

## **PROPOSED PLAN FOR REMEDIAL ACTION FOR THE FORMER OKMULGEE REFINERY SITE IN OKMULGEE, OKLAHOMA**

This Proposed Plan identifies the preferred remedial alternatives for contaminated soils, surface water, sediments, and wastes at the former Okmulgee Refinery Site (Site) in Okmulgee, Oklahoma, selected by the Oklahoma Department of Environmental Quality (DEQ). It also describes many of the remedial action alternatives considered for addressing contamination in soil and wastes. Groundwater contamination will be addressed as a separate operable unit.

The Proposed Plan summarizes information explained in greater detail in the Phase I and Phase II Site Characterization Reports and the Remediation Plan prepared by The Benham Companies, Incorporated, on behalf of ConocoPhillips Company, for the Site. The Proposed Plan is available for public review at the information repositories listed at the end of this document. We invite you to comment on DEQ's preferred alternatives and/or the other remedial action alternatives. Your comments are important in DEQ's decision-making process for selecting a final remedy.

The Proposed Plan is open for formal public comment from:

October 24 to December 8, 2004. The comment period may be extended by DEQ up to an additional 30 days upon request by the public.

The DEQ and ConocoPhillips Company will hold a Public Meeting on the Proposed Plan at:

7:00 pm, Tuesday, November 9, 2004  
OSU-Okmulgee Student Union  
Okmulgee Conference Room  
1100 N. Loop 56- PO. Box 1217  
Okmulgee, OK 74447-1217  
Phone 918-758-0840

An opportunity for questions and verbal comment will be provided at the public meeting. Written comments on the Proposed Plan and other alternatives should be sent to:

Ms. Angela Brunzman  
Land Protection Division  
Department of Environmental Quality  
707 North Robinson, P.O. Box 1677  
Oklahoma City, Oklahoma 73101-1677

The DEQ will write a Record of Decision (ROD) for remediation of the Site after considering all public comments.

## **THE PROPOSED PLAN FOR REMEDIAL ACTION AT THE FORMER OKMULGEE REFINERY SITE**

### **INTRODUCTION**

This Proposed Plan describes remedial action alternatives considered for addressing elevated concentrations of volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) in soils, sediments, and wastes at the former Okmulgee Refinery Site (the Site) in Okmulgee, Oklahoma (Figure 1). It also addresses an elevated metal concentration for lead in on-site surface water. The Proposed Plan identifies the preferred alternatives selected by the Oklahoma Department of Environmental Quality (DEQ). The remedial action alternatives identified in this plan are a result of the Phase I and Phase II Site Characterization Reports prepared by The Benham Companies, Inc., on behalf of ConocoPhillips Company. The investigation was conducted pursuant to a voluntary agreement with ConocoPhillips, DEQ, and the Okmulgee Area Development Corporation (OADC), in 1997. The DEQ is responsible for the oversight of the investigation and remedy selection for the Site.

The purposes of the Proposed Plan are to:

- describe the remedial action alternatives,
- identify DEQ's preferred alternative for contaminated soils, sediments, surface water, and wastes.
- solicit public comment on the preferred alternatives and other alternatives.

### **BACKGROUND**

OADC owns a closed petroleum refinery Site located west of U.S. Highway 75 on the north side of the City of Okmulgee in Okmulgee County, Oklahoma. Petroleum storage and refining activities began at the Site in approximately 1906. The Site produced gasoline, lube oils, and asphalt. Various owners operated the Site from 1906 to 1930. Phillips Petroleum Company acquired the Site in 1930 and operated the refinery until 1966, at which time the refinery was sold to OKC Refining Company. In 1980, OKC Refining Company sold the refinery to Basin Refining Company who then operated the refinery through May 1981. Basin Refining Company filed for bankruptcy in June of 1981.

In 1981 and 1982, ownership of the Site was held by CKB & Associates, Inc., which leased the Site to OK Corporation of Dallas, Texas. The refinery was operated

intermittently from June of 1981 to June of 1982 at which time it was permanently shut down. In June of 1997, Basin Refining Company issued a quitclaim deed for the property to the OADC. The OADC intends to develop the Site for future use as an industrial park.

