazardous wastes in a permitted RCRA Subtitle D Landfill such as the Golden Triangle Regional Landfill located in Starkville, Mississippi.

- Offsite treatment and disposal of unanticipated soils that may be encountered during construction, and subsequently determined to contain RCRA hazardous waste, in a permitted RCRA Subtitle C Landfill approved by EPA in accordance with the Off-site Rule in the NCP at 40 CFR 300-440.
- Confirmation sampling and analyses to demonstrate that cleanup goals have been achieved.
- Placement of Imported Backfill Material in areas identified for potential future residential use. Beneficial Reuse Material will be placed in areas identified for potential future industrial/commercial use, and Imported Backfill Material will be placed if needed to achieve final grades.
- Implementation of institutional controls (ICs) such as environmental covenant and deed restrictions for soil areas that exceed residential cleanup levels. The property owner is responsible for maintaining ICs.
- Mandatory five-year review.

The NCP requires an FS to identify 'applicable' and/or 'relevant and appropriate' environmental requirements (ARARs) related to chemicals at the site, site location characteristics and remedial activities such as excavation of contaminated soil. The FFS identified all ARARs for the site remedial alternatives. Key ARARs associated with Alternative 2 can be found in the following Table. Final ARARs will be listed in tables in the Record of Decision.

Action	Requirements	Prerequisite	Citation
Characterization of solid waste (all primary and secondary wastes)	Must comply with generator requirements of 40 CFR waste is excluded under 40 CFR § 261.4; and Must determine if waste is listed as a hazardous waste under 40 CFR Part 261 or characteristic waste.	Generation of solid waste as defined in 40 CFR § 261.2 – applicable	40 CFR § 262.11(a) and (b)
Temporary on-site storage of remediation waste in staging piles (e.g., excavated soils)	Must be located within the contiguous property under the control of the owner/operator where the wastes are to be managed in the staging pile originated. May be temporarily stored (including mixing, sizing, blending, or other similar physical operations intended to prepare the wastes for subsequent management or treatment) at a facility if used only during remedial operations provided that the staging pile: • must facilitate a reliable, effective, and protective remedy; • must be designed to prevent or minimize releases of hazardous wastes and constituents into the environment, and minimize or adequately control cross-media transfer as necessary to protect human health and the environment (e.g., use of liners, covers, run-off/run-on controls)	Accumulation of non-flowing hazardous remediation waste (or remediation waste otherwise subject to land disposal restrictions) as defined in 40 CFR § 260.10 – applicable	40 CFR § 264.554(a)(1) 40 CFR § 264.554(a)(1)(i) and (ii)

Action	Requirements	Prerequisite	Citation
Transportation of hazardous waste off-site	Must comply with the generator requirements of 40 CFR § 262.20-262.23 for manifesting, § 262.30 for packaging, § 262.31 for labeling, § 262.32 for marking, § 262.33 for placarding, §§ 262.40 and 262.41(a) for record keeping requirements, and § 262.12 to obtain EPA ID number.	Preparation and initiation of shipment of RCRA hazardous waste off-site – applicable	40 CFR § 262.10(h)

Alternative 2 will comply with ARARs identified in the FFS. No ARAR waivers are proposed for this alternative. The expected outcome of this Alternative is portions of the Pine Yard will be available for an unrestricted land use upon achieving performance standards at the completion of construction. The remaining portions of the site will be available for industrial/commercial land use.

Alternative 3 - Removal and Onsite Consolidation

Estimated Capital Cost: $5,372,000
Estimated Annual Operation and Maintenance Cost: $132,000
Indirect Costs: $961,000
Net Present Value: $6,465,000
Estimated Construction Timeframe: 6 to 9 months
Estimated Time to Achieve RAOs: Approximately 3 years

This alternative includes the following main elements:

- Excavation of Zone 2 soils with COC concentrations that exceed PRGs and excavation of Zone 3 soils where visible contamination is present. Figure 4 presents the estimated extent of Zone 2 impacted soils and the estimated extent of known Zone 3 impacted soils.
- Consolidation of excavated contaminated soils beneath a low permeability cover. Consolidation under this alternative would be integrated in with the future remedial action for the Former Plant Area (OU 2). The low-permeability cap would be designed to meet 'relevant and appropriate' RCRA landfill cover requirements which are identified as ARARs.
- Excavated soil would be placed into a temporary staging pile until a remedy is selected for the Former Plant Area (OU 2).
- Confirmation sampling and analyses to demonstrate that cleanup goals have been achieved. Placement of clean backfill.
- Implementation of institutional controls (ICs)such as environmental covenant and deed restrictions for soil areas that exceed residential cleanup levels. The property owner is responsible for maintaining ICs. Placement of clean backfill.
- Implementation of ICs to prevent disturbance of the soil cover and prevent exposure to underlying contaminated soil. The property owner is responsible for maintaining ICs.

