

# Final Damage Assessment and Restoration Plan for the Former Arkema, Inc. Agriculture Pesticide Formulation Production Facility in Bryan, Texas

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November 30, 2016

Prepared by:



# Final Damage Assessment and Restoration Plan for the Former Arkema, Inc. Agriculture Pesticide Formulation Production Facility in Bryan, Texas

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## Executive Summary:

This final DARP has been prepared by state and federal natural resource trustees to address natural resources and services injured or lost due to releases of hazardous substances at or from the agriculture pesticide formulating production facility formerly owned and operated by Arkema, Inc. (Arkema) and its predecessors, located in Bryan, Texas. The designated natural resource trustee agencies involved in the development of this document are the United States Department of the Interior (DOI) represented by the U.S. Fish and Wildlife Service (USFWS), Texas Commission on Environmental Quality (TCEQ), Texas General Land Office (GLO) and Texas Parks and Wildlife Department (TPWD) (collectively, the Trustees).

The former agriculture pesticide formulating production facility is located at 201 West Dodge Street in Bryan, Brazos County, Texas (Facility). The Facility began operations circa 1940. Prior to cessation of all chemical production activities in 1993, arsenic acid, formulated endothal, encapsulated insecticides, and emulsified fungicides were produced at the Facility.

The Facility is located immediately adjacent to Finfeather Lake, which encompasses approximately 27 acres. Historically, groundwater, stormwater runoff, and surface water runoff from the Facility discharged directly into and overland into Finfeather Lake. Surface water in Finfeather Lake and the Bryan stormwater system discharge via a small creek referred to as the Connecting Channel into Municipal Lake, located approximately 3,500 feet downstream from Finfeather Lake and encompassing approximately 15 acres. The injury assessment evaluated those areas impacted by the release of hazardous substances at or from the Facility, including Finfeather Lake, No-Name Lake, Kazmier Pond, the Connecting Channel, and Municipal Lake, located in the City of Bryan, Brazos County, Texas (Site).

Documented releases of hazardous substances at or from the Facility contaminated the Site. The Trustees determined that the releases of these hazardous substances posed a direct and indirect threat to natural resources for which the federal and/or state governments may assert trusteeship under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9601 *et seq.*; the Clean Water Act (CWA), 33 U.S.C. § 1321 *et seq.*; and the Texas Hazardous Substances Spill Prevention and Control Act, Texas Water Code, Chapter 26, Subchapter G. The natural resources affected by releases at or from the Facility

## **Damage Assessment and Restoration Plan Arkema**

include the aquatic habitats associated with Finfeather and Municipal Lakes, including surface waters, submerged lands, sediments, wetlands, migratory avian species, wildlife, fisheries, and other aquatic organisms.

For the Site, the Trustees identified Arkema as the responsible party for releases of hazardous substances and corresponding natural resource damages. To facilitate the settlement and achieve a cost-effective resolution, the Trustees invited Legacy Site Services (Legacy), as the registered agent for Arkema, to conduct a cooperative assessment. The Trustees and Legacy reviewed site-specific data and evaluated a reasonable range of restoration alternatives to compensate for injuries to natural resources and lost services. The overall objective of the restoration planning process is to identify restoration alternatives that are appropriate to restore, rehabilitate, replace, or acquire natural resources and their services equivalent to natural resources injured or lost as a result of releases of hazardous substances. The purpose of restoration is to make the public whole by providing compensation for injuries and losses to natural resources. Based on a thorough evaluation, the Trustees concluded that the acquisition and or preservation of a minimum of 402 acres of existing mixed open water, wetland, and bottomland hardwood habitat is feasible and the most appropriate restoration option for the services injured. Therefore, the acquisition and preservation of existing habitat was selected as the preferred restoration alternative. The Trustees and Arkema settled liabilities for natural resource damages and all Trustee costs in August of 2013. The Trustees evaluated a wide range of restoration projects and proposed the Neches River National Wildlife Refuge (NWR) project described in section 7.2 of this Final DARP as the preferred restoration project. This project would add at least 402 acres of open water, wetland, and wet bottomland hardwoods along the Neches River to the Neches River NWR.

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# Final Damage Assessment and Restoration Plan for the Former Arkema, Inc. Agriculture Pesticide Formulation Production Facility in Bryan, Texas

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## 1.0 Introduction

This final Damage Assessment and Restoration Plan (DARP) has been prepared by state and federal natural resource trustees to address natural resources and services injured or lost due to releases of hazardous substances from the agriculture pesticide formulation production facility formerly owned and operated by Arkema, Inc. (Arkema) and its predecessors, located at 201 West Dodge Street in Bryan, Texas (Facility). The designated natural resource trustee agencies involved in the development of this document are the United States Department of the Interior (DOI) represented by the U.S. Fish and Wildlife Service (USFWS), Texas Commission on Environmental Quality (TCEQ), Texas General Land Office (GLO), and Texas Parks and Wildlife Department (TPWD) (collectively, the Trustees).

This DARP is intended to inform members of the public on the Trustees' damage assessment of natural resource injuries and service losses and the approved restoration actions to compensate the public for those injuries and losses. Public Notices were published in the *Texas Register* and *Bryan-College Station Eagle* on September 30, 2016 soliciting public comments on the Draft DARP. The Trustees did not receive any comments during the 30-day public comment period; therefore this document serves as the Final DARP.

## 1.1 Authority

The Trustees were responsible for evaluating injuries to natural resources and resource service losses resulting from releases of hazardous substances at or from the Facility pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA §107(f), 42 U.S.C. § 9607(f)); the Clean Water Act §311, 33 U.S.C. § 1321; the Texas Hazardous Substances Spill Prevention and Control Act, Texas Water Code, Chapter 26, Subchapter G; and other applicable federal or state laws and regulations, including Subpart G of the National Oil and Hazardous Substances Pollution Contingency Plan (40 C.F.R. §§ 300.600 through 300.615), and regulations at 43 C.F.R. Part 11 which are applicable to natural resource damage assessments (NRDA) under CERCLA.

This DARP was jointly prepared by the Trustees. Each author agency is a designated natural resource trustee under CERCLA § 107(f), 42 U.S.C. § 9607(f). As a designated trustee, each

agency is authorized to act on behalf of the public to assess and recover natural resource damages where natural resources and resource services are injured, lost, or destroyed as a result of releases of hazardous substances designated by CERCLA.

### **1.2 NRDA Restoration Under CERCLA**

NRDA is a process that occurs in addition to the remedial process under CERCLA. These two processes have different goals. Response actions, which include both removal and remedial actions, focus on controlling exposure to released hazardous substances, by removing, neutralizing, or isolating them in order to protect human health and the environment from the threat of harm. Response action objectives are risk-based, and are developed to protect human health and the environment from further unacceptable harm. Remedies are selected based on a comparative analysis of response alternatives and may result in contamination remaining in the environment above levels that existed prior to their release. The goal of NRDA is to make the environment and public whole by restoring resources to their baseline condition (i.e., what their condition would be absent the release of a hazardous substance). Losses resulting from natural resource exposure to released hazardous substances are estimated over time until the resource is restored (i.e., interim losses) (see Figure 4.4-1). These losses can therefore extend beyond the date of remedy completion if contaminants are left in place at levels harmful to natural resources.

### **1.3 Purpose and Need for Restoration**

The purpose of the assessment and restoration actions identified in this DARP are to compensate the public for natural resources injured, lost, or destroyed within Bryan, Brazos County, Texas, due to releases of hazardous substances and subsequent response actions to address the releases at or from the Facility. Damages recovered by trustees for these losses must be used to restore, replace, rehabilitate, or acquire natural resources or services equivalent to those lost (42 U.S.C. § 9607(f)(1)). This DARP identifies and evaluates a reasonable range of restoration alternatives and identifies the preferred restoration alternative.

### **1.4 National Environmental Policy Act Compliance**

The National Environmental Policy Act (NEPA) generally requires an assessment of any federal action that may impact the quality of the human environment. NEPA applies to restoration actions undertaken by federal trustees, except where a categorical exclusion or other exception to NEPA applies. The process outlined in CERCLA for NRDA selection of restoration alternatives is substantially similar to a NEPA process. This DARP summarizes the current environmental setting, describes the purpose and need for action, identifies restoration alternatives, assesses their applicability and environmental consequences, and summarizes Trustee actions taken to



facilitate opportunities for public participation in the decision-making process. The Trustees determined that, as proposed, the preferred restoration alternative met the criteria for Categorical Exclusion from further environmental assessment or environmental impact statement evaluation as provided by the Fish & Wildlife Service at 516 Department Manual 8.5(b)(11). As such, an environmental assessment or environmental impact statement was not prepared regarding the DARP.

## **1.5 Public Participation**

Public review of the DARP is an integral part of the restoration planning process. Through public review, the Trustees solicited comment on the analyses used to define and quantify natural resource injuries and service losses and the methods being proposed to restore injured natural resources or replace lost resource services. The DARP provides the public with current information about the nature and extent of the natural resource injuries identified and restoration alternatives evaluated.

Following a public notice, the Draft DARP was made available to the public for a 30-day comment period on September 30, 2016. The deadline for submitting written comments on the Draft DARP was specified in public notices placed in both the *Texas Register* and the *Bryan-College Station Eagle* as October 31, 2016. Any comments received would be considered by the Trustees prior to finalizing the DARP. The Trustees did not receive any public comments during this public comment period.

## **1.6 Administrative Record**

The Trustees have maintained records documenting the information considered and actions taken by the Trustees during this assessment and restoration planning process, and these records collectively comprise the Trustees' administrative record (AR) supporting both the draft and final DARP. The AR records are available for review by interested members of the public. Interested persons can access or view these records at the Texas Parks and Wildlife Department Headquarters at the following address:

Texas Parks and Wildlife Department  
Legal Division  
4200 Smith School Road  
Austin, TX 78744  
512-389-8877

Arrangements must be made in advance to review or obtain copies of these records by contacting the office listed above. Access to and copying of these records is subject to all applicable laws and policies, including, laws and policies relating to copying fees and the reproduction or use of any material that is copyrighted.

