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Mitigation Action Plan

Mayflower Pipeline Incident Response
Mayflower, Arkansas

May 2014

ARCADIS

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Mayflower Pipeline Incident Response
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Acronyms and Abbreviations

%	percent
ADEQ	Arkansas Department of Environmental Quality
ARCADIS	ARCADIS U.S., Inc.
BMP	best management practice
bss	below sediment surface
CQA	construction quality assurance
CQAP	Construction Quality Assurance Plan
CRA	Conestoga-Rovers & Associates
DADAR	Downstream Areas Data Assessment Report
EMES	ExxonMobil Environmental Services Company
EMPCo	ExxonMobil Pipeline Company
HASP	Health and Safety Plan
I-40	Interstate 40
lb(s)	pound(s)
NAPL	non-aqueous phase liquid
NAVD88	North American Vertical Datum of 1988
NWP	Nationwide Permit
OSHA	Occupational Safety and Health Administration
PTS	PTS Laboratories
plan	Mitigation Action Plan
RAO	remedial action objective
site	Mayflower Pipeline Incident Response Site located in Mayflower, Arkansas
STAA	Short Term Activity Authorization
SWPPP	Stormwater Pollution Prevention Plan
USACE	U.S. Army Corps of Engineers

USEPA	U.S. Environmental Protection Agency
WQC	water quality certification

Executive Summary

This Mitigation Action Plan (plan) presents the basis of design for sheen mitigation in the cove of the Mayflower Pipeline Incident Response Site located in Mayflower, Arkansas (site). This plan was prepared for ExxonMobil Environmental Services Company, on behalf of ExxonMobil Pipeline Company, under the Arkansas Department of Environmental Quality (ADEQ)'s direction, as part of the path forward for addressing remaining environmental issues as a result of the Pegasus Pipeline breach that occurred on March 29, 2013. This plan is based on the preferred remedial alternative identified in the Downstream Areas Data Assessment Report (DADAR) approved by ADEQ on March 19, 2014 (ADEQ 2014).

The DADAR identified mitigation needs to address residual sheens in three areas of the cove:

- Inlet Channel: Main channel between Interstate 40 (I-40) and the Open Water Area of the cove
- Open Water Area: Open marsh and water area located between the Inlet Channel and the Heavily Vegetated Area
- Heavily Vegetated Area: Vegetated area located east of the existing floating boom along the edge of the Open Water Area, including several natural channels

The remedial action objective (RAO) established in the DADAR is to mitigate surface water sheens related to crude oil from the Pegasus Pipeline, to the extent technologically feasible.

Basis of Design

As described in the Downstream Areas Data Assessment Report, which was approved in March 2014, the preferred alternative is a combination of targeted removal in the Cove Inlet Channel, reactive capping in the Open Water Area, and targeted in-situ amendment in the Heavily Vegetated Area.

Additional data collection efforts were completed in April 2014 to support the design of the mitigation action. A pre-design study was completed to delineate the sheen-bearing sediments and refine the mitigation areas. The results of the pre-design study were submitted to the ADEQ on April 18, 2014; and a revised version was submitted on May 9, 2014 based on ADEQ comments. In addition, bench-scale testing was conducted to evaluate organoclay properties for use in reactive cap design calculations, and a site-wide topographic survey to represent current conditions.

The basis of design for each of the three areas is discussed below.

Targeted Sediment Removal – Inlet Channel

The objective of the targeted removal is to eliminate crude-oil-related-sheens in the Inlet Channel to the extent practical by removing sheen-bearing sediment along the bottom of the channel. Based on the pre-design study results, the removal depths vary from 6 to 18 inches (0.5 to 1.5 feet). A total of approximately 480 cubic yards of sediment will be removed, along approximately 1,300 feet of the Inlet Channel.

The removal area will be dewatered during removal using temporary diversion dams and bypass pumping to reduce disturbance and erosion of sediment downstream of the work area, to the extent practicable. Removal will be conducted using a mechanical excavator working from within the dewatered channel. Confirmation sampling for sheen-bearing material will be conducted along the bottom of the channel to confirm that the targeted material has been removed. Excavation areas with depths greater than 0.5 foot will be backfilled with clean material.

Removed material will be transported to the sediment removal staging area where it will be dewatered and solidified as needed. Dewatered sediment will be loaded into trucks for transport to an appropriate licensed off-site disposal facility.

Reactive Capping – Open Water Area

The objective of the reactive cap is to reduce the potential for sheens to be generated by sediments in the Open Water Area to the extent practical. Based on the pre-design study, the reactive cap will cover approximately 4.5 acres. The cap will consist of an approximate 3- to 6-inch layer of clean sand mixed with organoclay placed directly over the sediment surface. Organoclay is an effective sorptive medium for petroleum hydrocarbons and sheens. The reactive cap is designed to have 3.6 pounds per square foot of organoclay.

The reactive cap will be placed over the existing sediments by mechanical broadcasting of the cap materials from amphibious excavators. Where there is adequate water depth, cap materials will be placed through the water column. In areas without adequate depth, cap materials will be placed directly on the exposed sediment surface. Confirmation measurements will be collected to confirm that the target cap thickness is consistent with specified performance criteria.

Targeted In-Situ Amendment - Heavily Vegetated Area

The objective of the in-situ amendment is to reduce the potential for sheens to be generated in the Heavily Vegetated Area to the extent practical while limiting disturbance to the existing vegetation. This vegetation was preserved during the response activities because of its habitat value and the relatively light degree of oiling that occurred in this area. This action will consist of placing organoclay directly over the sediment

surface. The lateral extent of in-situ amendment placement is approximately 2 acres based on the pre-design study. Upon placement of organoclay, the Heavily Vegetated Area is designed to have a target organoclay coverage of 1.0 pound organoclay per square foot.

Organoclay will be placed in accessible areas, such as the existing relatively open surface water channels, through the water column using mini-excavators or pneumatic broadcasting equipment from floating barges or air boats. In areas that have dense vegetation, organoclay will be applied using pneumatic application to spray it into the vegetation from the shoreline or from relatively open water areas.

The application of organoclay in the Heavily Vegetated Area will be conducted during summer 2014 (pending permit approvals and authorization). Sheen monitoring will be conducted in the area for approximately 3 months and, if warranted, an additional application will be conducted where crude-oil-related sheening is observed.

Permitting

A Nationwide Permit (NWP) 38 was issued for the response efforts, and U.S. Army Corps of Engineers has indicated that implementation of the remedy is authorized under this NWP. A restoration plan is currently under development to comply with the permit. In addition, an application for Short Term Activity Authorization, a site-specific Stormwater Pollution Prevention Plan and Notice of Intent will be submitted to the ADEQ; and a Faulkner County Floodplain Development Application will be submitted to Faulkner County.

Construction and Quality Assurance

Following receipt of permits and authorization, mobilization efforts will begin. Construction activities will be conducted concurrently in the Inlet Channel and Heavily Vegetated Area first, followed by cap installation in the Open Water Area. Limited debris and vegetation removal will be performed to allow for safe access to the work area. Construction activities are anticipated to begin in summer and/or fall 2014 and to take approximately 6 months to complete.

A Construction Quality Assurance Plan (CQAP) will be used to confirm that sediment removal, cap installation, and in-situ amendment placement are conducted as designed and documented with an appropriate level of quality assurance and quality control. The CQAP is provided as an appendix to the Mitigation Action Plan.

Monitoring

Two monitoring programs are ongoing at the site: (1) surface water sampling, and (2) sheen monitoring and maintenance. The weekly surface water sampling, conducted at five locations near the cove outlet, will continue throughout the construction period. Sheen monitoring and maintenance will continue weekly (and after rainfall events) until mobilization is complete; at that time, a construction sheen monitoring and maintenance plan will be implemented to accommodate construction activities, as described in the CQAP.

Throughout construction, environmental protection and monitoring will be performed to reduce potential construction-related impacts to the surrounding environment. Water quality controls and work isolation measures will be implemented to reduce potential construction-related impacts to surface water.

Post-Construction

A Mitigation Action Completion Report will document the construction and construction quality assurance activities. The report will be submitted to ADEQ within 90 days after completion of construction activities and receipt of final survey data. The report will also propose a post-construction site monitoring and maintenance plan.

1. Introduction

ARCADIS U.S., Inc. (ARCADIS) has prepared this Mitigation Action Plan (plan) for ExxonMobil Environmental Services Company (EMES) on behalf of ExxonMobil Pipeline Company (EMPCo) for the Mayflower Pipeline Incident Response located in Mayflower, Arkansas (the site) (Figure 1-1). This plan was prepared following approval of the Downstream Areas Data Assessment Report (DADAR), Revision 5 (ARCADIS 2014), which presents a summary of environmental sampling and sheen monitoring results, a refined risk evaluation of soil and sediment sampling results, and an evaluation of remedial alternatives potentially capable of mitigating surface water sheens that result from residual crude oil from the Pegasus Pipeline. The DADAR was submitted on March 11, 2014 and approved by the Arkansas Department of Environmental Quality (ADEQ) on March 19, 2014 (ADEQ 2014). EMES received the approval letter on March 20, 2014. A preferred remedial alternative was selected as part of the recommended path forward; this plan was presents the design for that alternative.

For the purposes of this plan, the site consists of the following three areas located in the cove downstream from the residential neighborhood affected by the incident (Figure 1-2):

- *Inlet Channel:* Main channel between Interstate 40 (I-40) and the Open Water Area of the cove.
- *Open Water Area:* Open marsh and water area located between the Inlet Channel and the Heavily Vegetated Area.
- *Heavily Vegetated Area:* Vegetated area located east of the existing floating boom along the edge of the Open Water Area, including several natural channels.