The FFS identified all ARARs for the site remedial alternatives. Key ARARs associated with Alternative 3 can be found in the following Table. Final ARARs will be listed in tables in the Record of Decision.

Action	Requirements	Prerequisite	Citation
Characterization of solid waste (all primary and secondary wastes)	Must comply with generator requirements of 40 CFR waste is excluded under 40 CFR § 261.4; and Must determine if waste is listed as a hazardous waste under 40 CFR Part 261.	Generation of solid waste as defined in 40 CFR § 261.2 – applicable	40 CFR § 262.11(a) and (b)
Temporary on-site storage of remediation waste in staging piles (e.g., excavated soils)	Must be located within the contiguous property under the control of the owner/operator where the wastes are to be managed in the staging pile originated. May be temporarily stored (including mixing, sizing, blending, or other similar physical operations intended to prepare the wastes for subsequent management or treatment) at a facility if used only during remedial operations provided that the staging pile: • must facilitate a reliable, effective, and protective remedy; • must be designed to prevent or minimize releases of hazardous wastes and constituents into the environment, and minimize or adequately control cross-media transfer as necessary to protect human health and the environment (e.g., use of liners, covers, run-off/run-on controls)	Accumulation of non-flowing hazardous remediation waste (or remediation waste otherwise subject to land disposal restrictions) as defined in 40 CFR § 260.10 – applicable	40 CFR § 264.554(a)(1) 40 CFR § 264.554(a)(1)(i) and (ii)
Operation of a staging pile	The staging pile must not operate for more than two years, except when the EPA or Director grants an operating term extension under 40 CFR § 264.554(i).	Accumulation of non-flowing hazardous remediation waste (or remediation waste otherwise subject to land disposal restrictions) as defined in 40 CFR § 260.10 – applicable	40 CFR §§ 264.554(d)(1)(iii)
Transportation of hazardous waste on-site)	The generator manifesting requirements of 40 CFR § 262.20-262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 CFR § 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way – applicable	40 CFR § 262.20(f)

Alternative 3 will comply with ARARs identified in the FFS. No ARAR waivers are proposed for this alternative. The expected outcome of this Alternative is portions of the Pine Yard will be available for an unrestricted land use upon achieving performance standards at the completion of construction. The remaining portions of the site will be available for industrial/commercial land use.

Alternative 4 - Cover and Institutional Controls

Estimated Capital Cost: $2,519,000
Estimated Annual Operation and Maintenance Cost: $132,000
Indirect Costs: $490,000
Net Present Value: $3,141,000
Estimated Construction Timeframe: 3 to 6 months
Estimated Time to Achieve RAOs: Approximately 3 years

This alternative includes the following main elements:

- Placement of a 2-ft thick semi-permeable soil cover over contaminated the semi-permeability cover would be designed to meet 'relevant and appropriate' RCRA landfill cover requirements which are identified as ARARs.
- Maintenance of the cover and repairs as necessary.
- Implementation of ICs to prevent disturbance of the soil cover and prevent exposure to underlying contaminated soil. The property owner is responsible for maintaining ICs.

The FFS identified all ARARs for the site alternatives. Key ARARs associated with Alternative 3 can be found in the following Table. Final ARARs will be listed in tables in the Record of Decision.

Action	Requirements	Prerequisite	Citation
Characterization of solid waste (all primary and secondary wastes)	Must comply with generator requirements of 40 CFR waste is excluded under 40 CFR § 261.4; and Must determine if waste is listed as a hazardous waste under 40 CFR Part 261.	Generation of solid waste as defined in 40 CFR § 261.2 – applicable	40 CFR § 262.11(a) and (b)
Installation of low-permeability cover	Must cover the landfill (or cell) with a final cover designed and constructed to: (1) provide long-term minimization of migration of liquids through the closed landfill; (2) function with minimum maintenance; (3) promote drainage and minimize erosion or abrasion of the cover; (4) accommodate settling and subsidence so that the cover's integrity is maintained; and (5) have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	Closure of RCRA hazardous waste landfill – relevant and appropriate	40 CFR § 264.310(a)

Alternative 4 will comply with ARARs identified. No ARAR waivers are proposed for this alternative. The expected outcome of this Alternative is portions of the Pine Yard will be available for an unrestricted land use upon achieving performance standards at the completion of construction. The remaining portions of the site will be available for industrial/commercial land use. EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy (see table below, Evaluation Criteria for Superfund Remedial Alternatives). This section of the Proposed Plan describes the relative performance of each alternative against seven of the nine

criteria, noting how each compares to the other options under consideration. A detailed analysis of the alternatives can be found in the 2018 FS Report.