### **1.7 Settlement of Natural Resource Damages**

For this Facility, the Trustees identified Arkema as the responsible party (RP) for releases of hazardous substances and corresponding natural resource damages. To facilitate settlement and achieve a cost effective resolution, the Trustees invited Legacy Site Services (Legacy), as the registered agent for Arkema, to conduct a cooperative assessment. The Trustees and Legacy cooperated to review site-specific data, quantify the injury to natural resources, and evaluate a reasonable range of restoration alternatives to compensate for injuries to natural resources and lost services. As a result, the Trustees and Arkema reached an agreement for Arkema to pay \$1.4 million to resolve natural resource damages and Trustee costs. Past Trustees costs, incurred through January 15, 2010, for assessing damages to natural resources total \$283,053. The Trustees also anticipate additional costs through settlement and implementation of the restoration project in the amount of \$165,736. The remaining \$951,211 (plus interest) will be used for the selected restoration project. The Trustees anticipated that this amount will be adequate to compensate for natural resource injuries at the Site and all Trustee costs. The details of the settlement were published for public review in the *Federal Register*, Volume 78 Issue 69 (Wednesday, April 10, 2013) and the *Texas Register* (38 TexReg 2529, April 19, 2013). Having received no public comment, the final settlement was lodged in the United States District Court for the Southern District of Texas, and the settlement was finalized on August 27, 2013.

## **2.0 Site Description and History**

This section describes the area affected by releases of hazardous substances at or from the Facility by Arkema and its predecessors, and summarizes the response actions that have been undertaken to address that contamination.

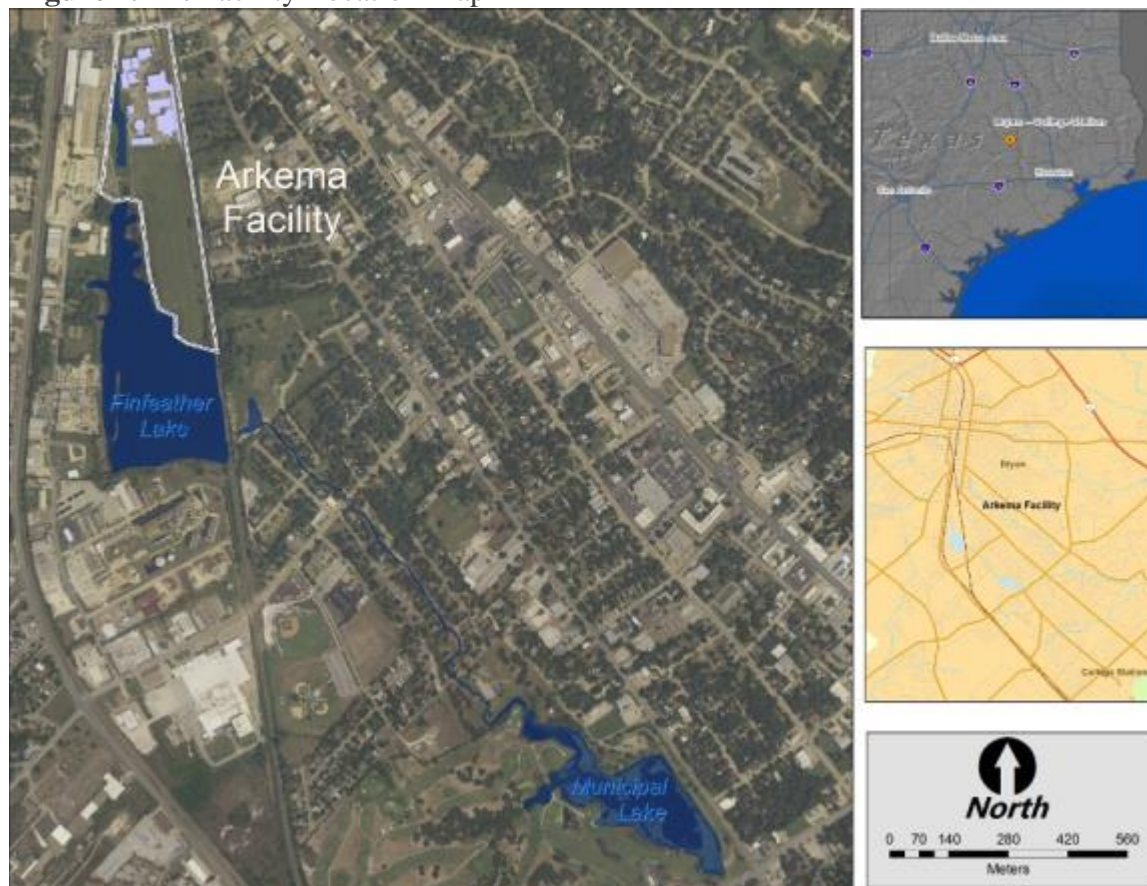
### **2.1 Overview of the Facility and Operational History**

The former agriculture pesticide formulating production facility located at 201 West Dodge Street in Bryan, Brazos County, Texas, is located in south central Bryan, adjacent to the former Houston and Texas Central (H&TC) Railroad Company (now Union Pacific Railroad) cooling-water lake, Finfeather Lake, and is immediately upstream from Municipal Lake. The Facility was operated by Arkema and its predecessors (Figure 2.1-1). When the Facility began operations in 1940, it primarily produced calcium arsenate. In 1944, production shifted to an

## Damage Assessment and Restoration Plan Arkema

arsenic-based compound used as a cotton defoliate. Prior to cessation of all chemical production activities at the Facility in 1993, arsenic acid, formulated endothal, encapsulated insecticides, and emulsified fungicides were produced at the Facility. A summary of the Facility owners and operators is provided in Table 2.1-1.

**Figure 2.1-1:** Facility Location Map



**Table 2.1-1:** Facility Owner and Operator History

Year	History
1940	Facility began operations under the name of Cotton Poisons, Incorporated (Inc.)
1944	Facility was purchased by the Pennsylvania Salt Manufacturing Company
1957	The company name was changed to Pennwalt Chemical Corporation
1969	During a merger the company name was changed to Pennwalt Corporation
1989	Atochem, Inc. acquired the Facility in a merger with Pennwalt Corporation and M&T Chemicals, Inc., and the company name was changed to Atochem North America, Inc.
1992	Name of company changed from Atochem North America, Inc., to Elf Atochem North America, Inc. (a company of Elf Aquitaine)
1993	All production operations at the Facility ceased
2000	The chemical operations of Totalfina and Elf Aquitaine were combined to create ATOFINA, and Elf Atochem North America, Inc. became ATOFINA Chemicals, Inc.
2003	ATOFINA changed its name to TotalFinaElf.
2004	TotalFinaElf spun off the Atofina chemical business and renamed it Arkema, Inc.
2006	Legacy Site Services became the registered agent for Arkema, Inc. at the Facility.

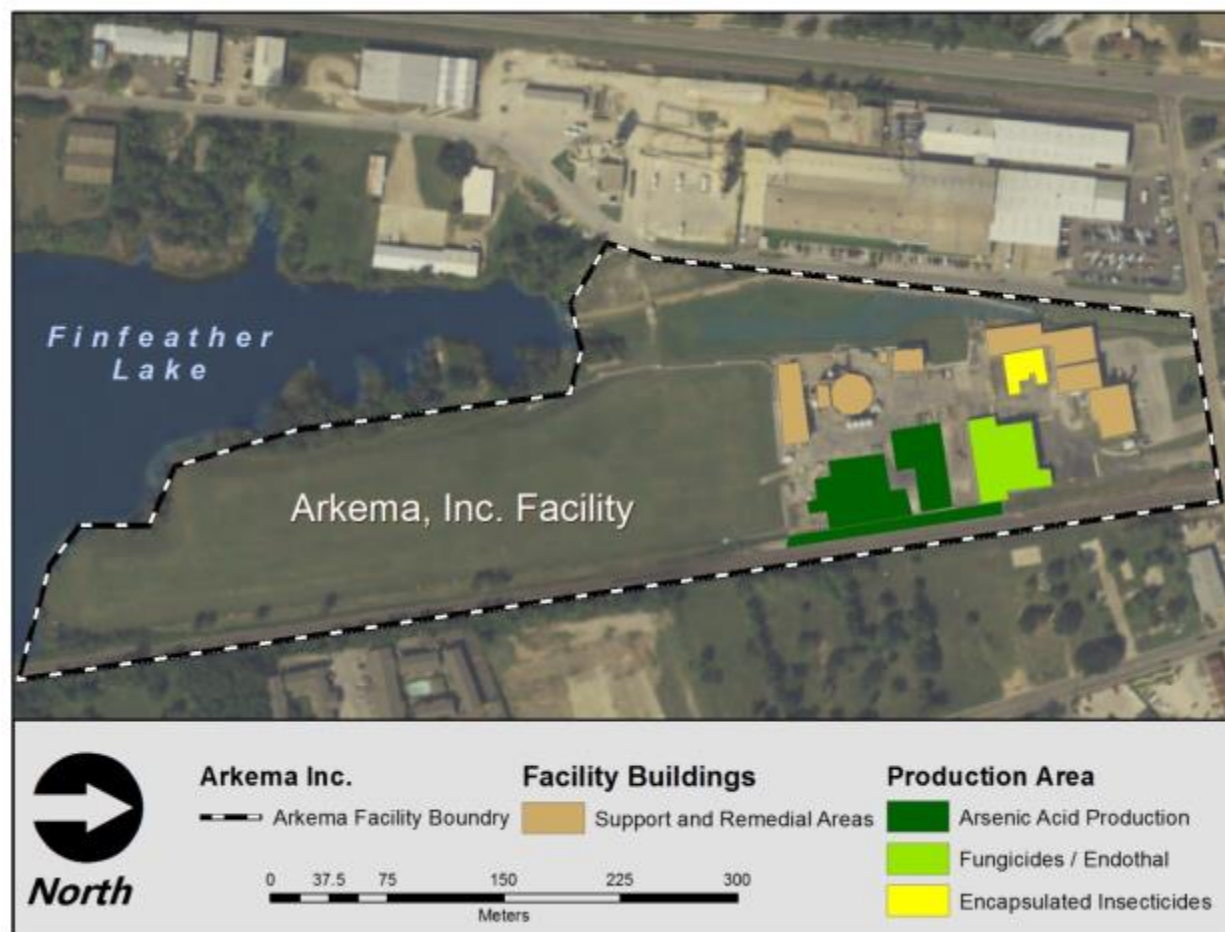
The footprint of the Facility consists of approximately 24 acres and currently contains foundations and containment areas associated with the former production areas; several office, warehouse, and maintenance buildings; aboveground chemical, water, and wastewater tanks associated with groundwater and stormwater treatment systems; and a capped landfill. When the Facility was in operation it included: four main production areas; two unlined process water retention ponds with a main sump; an arsenic acid truck loading/unloading area; an arsenic acid rail loading/unloading area; a materials handling area; a sprinkler basin; a containment basin for stormwater, fire suppression water, and overflow from the sump; and a small retention pond for on-site stormwater.