1.1 Background

On March 29, 2013, a breach in a pipeline operated by EMPCo (the 20-inch Pegasus Pipeline) released crude oil in Mayflower, Arkansas. The crude oil was identified to be Wabasca heavy crude oil (herein referred to as “crude oil”). An emergency response action was implemented immediately to mitigate the release, and a substantial amount of the crude oil was removed.

In July and August 2013, ARCADIS conducted environmental sampling activities in accordance with the ADEQ-approved Downstream Areas Remedial Sampling Plan (ARCADIS 2013) to evaluate the conditions in soil, sediment, and surface water following the response actions. In addition, sheen monitoring and sampling were initiated on October 21, 2013 and are ongoing, with the primary objectives of observing and characterizing sheens in the downstream areas. The results and evaluation of environmental sampling are presented in the DADAR (ARCADIS 2014). Based on the environmental sampling results for soil, sediment, and surface water, no action is necessary to protect ecological populations at the site. However, based on

sheen monitoring results and under ADEQ's direction, the DADAR recommended that sheen mitigation actions be conducted where sheens related to crude oil are recurring.

The DADAR (ARCADIS 2014) proposed that the following areas be considered for sheen mitigation and further evaluated to delineate the extent of sheen-bearing materials:

- *Inlet Channel and Open Water Area:* These areas include sheens, some of which appear to be related to crude oil.

- *Heavily Vegetated Area:* Based on observations of some remaining sheens following the response action, a portion of this area may still contain sheen-bearing material related to crude oil.

Upon receiving ADEQ's approval of the DADAR, a pre-design study was conducted in April 2014 to confirm and refine the extent of downstream areas proposed for mitigation (i.e., Inlet Channel, Open Water Area, and Heavily Vegetated Area) and support the permitting and design of the mitigation action. Results of the pre-design study are summarized in Section 2 and documented in Appendix A.

The objectives of this plan, the proposed mitigation action, and organization of this plan are described below.

1.2 Mitigation Action Plan Objectives

The remedial action objective (RAO) identified for the site is to mitigate surface water sheens related to crude oil from the Pegasus Pipeline, to the extent technologically feasible. The RAO was developed based on the results from site sampling activities, a refined ecological risk evaluation, and sheen monitoring and sampling results, as presented in the DADAR (ARCADIS 2014). The specific objectives of this Mitigation Action Plan are to describe and document the pre-design study findings, the basis of design for the mitigation action, and the implementation methods and approach for completing the mitigation action.

1.3 Mitigation Action Summary

The selected alternative for mitigation described in the DADAR (ARCADIS 2014) consists of a combination of targeted sediment removal, reactive capping, and targeted in-situ amendment placement. The main components of the mitigation action include the following:

- Site preparation, including the construction of staging areas and other temporary facilities, and vegetation removal.

- Excavation of localized sheen-bearing sediments in the Inlet Channel, and off-site disposal of removed sediments. Approximately 480 cubic yards of sediment is targeted for removal.

- Installation of a reactive cap over sediments where sheens have been observed in the Open Water Area. Approximately 4.5 acres are targeted for reactive cap placement.

- Placement of in-situ amendments at targeted locations where sheens have been observed within the Heavily Vegetated Area. Up to 2 acres are targeted for treatment with amendments (organoclay) within the Heavily Vegetated Area.

- Monitored natural attenuation at locations within the Heavily Vegetated Area that are inaccessible and were left in place during the emergency response due to the habitat value and light degree of oiling.

- Restoration and revegetation of the areas affected by construction.

- Post-construction reporting.

1.4 Plan Organization

The remainder of this plan is organized into the following sections:

2 – Additional Data Collection	Describes data collection efforts conducted to support the development of this plan, including a pre-design study, bench-scale testing, and a topographic survey.
3 – Project Elements	Describes the mitigation action and summarizes the findings of the pre-design study, site constraints and limitations, and applicable regulations.
4 – Basis of Design	Describes the basis of design for mitigation actions in the Inlet Channel, Open Water Area, and Heavily Vegetated Area.
5 – Construction	Discusses implementation of the mitigation action, applicable health and safety measures, construction quality assurance (CQA), overall construction schedule, and Mitigation Action Completion Report.
6 – References	Lists the references cited throughout this report.

Tables and figures are provided as attachments to this plan and include further detail, as appropriate. In addition, the following appendices are included to provide additional supporting documentation:

- *Appendix A – Pre-Design Study Results:* Results from the pre-design study, including the extent of sheen-bearing material in the mitigation areas.

- *Appendix B – Bench-Scale Test Results*: Results from the bench-scale tests, including pore fluid saturation tests, core photography, reactive media settling tests, and organoclay sorption capacity tests.

- *Appendix C – Construction Quality Assurance Plan (CQAP):* Construction monitoring and verification procedures for the mitigation action.

2. Additional Data Collection

This section describes the additional data collection efforts that were completed to support this plan. These efforts included conducting the following activities:

- Pre-design study to delineate sheen-bearing material
- Bench-scale testing to provide data for the basis of design for the organoclay
- Topographic survey to provide the base map and to identify visible aboveground features and existing staging or access points

2.1 Summary of Pre-Design Study

A pre-design study was conducted between March 31 and April 9, 2014 in the Inlet Channel, Open Water Area, Heavily Vegetated Area, and select areas of the cove downstream of the Heavily Vegetated Area to confirm and refine the mitigation action areas. Additional activities were conducted on April 25, 2014 in the Open Water Area and on May 7, 2014 in the area downstream of the Heavily Vegetated Area. This study was completed as described in Appendix O of the DADAR (ARCADIS 2014) and the results are provided in Appendix A. The main field activities included sediment probing, followed by sheen testing on sediment core samples to evaluate the extent of sheen-bearing material.

Sediment probing activities in the Inlet Channel, Open Water Area, and Heavily Vegetated Area were conducted using a probing rod in three increments: sediment surface, 0 to 6 inches below sediment surface (bss), and 6 to 12 inches bss. Sediment probing activities in the areas downstream of the Heavily Vegetated Area were conducted using a probing rod at the sediment surface only (approximately 0 to 0.1 foot bss). For each probing increment, the following steps were followed:

- Submerged sediments were gently probed to agitate the sediments for sheen generation.
- If sheen was generated during probing, it was photographed, characterized, and documented in accordance with the procedures described in Appendix O of the DADAR (ARCADIS 2014).
- Sheen was removed using absorbent booms or pads and probing for the next increment was conducted.

Following the probing activities, sheen stir tests were conducted in the Inlet Channel, Open Water Area, and Heavily Vegetated Area (sheen stir tests were not scoped for the areas downstream of the Heavily Vegetated Area). A sediment core was collected from the undisturbed sampling area using push cores with

soil sampling sleeves. Sheen stir tests were conducted by opening the core, collecting sediment from the target increment, placing the sediment into a cup, adding clean water, and gently stirring to watch for sheen generation. The sheen stir tests were conducted at the following increments from the sediment cores:

- *Inlet Channel:* 0 to 6 inches, 6 to 12 inches, and subsequent 6-inch intervals until a stir test with no sheen was observed. The relative amount of sheening was estimated for each interval.

- *Open Water Area:* 0 to 6 inches and 6 to 12 inches. The relative amount of sheening was estimated for each interval.

- *Heavily Vegetated Area:* 0 to 0.1 inch and 0.1 to 6 inches. The relative amount of sheening was estimated for the overall location.

Sheen observed during probing and sheen stir testing was characterized in accordance with the DADAR (ARCADIS 2014). Additionally, coordinates of each sampling location were recorded using a hand-held global positioning system unit. Photographs were taken to record sheen observations during probing and sheen stir testing. Detailed descriptions of sediment probing and sampling activities are included in Tables A-1 and A-2 in Appendix A. Based on the probing and sampling observations, sheens generated at each location were characterized as lighter, medium, or heavier in accordance with the rating system described in Table A-3 (Appendix A). The relative degree of sheening observed for each sediment sample is presented in Tables A-4, A-5 and A-6 and on Figures A-1, A-2, and A-3 (Appendix A). Pre-design study results for each of these areas are summarized below and Section 4.1 discusses the proposed mitigation extents.

Inlet Channel

In the Inlet Channel, 25 sediment locations were probed along the centerline of the channel (approximately every 50 feet), and sediment cores were collected from each location for sheen stir testing (Figure A-1 of Appendix A). Sheen was observed in samples collected from 16 of the 25 sediment sample locations. A total of 74 sediment samples were collected and sheen was observed in 22 samples during probing and/or sheen stir testing. In general, the qualitative sheening amount declined with depth.

Open Water Area

In the Open Water Area, 71 sediment locations were probed and sediment cores were collected from each location for sheen stir testing (Figure A-2 of Appendix A). The Open Water Area pre-design results are presented on Figure A-2. Thirty-four sampling locations (approximately 48 percent [%]) indicated no sheen presence during probing and/or sheen stir testing. Sheen was observed at the remaining 37 locations during probing and/or sheen stir testing. Of the 142 samples collected from the 0- to 6-inch and 6- to 12-inch intervals in the Open Water Area, 46 samples (approximately 32%) exhibited sheen.