The remedial alternative selected for a Superfund site must meet the two threshold criteria (Overall Protection of Human Health and the Environment and Compliance with ARARs) as well as attain the best balance among the five evaluation criteria. EPA, after considering State (MDEQ) acceptance and public comments received on this proposed plan, will select the final remedy in the Record of Decision (ROD). EPA's Preferred Remedial Alternative may be altered or changed based on the two modifying criteria. The nine criteria are as follows:

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES

THRESHOLD CRITERIA

Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through ICs, engineering controls or treatment.

Compliance with **Applicable or Relevant and Appropriate Requirements (ARARs)** evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

EVALUATION CRITERIA

Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

MODIFYING CRITERIA

State/Support Agency Acceptance considers whether the State agrees with EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.

Community Acceptance considers whether the local community agrees with EPA's analyses and Preferred Remedial Alternative. Comments received on this Proposed Plan are an important indicator of community acceptance.

THRESHOLD CRITERIA

Overall Protection of Human Health and the Environment

All alternatives evaluated in the FFS except for Alternative 1 (No Action) would be protective of human health and the environment. Since Alternative S1 does not meet this threshold criterion, it will not be carried through the remaining criteria.

Alternatives 2 and 3 would remove soils with concentrations of COCs above health-based cleanup levels and replacing those soils with clean backfill. Alternative 4 would employ a soil cover to eliminate risks associated with exposure to soils with concentrations of COCs above health-based cleanup levels.

Compliance with ARARs

Alternatives 2, 3 and 4 would achieve RAOs and the location-specific, and action-specific ARARs identified in the FFS.

BALANCING CRITERIA

Long-Term Effectiveness and Permanence

Alternatives 2, 3, and 4 all would substantially attain the criteria of long-term effectiveness and permanence. Alternatives 2 and 3 would both eliminate soils with COC concentrations above health-based cleanup levels from the Pine Yard. Under Alternative 2, excavated soils would be disposed in an offsite landfill, while under Alternative 3 the soils would be consolidated under a cover within the Former Plant Area (OU 2) of the KMCC site. Thus, although Alternative 3 would eliminate contamination associated with soils from the Pine Yard, the contamination would still be present within the boundaries of the Former Main Plant Area (OU 2)—albeit within an engineered containment facility to prevent potential migration or receptor contact. For this reason, Alternative 3 is ranked lower for this criterion than Alternative 2.

Alternative 4 involves isolation of soils. Although this alternative has a high degree of certainty with respect to long-term effectiveness and permanence, ICs will be required to protect against disturbance of the soil cover and to prevent unacceptable exposure risks associated with potential future excavation work (e.g., to construct building footings or utilities). Therefore, because Alternative 4 leaves impacted soils in place in the Pine Yard, it ranks lower than Alternatives 2 and 3 with respect to long-term effectiveness and permanence.

Short-Term Effectiveness

Alternatives 2, 3 and 4 rank similarly high with respect to the short-term effectiveness criterion, and all three alternatives would be immediately effective upon completion of the remedial action.

All three of the alternatives involve the use of conventional construction techniques and potential short-term impacts to workers and the community can be readily addressed though proper design and execution of the remedial action, including use of well-established best management practices. Many of the potential short-term impacts and nuisances associated with the active remedies are related to the excavation, stockpiling, and transport of contaminated soils.

Reduction of Toxicity, Mobility, and Volume

By removing all of the OU1 soils with COCs above health-based cleanup goals, Alternative 2 would substantially reduce the toxicity, mobility and volume of contamination. Alternative 3 would result in a similar level of reduction in Pine Yard soils; however, the contaminant mass would be transferred to a consolidation area in the Former Plant Area. As a result, there would be no net reduction in contaminant volume or toxicity when the full KMCC Site is considered. The soils would be isolated below a low permeability cap in the Former Plant Area, which would substantially reduce any potential mobility of contaminants associated with the excavated OU1 soils under Alternative 3. Alternative 4 would not result in a reduction in contaminant toxicity or volume; however, the soil cover would reduce the potential mobility of the contaminants associated with OU1 soils by isolating the soils from stormwater and wind erosion.