The Facility can be divided into four distinct former production areas: arsenic acid, endothal, encapsulated insecticides (encapsulation), and emulsified fungicides (flowables). Arsenic acid was produced by combining nitric acid with arsenic trioxide (Figure 2.1-2). The resulting product was then combined with either potable water for commercial grade products or deionized water for technical grade products. Endothal, an organic acid with herbicidal properties, was produced by mixing technical grade endothal with caustic potash, amines, or isopropanol. The final endothal product was packaged into various-sized containers up to 30 gallons or shipped in bulk by tank trucks. Encapsulated insecticides were produced by combining diazinon or methyl parathion with polymeric isocyanate, polyvinyl alcohol, amines,



and water. Emulsifiers were added to the mixture and the pH adjusted. The final concentrated insecticide was screened and sent to storage. Emulsified fungicides were concentrated emulsions of fungicide that the consumer normally diluted and used for crop dusting or applied to ornamental trees and shrubs. Powdered reagents were mixed with emulsifiers and surfactants, and water to form the final product. Potential contaminants of concern (COC) released at or from the Facility threatening or potentially threatening natural resources included arsenic, copper, zinc, dichlorodiphenyltrichloroethan (DDT) and metabolites, endothal, insecticides, and fungicides.

**Figure 2.1-2: Arkema Facility Layout Map**



The Facility is located immediately upgradient and adjacent to Finfeather Lake (Figure 2.1-1). This freshwater lake was constructed in 1905, encompasses approximately 27 acres, and has an estimated average depth of 7.7 feet. Historically, groundwater, stormwater runoff, and surface water runoff from the Facility discharged directly into and overland into both Finfeather Lake and No-Name Lake (a small series of ponds isolated on the Facility that were originally the headwaters to Finfeather Lake). No-Name Lake also flowed into Finfeather Lake through stormwater channels and groundwater. Surface water then flowed from Finfeather Lake through

a weir system to Kazmier Pond. Kazmier Pond, an intermediate stormwater pond, received water from Finfeather Lake and the surrounding area and discharged the overflow through a drainage channel, the Connecting Channel, to Municipal Lake. After remedial actions closed Kazmier Pond, surface water in Finfeather Lake and the Bryan stormwater system now flows south through the Connecting Channel directly into Municipal Lake, which is located approximately 3,500 feet downstream from Finfeather Lake. Municipal Lake encompasses approximately 15 acres and has a maximum depth of approximately 7 feet. Downstream of Municipal Lake, surface water flows through Burton Creek, into Carters Creek, to the Navasota River, and ultimately discharges into the Brazos River. The injury assessment evaluated those areas impacted by the release of hazardous substances at or from the Facility, including Finfeather Lake, No-Name Lake, Kazmier Pond, the Connecting Channel, and Municipal Lake, located in the City of Bryan, Brazos County, Texas (Site).

### **2.2 Summary of Closure and Response Actions**

In 1970, the Texas Water Quality Board (TWQB), a predecessor to the Texas Water Commission (TWC), now known as the TCEQ, discovered that surface water collected from Finfeather Lake contained arsenic levels that exceeded the water quality standard for arsenic by almost 100 times, while surface water taken from Municipal Lake contained arsenic levels that exceeded the standard 34 times (Snyder et al., undated). The arsenic contamination in both lakes was attributed to chronic releases from the Facility (Snyder et al., undated).

In 1973, further investigations conducted by the TWQB in Finfeather and Municipal Lakes revealed that the elevated levels of arsenic were having adverse impacts on the biological communities inhabiting both systems (Snyder et al., undated). As a result, the TWQB issued an Agreed Order in 1976 which required Arkema to initiate remediation of Finfeather and Municipal Lakes. As part of the remediation, both lakes were completely dewatered and arsenic-contaminated sediments were excavated and removed. Pursuant to the 1976 Agreed Order, a number of surface water impoundments located on the Facility along the historic headwaters to Finfeather Lake were also ordered to be remediated and removed from further use. This included the earthen sump (Main Sump) and two surface impoundments known as Retention Ponds 1 and 2, all of which were used to manage process wastewater before historically being discharged into Finfeather Lake and later the City of Bryan municipal waste system. An on-site landfill was constructed to contain the contaminated sediments excavated from the Main Sump and two Retention Ponds as well as the lake sediments excavated during the remediation of Finfeather and Municipal Lakes.

The TWC issued an Agreed Order amending the 1976 TWQB Agreed Order in 1981. Under the amended Agreed Order, Arkema was required to remove and legally dispose of all arsenic-

contaminated sediments from both Finfeather and Municipal Lakes. Once arsenic levels were determined to be at or below acceptable ecological and human health levels, the top 6 inches of “clean” sediment in both lakes were to be scarified and compacted to help prevent further groundwater migration. The amended Agreed Order also required Arkema to monitor the arsenic and pH levels in the impounded waters of the lakes for a period of 10 years following remediation and refilling of the lakes. Once the remediation in the lakes was completed, the on-site landfill would be closed, and arsenic and pH levels in the groundwater in the immediate vicinity of the landfill would be monitored. This amended Agreed Order also required Arkema to post no trespassing and warning signs along the perimeter of Finfeather Lake, informing the public that the lake may contain arsenic in concentrations hazardous to human health. The remedial process for the lakes was completed in 1982, and the lakes were allowed to be refilled; however, arsenic concentrations remained highly elevated in Finfeather Lake even after the completion of the remedial action. Subsequent investigations determined that, in addition to superficial sediment contamination, arsenic contamination was identified in the groundwater of the underlying aquifer, which was connected with Finfeather Lake.

Consequently, in 1982, a groundwater investigation was initiated at the Site, and the TWC required Arkema to develop and implement a groundwater remediation plan. The engineering design for the proposed remedial action was not initiated until December 1987. TWC issued final approval of the conceptual engineering plan two years later and issued an Agreed Order in 1991, requiring compliance with the approved plan and expanded groundwater monitoring. The major elements of the remedial action included a groundwater extraction and treatment system; warning signs around the lakes; closure of the arsenic-contaminated on-site waste pile; and the draining, remediation and closure plans for No-Name Lake. The approved groundwater extraction system, which began operation in 1992, consists of eight extraction wells designed to remove water from the upper and middle aquifers beneath the Facility. Extracted water is then conveyed to the on-site treatment system, treated, and then discharged to the City of Bryan municipal waste system. Due to continued public use of the lakes and to help prevent exposure to elevated levels of arsenic, the 1991 Agreed Order also required Arkema to provide security measures around accessible areas of the lakes.

To address elevated levels of arsenic in the surface waters of Finfeather Lake, the TWC issued an Emergency Order to install a mobile surface water treatment unit that began operating in 1991. The mobile treatment system was installed to treat water piped from Finfeather Lake prior to discharge into the Connecting Channel between Finfeather Lake and Municipal Lake. The mobile surface water treatment operations at Finfeather Lake were discontinued in 2003 due to declining arsenic concentrations in the lake water. The TWC also determined that the Site was discharging arsenic-contaminated stormwater into Finfeather Lake. Consequently, in 1992, Arkema was required to install an on-site stormwater treatment system. This system collected

stormwater in a 600,000-gallon primary storage tank with overflow storage in the concrete containment areas of the former production areas. Collected stormwater was treated on-site and discharged in accordance with the approved discharge permit to Finfeather Lake. Additional remedial actions at the Site have resulted in the closure of several other waterbodies, including No-Name Lake in 1992, the sprinkler basin in 1996, and Kazmier Pond in 2008. Each of these ponds was excavated and backfilled with clean soil. In 2008, the soils and sediments of the Connecting Channel were removed and the channel recreated with new soil. Several remedial activities are still occurring at the Site, including groundwater monitoring; surface water monitoring of Finfeather Lake, Municipal Lake, and Connecting Channel; stormwater collection and treatment prior to discharge; and groundwater extraction and treatment.

### **3.0 Affected Environment**

This section presents a general overview of the area and describes the resources and services injured by the release of hazardous substances. The description of these resources focuses primarily on the natural resources and services that are relevant to the discussion of injuries and restoration projects presented in this document.

#### **3.1 Physical Environment**

Bryan is located in the southern post oak savanna ecological region (ecoregion) of the east central Texas plains in Brazos County. This ecoregion is a transitional zone between the blackland prairies to the west and the pineywood immediately to the east. Historically, the post oak savanna was dominated by native bunch grasses and forbs with scattered post oaks. Forested areas were generally restricted to bottomland areas associated with water.

The Facility is located in an urbanized part of Bryan dominated by mixed industrial and commercial structures. Located immediately downgradient and adjacent to the Facility is a freshwater impoundment known as Finfeather Lake. This lake encompasses approximately 27 acres and has an estimated average depth of 7.7 feet. Land use surrounding this lake is dominated by industrial and/or commercial structures. A power plant is located along the southern edge of the lake. Located approximately 3,500 feet downstream from Finfeather Lake is Municipal Lake. This lake encompasses approximately 15 acres and has a maximum depth of approximately 7 feet. This lake is located adjacent to a city park and golf course.