When Site remediation began in early 1998, the Site offered numerous challenges. In order to address these challenges, the following tasks were undertaken by ConocoPhillips, with work being completed in 2001.

- Clearing of the Site perimeter and construction of a fence around the Site
- Characterization/disposal of containerized chemicals
- Abatement and off-site disposal of over 8,000 cubic yards of asbestos
- Characterization and disposal of over 5,000 cubic yards of non-hazardous tank bottoms
- Off-site disposal of hazardous waste streams such as leaded gasoline tank bottoms, crude tank bottoms, mercury, PCBs, neutralized hydrofluoric acid, chromium, etc.
- On-site neutralization and subsequent off-site disposal of 300 gallons of 99%, anhydrous hydrofluoric acid
- Demolition of a 260 foot tall cat cracker and a 160 foot tall boiler house stack using explosives
- Demolition of over 100 onsite tanks, vessels, and buildings
- Removal of the majority of underground piping

An assessment of the environmental conditions at the Site began with the submittal of a Work Plan on August 2, 2000, to the DEQ. The Phase I Site Characterization field activities were conducted from August 9, 2000, through June 19, 2002, and addressed stream water, stream sediment, on-site surface water, impoundment waste/sediment, non-impoundment waste/soil, and groundwater. The initial Phase II Site Characterization field activities were conducted from March 31, 2003, through September 29, 2003. The objectives of the characterization were to more fully characterize the affected media, and to delineate and quantify the volumes of waste, sediment and soil materials that are to be considered for remedial action. The reports indicate elevated concentrations of VOCs and SVOCs in the soils, sediments, and waste and lead in on-site surface water, at the Site.

The Phase I and Phase II Site Characterization data provided sufficient information to develop Clean-Up Levels and to estimate the volumes of contaminated media that would require remediation in order to protect human health and the environment. Additional Site investigations involving impacted groundwater and associated soils were performed subsequent to the Phase II investigation.

## REMEDIAL ACTION OBJECTIVES AND CLEAN-UP LEVELS

Of the environmental media evaluated in the characterization reports, human or other biota could contact four different contaminated media: surface soils, surface water, sediments, or impacted groundwater. This Proposed Plan addresses contaminants in soils, surface water, sediments, and wastes. Groundwater impacts will be addressed in as a separate operable unit and plan.

The chemicals of potential concern for the impacted media are VOC's, SVOC's and the metal, lead. Utilizing results from the characterization reports, along with published standards; Clean-Up Levels were developed for soils, sediments, and wastes at the Site that are protective of human health and the environment and take into consideration the exposure routes, receptors, and risk levels of concern. Clean-Up Levels are specific contaminant concentrations (e.g., contaminate concentrations in soil) that are protective of human health and the environment (i.e., that achieve the remedial action objectives). The clean-Up Levels must comply with state and federal regulations called applicable or relevant and appropriate requirements (ARARs). These preliminary levels are used during the evaluation of the remedial action alternatives that will be presented in this Proposed Plan. After consideration of public comment, the Clean-Up Levels will be finalized and documented in a ROD in which the remedy for the Site will be selected. The DEQ expects to issue the ROD for clean up at the Site approximately sixty days after the public comment period ends.

The Clean-Up Levels derived for soils, surface water, sediments, and wastes are intended to:

- Be protective of human health based on several potential land uses including trespasser, commercial, industrial worker, and residential scenarios.
- Be protective of recreational users of Okmulgee Creek.

Development of Clean-Up Levels for the affected media at the Site used risk-based calculations to derive acceptable soil concentrations. Clean-up levels for the affected media were calculated based on different exposures scenarios and land uses. The Clean-Up Levels are presented in Table 3. Remedial decisions for the Site will be based on whether the chemical analysis of soil, surface water, sediment, or waste samples exceeds any of the final Clean-Up Levels.

Clean-up levels have been selected for the primary chemicals of concern found at the Site. The levels are based on an individual having direct contact with soil or sediment on their skin or incidentally ingesting soil or sediment. The levels proposed for sediments in Okmulgee Creek are protective of individuals using the creek for recreational purposes. The levels proposed for the soils/sediments located on the Site are protective of on-site industrial workers who would work a standard workweek on the Site for 25 years.