Implementability

All three of the active remedial alternatives are relatively easy to construct and involve readily available and highly reliable technologies and equipment, and the effectiveness of all three alternatives can be readily evaluated through monitoring. Alternative 2 does not pose any significant impedances to additional remedial actions in the future, while the cover under Alternatives 3 and 4 may pose some minor impedance to additional remedial action should it be warranted in the future. Alternative 3 also poses a potential logistical challenge in that it relies on consolidation onsite in the Former Plant Area (OU 2). Because the remedial action for the Former Plant Area has not been selected, it is not clear at this time whether consolidation of Pine Yard OU1 soils in the Former Plant Area would be compatible or inconsistent with the final remedy selected for the area. Further, the schedule for excavation and consolidation of OU1 soils in the Former Plant Area would need to be coordinated with implementation of the Former Plant Area remedial action.

Costs

Table 3: Remedial Alternative Costs

ESTIMATED COSTS FOR REMEDIAL ALTERNATIVES				
Activity	**Alternative #1**	**Alternative #2**	**Alternative #3**	**Alternative #4**
Estimated Capital Cost	$0	$8,371,000	$5,372,000	$2,519,000
Indirect Cost	$75,000	$1,431,000	$961,000	$490,000
Estimated O&M Costs	$105,000	$90,000	$132,000	$132,000
Net Present Value	$180,000	$9,892,000	$6,465,000	$3,141,000
Estimated Time to Achieve RAOs	greater than 30 years	~3 years	~5 years	~3 years

At an estimated cost of $3,140,000, Alternative 4 is the lowest-cost alternative. Alternative 3 is estimated to cost $6,470,000, and Alternative 2 is estimated to cost $9,890,000.

MODIFYING CRITERIA

State Acceptance

State acceptance of the preferred alternative will be addressed in the ROD following review of comments received on the Proposed Plan. State has indicated a willingness to accept the preferred alternative pending review of any public comments.

Community Acceptance

Community acceptance of the preferred alternative will be addressed in the ROD following review of comments received on the Proposed Plan.

SUMMARY OF PREFERRED ALTERNATIVE

The diagram below summarizes the results of the detailed evaluation of remedial alternatives presented in this Proposed Plan.

LEGEND
● Excellent
◕ Good
◑ Fair
◔ Poor
○ Very Poor

		EVALUATION CRITERIA								
		Threshold		Balancing					Modifying	
		Protectiveness	Compliance with ARARs	Long-Term Effectiveness	Short-Term Effectiveness	Reduction of Toxicity, Mobility, or Volume	Implementability	Cost (millions)	Regulatory Acceptance	Community Acceptance
Alternative 1	No Action	○	○	○	◑	○	●	0.18	○	
Alternative 2	Removal and Offsite Disposal	●	●	●	◔	●	●	9.89	●	
Alternative 3	Removal and Onsite Consolidation	●	●	◕	◔	◕	◕	6.47	◕	
Alternative 4	Cover	●	●	◕	●	◑	●	3.14	◕	

Using the above information/assumptions, the Agency's Preferred Remedial Alternative for the Kerr McGee Columbus Site is Alternative 2: Removal and Offsite Disposal. The estimated total cost of this Preferred Alternative is $9,890,000.

Based on the information currently available, EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing criteria. EPA expects the preferred alternative to satisfy the following statutory requirements of CERCLA

Section 121(b), 42 U.S.C. § 9621(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. None of the alternatives, including the Preferred Alternative, satisfy the preference for treatment as a principal element. EPA will assess the two modifying criteria of state acceptance and community acceptance in the ROD to be issued following the close of the public comment period.

PUBLIC PARTICIPATION

The public meeting for the Proposed Plan will begin at 6 p.m. on December 13, 2018 at the Genesis Dream Center

EPA has provided information regarding the cleanup of the Site to the public through Fact Sheets, public meetings, announcements in **Local Newspaper**, and the Administrative Record file. In addition to readingthis Proposed Plan, EPA and MDEQ encourage the public to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted at the Site by reviewing the documents contained in the Administrative Record/Information Repository.