For the 37 locations and 46 samples where sheen was present, the following was observed:

- The interval of sheen-bearing sediment ranged from 0 to 6 inches bss in 22 locations.
- The interval of sheen-bearing sediment ranged from 0 to 12 inches bss in 15 locations.
- In general, the qualitative sheening amount declined with depth.
- Sixteen of 37 locations had lighter sheens, and 21 locations had medium or heavier sheens.
- In general, lighter sheens were observed along the north and west perimeter of the Open Water Area, and medium to heavier sheens were observed at the central and southeast portions of the Open Water Area.

Heavily Vegetated Area

In the Heavily Vegetated Area, 32 sediment locations were probed, and sediment cores were collected from each location for sheen stir testing (sample locations starting with "VA-", Figure A-3 of Appendix A). Sixteen sampling locations (one-half of the locations) within this area exhibited no sheen during probing and/or sheen stir testing. At the remaining 16 locations, sheen was observed during probing and/or sheen stir testing. These locations are within the heavy vegetation on the north and south sides of the channel flowing through the center portion of this area. Typically, lighter sheens are observed within this area.

In the downstream portion of the Heavily Vegetated Area and the cove, 47 sediment locations were probed in the top 1-inch-thick sediment layer (sample locations starting with "PA-", Figure A-3 of Appendix A). No sheens were observed at the majority of these locations during probing activities. Light sheens were observed at three locations: PA-3 and PA-2 were located close to the other VA- locations, and PA-40 was located in an open area along the southeast bank of the cove.

2.2 Bench-Scale Tests

Bench-scale tests were conducted to support the design for the reactive cap in the Open Water Area and in-situ amendments for the Heavily Vegetated Area. These activities were completed between April 21 and May 2, 2014. Appendix B includes procedures, test data sheets, a summary of results, and photologs for the bench-scale tests.

The results of the bench-scale tests were used to determine the type and amount of organoclay to use in the reactive cap in the Open Water Area, and to apply as amendments in the Heavily Vegetated Area. In addition, the results will provide guidance about organoclay application rates.

2.2.1 Pore Fluid Saturation and Core Photography

Sediment cores were collected from pre-design study locations within the Open Water Area for evaluation of residual oil content. Six cores were submitted to PTS Laboratories (PTS) of Santa Fe, California for evaluation. PTS conducted core photography (white light and UV light) on the six cores. The core photography was used to select nine samples with the most potential residual oil for analysis by Method API RP 40 (Dean-Stark Method). The Dean-Stark Method includes evaluation of initial fluid (water and oil) saturations, total porosity, grain density, bulk density, and air-filled porosity. These tests were conducted to evaluate crude oil mass in the reactive capping and targeted in-situ amendment areas.

The reported range of oil saturations for the nine samples was 2.9 to 8.8% with a median of 4.2%. Based on their evaluation of the cores, PTS indicated there was little or no physical evidence of hydrocarbon saturation presence based on the following four observations: 1) UV fluorescence appears to be from mineral or organic material, 2) no presence of hydrocarbon odor, only organic odor, 3) no visual presence of non-aqueous phase liquid (NAPL), 4) the core material consists of very fine-grained sediments and/or organic material which may yield false-positive oil (NAPL) saturation results. PTS core photography and laboratory report are enclosed in Appendix B. Given these potential interference effects, the reported oil saturation values are considered conservative (high-end) estimates.

2.2.2 Reactive Media Bench-Scale Settling Test

The main objective of the Reactive Media Bench-Scale Settling Test was to evaluate the settling rate and characteristics of organoclay products (PM-199, PMFI, and AquaGate) and organoclay-sand mixtures (90% Sand – 10% PM-199 and 90% Sand – 10% PMFI). Test procedures consisted of applying pre-determined amounts of each material into a separate graduated cylinder filled with potable water. After initial application of material, settling characteristics were observed and the thickness of material at the base of the graduated cylinder was measured every 15 minutes for the first hour, then every 30 minutes for up to 2 hours for a total of 3 hours. The data collected during these tests are presented in Appendix B.

The results of the settling test showed the following:

- The organoclay product PMFI settles at a slightly faster rate than PM-199, and both products take approximately 45 to 60 minutes for a majority (at least 90%) of material to finish settling, although residual material continues to float.

- For both organoclay-sand mixtures, the majority of material immediately settles upon initial application, but fine particles tend to settle slowly due to foaming on the water surface. PM-199-sand material finished settling approximately 60 minutes following initial application, whereas the PMFI-sand material finished settling approximately 120 minutes after initial application.

- Unlike the organoclay products/mixtures discussed above, AquaGate settles immediately after application.

2.2.3 Organoclay Sorption Capacity Bench-Scale Test

The main objective of the Organoclay Sorption Capacity Bench-Scale Test is to estimate the mass of site-specific oil (non-aqueous phase liquid [NAPL]) that can be sorbed by a specific mass of organoclay such that a sheen is not produced from the resulting material upon contact with water. Seven different ratios of NAPL:organoclay were tested to evaluate the occurrence of sheens upon contact with water. Prior to testing, samples were allowed to sit in a sealed container at room temperature for at least 48 hours.

Data collected during these tests are presented in Appendix B. The results show that after a minimum of 48 hours, surface water sheens were not observed for samples with NAPL:organoclay ratios of 100% or less. At a NAPL:organoclay ratio above 100%, surface water sheens were observed when the sample was broken up by hand at the water surface (125% ratio) or dipped into surface water (150% ratio). After 96 hours, the sample with a NAPL:organoclay ratio of 125% did not have a sheen when dipped into the surface water or broken up by hand. This bench-scale testing indicates that the organoclay sorption capacity is at least 100% by weight (e.g., 1 pound [lb] of NAPL requires 1 lb of organoclay) and may be as high as 125% by weight.

2.3 Topographic Survey

A site-wide topographic survey was completed on April 22, 2014 by Crafton Tull Surveying (under subcontract to Conestoga-Rovers & Associates [CRA]), located in Conway, Arkansas. The survey scope included generating the topographic contours of the site and the locations of visible aboveground features, including changes in vegetation, water bodies, structures, culverts, road alignments, observed utilities, and existing staging or access points. Survey control was established using known benchmarks and temporary survey control points were established for use during construction activities. The elevations and features identified in the topographic survey serve as the basis of design for the current site conditions.

3. Project Elements

This section describes the hydraulic characteristics of the mitigation areas, site constraints, and the applicable regulations and permits necessary for completing the mitigation action.

3.1 Hydraulic Characteristics of the Mitigation Areas

The Inlet Channel, through which water flows under I-40 to the east and into the cove, is confined within defined banks and is approximately 20 feet wide, with typical water depths of approximately 1 to 3 feet. The Inlet Channel flows through a floodplain area and then transitions into an approximately 6-acre open marsh. The marsh contains large trees that were not removed during the emergency response activities. Other woody vegetation was removed, and the majority of the area is currently open water with emergent aquatic vegetation; this area is referred to as the Open Water Area for purposes of this plan. Water levels and the edge of standing water in the marsh and large adjoining floodplain to the west vary in response to seasonal and storm event-driven runoff variations and seasonal water levels in Lake Conway. The marsh area is bordered to the east by the Heavily Vegetated Area. Water through the Heavily Vegetated Area primarily flows via a partially open channel located in the center of this area (Figure 1-2). The Heavily Vegetated Area is inundated most of the year.

Water levels in the cove fluctuate in response to runoff and fluctuations in Lake Conway, except when water levels in Lake Conway drop below the controlling elevations of the two culverts that convey water flow beneath Highway 89 (Figure 1-2). Due to the controlling effect of the culverts (invert elevation of 262.2 feet North American Vertical Datum of 1988 [NAVD88]), normal seasonal water levels in the cove are 262.2 feet (NAVD88) during winter (or possibly lower) and 262.87 feet (NAVD88) during summer, as controlled by the Lake Conway dam.

3.2 Site Conditions, Constraints, and Limitations

The following site conditions, constraints, and limitations were considered in the design of the mitigation action:

- As a result of the dense vegetation, the Heavily Vegetated Area is difficult to access without significantly degrading the remaining habitat.
- Some areas of the site have relatively soft soils, and the slopes along the southwest perimeter of the cove are steep.
- The site is bounded to the east and south by residential areas.

- Large-diameter, mature trees are present along the south and northern banks of the cove, and preservation of these trees is important, which limits the means and routes of access for construction.

- An existing staging area remains from the emergency response on the west side of the cove, providing an available access point for construction.

- Water depths in most of the mitigation areas are relatively shallow (e.g., less than 1 foot to 3 feet).

- The Inlet Channel water flows are highly variable in response to runoff events.

- Water levels in the cove fluctuate as described in Section 3.1.

3.3 Applicable Regulations and Permits

All regulatory compliance requirements for implementation of the mitigation action are summarized in Table 3-1. Permits required prior to implementation are listed below:

- *Clean Water Act Section 404/Rivers and Harbors Act of 1899 permit:* A Nationwide Permit (NWP) 38 was issued for the response efforts, and USACE indicated that implementation of the remedy is authorized under this NWP. A restoration plan is required to be prepared and is currently under development.

- *Clean Water Act Section 401 Water Quality Certification:* ADEQ has issued programmatic water quality certification (WQC) for USACE NWPs contingent on submittal of a Short Term Activity Authorization (STAA) application (see next item below). If an Individual 401 WQC is required, submittal of an application and information regarding anti-degradation analysis to ADEQ is required. If an Individual 401 WQC is required, agency review and approval would require a minimum of 60 days. If an Individual 401 WQC is not required, no further action is required.

- *Short Term Activity Authorization (STAA):* An STAA will be required from ADEQ for activities in waters of the state. This permit requires application submittal to ADEQ with a description of work within waters of Arkansas. It is estimated that this authorization could require a minimum of 60 days for review by the ADEQ.