#### **3.2 Terrestrial and Aquatic Habitat Description**

Finfeather Lake is a man-made impoundment with riprap shoreline along much of the earthen embankment (Figure 3.2-1). The northwestern section of the lake has the only natural shoreline,



which is comprised of aquatic vegetation (cattails and duckweed), willows, and cottonwoods. Most of the riprap shoreline has a heavy growth of cattails and various rushes that starts at the edge of the riprap and extends for several feet into the lake. Beyond the northwestern shoreline of aquatic vegetation and small trees, much of the surrounding area is mowed landscape associated with commercial/industrial buildings.

**Figure 3.2-1: Finfeather Lake Photograph**



Connected by the Connecting Channel from Finfeather Lake, Municipal Lake is approximately one mile downstream, immediately adjacent to a city park and golf course (Figure 3.2-2). The terrestrial habitat immediately around the entire lake is mowed and maintained for a variety of public uses. Golf course greens and picnic tables are the dominant features. The aquatic environment is similar to Finfeather Lake, with sedges, cattails, lily pads, and rushes growing along much of the border of the lake and other aquatic submergents growing in much of the shallow areas.

**Figure 3.2-2:** Municipal Lake Photograph



Finfeather and Municipal Lakes support a variety of terrestrial and aquatic species typically associated with fringe urban habitats. These species can be found in Table 3.2-1 and include a variety of rats and mice, turtles, snakes, amphibians, and birds. A number of amphibian species were noted around the lakes including tadpoles and a few large adult species of frogs.

**Table 3.2-1:** Semi-aquatic and terrestrial species of Finfeather and Municipal Lakes

COMMON NAME	SCIENTIFIC NAME
Semi-Aquatic and Terrestrial Species	
beaver	<i>Castor canadensis</i>
mink	<i>Mustela vison</i>
muskrat	<i>Ondatra zibethicus</i>
raccoon	<i>Procyon lotor</i>
Aquatic Species	
hybrid sunfish	
yellow bullhead	<i>Ameiurus natalis</i>
black bullhead	<i>Ameiurus melas</i>

top minnow	<i>Fundulus sp.</i>
mosquito fish	<i>Gambusia sp.</i>
channel catfish	<i>Ictalurus punctatus</i>
green sunfish	<i>Lepomis cyanellus</i>
bluegill	<i>Lepomis macrochirus</i>
largemouth bass	<i>Micropterus salmoides</i>
Amphibian	
bullfrog	<i>Rana catesbeiana</i>
Reptiles of Finfeather Lake	
common snapping turtle	<i>Chelydra serpentina</i>
water snake	<i>Nerodia sp.</i>
red-eared slider	<i>Trachemys scripta elegans</i>
Reptiles of Municipal Lake	
softshell turtle	<i>Apalone sp.</i>
blotched water snake	<i>Nerodia erythrogaster transversa</i>
razorback musk turtle	<i>Sternotherus carinatus</i>
garter snake	<i>Thamnophis sp.</i>
red-eared slider	<i>Trachemys scripta elegans</i>

Located along the intersection of the eastern and central flyways, a number of resident and migratory avian species were observed at the lakes (Table 3.2-2).

**Table 3.2-2:** Common resident and migratory avian species of Finfeather and Municipal Lakes

Common Name	Scientific Name
red-winged blackbird	<i>Agelaius phoeniceus</i>
wood duck	<i>Aix sponsa</i>
mallard duck	<i>Anas platyrhynchos</i>
geese	<i>Anatidae sp.</i>
great blue heron	<i>Ardea herodias</i>
egrets	<i>Ardeidae sp</i>
muscovy duck	<i>Cairina moschata</i>
Northern cardinal	<i>Cardinalis cardinalis</i>
pyrrhuloxia	<i>Cardinalis sinuatus</i>
belted kingfisher	<i>Ceryle alcyon</i>
killdeer	<i>Charadrius vociferus</i>
blue jay	<i>Cyanocitta cristata</i>
yellow rumped warbler	<i>Dendroica coronata</i>
American coot	<i>Fulica americana</i>
common moorhen	<i>Gallinula chloropus</i>
barn swallow	<i>Hirundo rustica</i>

bitterns	<i>Ixobrychus</i> sp.
song sparrow	<i>Melospiza melodia</i>
merganser	<i>Merginae</i> sp.
Northern mockingbird	<i>Mimus polyglottos</i>
black-crowned night heron	<i>Nycticorax nycticorax</i>
downy woodpecker	<i>Picoides pubescens</i>
black phoebe	<i>Sayornis nigricans</i>
yellow-bellied sapsucker	<i>Sphyrapicus varius</i>
chipping sparrow	<i>Spizella passerina</i>
Bewick's wren	<i>Thryomanes bewickii</i>
scissor-tailed flycatcher	<i>Tyrannus forficatus</i>
mourning dove	<i>Zenaida macroura</i>

The benthic macroinvertebrate community in Municipal Lake is similar to the community in Finfeather Lake, dominated by red swamp crayfish (*Procambarus clarkii*) and a smaller species of crayfish (*Procambarus* sp.). No biological studies of bivalves and benthic insect species for Finfeather and Municipal Lakes were found and no significant aquatic insect or bivalve communities were noted during site visits by the Trustees.

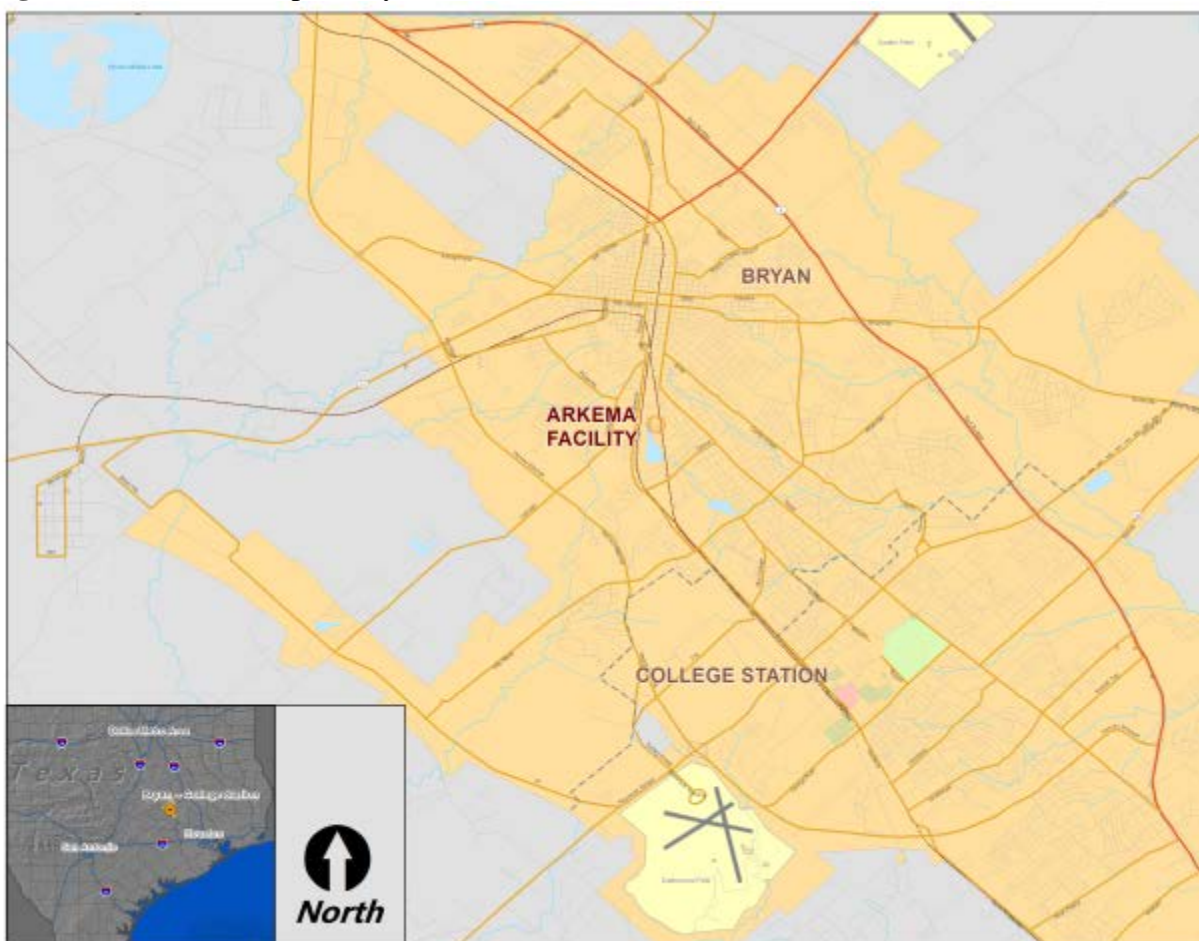
Releases of hazardous substances at or from the Facility adversely affected the resources and services provided by the aquatic habitats of both Finfeather and Municipal Lakes. The resources and services that were injured consisted of surface water, sediments, and aquatic and aquatic-dependent wildlife, including macroinvertebrates, fish, amphibians, reptiles, migratory avian species, and mammals.

### **3.3 Human and Cultural Environment**

Bryan is a small rural city of approximately 76,000 people located in the Brazos River Valley just southeast of the Texas hill country (Figure 3.3-1). Immediately adjacent to College Station and the Texas A&M University, Bryan is best known for its rich agricultural farmlands; railroad access; and the area's abundance of cotton, cattle, and oil. Over the years, as Bryan's agricultural, cattle, and oil industries have grown, so have the various businesses that support these industries. The former agriculture pesticide formulation production facility was formed to provide various agricultural chemicals to local farms and ranches.



**Figure 3.3-1:** Civic Map of Bryan



Finfeather Lake was originally constructed as the northernmost terminus of the H&TC rail line in 1860. Used as a water source for the steam engines in use in that era, the lake was surrounded by agricultural and ranch lands. Over time, as the City of Bryan and local industry continued to grow, the lake and its sounding environment became highly modified. Pastures and riparian corridors were converted to power plants and industrial facilities. To meet the housing demand of the growing industry, homes were constructed near the various businesses surrounding Finfeather Lake. As Bryan continued to grow, the city needed places for people to recreate and a number of parks were added to its landscape. This included Williamson Park and the Bryan Municipal Golf Course adjacent to Municipal Lake, immediately downstream from Finfeather Lake and the Facility.