For further information on the Site, please contact:

Charles King, Remedial Project Manager
(404) 562-8931 or (800) 435-9233
E-mail: King.CharlesL@EPA.gov

Kerisa Coleman, Community Involvement Coordinator
(404) 562-8831 or (800) 435-9233
E-mail: coleman.kerisa@epa.gov

US EPA Region 4
61 Forsyth Street, SW
Atlanta, GA 30303-8960

DOCUMENT INFORMATION

The Administrative Record contains all the information used by the Agency to select a Remedial Action. Copies of the Administrative Record are kept at:

Columbus-Lowndes Public Library
314 N. Seventh Street
Columbus, MS 39701
(662) 329-5300
Hours: Monday – Tuesday 9 a.m. –7 p.m.
Wednesday – Thursday 9 a.m. – 6 p.m.
Friday 9 a.m. – 4 p.m. and Saturday 10 a.m. –4 p.m.

U.S. Environmental Protection Agency Region IV - Records Center
61 Forsyth Street, SW Atlanta, Georgia 30303-3104
Phone: 404-562-8816
Hours: Monday - Friday 8 a.m. - 5 p.m.

GLOSSARY

Administrative Record: Materials, information and documents that provide the basis and support EPA's selection of a remedial action at Superfund sites usually placed in the **information repository** near the Site.

Applicable or Relevant and Appropriate Requirements (ARARs): Refers to Federal and more stringent State environmental requirements a selected remedy must attain which vary from site to site. Reference 40 CFR 300.5 Definitions of 'Applicable requirements' and 'Relevant and appropriate requirements'.

Baseline Risk Assessment (BRA): A qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and the environment by the presence or potential presence and use of specific pollutants.

Chemical of Concern (COCs): Chemical constituents associated with a Superfund Site that have been released into the environment and pose an unacceptable risk to human health.

Cleanup: Actions taken to deal with a release or threat of release of a hazardous substance that could affect humans and/or the environment. The term "cleanup" is sometimes used interchangeably with the terms remedial action, removal action, response action, or corrective action.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA): Also known as **Superfund**, is a federal law passed in 1980 and modified in 1986 by the Superfund Amendment and Reauthorization Act (SARA). The act created a trust fund, to investigate and cleanup abandoned or uncontrolled hazardous waste sites.

Ecological Risk Assessment (ERA): A qualitative and quantitative evaluation performed in an effort to define the risk posed to ecological receptors by the presence or potential presence of specific contaminants.

Focused Feasibility Study: Study conducted after the Remedial Investigation to determine what alternatives or technologies could be applicable to the site specific COCs.

Groundwater: Water located beneath the ground surface in soil pore spaces and in the fractures of lithologic formations.

Human Health Risk Assessment (HHRA). The process used to estimate the nature and probability of adverse health effects in humans who may be exposed to hazards in contaminated environmental media, now or in the future.

Information Repository: A library or other location where documents and data related to a Superfund project is placed to allow public access to the material.

Institutional Controls: Administrative, non-engineering, controls that inform and prevent exposures to human receptors.

Monitoring: The periodic or continuous surveillance or testing to determine the level of pollutants in various media.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The federal regulation that guides the Superfund program.

Proposed Plan: Document that summarizes the RI/FS, the alternatives developed and the proposed Preferred Remedial Alternative and the rationale for its proposal

Public Comment Period: The time allowed for the public to express its views and concerns on the information provided in the Proposed Plan and EPA's proposed Preferred Remedial Alternative.

Record of Decision (ROD): A decision document that selects and describes the remedy that will be implemented at a Site. The ROD is based on information and technical analysis generated during the remedial investigation/feasibility study and consideration of public comments.

Remedial Action (RA): The actual construction or implementation phase of a Superfund site cleanup that follows remedial design.

Remedial Action Objectives (RAOs): Provide a general description of what the cleanup will accomplish (e.g., restoration of groundwater to drinking water levels). These goals typically serve as the as the basis for developing remedial alternatives.