- *National Pollution Discharge Elimination System Compliance with Construction General Permit in Arkansas (Permit No. ARR150000):* Compliance with the Construction General Permit for construction projects larger than 5 acres requires preparation of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP must identify site-specific best management practices (BMPs) that reduce stormwater

discharge of sediment during construction. The SWPPP, Notice of Intent, and appropriate fees must be submitted to ADEQ at least 30 days prior to construction.

- *Faulkner County Floodplain Protection Ordinance 11-15:* Compliance with Ordinance 11-15 requires the project not result in increased hazards within the Special Floodplain Hazards Area. A Floodplain Development Application will be prepared and submitted to the county.

4. Basis of Design

This section presents the basis of design for the mitigation action, including assumptions, design requirements, and proposed construction methodologies. The mitigation action was designed to meet the RAO of mitigating surface water sheens related to crude oil from the Pegasus Pipeline, to the extent technologically feasible. The mitigation areas are shown on Figures 4-1, 4-2, and 4-3. Design criteria are summarized in Tables 4-1, 4-2, and 4-3.

4.1 Delineation of Mitigation Areas

Based on the pre-design study data (Section 2.1), sheen-bearing materials are present in sediments intermittently along the channel and within portions of the Open Water Area and Heavily Vegetated Area. Mitigation actions will be conducted to address sheen-bearing sediments in the specific areas delineated during the pre-design study. The refined mitigation areas are shown on Figures 4-1, 4-2, and 4-3 and the basis for each area is provided below:

- *Inlet Channel (targeted sediment removal):* Because lighter, medium, and heavier sheens were observed intermittently within the Inlet Channel (Figure 4-1), a minimum of 6 inches of surface sediment will be removed along the entire Inlet Channel. Based on the pre-design study results, a few locations had sheen-bearing material at 6 to 12 inches bss and 12 to 18 inches bss and additional sediment will be removed in these areas.

- *Open Water Area (reactive capping):* The extent of the reactive cap is based on the pre-design results and the topography in the area (Figure 4-2). A large area of the cap extent will be in the central and southeast portions of the Open Water Area and a small finger along a channel in the northern portion of the Open Water Area. The large area of the cap is bounded by the bank slope and wooded area to the south, the Heavily Vegetated Area to the east, and offset at least 15 feet from sheen-bearing material to the west and north. The cap extents to the west and north are in the transitional area with shallow slopes and where the water's edge can vary significantly based on rainfall events and Lake Conway Dam operations. The small finger in the northern portion of the Open Water Area is bounded by the channel slopes where present; where the channel slopes are not prominent, the cap is offset 15 feet from the sheen-bearing material. The total area of the reactive cap is 4.5 acres.

- *Heavily Vegetated Area (targeted in-situ amendment):* The Heavily Vegetated Area contains willows and other dense woody vegetation that provide habitat value for this area and function as a stormwater runoff buffer for the cove. As a result, it was first determined during the response action, in conjunction with oversight agencies, that these trees and vegetation would not be removed. Therefore, the future mitigation action is also designed to preserve the trees and vegetation. The extent of the in-situ amendment will include locations where lighter, medium, and heavier sheens were observed as part of

the pre-design study within the Heavily Vegetated Area. The lateral extent of in-situ amendment placement is approximately 2 acres (Figure 4-3), or to the extent technologically feasible given the dense vegetation.

No sheens were observed at the probing location near Highway 89 during the pre-design study. Sheens have been observed very intermittently near Highway 89 since October 2013 (on average less than one sheen per month). The observations of these sheens were similar to the sheens in the drainage ways, suggesting urban runoff and/or biological activity sources. Therefore, no mitigation is warranted in the northern portion of the cover adjacent to Highway 89.

4.2 Targeted Sediment Removal in the Inlet Channel

This section summarizes the basis of design for targeted sediment removal in the Inlet Channel; material handling, dewatering, and disposal; and management of decant water or water that is drained from the removed sediment during dewatering. The objective of the targeted sediment removal is to eliminate crude-oil-related sheens in the Inlet Channel through the removal of sheen-bearing sediment in the Inlet Channel. The basis of design criteria for targeted sediment removal in the Inlet Channel are summarized in Table 4-1.

Based on the pre-design study results, the removal depths vary from 6 to 18 inches (0.5 to 1.5 feet) (Figure 4-1). A total of approximately 480 cubic yards will be removed, along approximately 1,300 feet of the Inlet Channel.

4.2.1 Water Management in the Inlet Channel

The Inlet Channel removal area will be dewatered using temporary diversion dams and bypass pumping. The removal will be conducted in three segments (approximately 400 feet long) starting at the upstream end of the Inlet Channel. The temporary diversion dams will be constructed on the upstream and downstream end of each segment using sandbags or similar temporary materials. For each segment, a pumping pool will be located upstream of the temporary diversion dam. Channel water will be extracted from the pool via pumps and routed through pipes placed along the top of the bank to a discharge point downstream of the removal area segment. The discharge point will include a diffuser, such as hay bales, to reduce erosion of the bank.

After the bypass pumping system is constructed, standing water within the removal area segment will also be pumped downstream of the segment prior to starting removal. The discharge point will also include a diffuser and a sorbent boom around the discharge to remove sheens, if present.

The farthest downstream temporary dam will be constructed near the downstream end of the removal area. A small portion of the removal is in a section that is not well channelized and therefore, the removal will be

conducted downgradient of the final temporary dam due to the unconfined nature of this portion of the channel.

The temporary dams are designed to allow water to flow over them in the event of a large runoff event to avoid upstream flooding impacts. If a large runoff event occurs, the removal activities will temporarily cease and equipment will be removed from the Inlet Channel until standing water is removed (using pumps). Water diversion will be performed to reduce the disturbance and erosion of sediments downstream of the work area, to the extent practicable.

4.2.2 Sediment Removal

Sheen-bearing sediment will be removed from the Inlet Channel up to the target depth (Figure 4-1). Mechanical removal will be conducted in relatively dry conditions following diversion of the surface water around the removal area using temporary dams and bypass pumping, as described in Section 4.2.1.

Sediment removal will be conducted using a mechanical excavator working from within the dewatered channel. Low-ground-pressure vehicles, such as “marsh buggy” mini-excavators and small tracked dump trucks, or similar equipment, will be used to reduce the disturbance of the sediment and adjacent marsh. It is anticipated that these low-ground-pressure vehicles will be used to transfer sediment from the channel bottom to temporary access ramps out of the channel bottom and then to the sediment removal staging area. Transport routes for the tracked dump trucks will avoid contact with in-situ sheen-bearing sediment. To avoid tracking sheen-bearing sediment out of the creek bed, sediment will be progressively removed before the transport vehicles advance along the channel.

Following completion of removal to the target depths, confirmation sheen sampling will be conducted by collecting sediment samples along the bottom of the channel to confirm that the removal addressed sheen-bearing materials. If the confirmation sheen sampling results confirm that sheen-bearing materials have been removed, and no sheens are visible along the face of the banks between toe of bank and top of bank, the removal will be verified as complete. If the confirmation sheen sampling indicates that sheen-bearing materials are still present in the channel, or visual observation shows presence of sheen along the banks, up to an additional 6 inches of material may be removed at those locations, as described in the CQAP (Appendix C).

Following confirmation activities, removal areas with depths greater than 0.5 foot will be backfilled with clean material up to approximately 0.5 foot below the original grade. The backfill will be compacted by passing construction equipment or a vehicle over the backfill. The removal areas with depths of 0.5 foot will not be backfilled.

4.2.3 Sediment Handling and Dewatering

Removed material will be transported to the sediment removal staging area where it will be allowed to gravity dewater within a lined bermed area. As needed, following gravity dewatering, sediment will be mixed with a solidification reagent to stabilize free liquids until the sediment is suitable for off-site transport and disposal (e.g., passes the Paint Filter Test, as described in U.S. Environmental Protection Agency [USEPA] Method 9095B). The solidification reagent will consist of Portland cement, quick lime, or similar drying or absorbent material to be selected based on local availability. Solidification reagent dose requirements will be determined by the Contractor and confirmed using field Paint Filter Tests, as described in the CQAP (Appendix C). Stockpiled sediment will be covered with plastic sheeting to reduce wastewater generation and to keep dewatered and stabilized sediments dry until they are loaded and transported to an approved off-site disposal facility.

4.2.4 Transport and Disposal

The dewatered sediment will be transferred from the sediment removal staging area and loaded into trucks for transport to an approved off-site disposal facility. Trucks will be covered with tarps (or similar) for dust control during transport. The disposal facility will be selected from the approved waste site list.

Sediment decant water and wastewater generated from cleaning the equipment, will be collected and containerized for off-site disposal in accordance with applicable local, state, and federal regulations.

4.3 Reactive Capping in the Open Water Area

This section summarizes the basis of design for the reactive cap for the Open Water Area. The objective of the reactive cap is to reduce the potential for crude-oil-related sheens to be generated by sediments in the Open Water Area. The basis of design criteria for the reactive cap are summarized in Table 4-2. The reactive cap extent was determined based on the pre-design study results as described in Section 4.1. The extent of the reactive cap is approximately 4.5 acres and is shown on Figure 4-2.