Overland and groundwater releases of hazardous substances from the Facility flowed into Finfeather Lake and downstream through various ponds and the Connecting Channel to Municipal Lake and ultimately the Brazos River. Finfeather Lake was not only a source of industrial water, but was also used by the local community as a favorite fishing hole.

Contamination from the Facility moving downstream impacted the housing communities along Finfeather Lake and Connecting Channel as well as the ecological communities in the Connecting Channel and Municipal Lake. In the early 1990's, predecessors to the TCEQ working with the Texas Health Department and TPWD placed a fish advisory on Municipal and Finfeather Lakes, impacting the available recreational opportunities for these communities.

### **3.4 Endangered and Threatened Species**

The federal Endangered Species Act (ESA) of 1973 (16 USC Section §1531 *et seq.*) and the Texas Parks and Wildlife Code (Title 31, Section 65 *et seq.*) direct federal and state agencies to protect and conserve listed endangered and threatened animals. These statutes also protect listed plants on public lands and prohibit their commercial sale, import and export, and to conserve the ecosystems upon which these species depend. Table 3.4-1 provides a list of federally recognized endangered or threatened species known to occupy Brazos County. In general, the historical distribution of a species that appears on the threatened and endangered list can be more widespread than is observed currently. Designated critical habitat protects areas that are necessary for the conservation and recovery of the species; the Facility does not overlap any designated critical habitats.

**Table 3.4-1:** Federally listed species known to occupy Brazos County, Texas

Scientific Name	Common Name	Classification	Federal Status
<i>Abronia macrocarpa</i>	Large-fruited Sand-verbena	Plant	Endangered
<i>Bufo houstonensis</i>	Houston toad	Amphibian	Endangered
<i>Calidris canutus rufa</i>	Red knot	Bird	Threatened
<i>Charadrius melodus</i>	Piping plover	Bird	Threatened
<i>Grus americana</i>	Whooping crane	Bird	Endangered
<i>Spiranthes parksii</i>	Navasota Ladies'-tresses	Plant	Endangered
<i>Sterna antillarum</i>	Interior Least Tern	Bird	Endangered

\*Note: The species in Table 3.4-1 have final designated critical habitat however, it may/may not occur within Brazos County, Texas.

### **4.0 Injury and Service Loss Evaluation**

The Trustees must determine that a measurable adverse change in the quality or the viability of a natural resource resulting from exposure to a release of hazardous substances has occurred. Injury may occur directly or indirectly to a natural resource and/or service from the release of hazardous substances. Lost services include the loss of the physical and biological functions performed by the resource that may include the human uses of those functions (e.g., lost use associated with fishing, hunting, and bird watching).

The adverse effect may be quantified as the reduction in services provided by a natural resource due to the release of hazardous substances into the environment. The loss of services may include impairment of a habitat that supports a native species or diminished human use of a resource.

The Trustees utilized sediment and biological data collected as part of remedial investigations, various state agency studies, and scientific literature to evaluate injury to resources at the Site. The Trustees considered several factors during the evaluation, including, but not limited to:

- hazardous substances released at or from the Facility;
- natural resources and ecological services potentially impacted;
- evidence indicating exposure, pathway, and injury;
- mechanism(s) by which injury to natural resources would occur;
- type, degree, spatial and temporal extent of injury; and
- types of restoration actions that are appropriate and feasible.

### **4.1 Injury and Service Losses due to Response Actions at the Site**

Response actions may at times cause additional injuries to natural resources. When such injuries result from response actions, those injuries are included in the damage assessment (43 C.F.R. § 11.15).

For the Arkema Site, the Trustees coordinated with TCEQ, the lead response agency, and the RP to review the ecological risk assessments (ERAs) and evaluate any implemented remedies. This coordination provided an understanding of the remedial process and helped the Trustees evaluate how the response affects estimates of natural resource damages. The Trustees concluded that response actions taken have not fully compensated for injuries resulting from the Site.

### **4.2 Pathways to Trust Resources**

For each resource category represented as either a group of organisms or a habitat type that were potentially or actually affected, the Trustees determine whether an injury is likely to occur or has occurred and identified the nature of the injury and the pathway linking the injury to the Site. Identifying and understanding all potential COCs for the Site (including the primary COC, arsenic), as well as their pathways to, and potential effects on, ecological receptors is critical to the Trustees' approach to injury assessment. A pathway is defined as the route or medium (for example, water or soil) through which hazardous substances are transported from the source of contamination to the injured resource (43 CFR § 11.14).

Results of the ERAs and other relevant data revealed that sediments in Finfeather and Municipal Lakes were contaminated with hazardous substances that are characteristic of chemical used at

agriculture pesticide formulating production facilities. Spills and past housekeeping practices at the Facility were the sources of the hazardous substances presently located in the sediments of Finfeather and Municipal Lakes. Fish and other aquatic receptors known to utilize these areas are exposed to the contaminated sediments through direct contact or indirectly through consumption of contaminated sediment and prey.

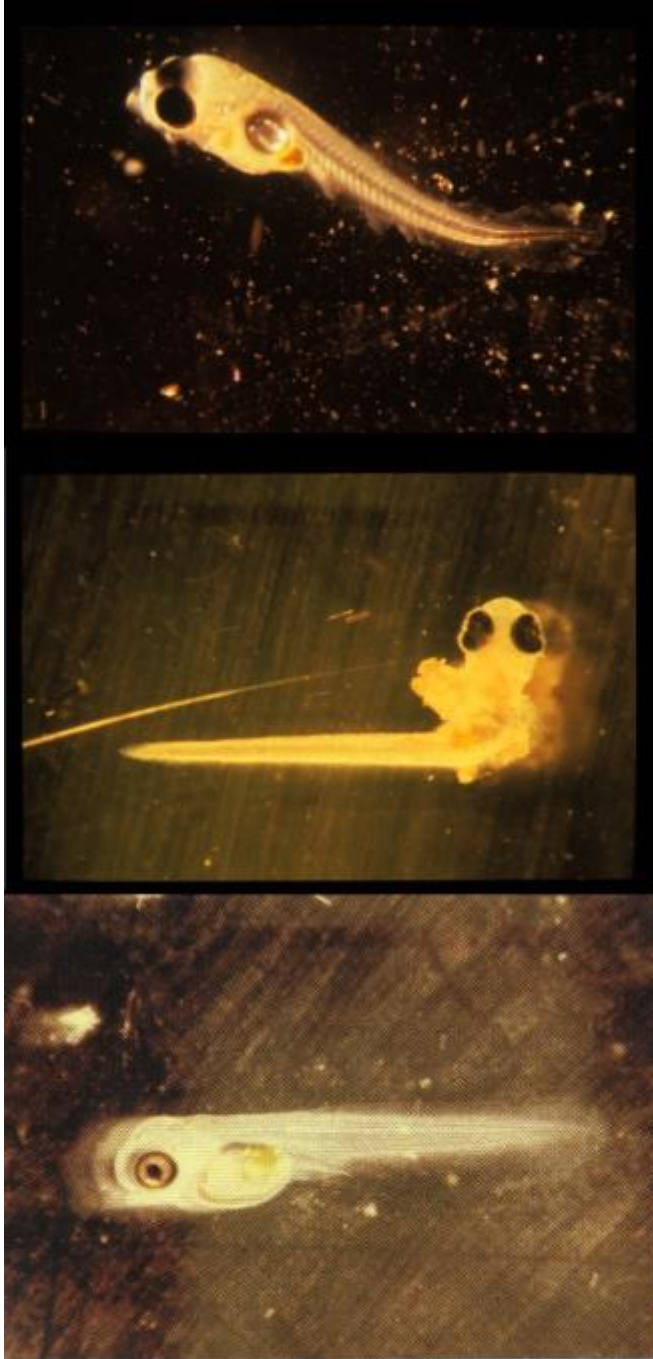
In 1973, investigations conducted by the TWQB in Finfeather and Municipal Lakes revealed that elevated levels of arsenic measured in surface water and sediments were having significant adverse effects on the biological communities inhabiting both systems (Snyder et al., undated). As part of an effort to remove contaminated sediments, both lakes were completely dewatered during remedial activities initiated in 1978. The dewatering and sediment removal resulted in the complete elimination of aquatic habitat in both systems which did not begin to recover until the lakes were refilled with water in 1982. These remedial actions were not successful, and arsenic levels in the lakes remained at levels that were harmful to the aquatic community.

In 1991, the TWC determined that sediments collected from Finfeather and Municipal Lakes still contained elevated levels of arsenic. Macroinvertebrate communities present in the lakes continued to exhibit poor species diversity and low populations, consistent with the 1973 results (Snyder et al., undated). In addition, even though arsenic levels in fish tissue were lower in 1991 when compared to the 1973 data, the fish community structure in Finfeather Lake was altered, and significant toxicity to aquatic life was observed in bioassays conducted in surface water taken from Finfeather Lake (Snyder et al., undated). Furthermore, data from 1991 showed that both Finfeather (Snyder et al., undated) and Municipal Lakes were devoid of snakes; only turtles were observed in Municipal Lake (not in Finfeather Lake (Snyder et al., undated)). During the same year, TPWD reported an unusually large number of fin deformities and other abnormalities in adult and juvenile largemouth bass (Figure 4.2-1) collected from Finfeather and Municipal Lakes (Mills et al., undated). TPWD research attributed these deformities to the arsenic contamination in both lakes (Mills et al., undated).



**Figure 4.2-1: TPWD Larval Fish Pictures**

Both the top fish and the middle fish are deformed, one having three eyes and the other having a spinal deformity, respectively. The bottom fish is normal and does not have any notable deformities.



A joint investigation conducted by the U.S. Geological Survey and TPWD in 1996 demonstrated that between 1993 and 1995, tadpoles, turtles, and snakes were absent from Finfeather Lake (Clark et al., 1998). In 1996, during a follow up survey only turtles were observed at Finfeather

Lake (Clark et al., 1998). Unlike Finfeather Lake, between 1994 and 1996 Municipal Lake had abundant numbers of tadpoles and turtles, however no snakes were encountered (Clark et al., 1998). Clark et al. (1998) concluded that arsenic concentrations found in tadpoles from Municipal Lake exceeded diet-based predator protection levels for birds and mammals. The study also concluded that the absence of snakes from both lakes may be indicative of greater sensitivity to the arsenic contamination or that their exposure to arsenic through the food web was greater than turtles or frogs (Clark et al., 1998).