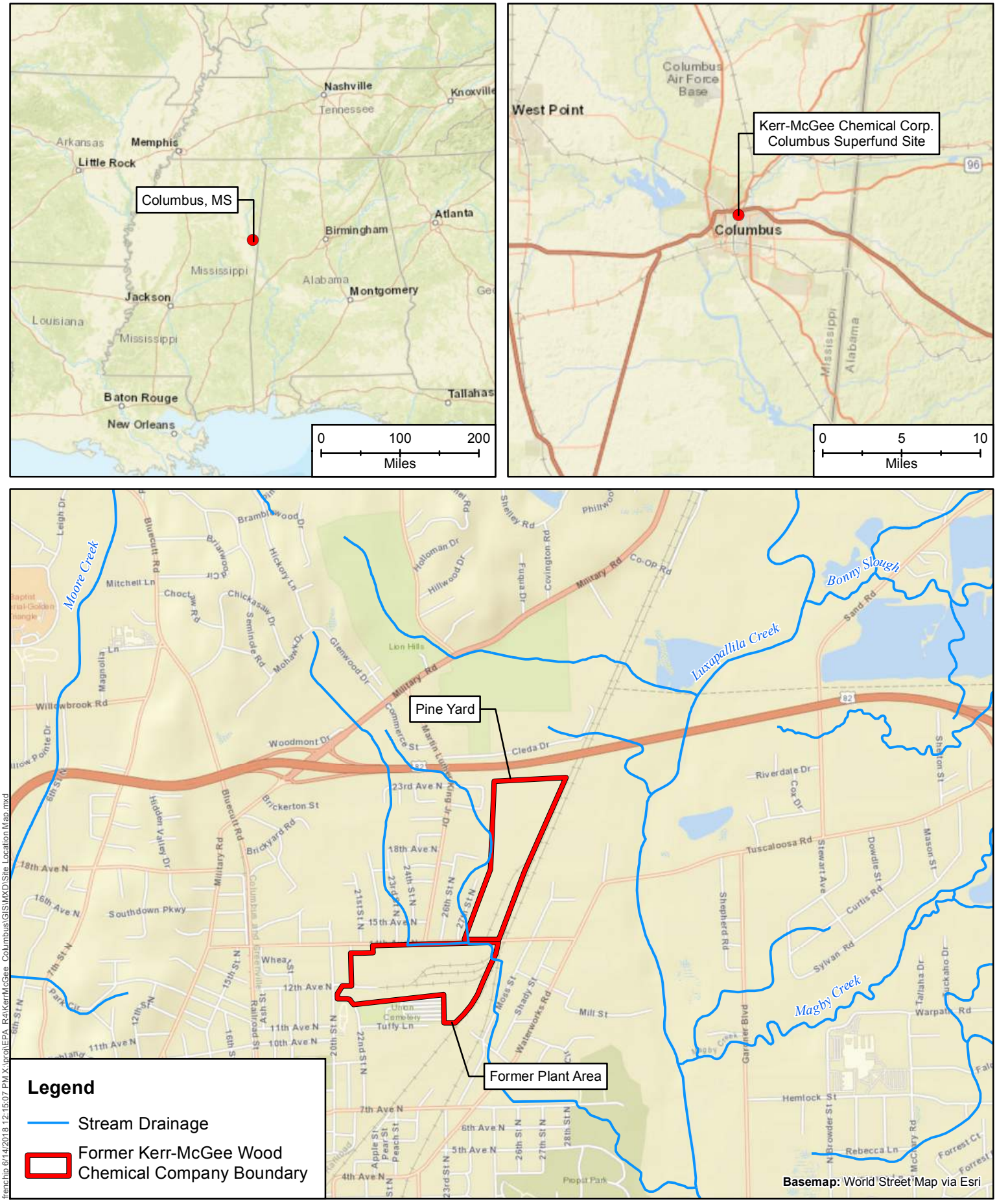
Remedial Design (RD): The development of engineering drawings and specifications for the implementation and construction of a remedial action.

Remedial Investigation (RI): An investigation conducted to fully characterize the nature and extent of contamination of a release, or threat of release, of hazardous substances, pollutants, or contaminants. In addition, the RI also evaluates risks posed to human health and the environment. The RI gathers the necessary data to support the corresponding FS.

Response Action: A CERCLA-authorized action involving either a short-term removal action or a long-term removal response. This may include but is not limited to: removing hazardous materials from a site to an EPA-approved hazardous waste facility for treatment, containment or treating the waste on-site, identifying and removing the sources of groundwater contamination and halting further migration of contaminants.

Superfund: The common name used for the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended in 1986.

FIGURES



frenchip 6/14/2018 12:15:07 PM X:\proj\EPA_R4\KerrMcGee_Columbus\GIS\MXD\Site Location Map.mxd

N

0 0.25 0.5
Miles

NAD 83 State Plane Alabama West, Feet

Site Location Map
Kerr-McGee Chemical Corp. - Columbus Superfund Site
Columbus, Lowndes County, Mississippi

Figure 1

Basemap: 2016 Digital Globe via Esri

82

Martin Luther King Jr Dr

14th Ave N

Legend

- Zone 2 (0-2 ft bgs)
- Zone 3 (2-8 ft bgs)
- Zone 4
- DNAPL Source Area
- OU1 Boundary
- Former Kerr-McGee Chemical Corporation Property Boundary
- Railroad

frenchjp 6/14/2018 3:51:01 PM X:\proj\EPA R4\KerrMcGee Columbus\GIS\MXD\OU-1 Boundary.mxd