The reactive cap will consist of an approximate 3- to 6-inch layer of clean sand mixed with organoclay placed directly over the sediment surface. The reactive component of the cap is organoclay, specifically PM-199 organoclay developed by CETCO™. Organoclay is manufactured by replacing cations in layered clays such as bentonite, with cationic organic compounds such as quaternary amine compounds, to create an organic phase along the surface of each layer in the molecular lattice. Organoclay sorbs oils, thereby eliminating or greatly reducing their transport from sediments to the water column (Reible and Lampert 2008, Reible et al. 2011, Alther 2008). Organoclay was selected for use in the cap because it is an effective sorptive medium for petroleum constituents and has been used to successfully control sheens at numerous

sediment sites. During the past 10 years, organoclay reactive caps have been approved by USEPA and state agencies and installed at numerous sites around the United States.

4.3.1 Reactive Media Basis of Design

The objective of the reactive cap is to reduce the potential for crude-oil-related sheens to be generated by sediments in the Open Water Area to the extent technologically feasible. To achieve this objective, the primary design criterion is the mass of organoclay needed to sufficiently sorb residuals that may generate sheens. Based on data available for design, the mass of organoclay per cap area for the Open Water Area was conservatively calculated to be 3.6 pounds per square foot (sf) based on the approach described below:

- The maximum depth that residual oil was observed in the Open Water Area (1 foot bss) was used to estimate the potential vertical extent of sheen-bearing sediments. This assumption that residual oil is present within the entire top 1 foot of sediments represents a conservative assumption of the maximum amount of sheen-bearing material that may be present in any location within the Open Water Area and significantly overestimates the amount of sheen-bearing material that may be present within the entire reactive cap area.

- The median reported oil saturation of 4.2% was selected as a conservative, high-end estimate for design. This value was combined with the average porosity of 0.75 from the bench scale tests (see Section 2.2).

- Organoclay sorption capacity was assumed to be 100% (i.e., 1 lb of NAPL per pound of organoclay) based on the bench-scale testing results summarized in Section 2.2. These tests indicated an organoclay oil sorption capacity of at least 100% by weight and up to 125% by weight. These results are consistent with vendor and literature data.

Based on the assumptions identified above, the organoclay mass per area needed for the reactive cap was calculated to be 2.0 lbs per square foot. As described above, this calculated value includes conservatism in each assumption. An additional safety factor of 1.8 was included to the calculated organoclay dose to allow for a 30% variation in the cap thickness upon placement in the field, and a 50% variation at any location in the actual percent organoclay by mass in the sand-organoclay cap mixture. The resulting design organoclay mass for the reactive cap area is 3.6 lbs per square foot.

A target reactive cap thickness of 3 to 6 inches was selected based on implementability considerations and to limit the amount of imported material to be placed in the cove. Based on the area to be capped, approximately 360 tons of organoclay will be included in the cap.

4.3.2 Cap Stability

The potential for scouring at the Open Water Area is limited because surface water flow velocities are low due to the wide, shallow floodplain and there will be no regular boat traffic following completion of the mitigation action. The potential for wind waves to scour the cap is limited and will decline further when the area is revegetated. The potential for mud waves to occur during placement is limited because cap materials will be placed carefully through the water column. Limited cap settlement may occur due to consolidation of the underlying soft sediment. The potential for differential settlement is low, however, due to the relatively thin cap and low variation in thickness of underlying soft sediment. No stabilization measures are necessary for the cap once it is placed. However, if sections of the cap are exposed during low water levels in the cove, erosion protection measures (e.g., biodegradable mats) may be installed to promote stability until the area has been revegetated.

4.3.3 Reactive Cap Placement

The reactive cap will be placed over the existing sediments in the Open Water Area (Figure 4-2). Where there is adequate water depth, the blended sand/organoclay mixture will be placed through the water column. It is anticipated that the reactive cap will be installed by mechanically broadcasting the cap materials from amphibious excavators to achieve placement of a relatively consistent cap layer. The sand and organoclay material will be mixed on site and pre-wetted prior to spreading to aid in settling and cap consistency. In areas without adequate water depth, the cap materials will be placed directly on the existing sediment/soil surface.

The cap thickness will be verified within specific cap confirmation units (sub area of the capping area) using measurement plates deployed prior to the start of capping and collected at a pre-determined frequency, as described in the CQAP (Appendix C).

4.4 Targeted In-Situ Amendment in the Heavily Vegetated Area

This section summarizes the basis of design for the targeted in-situ amendment placement in the Heavily Vegetated Area. The objective of the in-situ amendment is to reduce the potential for sheens to be generated in the Heavily Vegetated Area while limiting disturbance to the existing vegetation. The basis of design criteria for the targeted in-situ amendment are summarized in Table 4-3. The extent of the in-situ amendment was determined based on the pre-design study results described in Section 4.1. The lateral extent of in-situ amendment placement is approximately 2 acres (Figure 4-3).

Targeted in-situ amendment in the Heavily Vegetated Area consists of placing organoclay directly over the sediment surface to meet the site RAO of mitigating surface water sheens related to crude oil from the Pegasus Pipeline, to the extent technologically feasible. The in-situ amendment will consist of PMFI®

(organoclay) developed by CETCO™. As described in Section 4.3, organoclay was selected as the sorbent because it is an effective sorptive medium for petroleum hydrocarbons and sheens.

4.4.1 In-Situ Amendment Media Basis of Design

The objective of the in-situ amendment is to reduce the potential for crude-oil-related sheens to be generated by sediments in the Heavily Vegetated Area to the extent technologically feasible. Similar to the reactive cap design, the primary design criterion for the in-situ amendment is the mass of organoclay needed to sorb residuals that may generate sheens. Based on data available for design, the mass of organoclay per area for the Heavily Vegetated Area was conservatively estimated to be 1.0.0 lb per square foot based on the approach described below:

- The maximum depth that residual oil was observed in the Heavily Vegetated Area (0.5 foot bss) was used to estimate the potential vertical extent of sheen-bearing sediments. This assumption that residual oil is present within an entire 0.5 foot of sediments represents a conservative assumption of the maximum amount of sheen-bearing material that may be present in the Heavily Vegetated Area.

- As described for the reactive cap, the median value of the oil saturation results (4.2%) was selected for design of the in-situ amendment and is believed to be a conservatively high estimate for design. The average porosity of 0.75 from the bench-scale tests described in Section 2.2 was used to estimate the total porosity of the sediments.

- Organoclay NAPL sorption capacity was assumed to be 100% (i.e., 1 lb of NAPL per pound of organoclay) for the in-situ amendment, which is the same as described for the reactive cap.

Based on the assumptions identified above, the organoclay mass per area needed for the in-situ amendment area was calculated to be 1 lb per square foot. As described above, this calculated value includes conservatism in each assumption. As described in Section 2.1, the Heavily Vegetated Area typically had lighter sheens than the Open Water Area; therefore, less organoclay is needed. Due to the lighter sheens and objective of preserving the vegetation, an additional safety factor was not applied on the organoclay dose. Contingencies are described in Section 4.4.3.

4.4.2 In-Situ Amendment Placement

The organoclay will be placed through the water column using mechanical broadcasting equipment and/or using pneumatic application to spray materials. Because the organoclay will be applied as an amendment in a thin and discontinuous layer, the organoclay is not anticipated to disturb the existing vegetation. In-situ amendment placement will be verified by confirming that the specified mass of amendment has been applied, as described in the CQAP (Appendix C).

The application of in-situ amendment is anticipated to occur during summer 2014. The heavy vegetation in this area presents a challenge for delivering the in-situ amendment to potential sheen-bearing sediments and thus, there is some potential for intermittent sheens to remain following implementation. Therefore, sheen monitoring will be conducted in the Heavily Vegetated Area following the first application and during construction of the other mitigation actions. After approximately 3 months (and after the leaves fall from the vegetation), an additional application of in-situ amendment may be conducted in targeted locations.

The extent of the mitigation area within the Heavily Vegetated Area and the approach for this area were selected with a goal of preserving the habitat and ecological function of this buffer area. Adaptive management will be used to evaluate and implement subsequent additional measures if warranted.

5. Construction

This section summarizes the general construction approach, health and safety requirements, CQA, and construction schedule. Final Construction Drawings and Specifications will be developed prior to mobilization and stamped by an Arkansas-licensed Professional Engineer. The construction documents will include the requirements for the materials and implementation approaches for the mitigation actions.

5.1 Implementation Approach

Mobilization will begin after this plan is approved by the ADEQ and the required permits and authorizations are obtained from state and federal agencies. After mobilizing, site preparation activities (e.g., the construction of temporary staging) areas will be completed. The construction will be conducted concurrently in the Inlet Channel and the Heavily Vegetated Area first, followed by cap installation in the Open Water Area. The work will be performed by CRA (Contractor). ARCADIS will provide documentation of the mitigation action and perform CQA monitoring and oversight during construction in accordance with the CQAP (Appendix C).

5.2 Site Preparation Activities

Site preparation and mobilization of the Contractor's personnel and equipment will be conducted prior to the start of construction activities. Staging areas, temporary access roads, temporary field facilities, site security, and truck loading areas will be constructed during site preparation activities. Prior to mobilization, the Contractor will conduct utility locates to identify existing aboveground and buried utilities within the limits of work.

5.2.1 Site Access and Security

The site will be accessed primarily from Interstate Drive via the existing rock yard staging area (Figure 1-2). This access point will be used for the deployment of construction equipment and materials. Additional access will be from the staging area adjacent to Interstate Drive and will be used for removal activities along the Inlet Channel. Temporary daily staging of removed material will occur at this location prior to transporting the material off site for disposal. Existing access routes within the site will be used to the extent practicable.