## **SUMMARY OF CONTAMINANTS AND POTENTIAL RISKS TO HUMAN HEALTH**

The Site Characterization Reports revealed that soils, sediments, surface water, and groundwater contamination were found in the former process area, ponds, pits, and in numerous areas scattered around the Site. Contaminants include VOC's, SVOC's and one metal, lead. The property is enclosed with security fencing. Limited access to the Site will prevent general contact with contamination. The primary risk associated with the Site is related to ingestion of and/or direct contact with contaminated soils or sediments. A small amount of contamination in surface soils was found directly adjacent to the fence line and will be cleaned up to approved standards. The surface water in Pond 6 of Area 7 contains lead above the clean-up level. This water will be utilized in the treatment of wastes or disposed of properly.

Exposure to SVOC's is associated with the potential for an increased risk for a variety of cancers, phototoxic dermatitis, and adverse reproductive outcomes. Concentrations of SVOCs can present a biomagnification risk to ecological systems. VOC exposure is associated with the potential for an increased risk of cancer and systemic diseases. Elevated lead levels can affect blood pressure, kidney function, and the central nervous system.

## **DEQ's PREFERRED REMEDIAL ALTERNATIVES**

DEQ's preferred alternative for the Site is presented in this document in order to solicit public comment. The final remedial action alternative will be developed in detail as part of the Remediation Work Plan and will be documented in the ROD.

A number of possible remedies were considered in the Remediation Plan (The Benham Companies, Inc., August 2004). The Site has been divided into 12 distinct Work Areas (Figure 1). The DEQ's preferred remedy is the following: all soils, sediments, and wastes that exceed Clean-Up Levels will be treated and/or excavated and placed in an on-site disposal cell. Surface water with the elevated lead level will be utilized in the treatment water or disposed of properly. The disposal cell will be constructed to state standards. Institutional controls will consist of maintaining Site fencing along with appropriate deed restrictions. The DEQ is required to file a deed notice of risk-based closures. Post-closure groundwater monitoring will be performed in the area surrounding the disposal cell.

The south end of Pond 1 will remain in place. This area will be restricted from future use, fenced, and deed restricted. The bermed area surrounding Pond 1 will be improved and maintained to allow for proper drainage and to ensure the berm to the creek does not fail. Groundwater monitoring will be performed in the Pond 1 area.

**Table 1. Summary of Preferred Alternative**

Area of Concern	Chemicals of Concern	Remedies
Area 1	None	N/A
Area 2	None	Excavate surficial waste and place in on-site disposal cell on an as-needed basis
Area 3	Benzene impacted soil	Area will be addressed in separate groundwater plan.
Area 4	None	N/A
Area 5	None	Grade area
Area 6	VOC's, SVOC's & Asbestos	Excavate and place in on-site disposal cell
Area 7	VOC's, SVOC's, Lead	Excavate and place in on-site disposal cell. Pond 6 surface water has an elevated lead level. This water will be disposed of properly.
Area 8	VOC's, SVOC's	Excavate and place in on-site disposal cell
Area 9	VOC's, SVOC's	Excavate and place in on-site disposal cell
Area 10	VOC's in groundwater	No Current Action – Separate operable unit
Area 11	SVOC's impacted sediment	Excavate and place in on-site disposal cell
Area 12	VOC's, SVOC's	Excavate and place in on-site disposal cell

VOC = Volatile Organic Compounds  
 SVOC = Semi-Volatile Organic Compounds

### **ALTERNATIVES CONSIDERED IN THE FINAL SELECTION PROCESS**

The preferred remedial action alternative was selected after consideration and evaluation of various alternative remedies, including but not limited to the following:

- Off-site disposal
- Treatment in bio-cells
- Landfarming
- Thermal desorption
- Beneficial reuse / recycling
- No action (i.e., leaving waste material in place)
- Institutional controls
- Placement in on-site repository

The alternatives selected for consideration were analyzed based on their feasibility for the existing Site conditions and overall cost. An explanation of the analysis for each alternative follows.