BLACK & VEATCH

N

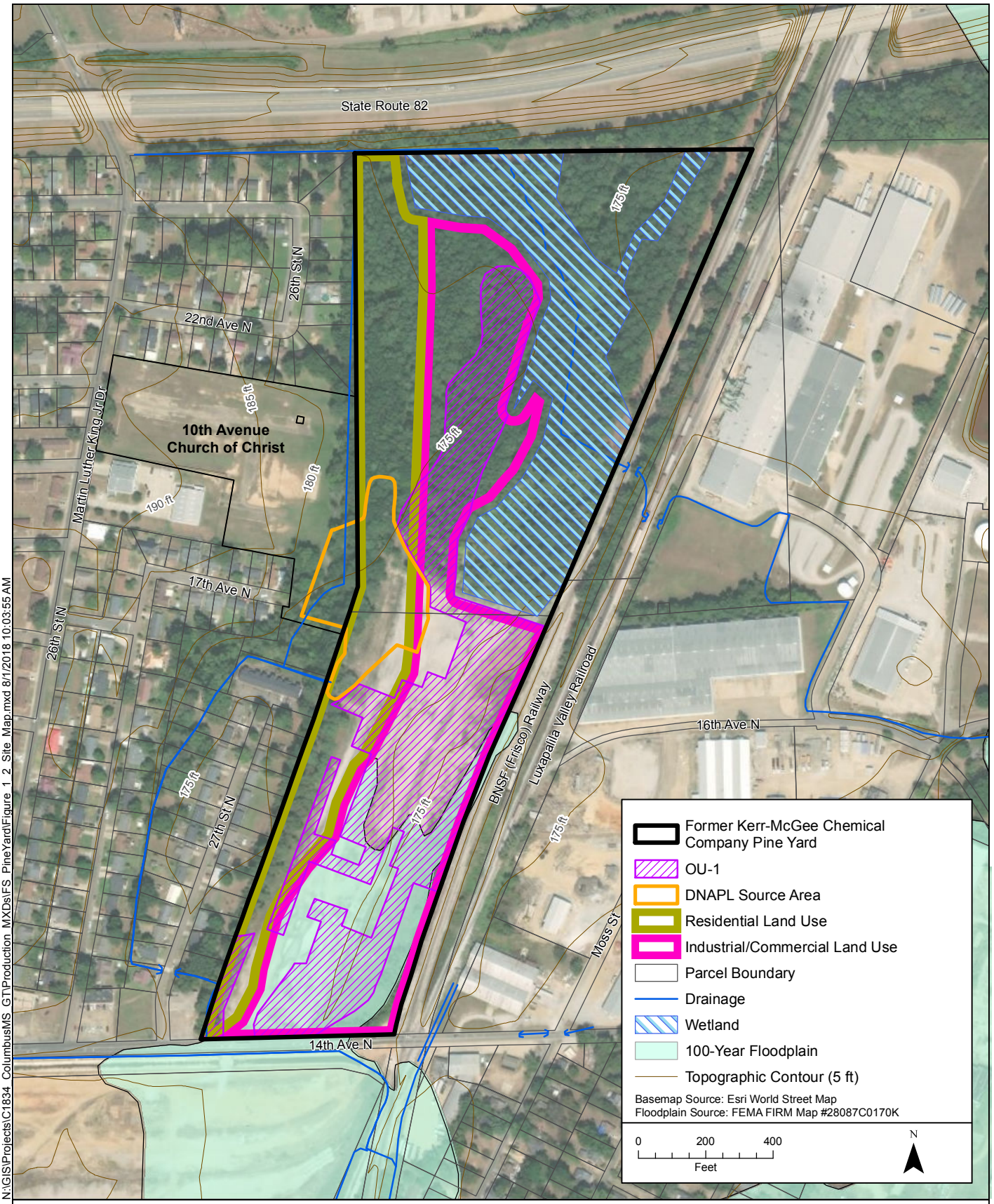
0 100 200 400

Feet

NAD83 Stateplane MS, East Feet

OU-1 Boundary
Kerr-McGee Chemical Corp. - Columbus Superfund Site
Columbus, Lowndes County, Mississippi