The Contractor will develop and implement a traffic control plan to allow reasonable convenient access to the site during construction, and to minimize traffic and noise during mitigation activities. Site security will be implemented to restrict access to the work and staging areas. Temporary fencing and warning flagging will be placed around work areas to prevent public access during active operations and to discourage access during non-working hours. A visitor check-in will be located at the main construction entrance. All visitors will be required to show appropriate identification and current Occupational Safety and Health Administration

(OSHA) training certificates prior to receiving authorization to enter the work area. Visitors without current OSHA training will require escort by site personnel.

5.2.2 Debris and Vegetation Removal

Limited clearing and grubbing will be performed, as needed, to allow for safe access to the work area during construction and the construction of staging areas. Mature or large-diameter trees will be protected, to the extent practicable, during site clearing and subsequent construction activities. Vegetation removed from upland areas during clearing and grubbing may be chipped and reused as a stabilizing agent for the construction of temporary access roads. Unused vegetation will be temporarily stored for post-construction site restoration or for transport to an approved off-site disposal facility.

Surficial debris and vegetation within the Inlet Channel and Open Water Area will be removed, to the extent needed, to allow for sediment removal or placement of the reactive cap. Larger woody debris and vegetation will be transported to a staging area and temporarily stored on site for potential reuse as in-water habitat. Woody debris and vegetation that are not used for restoration of habitat will be chipped and staged for transport to an approved off-site disposal facility. Upright, large-diameter trees in the mitigation area will be preserved unless they present a safety hazard.

5.2.3 Staging Area Requirements

Staging areas will be constructed to support sediment removal and cap installation activities. Silt fences and/or other stormwater erosion and sedimentation BMPs will be installed around the staging areas in accordance with a site-specific SWPPP to control erosion. The Contractor will develop the SWPPP.

The sediment removal staging area will be located in an area with access to the Inlet Channel and will consist of dedicated areas for material handling, dewatering, and stabilization of excavated sediment. The sediment removal staging area will be constructed with impermeable liners and low berms to collect and manage free liquids. Collected liquids will be drained or pumped from the sediment removal staging area for off-site disposal in accordance with applicable local, state, and federal regulations.

The sediment cap staging area will be located in an area with access to the Open Water Area and will consist of an area for cap material storage and an area for amendment blending operations. The location, size, and configuration of the staging areas will be determined based on input from the Contractor.

5.3 Environmental Protection and Monitoring

The construction activities will be conducted in a manner to reduce environmental impacts during, and as a result of, construction operations. The environmental protection and monitoring requirements are provided in the CQAP (Appendix C) and summarized below.

5.3.1 Water Quality Controls

Water quality controls and work isolation measures will be used during construction to reduce potential construction-related impacts to surface water. These controls include the following:

- The Inlet Channel removal activities will be isolated from the water by water diversion and temporary soil berms, as described in Section 4.2.
- A silt curtain will be placed at the downstream end of the in-situ amendment area to isolate the in-water work area. The placement of cap materials and amendments will be done in a manner that reduces potential sediment resuspension.
- Floating absorbent booms will be maintained in the cove during construction.
- The Contractor will prepare a Spill and Contamination Prevention Plan prior to construction. Spill containment kits and additional sorbent booms, sorbent pads, and replacement silt curtain materials will be kept on site during construction and used to manage sheens if observed.
- BMPs will be implemented in accordance with the SWPPP to reduce potential erosion of soils or staging areas.

5.3.2 Water Quality Monitoring

Water quality monitoring will be conducted during construction to confirm that the water quality controls are effective and that construction activities are not affecting water quality downstream of the work areas. Water quality monitoring will include sheen monitoring and management and turbidity monitoring, as described in the CQAP (Appendix C). Ongoing weekly surface water sampling will also be conducted as described in the CQAP. The results from the water quality monitoring and surface water sampling will be included in the completion report (Section 5.9).

5.4 Construction Quality Assurance

The CQAP (Appendix C) establishes procedures that will be implemented to confirm that targeted sediment removal, reactive capping, and targeted in-situ amendment placement are conducted and documented with an appropriate level of quality assurance and quality control. In addition, the CQAP describes construction monitoring that will be performed to confirm that the mitigation action components meet the design criteria.

5.5 Health and Safety

A site-specific Health and Safety Plan (HASP) will be implemented to address worker health, worker and site safety, site security, and site traffic management and control. The HASP will be supplemented by job safety analyses for work activities that may pose a hazard to employees. The Loss Prevention System® will be implemented during all project work. Applicable EMES Operations Integrity Management System procedures will also be followed

Work zones will be established and enforced to prevent trespassing at the site. Project personnel contact numbers and appropriate signs will be posted at the main staging area. Personnel and visitors will be required to sign in at the project trailer to complete site orientation prior to entering the site.

5.6 Demobilization

Following implementation of the mitigation action, the staging areas will be deconstructed, and temporary facilities and construction equipment will be demobilized from the work area. Gravel and materials used for construction of the staging areas and access roads will be removed and disposed; the disturbed areas will be restored.

After completing the mitigation activities, the containment booms located at the western boundary of the Heavily Vegetated Area and all sorbent booms within the Heavily Vegetated Area will be removed. The booms located downstream of the Heavily Vegetated Area will remain in place until post-construction monitoring is complete.

5.7 Restoration

A restoration plan is currently under development for the site to meet the USACE requirements for wetlands restoration.

5.8 Construction Schedule

It is anticipated that construction activities associated with the mitigation action will be implemented in summer and/or fall 2014. The Contractor will prepare a detailed project construction schedule as part of the Contractor Work Plan. An updated project schedule will be maintained through completion of construction activities.

The following are the anticipated milestones for construction:

- Submittal of this plan to ADEQ on May 19, 2014
- ADEQ approval of this plan
- Receipt of permits and authorizations
- Mobilization for construction

5.9 Mitigation Action Completion Report

A Mitigation Action Completion Report will be prepared and submitted to ADEQ for approval within 90 days following the completion of construction activities (i.e., completion of the final inspection) and the receipt of final survey data. This report will include documentation of the construction activities and CQA activities conducted at the site. The report will also include a proposed post-construction monitoring schedule and procedures.

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Tables

Table 3-1
Applicable Permits and Authorizations

Mitigation Action Plan
ExxonMobil Environmental Services Company
Mayflower Pipeline Incident Response, Mayflower, Arkansas

Regulation	Agency	Citation	Requirement	Compliance
Local Regulations				
County Ordinance 11-15	Faulkner County	Ordinance 11-15 (August 16, 2011)	Floodplain development permit required for work within the Special Flood Hazard Areas (generally the 100-year floodplain) within Faulkner County	Preparation of floodplain development application and submittal to Faulkner County. Remain in compliance with Ordinance 11-15 during implementation of Mitigation Action Plan.
State Regulations				
Hazardous Waste Management	ADEQ and APCEC	APCEC Regulation 23 (August 12, 2012)	Applies to the management of soil or sediment excavated as part of a mitigation action.	Any waste considered hazardous must be handled according to Regulation 23, including restrictions for comingling, transport, and deposition. A site accepting hazardous waste must have a USEPA identification number and be approved by ADEQ to accept that specific classification of waste. Transporters must have an ADEQ permit and meet Regulation 23 standards for permits. EMES will ensure that all requirements of Regulation 23 are met during project implementation.
Water Quality Standards for Surface Water	ADEQ	APCEC Regulation 2 (effective August 26, 2011)	Applies to surface water quality cleanup. Regulation 2 includes the Arkansas Anti-degradation Policy.	Implementation of the alternative must meet state water quality standards. It is anticipated that state stormwater quality standards will be met by submitting a NOI, posting a site notice, and preparing an SWPPP.
Regulations for State Administration of the NPDES	ADEQ	APCEC Regulation 6 (effective February 9, 2013)	Applies to discharge of wastewater (including dewatering water from sediment) to a surface water of the United States.	No discharges to surface waters will occur. Dewatered water will be off-hauled from the site and disposed of at an appropriate facility or discharged into the municipal sewer system.
Solid Waste Management	ADEQ	APCEC Regulation 22 (effective April 26, 2008)[1]	Applies to the disposal of solid waste.	Solid waste removed from the site must be deposited at a landfill that is permitted to accept the waste. EMES will ensure that all requirements of Regulation 22 are met during project implementation.
Federal Regulations				
CWA Section 404	USACE	40 CFR Sections 230 and 231; and 33 CFR 320-330	Placement of dredged or fill material into waters of the United States, including wetlands.	The USACE has indicated that a Nationwide Permit 38 Cleanup of Hazardous and Toxic Waste issued for the incident is appropriate to cover the mitigation action, per the meeting with Aaron Howell (USACE) on April 14, 2014.
Rivers and Harbors Act of 1899	USACE	33 CFR 322	Placement of dredged or fill material into waters of the United States. Prohibits the unauthorized obstruction or alteration of navigable waters of the United States.	The USACE has indicated that a Nationwide Permit 38 Cleanup of Hazardous and Toxic Waste issued for the incident is appropriate to cover the mitigation action, per the meeting with Aaron Howell on April 14, 2014.
CWA Section 401	ADEQ	40 CFR 131	ADEQ must certify the permits issued by the USACE meet state water quality objectives.	ADEQ has issued programmatic 401 Water Quality Certification for the majority of USACE Nationwide Permits, including Nationwide Permit 38. However, to ensure the project meets state water quality objectives, the ADEQ requires submittal of an STAA. The review of an STAA also identifies whether an individual 401 Water Quality Certification is required.
STAA	ADEQ	APCEC Regulation 2 (effective August 26, 2011)	Activity conducted in ANY water that might violate the Arkansas Water Quality Standards MUST be authorized by the ADEQ Director. This would include debris removal or movement of machinery into the water, or bridge construction that disturbs the water. Other activities that are essential to the protection or promotion of the public interest and that result in no permanent or long-term impairment of beneficial uses of the water from the activity may also be eligible for authorization.	The STAA is required for all work within waters of Arkansas. STAA application supports the 401 Water Quality Certification and is used to determine if an individual 401 Water Quality Certification is required.
Section 7 Federal ESA	USFWS/ NOAA Fisheries	ESA, Section 7, as Amended, 50 CFR § 402 (2000)	Under Section 7 of the ESA, an action by a federal agency cannot result in 'take' or jeopardize the continued existence of a listed or candidate species. Where the potential for take exists, conservation measures to reduce the potential for take must be implemented. The USACE must comply with Section 7 by ensuring that the permitting action does not result in the jeopardy of a listed species.	Information regarding the potential for federally listed endangered or threatened species must be included in the permit application package to the USACE. Information will include a list of species with the potential to occur near the project and potential effects on species as a result of project implementation.