#### **Alternative 1 Off-Site Disposal**

Wastes that exceed Clean-Up Levels and require removal in order to protect public health and the environment must be disposed in a protective manner. One option considered for disposal was off-site disposal in a permitted landfill. This alternative was dismissed as impracticable due to the large volume of waste that will require disposal and the excessive cost and potential hazards of transportation to an off-site facility.

#### **Alternative 2 Treatment in Bio-Cells**

Bio-cells use biodegradation to remove contaminants. A large portion of the waste that will require removal is acidic sludge, which is not readily amenable to treatment in bio-cells. Other hydrocarbon contaminated waste is contaminated with constituents that would potentially require many years of treatment, such as benzo(a)pyrene. For these reasons, bio-cell treatment was not considered further due to its difficulty in implementation in a reasonable timeframe.

#### **Alternative 3 Landfarming**

Landfarming is very similar to treatment in bio-cells because it uses bioremediation as its primary means of contaminant degradation; however, it is generally carried out by placing wastes directly on the land as opposed to placing them in a controlled treatment cell. Landfarming was dismissed for the same reasons as treatment in bio-cells and was considered even less desirable due to the lack of controls, potential impact to groundwater, and potential impact to the atmosphere due to benzene air emissions during tilling.

#### **Alternative 4 Thermal Desorption**

Thermal desorption uses heat to remove organic contaminants from environmental media. The heavy hydrocarbon and acidic materials at the Site are not amenable to thermal desorption because these materials would coat the internal components of the equipment and cause it to become inoperable. Accordingly, this alternative was dismissed.

#### **Alternative 5 Beneficial Reuse/Recycling**

Several old refineries in Oklahoma have previously evaluated the possibility of recycling or reusing acid sludge and asphaltic materials. Currently, no market has been identified for these materials. Therefore, this alternative was dismissed.

#### **Alternative 6 No Action**

The No Action alternative would leave all the waste materials in place. Because certain materials on-site exceed levels that would be protective of human health, the no action alternative is not a viable alternative and was dismissed.

### **Alternative 7 Institutional Controls**

Institutional controls would restrict access to the Site but would not remediate wastes that exceed Clean-Up Levels. Since the future use of the Site is industrial, restricting access for the entire Site is not feasible. Portions of the Site where institutional controls may be feasible include areas of impacted groundwater, the Pond 1 area, and Work Area 12. Therefore, institutional controls are carried forward in the preferred alternative.

### **Alternative 8 On-Site Repository with Institutional Controls**

The use of an on-site repository for the consolidation and disposal of waste that exceeds Clean-Up Levels offers the same protection as disposal in an off-site repository, but without the cost of, and potential hazards associated with, off-site transportation. Therefore, an on-site repository was carried forward in the preferred alternative. This alternative involves excavating impacted soils for placement in an on-site disposal cell. The disposal cell would be located on the south end of the property, formerly the process area. The disposal cell would likely include a composite liner and an appropriate cap. Institutional controls would include maintaining Site fencing and obtaining deed restrictions on land use. Post-closure monitoring would be performed.

## **EVALUATION OF REMEDIAL ACTION ALTERNATIVES**

The Site wide action alternatives were compared with eight evaluation criteria: Overall protection of human health and the environment; compliance with ARARs, cost, long term effectiveness and permanence, short term effectiveness, reduction of toxicity, mobility and volume through treatment, implementability, and community acceptance. These criteria are defined below:

**TABLE 2  
EVALUATION CRITERIA**

#### **Threshold Criteria**

1. Overall Protection of Human Health and the Environment - How well does the alternative protect human health and the environment both during and after construction?
2. Compliance with Federal and State Environmental Standards - Does the alternative meet all applicable or relevant and appropriate state and federal standards and laws?

#### **Balancing Criteria**

3. Implementability - Is the alternative both technically and administratively feasible? Has the technology been used successfully on other similar sites?

4. Long Term Effectiveness and Performance - How well does the alternative protect human health and the environment after completion of cleanup? What, if any, risks remain at the site?
5. Reduction of Toxicity, Mobility, or Volume through Treatment - Does the alternative effectively treat the contamination to significantly reduce the toxicity, mobility, or volume of the hazardous substances?
6. Short Term Effectiveness - Are there potential adverse effects to either human health or the environment during construction or implementation of the alternative? How fast does the alternative reach the cleanup goals?
7. Cost - What are the estimated costs of the alternative?