### 4.3 Contaminants of Concern

The Facility functioned as a pesticide and herbicide formulation and packaging operation from 1940 until all operation ceased in 1993. During this time various pesticides and herbicides were produced from basic chemical components and compounds. Releases of these COCs have the potential to injure or have been shown to cause injury to natural resources. COCs considered by the Trustees included arsenic, copper, zinc, endothal, insecticides, and fungicides manufactured at the Facility. Over the course of the remedial and NRDA investigations, it was determined that while the other COCs listed above may be present at various elevated concentrations in Finfeather and Municipal Lakes, arsenic was most commonly detected at levels that were actually or potentially injurious to natural resources. The Trustees, therefore, identified arsenic in its various forms as the primary COC and focused the assessment on injuries resulting from this contaminant.

Arsenate, commonly referred to as arsenic acid and used as a defoliant in cotton fields, was the first product produced at the Facility. Arsenic acid, is a colorless acid that readily dissociates in water, forming various ionized compounds that are not readily discernible from elemental arsenic (Mountfort, 1986). While arsenic is known to be highly toxic, few studies are available for the formulated products of arsenic acid. Moreover, the toxicity of arsenic compounds may vary widely depending on the type of formulation and the form of inorganic arsenic in the product (Mountfort, 1986). However, the general mechanism of toxicity for arsenic acid in water and sediments is assumed to be substantially similar to that of elemental arsenic since this product readily dissociates in water, producing reduced arsenic compounds.

Arsenic is a commonly occurring element that is widely used in the manufacture of agricultural products such as insecticides, herbicides, fungicides, algacides, wood preservatives, and growth stimulants for plants and animals. While elemental arsenic is insoluble in water it may readily dissociate into various arsenic species that are highly soluble in freshwater (Schneider, 1971). Common water soluble forms of arsenic include arsenate, arsenite, methanearsonic acid, and dimethyl arsenic acid (USEPA, 1980). In aerobic waters, reduced forms of arsenic tend to be oxidized into arsenates (USEPA, 1980). In turn, the adsorption of arsenate by metal oxides and

the formation of arsenic sulfide appear to remove arsenic from the water column, binding it to the sediments, thus preventing high concentrations of arsenic remaining in solution (USEPA, 1980). However, naturally occurring biological and physical processes work to move sediment-bound arsenic compounds back into the water column making it biologically available in its more toxic reduced form (Fabiana et al., 2003). This process known as cycling may continue for years. The estimated residence time for arsenic in lentic systems such as Finfeather and Municipal Lakes is approximately 45 years before arsenic becomes bound to inorganic substrates and sequestered in deeper sediments of the lakes (Eisler, 1988).

The toxic effects of arsenic to aquatic life are dependent on numerous biological and abiotic factors, including water temperature, pH, organic content, phosphate concentrations, suspended solids, and arsenic speciation (Eisler, 1988). Birds and freshwater biota usually contain arsenic concentrations less than 1.0 part per million wet weight (DOI, 1998). Arsenic tissue residues of 1.35 parts per million wet weight in juvenile sunfish and 5.0 parts per million wet weight in adult sunfish are considered elevated and potentially hazardous (Eisler, 1988). In humans and other mammalian species, the consumption of arsenic contaminated food can lead to carcinogenic and teratogenic effects (National Oceanic and Atmospheric Administration [NOAA], 1990; DOI, 1998). The ingestion of large doses of arsenic (70 to 180 milligrams) can be acutely fatal, while chronic exposure to smaller amounts can lead to neurotoxicity of both the peripheral and central nervous systems (Goyer, 1991).

### **4.4 Description of Habitat Equivalency Analysis**

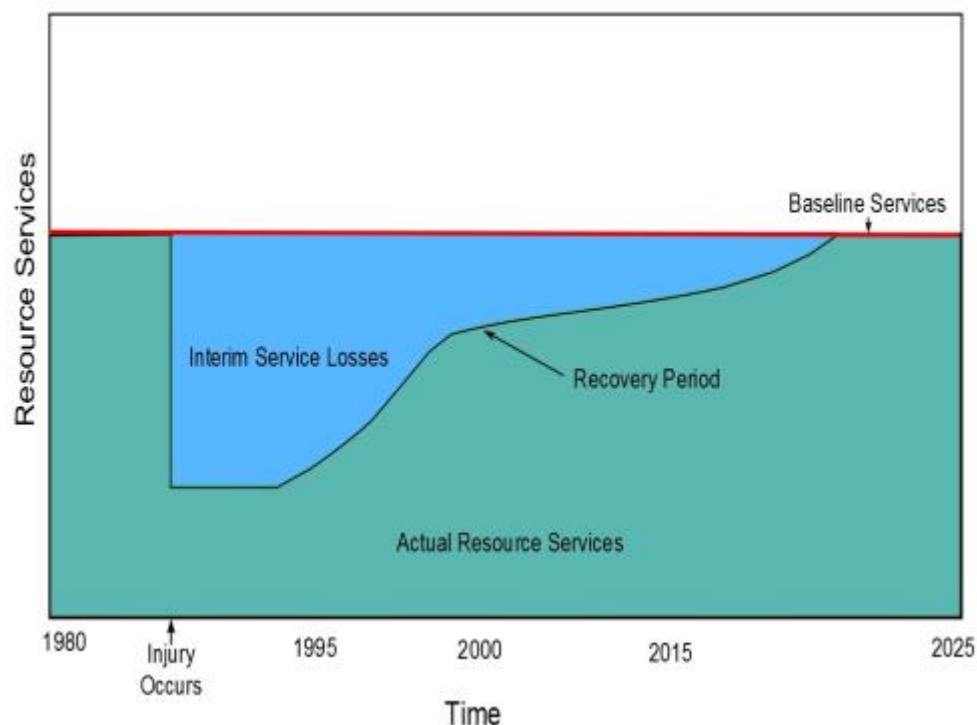
The Trustees used a restoration-based assessment consistent with CERCLA NRDA regulations (43 CFR §11.31), in which injuries and/or losses are quantified in ways that facilitate identification and scaling of restoration alternatives. To quantify the injury and scale the appropriate level of compensation for lost use of ecological services, the Trustees used a combination of Habitat Equivalency Analysis (HEA) and estimated habitat restoration costs to determine damages at the Site.

Habitat Equivalency Analysis (HEA) is an approach to restoration scaling that has been used successfully to determine the size of compensatory restoration actions in Texas and elsewhere around the nation. Since 1999, HEA has generally been accepted as the standard for determining the size or scale of natural resource restoration projects. HEA has been recognized as a valid and reliable procedure and has been used successfully at various restoration projects in Texas and around the country. The focus of a HEA is to identify habitat services lost or diminished due to releases of hazardous substances and to estimate the restoration actions needed to offset the lost service.

Losses are quantified as lost habitat resources and services. Restoration projects provide comparable habitat resources and services, meaning that the scale of the restoration projects is that which provides equivalency between the lost and restored habitat resources and services. Restoration habitat of the same type, quality, and of comparable value should be provided to compensate for the resource and service losses so that the total losses equal the total restoration benefits. Thus the public can be compensated for past and future losses of natural resource services through a habitat replacement project that provides resource services of at least the same level and type as those lost.

The HEA requires the development of injury parameters to quantify lost habitat resources and services. These parameters characterize the reduction of natural resource services associated with the release of hazardous substances to the environment over the time required for the lost services to recover to pre-release levels. The parameters needed to estimate losses include the area of habitat injury, the degree of injury within that habitat, and how that degree of injury changes over time. The degree of injury is determined by the condition of key or representative resources or services in the habitat (for example, primary production or macrofaunal density). The losses are quantified by year as lost service acre-years, where a service acre-year is the loss of one acre of habitat and its resources and services for a year (Figure 4.4-1).

**Figure 4.4-1: HEA 1**



Because the losses occur in different time periods, they are not directly comparable. People place more value on the use or consumption of goods and services in the present rather than postponing their use or consumption to some future time. To make the losses that occur in different time periods comparable, a discount factor is applied to the losses to determine discounted service acre-years (DSAYs). In general, HEA is a technique that balances “debits” (habitat loss or other injuries) that have occurred as a result of releases of hazardous substances against compensatory “credits” (habitat restoration projects) and uses the discount factor to account for the difference in time that the restoration services are delivered.

Other parameters are necessary to quantify the benefits of restoration actions in a HEA. They include when the habitat restoration action begins, the time until the habitat provides full services, the level of services provided between the time when the restoration action begins and when it provides full services, and the relative services of the created or enhanced habitat compared to the injured habitat before the injury. These parameters, along with the size of a restoration action and the discount rate, define the DSAY benefits that result from a restoration action. The task was to determine the size of the restoration action such that the DSAY benefits adequately offset the losses.

To focus the assessment on the primary habitat type impacted at the Site, the Trustees normalized all injuries to one habitat type (aquatic/wetlands) so that, to the extent possible, injuries could be proportioned to this specific habitat type that would be created or enhanced to provide compensation. Injuries were scaled based on the number of acres affected, the estimated level of services at the time of the injury, number of months or years of impact, and how many months or years until full recovery can be achieved. Injuries were reported as DSAYs for the community type and were then converted to an appropriately scaled acreage for acquisition of this specific habitat type.