Table 3-1
Applicable Permits and Authorizations

Mitigation Action Plan
ExxonMobil Environmental Services Company
Mayflower Pipeline Incident Response, Mayflower, Arkansas

Regulation	Agency	Citation	Requirement	Compliance
Federal Regulations				
Section 106 of the NHPA	SHPO	Public Law 89-665 and amendments thereto 16 USC 470 et seq.	Section 106 of the NHPA requires that all federal agencies provide the Advisory Council on Historic Preservation with an opportunity to comment on any undertaking for which an agency has direct or indirect jurisdiction when the undertaking has the potential for adverse effects on a historic property listed or eligible for listing on the National Register of Historic Places. The USACE must comply with Section 106 of NHPA by ensuring that the permitting action does not result in adverse effects on historic resources.	Information regarding known historic and cultural resources near the project will be included in the permit application to the USACE, with a description of any cultural resources and the potential adverse effects on resources as a result of project implementation.
NPDES	ADEQ	Section 402 CWA 33 USC 1251-1387	Substantive requirements of NPDES permit for point source and non-point source discharges of pollutants into waters of the United States from on-site dewatering during construction.	Preparation of an SWPPP and submittal of an NOI to ADEQ at least 30 days prior the start of construction. The SWPPP would include best management practices to protect water quality during implementation of the mitigation action.
Migratory Bird Treaty Act	USFWS	16 USC 703-712	It is prohibited, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird."	Because the project is located in the Mississippi Flyway, if work occurs during the nesting and breeding season, pre-construction surveys for nesting and breeding birds would be conducted. An avoidance plan would be prepared outlining the specific protocols required for work during the nesting and breeding season.

Notes:
ADEQ = Arkansas Department of Environmental Quality
APCEC = Arkansas Pollution Control & Ecology Commission
CFR = Code of Federal Regulations
CWA = Clean Water Act
EMES = ExxonMobil Environmental Services Company
ESA = Endangered Species Act
NHPA = National Historic Preservation Act
NOAA = National Oceanic and Atmospheric Administration
NOI = Notice of Intent
NPDES = National Pollutant Discharge Elimination System
SHPO = State Historic Preservation Office
STAA = Short-Term Activity Authorization
SWPPP = Stormwater Pollution Prevention Plan
USACE = U.S. Army Corps of Engineers
USC = U.S. Code
USEPA = U.S. Environmental Protection Agency
USFWS = U.S. Fish and Wildlife Service
[1] APCEC Regulation 22.708 (a) Applicability - Petroleum contaminated soils may be disposed of in a Class 1 landfill provided the contaminated soils meet the requirements established in the Hazardous and Unauthorized Waste Exclusion Plan developed by each Class 1 facility, as required by Reg.22.412, unless otherwise specified in the facility disposal permit. The facility operator shall be responsible for complying with all applicable waste determination protocols. (b) Petroleum contaminated soils that comply with the facility Hazardous and Unauthorized Waste Exclusion Plan may be used as daily cover on interior working faces that drain directly into the facility leachate collection system.

Table 4-1
Removal Design Criteria

Mitigation Action Plan
ExxonMobil Environmental Services Company
Mayflower Pipeline Incident Response, Mayflower, Arkansas

Design Parameter	Criteria/Method	Basis of Design
Sediment Removal Method	Mechanical, following diversion of water around removal area	Depth of removal, water management limitation
Sediment Removal Thickness	6 to 18 inches	Pre-Design Study depth of sheen-bearing material
Volume of Removal	480 cy	Removal volume calculation, includes 30% contingency over neatline volume
Sediment Removal Verification	Confirmation sampling for sheen-bearing material	To confirm no remaining sheen-bearing material.
Removed Material Dewatering and Stabilization	Gravity dewatering, followed by addition of solidification agent (if needed)	No free liquid and disposal facility requirements
Removed Material Disposal Weight	860 tons	Assumes addition of up to 5% by weight of stabilization agent

Notes:
cy = cubic yards

Table 4-2
Capping Design Criteria

Mitigation Action Plan
ExxonMobil Environmental Services Company
Mayflower Pipeline Incident Response, Mayflower, Arkansas

Design Parameter	Criteria	Basis of Design
Organoclay Sorption Capacity	100% by weight (i.e., 1 pound of NAPL: 1 pound of organoclay)	Bench-Scale testing and vendor specifications
Organoclay Product	Organoclay PM-199 by CETCO	Bench-Scale testing and vendor specifications
Organoclay Mass per Square Foot of Cap	3.6 pounds of organoclay per square foot of cap area	Based on pore fluid saturation and organoclay sorption capacity, plus a factor of safety of 1.8 to allow for field variations
Total Cap Thickness	3 to 6 inches	Thickness based on implementability and site constraints
Estimated Total Mass of Organoclay	360 tons	Based on selected organoclay mass, cap area, and safety factor
Placement Method	Sand-organoclay mixture to be pre-wetted and then placed mechanically through the water column	Placement method selected based on site conditions and implementability

Notes:
NAPL = non-aqueous phase liquid

Table 4-3
Amendment Design Criteria

Mitigation Action Plan
ExxonMobil Environmental Services Company
Mayflower Pipeline Incident Response, Mayflower, Arkansas

Design Parameter	Criteria	Basis of Design
Organoclay Sorption Capacity	100% by weight (i.e., 1 pound of NAPL: 1 pound of organoclay)	Bench-Scale testing and vendor specifications
Organoclay Product	Organoclay PMFI by CETCO	Bench-Scale testing and vendor specifications
Organoclay Mass per Square Foot of Target Area	1 pound of organoclay per square foot of target area	Based on pore fluid saturation and organoclay sorption capacity
Estimated Total Mass of Organoclay	43 tons	Based on organoclay mass and area
Placement Method	Application of in-situ amendment through the water column to sediment surface using mechanical and/or pneumatic methods	Placement method selected based on site conditions and constraints (existing vegetation)

ARCADIS

Figures

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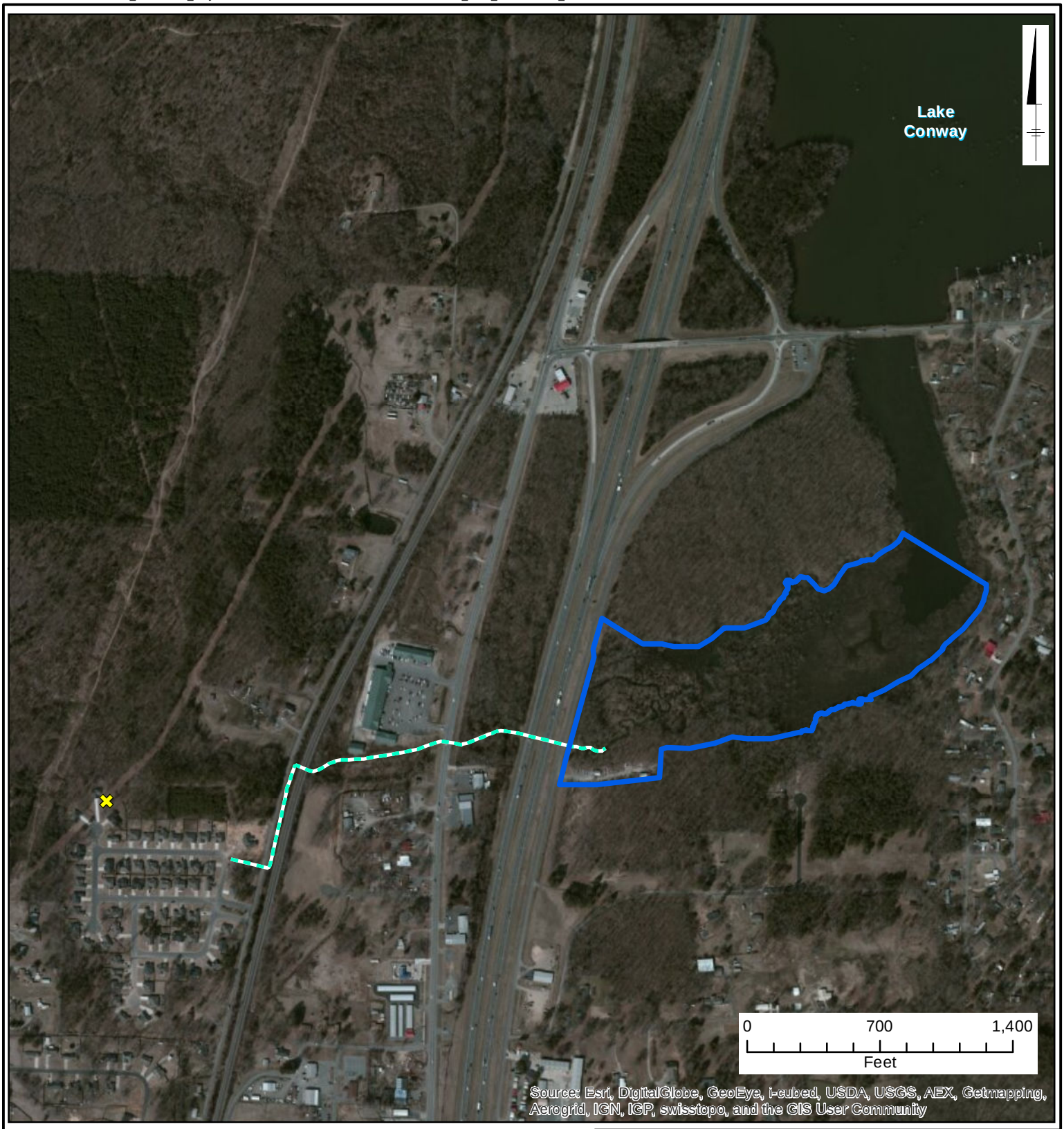