Figure 2

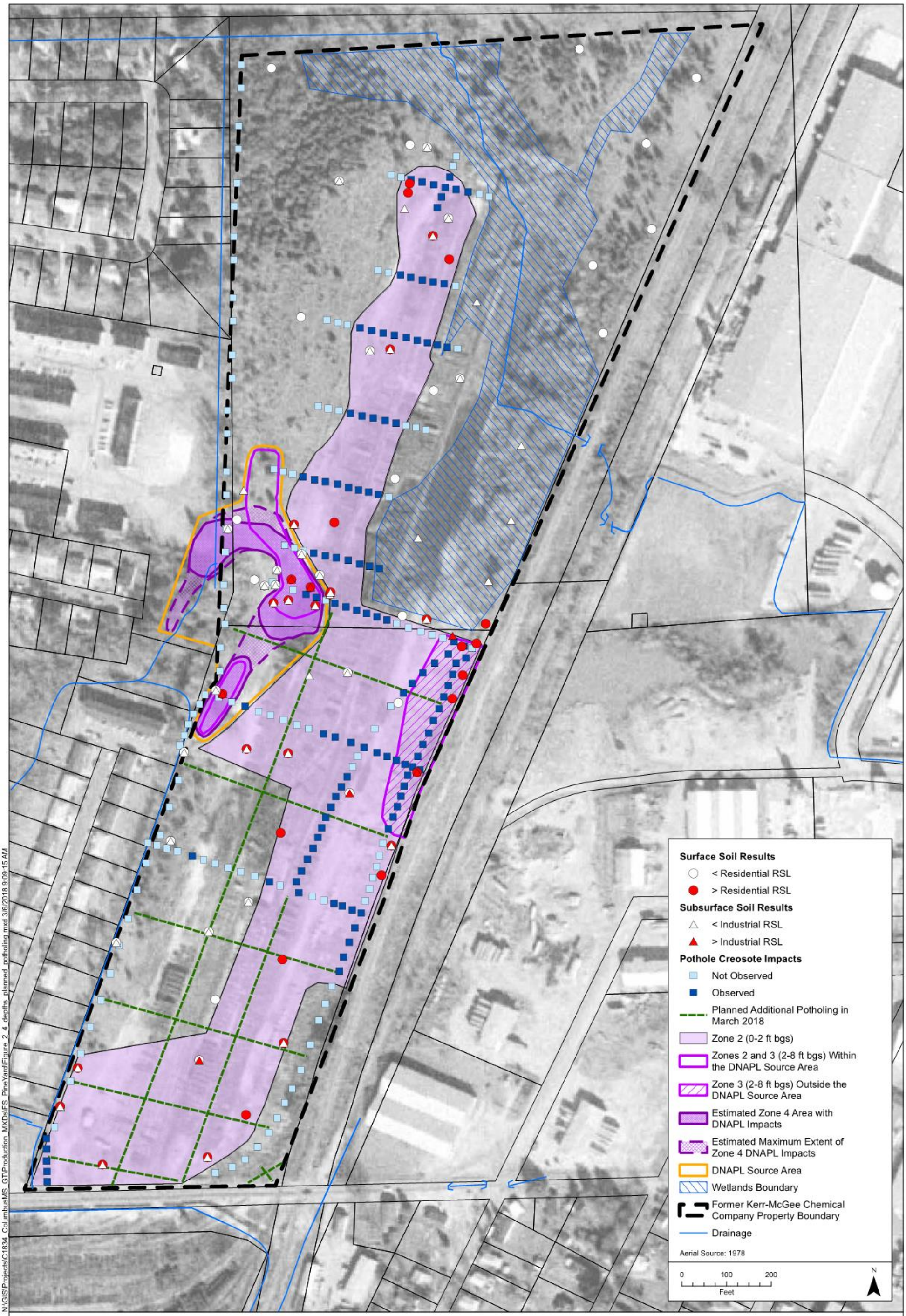


N:\GIS\Projects\C1834_ColumbusMS_GTVProduction_MXDs\FS_PineYard\Figure_1_2_Site_Map.mxd 8/1/2018 10:03:55 AM

Prepared for: Greenfield Environmental Multistate Trust, LLC
Trustee of the Multistate Environmental Response Trust

Prepared by: integral consulting inc.

Figure 3.
Pine Yard Features and Adjoining Properties
Ker-McGee Chemical Corp - Columbus Superfund Site
Columbus, Mississippi
Focused Feasibility Study Report, OU1
August 2018



Prepared for: Greenfield Environmental Trust, LLC
Trustee of the Multistate Environmental Response Trust

Prepared by: integral

DRAFT

Figure 4.
Estimated Areal Extent of Zone 2, Zone 3, and Zone 4 Soils
Ker-McGee Chemical Corp - Columbus Superfund Site
Columbus, Mississippi
Focused Feasibility Study Report, OU1
August 2018