### **4.5 Scope of Injury Assessment**

In an effort to reasonably consider injuries caused by releases of hazardous substances at or from the Facility, the Trustees restricted the geographical extent and the number of contaminants evaluated in this DARP. Based on current and historical contaminant studies, as well as Trustees’ professional judgment, this DARP only evaluated injuries to the aquatic resources associated with those areas impacted by the release of hazardous substances at or from the Facility, including Finfeather Lake, No-Name Lake, Kazmier Pond, the Connecting Channel and Municipal Lake. Burton Creek and the various water ways below Municipal Lake were not included in the assessment. The Trustees also evaluated the various hazardous substances released from the Facility and determined that arsenic was the most commonly found COC at levels injurious to natural resources. Therefore the assessment in this DARP is limited to the

effects of arsenic on the aquatic environment. Sections 4.3 through 5.0 discuss in more detail the Trustees' decision to restrict the geographic and COCs considered in the evaluation. Since different injuries and service losses occurred within the aquatic community of the Finfeather and Municipal Lakes, the Trustees calculated separate HEAs for each water body. All resource losses were scaled to open water aquatic and benthic communities.

### **5.0 Evaluation of Injury**

The Trustees used an integrated approach incorporating data from the remedial site investigation, Site surveys, computer aided analysis tools, scientific literature, and professional judgment to quantify injuries to natural resources. This information allowed the Trustees to evaluate impacts to the various communities found at and adjacent to the Site.

To support their injury determination, the Trustees used various information sources that generally fall into two categories. The first category involves injury based on regulatory criteria, which may include violation of established standards for acceptable levels of contamination or the existence of state health advisories warning against the consumption of contaminated fish or wildlife. In this case, some of the documentation the Trustees evaluated included the various remedial investigations and agreed orders issued by the TCEQ and its predecessors to the Facility, as well as, a prohibition on fishing in Finfeather and Municipal Lakes. The second category establishes injury based on physical, chemical, or biological adverse changes in a resource resulting from exposure to hazardous substances. Examples of these injuries include changes in an organism's physical development, health, reproductive success, or behavior. The Trustees considered biological assessments conducted by TPWD and other researches that showed reduced species diversity in the fish, amphibian, reptilian, and invertebrate communities, as well as, adult and larval fish deformities in Finfeather and Municipal Lakes.

From this information the Trustees determined that releases of hazardous substances (arsenic) at or from the Facility adversely affected the resources and services provided by the aquatic habitats of both Finfeather and Municipal Lakes. The Trustees were then able to quantify the amount of restoration required to offset lost use of ecological services provided by these aquatic habitats and associated services. Compensation for lost use resulting from historical and post-removal conditions (dewatering and sediment removal actions) in the lakes and associated aquatic/wetland habitats were calculated utilizing a combination of HEA and estimated habitat restoration costs.



## **5.1 HEA Evaluation of Injuries to Finfeather and Municipal Lakes**

This section provides an overview of the Trustees' assumptions and materials used in the injury and restoration calculations. HEA injury and restoration input parameters were developed using various remedial investigation and independent studies of the aquatic resources and sediments of Finfeather and Municipal Lakes, as well as relevant scientific literature, data from previous restoration projects, and the best professional judgment of the Trustees involved in this case. Where uncertainties existed, the Trustees utilized conservative assumptions.

The Trustees evaluated the ecological services provided by Finfeather and Municipal Lakes compared to similar urban lakes. Injury assumptions were considered relative to an urban aquatic ecosystem that has received non-point and point source pollution from the Facility and other urban contributions. Ecological services were evaluated as the quantity and number of fish and benthic species present in small urban lakes. In general, small urban lakes with mostly residential influences were assumed to provide similar ecological services as an un-impacted pristine water body. Studies of fish and benthic communities have shown that urban lakes with similar habitat have 80% to 90% of the same fish and invertebrate species present and are assumed to have similar levels of ecological services. As represented in the Revised Remedial Investigation Work Plan, Volume 1 Resource Book (Radian, 1999), land use in the upper Finfeather Lake watershed was mostly residential with only light industry near the lake. Therefore, the Trustees assumed that for the injury analysis the baseline conditions of Finfeather and Municipal Lakes would provide at least 90% of the services of a pristine east Texas lake. Based upon the Trustees' best professional judgment and literature review, injury calculations were reduced by 10% to account for urban non-point source influences to Finfeather and Municipal Lakes.

Conservative assumptions and geographic analysis were used to determine approximately how many acres of potentially injured habitats were included in the evaluation. These assumptions were based upon the spatial distribution of existing data for contaminated sediments, the level of severity of contamination (based on exceedances of the ecotoxicological screening values for sediment), and the potential for transport or mobilization of the contaminants to surrounding areas. In addition to analytical and field observations, the Trustees used information regarding operational practices, remedial investigations and interim actions, agreed orders and investigative reports to establish an operational timeline and potential impacts to the various aquatic communities during these time periods. The Trustees also considered the lost services provided by aquatic habitat in the vicinity of the Facility.

The Trustees' assessment quantifies injuries to approximately 42 acres of aquatic communities found in Finfeather and Municipal Lakes. The Trustees' evaluation of injury included

identifying where contaminated sediments were located, the severity of the contamination (showing where sediment concentrations exceeded known effects levels for sediment that may cause harm to fish and aquatic invertebrates), and the potential for contaminated sediments to be transported or moved into uncontaminated areas. This information was used along with consideration for current remedial actions taken which may have increased or reduced injuries and were considered as part of the HEA lost use calculations. Table 5.1-1 summarizes the Trustees' HEA assumptions by water body and provides the basis for the injury to the two lakes. The total lost services for the lakes were 2,255.74 DSAYs of lost freshwater aquatic and wetland equivalents.

**Table 5.1-1: Habitat Equivalency Analysis (HEA) Injury Assumptions**

HEA Inputs	Finfeather Lake		Municipal Lake	
Area Injured (Acres)	27		15	
Injury Input*	Year	% Injury	Year	% Injury
Initial Year of Injury	1970	70	1970	60
End of 1 Recovery Phase	1977	60	1977	60
End of 2 Recovery Phase	1978	100	1978	100
End of 3 Recovery Phase	1985	100	1992	20
End of 4 Recovery Phase	1992	60	2008	20
End of 5 Recovery Phase	2008	30	2038	0
End of 6 Recovery Phase	2038	20	2038	
End Recovery Period	2270			
Total Discounted Service Acre Years (DSAY) Loss	1668.30		587.44	
*2009 Base Year				

The Trustees determined that COCs at the Site have impacted and continue to impact the ability of natural resources to provide their baseline level of ecological services. Therefore, the Trustees focused on restoration projects that will compensate the public by providing additional (i.e., above and beyond baseline) ecological services in or near the assessment area.

## 6.0 Restoration Alternatives

The Trustees preferentially seek to restore injured natural resources in kind (e.g., create new wetlands to compensate for lost wetland function) and in the geographical vicinity affected, while working to maximize ecosystem benefit, benefit human uses (such as fisheries), and provide cost-effective restoration as a whole. However, in-kind restoration is not always possible or feasible or may not otherwise fit the restoration selection criteria, and in those instances, enhancement or acquisition of alternative resources that provide similar ecological benefits may be appropriate. Increased benefits and improved cost-effectiveness may often be



obtained by addressing several injured resources and/or services or classes of injury with a single restoration project.

In accordance with NRDA regulations, the Trustees developed appropriate restoration alternatives and identified the preferred restoration alternative (general restoration action and specific project) to address resource injuries and loss of services using both the factors specified in 43 C.F.R. §11.82.

The primary goal of any restoration project is to provide a level and quality of resources and services comparable to those lost. Thus, the ability of the restoration project to provide comparable resources and services is an important consideration. Specifically, the Trustees consider the potential relative productivity of restored habitat and whether the habitat is being created or enhanced. Future site management issues and the opportunity for conservation easements are also considered because they can influence the extent that a restoration action meets long-term objectives. The ability of projects to provide benefits to more than one resource was also considered by the Trustees. For example, certain types of marsh restoration projects could improve fish habitat such that recreational users experience higher catch rates. Although recreational benefits are not explicitly evaluated in this DARP, opportunities for a restoration alternative to provide these added benefits are considered a positive feature of the alternative.

As part of the effort to develop restoration alternatives, the Trustees consulted with local scientists and state agency personnel to get their perspective on the benefits and feasibility of various restoration actions. These efforts were important in assisting the Trustees in identifying projects that are potentially feasible, have strong net environmental benefits, and meet restoration requirements to compensate for injuries resulting from releases of hazardous substances at or from the Facility.

The Trustees first identified and evaluated general restoration actions capable of providing restoration for the injured natural resources and/or services. General restoration actions considered by the Trustees included no action, creation and restoration of habitat, and acquisition and preservation of high-quality habitat.

## **6.1 Selection Criteria**

The NRDA regulations (43 C.F.R. Part 11) require the Trustees to identify the preferred restoration alternative based on certain criteria. When selecting the preferred restoration alternative to pursue, the Trustees should evaluate each of the possible alternatives based on all relevant considerations, including the following factors.

**Technical feasibility of alternative:**

The Trustees must consider if the technology and management skills necessary to implement the proposed restoration alternative are well known and whether each element of the plan has a reasonable chance of successful completion in an acceptable period of time. Generally, known construction, planting, and/or management techniques are preferred over untried processes.

The Trustees also considered technical factors that represented risk to either the success of project construction or the long-term viability of the habitats involved. For example, high rates of subsidence at a project site are considered a risk to long-term existence of constructed habitats. Alternatives that are susceptible to future degradation or loss through contaminant releases or erosion were considered less viable. The Trustees also considered whether difficulties in project implementation were likely and whether long-term maintenance of project features would be necessary and/or feasible. Sustainability of a given restoration action is a measure of the vulnerability to natural or human-induced factors following implementation and the need for future maintenance actions to achieve restoration objectives.

**Cost-effectiveness and cost of the alternative to the service gains of the alternative:**

Cost-effectiveness means that when two or more activities provide the same or similar level of benefits, the least costly activity providing that level of benefits will be selected.

The Trustees must also consider the total cost of the alternative in relation to the expected amount of services provided by the restoration project when evaluating each restoration alternative. Factors that can affect and increase the costs of implementing the restoration alternatives may include project timing, access to the project site (for example with heavy equipment), acquisition of state or federal permits, acquisition of the land needed to complete a project, and the potential liability from project construction. Although a monitoring program does increase the cost of an alternative, the presence of an adequate monitoring component is considered a positive attribute because documenting project performance is important.