LEGEND

- Source Point
- Drainage Path
- Approximate Limit of Work

Map Date: 5/16/2014

MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
MITIGATION ACTION PLAN

SITE LOCATION MAP

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FIGURE
1-1

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OUTLET TO LAKE CONWAY

HEAVILY VEGETATED AREA

OPEN WATER AREA

Existing Staging Area

INLET CHANNEL

Culvert Outlet under I-40

Existing Rock Yard Staging Area

Legend

- Drainage Path
- Two-Tract Road
- Approximate Water's Edge
- Approximate Limit of Work
- Areas with Heavy Vegetation
- Existing Staging Areas

NOTES:
1. The Heavily Vegetated Area shown in this plan was digitized based on the February 2014 aerial photo that was acquired via Google Enterprise Geo Master License.
2. The water's edge changes based on season and recent rainfall. The approximate water's edge is based on conditions during the pre-design study in April 2014.

0 250 500
Feet

MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
MITIGATION ACTION PLAN

SITE PLAN

ARCADIS

FIGURE 1-2

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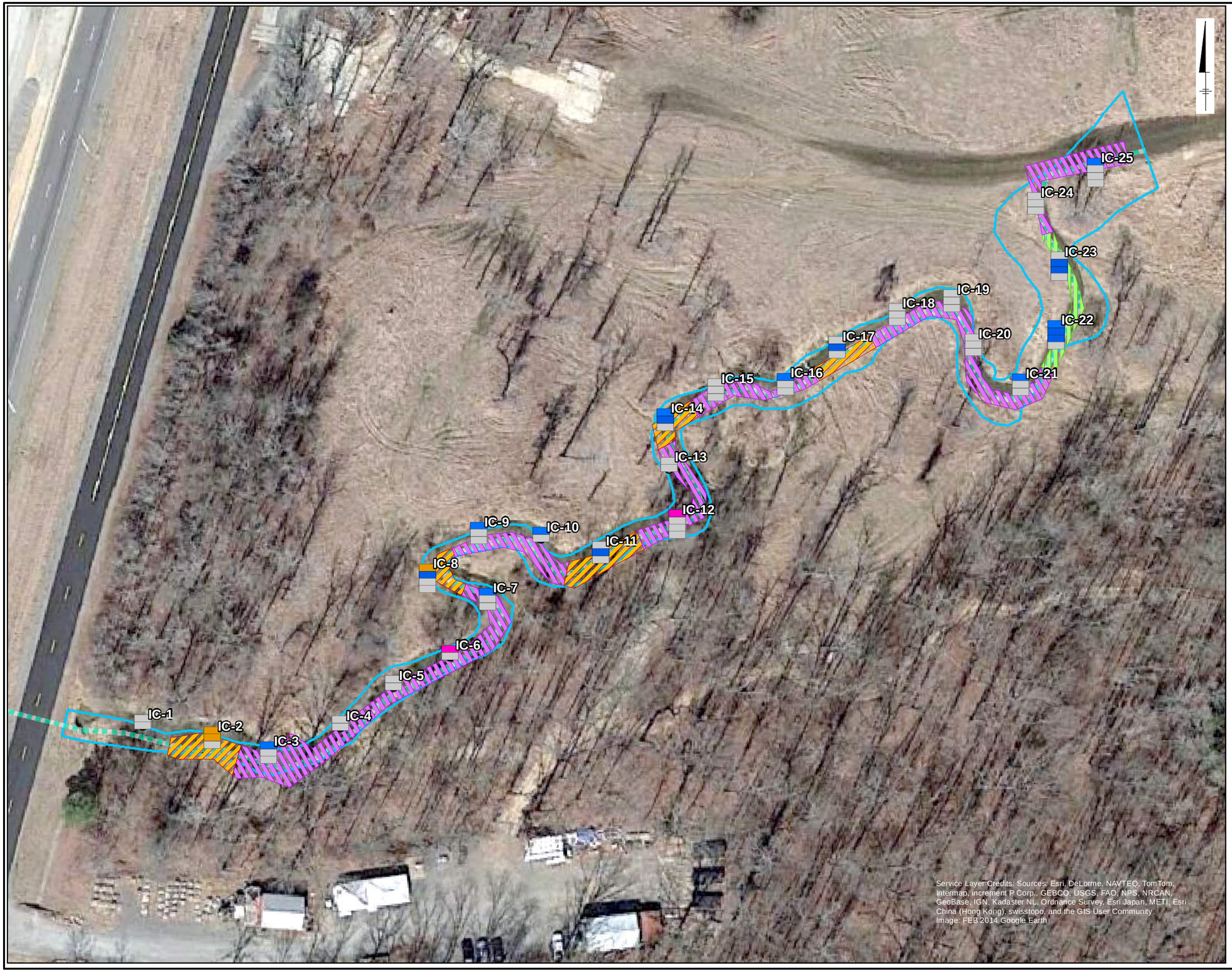

Legend

- Drainage Path
- Cove Inlet Channel

Proposed Limits of Removal

- 6-inch Removal Depth
- 12-inch Removal Depth
- 18-inch Removal Depth

Relative Sheening Observed During Pre-Design Study

- No Sheen
- Lighter Sheen
- Medium Sheen
- Heavier Sheen

- Sampling Depth 0-6 inches
- Sampling Depth 6-12 inches
- Sampling Depth 12-18 inches*
- Sampling Depth 18-24 inches*

* = Varies for some samples

NOTES:
1. Pre-design study activities were completed between March 31 and April 9, 2014.
2. Figure shows overall qualitative sheening amount for each sample interval based on probing and/or sheening stir-test results.
3. The limits of removal are based on the width of the channel bottom between each toe of bank (surveyed in April 2014). Limited scraping (less than 6 inches) along each bank maybe necessary to maintain slope stability.
4. Removal depths are below top of existing sediment surface.

0 70 140
Feet

MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
MITIGATION ACTION PLAN

COVE INLET CHANNEL PROPOSED REMOVAL EXTENT

ARCADIS

FIGURE 4-1

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Legend

- Proposed Reactive Cap Extent
- Approximate Water's Edge
- Drainage Path
- Containment Boom
- Areas with Heavy Vegetation

Relative Sheening Observed During Pre-Design Study

- No Sheen
- Lighter Sheen
- Medium Sheen
- Heavier Sheen

Sampling Depth 0-6 inches
Sampling Depth 6-12 inches*
* = Varies for some samples

NOTES:
1. Pre-design study activities were completed between March 31 and April 9, 2014. Additional activities were completed on April 25, 2014.
2. Figure shows overall qualitative sheening amount for each sample interval based on probing and/or sheeing stir-test results.
3. The water's edge changes based on season and recent rainfall. The approximate water's edge is based on conditions during the pre-design study in April 2014.
4. The existing containment boom within the Open Water Area will be removed prior to construction of the reactive cap.

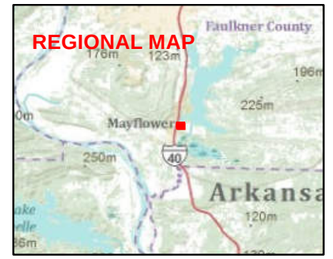
0 100 200
Feet

MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
MITIGATION ACTION PLAN

PROPOSED OPEN WATER AREA REACTIVE CAP EXTENT

ARCADIS

FIGURE
4-2



Legend

- Amendment Placement Areas
- Approximate Water's Edge
- Containment Boom
- Areas with Heavy Vegetation

Relative Sheening Observed During Pre-Design Study

- No Sheen
- Lighter Sheen
- Medium Sheen
- Heavier Sheen

NOTES:
1. Pre-design study activities were completed between March 31 and April 9, 2014. Additional activities were completed on May 7, 2014.
2. Figure shows overall qualitative sheening amount for each VA- location based on probing and/or sheening stir-test results. Figure shows amount of sheening for each PA- location based on probing results.
3. The water's edge changes based on season and recent rainfall. The approximate water's edge is based on conditions during the pre-design study in April 2014.

0 125 250
Feet

MAYFLOWER PIPELINE INCIDENT RESPONSE
EXXONMOBIL ENVIRONMENTAL SERVICES COMPANY
MITIGATION ACTION PLAN

PROPOSED HEAVILY VEGETATED AREA AMENDMENT PLACEMENT EXTENT

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FIGURE
4-3