#### **Modifying Criteria**

8. Community Acceptance - What are the community's comments or concerns about the preferred alternative? Does the community generally support or oppose the preferred alternative?

Note: These eight criteria are used to evaluate the remedial action alternatives. With the exception of the no action alternative, all alternatives must meet the first two "threshold" criteria. The next five criteria are used as "balancing" criteria for comparing alternatives and selecting a preferred alternative. After public comment, DEQ may alter its preference on the basis of the last "modifying" criteria.

The DEQ believes that the preferred alternatives will adequately satisfy the evaluation criteria.

### **COMMUNITY ACCEPTANCE**

The acceptance of the preferred alternative and/or other alternatives by the Okmulgee Community will be evaluated through the public participation process and any comments received during the formal public comment period.

### **WHAT'S NEXT?**

This Proposed Plan is open for formal public comment from October 24 to December 8, 2004. Requests to extend the public comment period should be addressed to Ms. Angela Brunsmann, of the DEQ, at the address given on page 1 of this document.

A public meeting about this Proposed Plan will be held as indicated on the front page of this document. The meeting will be an opportunity for people to ask questions about the Proposed Plan and to make comments in person. After the public comment period closes, DEQ will make the decision for the final remedy for the Site and will respond to

written and verbal comments on the Proposed Plan in the ROD. The ROD will be available for review at:

**Okmulgee Chamber of Commerce  
112 North Morton  
Okmulgee, Oklahoma 74447  
Phone: (918) 756 - 6172**

or,

**Department of Environmental Quality  
Land Protection Division  
707 N. Robinson, P. O. Box 1677  
Oklahoma City, Oklahoma 73101-1677  
Phone: (405) 702 - 5100**

The final remedial design is expected to be complete by: March 31, 2005.

#### **FOR MORE INFORMATION**

If you would like to review the reports or any other documents related to the former Okmulgee Refinery Site, please visit one of the information repositories listed above. If you have any questions about DEQ's Proposed Plan, please call:

**Ms. Angela Brunzman at (405) 702-5135**

**TABLE 3: CLEAN-UP LEVELS FOR THE FORMER OKMULGEE REFINERY  
 CONOCOPHILLIPS COMPANY, OKMULGEE, OKLAHOMA**

Medium	Primary Chemical of Concern	Clean-Up Levels <sup>*</sup>	
		Level <sup>c</sup>	Units
Okmulgee Creek, Sediment <sup>a</sup>	Benzo(b)fluoranthene	15.6	mg/kg
	Benzo(a)anthracene	15.6	mg/kg
	Benzo(k)fluoranthene	146	mg/kg
	Benzo(a)pyrene	1.56	mg/kg
	Dibenz(a,h)anthracene	1.56	mg/kg
	Indeno(1,2,3-cd)pyrene	14.6	mg/kg
On-Site Soils/Sediment <sup>b</sup>	Benzene	7.33	mg/kg
	Benzo(a)anthracene	3.38	mg/kg
	Benzo(b)fluoranthene	3.38	mg/kg
	Benzo(a)pyrene	0.338	mg/kg
	Benzo(k)fluoroanthene	33.8	mg/kg
	Chrysene	338	mg/kg
	Dibenz(a,h)anthracene	0.338	mg/kg
	Indeno(1,2,3-cd)pyrene	3.38	mg/kg

Notes:

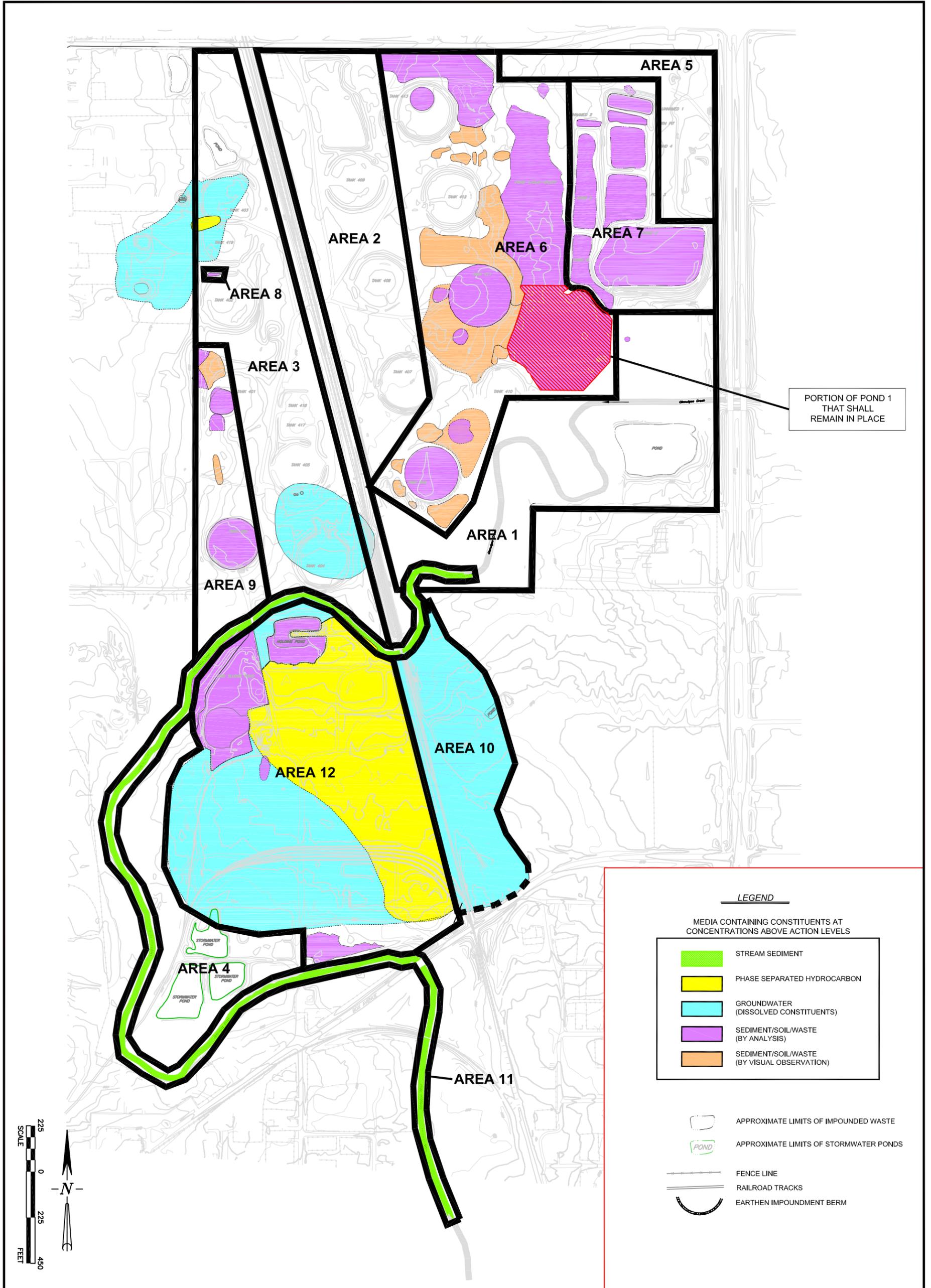
\* = Clean-up levels correspond to Risk-Based Remedial Goals (RGRGLs) in project documents.

<sup>a</sup> = Clean-up levels are protective for individuals in contact with sediment while using Okmulgee Creek for recreational purposes.

<sup>b</sup> = Clean-up levels are protective of on-site industrial workers in contact with on-site soils.

<sup>c</sup> = Clean-up levels are based on the potential for direct contact with sediment or soil on the skin and contact by ingestion of soil or sediment.

mg/kg: Denotes milligram per kilogram



PROJECT NUMBER	4102009405
FIGURE NUMBER	1

DATE	10/21/04
SCALE	1"=450'
DESIGNED BY	KDH
APPROVED BY	KDH
DRAWN BY	SKG

FIGURE TITLE	<b>WORK AREAS MAP</b>
DOCUMENT TITLE	PROPOSED PLAN
CLIENT	CONOCOPHILLIPS COMPANY
LOCATION	FORMER OKMULGEE REFINERY OKMULGEE, OKLAHOMA

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