**The results of any actual or planned response actions:**

The Trustees must consider the effects of any response or remedial activity on the proposed restoration actions. Efforts to control exposure to unauthorized releases of hazardous substances by removing, neutralizing or isolating hazardous substances to protect human health and the environment are unquestionably necessary. However, these activities may ultimately result in additional losses to natural resource services as well as alterations to the environment that may make on-site restoration technically infeasible or cost prohibitive.

**Potential for additional injury resulting from the proposed actions, including long-term and indirect impacts, to the injured resources or other resources:**

## **Damage Assessment and Restoration Plan Arkema**

The Trustees must consider the extent to which each restoration alternative will prevent future injury as a result of the release and will avoid collateral injury as a result of implementing the alternative. For example, the possibility of the project site being contaminated is considered, as is the potential for use of contaminated dredged sediments in the project. The isolation of the contaminants under less contaminated material would be considered positively. Compatibility of the project with the surrounding land use and potential conflicts with any federally listed species are also considered.

### **Natural recovery period:**

The Trustees must consider the amount of time needed for recovery if no restoration, rehabilitation, replacement, and/or acquisition of equivalent resources efforts are undertaken beyond response actions performed or anticipated shall be estimated. This time period shall be used as the No Action alternative.

### **Ability of the resources to recover with or without alternative actions:**

The Trustees must consider the ability of the effected resource to recover without remedial or restoration action. This is often referred to as natural attenuation. The Trustees considered natural attenuation as part of the No Action alternative.

### **The effect of each alternative on public health and safety:**

Projects that would negatively affect public health or safety are not appropriate.

### **Consistency with relevant federal, state, and tribal policies and compliance with applicable laws:**

The Trustees as part of their review and selection of a preferred restoration alternative must consider if the restoration alternative is consistent with all relevant federal, state and tribal policies. The Trustees must also consider if the restoration alternative complies with all relevant federal, state and tribal laws. Sections 1.3, 7.2 and 8 of this DARP provide the relevant review and constancy determinations for NEPA and other relevant environmental policies and laws.

The regulations give the Trustees discretion to prioritize these criteria and to use additional criteria as appropriate. The Trustees choose to evaluate the cost-effectiveness and ability of the restoration alternative to make the public whole from losses resulting from releases of hazardous substances from the Facility as the primary selection criteria. The Trustees also recognized the importance of public participation in the restoration planning process as well as the acceptance of the projects by the community. Alternatives that are complementary with other community development plans/goals are considered more favorably. In addition, the Trustees considered public access and recreational opportunities provided by a project as positive attributes. In

addition to the factors specified in 43 C.F.R. §11.82, the Trustees also considered the following criteria when evaluating the restoration alternatives.

## **6.2 Evaluation of General Restoration Actions**

Based on the injuries to aquatic/benthic communities associated with Finfeather and Municipal Lakes, the Trustees considered the following general restoration actions:

- 1) No Action;
- 2) Wetland Creation and Restoration; and
- 3) Wetland or Bottomland Hardwood Habitat Acquisition and Preservation.

Once the Trustees determined the general restoration action that would best meet the restoration requirements for lost natural services at the Site, they then reviewed a group of possible restoration projects and selected the preferred project that was most appropriate based on selection criteria in section 6.1.

### **6.2.1 No Action**

DOI NRDA regulations (43 C.F.R. Part 11) require the Trustees to evaluate the “No Action” alternative. Under this alternative, the Trustees would take no direct action to obtain compensation for injured resources and/or services. While natural recovery would occur over varying time scales for the various injured resources, the interim losses suffered would not be compensated under the “No Action” alternative. In addition, the Trustees determined that the nature of the remedy implemented or proposed for implementation would not allow all of the previous services provided to return to baseline; and, therefore, it is appropriate to consider restoration as an alternative to compensate for injuries. Therefore, the Trustees have determined that the “No Action” alternative is not preferred.

### **6.2.2 Wetland Creation and Restoration**

For the Wetland Creation and Restoration alternative, the Trustees calculated the amount of constructed wetland or wetland restoration that would be required to offset lost natural resource services from the Site. This included the consideration and feasibility of primary wetland restoration on the Site. The Trustees also considered the cost and technical feasibility for this restoration action as part of the evaluation process.

#### **6.2.2.1 Wetland Creation and Restoration Scaling**

Since the primary injury associated with the release of hazardous substances at or from the Facility was to the aquatic and benthic communities of Finfeather and Municipal Lakes, restoration “credits” were scaled to freshwater wetland construction. The Trustees evaluated

restoration construction based on a functional freshwater wetland that was assumed to be approximately 2-5 feet in depth. The constructed wetland was assumed to have a 30-year life span and would provide approximately 80% of the services of a fully functioning natural wetland. Restoration credits associated with the construction of 1 acre of freshwater wetlands are presented in Table 6.2.2.1-1. Scaled to the injury, freshwater wetland construction would require a minimum of 166 acres of freshwater wetlands to offset lost resources and services (Table 6.2.2.1-2).

**Table 6.2.2.1-1: Wetland Creation and Restoration Habitat Equivalency Analysis (HEA) Inputs**

<b>Area Restoration (Acres)</b>	1	
<b>Restoration Input*</b>	<b>Year</b>	<b>% Service</b>
<b>Initial Year of Restoration</b>	2012	0
<b>End of 1 Restoration Phase</b>	2017	80
<b>End of 2 Restoration Phase</b>	2042	80
<b>End of 3 Restoration Phase</b>	2042	80
<b>End of 4 Restoration Phase</b>	2042	80
<b>End of 5 Restoration Phase</b>	2042	0
<b>End Restoration Period</b>	2042	
<b>Total Discounted Service Acre Years (DSAY)</b>	13.56	
<b>Gain</b>		
<b>*2009 Base Year</b>		

**Table 6.2.2.1-2: Wetland Creation and Restoration Requirements**

<b>HEA Summary</b>	<b>Finfeather Lake</b>	<b>Municipal Lake</b>
<b>Total DSAY Loss</b>	1668.30	587.44
<b>Total DSAY Gain</b>	13.56	13.56
<b>Minimum Required Constructed Acres</b>	123	43
<b>Total Minimum Required Constructed Acres</b>	166	

### 6.2.2.2 Costs Associated with Wetland Creation and Restoration

Trustee knowledge and experience in the construction of wetlands was used to develop the cost of constructing a freshwater wetland as compensation for injuries resulting from hazardous substances releases at or from the Facility. Costs considered to develop a per acre cost for implementation of the restoration, included the cost associated with the purchase of the land, project engineering and design, excavation, planting, and Trustee oversight (Table 6.2.2.2-1). Based upon an evaluation of the most recent real estate transactions in Brazos County, the cost of property of a suitable size required to implement the project ranged from \$2,900 to \$4,500 per acre. Property with a reliable supply of water, which is required for the success of the restoration project, generally costs more than property without available water. Therefore, the Trustees determined that the upper end of the range of values was the most appropriate to use in

determining the cost of property for the restoration project site. Costs associated with excavation, an estimated \$6.00/cubic yard, were based on recent GLO data, which was developed by polling contractors. Total excavation costs were calculated using the required quantity of material to be removed. For a functional freshwater wetland, it is generally assumed that wetland elevations would be 2-5 feet in depth and that a ratio of vegetation to water habitat (or planting shelf to channel/pool ratio) of 60:40 would be used. The total construction cost per acre was calculated to be approximately \$55,977.

The Trustees will incur future costs associated with the implementation of the restoration project. These Trustee oversight and monitoring costs were included in the total project cost (Tables 6.2.2.2-1 and 6.2.2.2-2). These monies are required to compensate the Trustees for future costs associated with Trustee oversight of the design and implementation, and Trustee monitoring of the restoration project, as well as any corrective measures necessary to ensure restoration project success. Survey expenses, title policy costs and other costs associated with the acquisition of the property were also included in Trustee oversight and monitoring.

**Table 6.2.2.2-1: Freshwater Wetland Creation and Restoration Costs (per acre)**

<b>Item</b>	<b>Cost Factor</b>
<b>Land Acquisition</b>	\$4,500
<b>Planting</b>	\$9,700
<b>Excavation (2-5ft depth 60:40 ratio)</b>	\$30,976
<b>Engineering &amp; Design (20% of excavation &amp; planting)</b>	\$8,135
<b>Trustee Oversight &amp; Monitoring (5% of total project cost)</b>	\$2,666
<b>Total Cost / Acre</b>	<b>\$55,977</b>

In addition to the cost of construction, the Trustees considered the cost of preserving the ecological services of the project in perpetuity. To accomplish this, the Trustees assumed an average cost of \$50,000 for a conservation easement with a land trust organization qualified under Section 170(h) of the Internal Revenue Code and authorized to acquire and hold conservation easements under Chapter 183 of the Texas Natural Resources Code. A 20% contingency was included in the cost determination to account for the risk of implementation, including such factors as inflation, unforeseen increase in construction costs, and potential adaptive management adjustments required for project success. The total cost associated with the construction and preservation of 166 acres of freshwater wetlands is \$11,200,618 (Table 6.2.2.2-2).

**Table 6.2.2.2-2: Total Costs for 166 Acres of Wetland Creation and Restoration**

Item	Value
Construction Cost (166 Acres)	\$9,292,182
Conservation Easement (including closing and survey costs)	\$50,000
20% Trustee Contingency Fee	\$1,858,436
<b>Total Project Cost</b>	<b>\$11,200,618</b>

### 6.2.2.3 Determination of Wetland Creation and Restoration

The Trustees made the following determinations as part of their consideration of wetland construction and restoration as a general restoration action. The HEA calculated that approximately 166 acres of wetland habitat would need to be constructed to adequately compensate the public. The Trustees further determined that there was not enough contiguous acreage available at the Site for the implementation of this action, nor was on-site restoration at the Site considered feasible due to ongoing industrial activities and residual contamination. The Trustees calculated that offsite wetland construction and preservation would cost \$11,200,618 to implement and therefore, was not the most cost-effective restoration action. Consequently, the Trustees determined that Wetland Creation and Restoration, while technically feasible, was not the preferred general restoration action.

### 6.2.3 Wetland or Bottomland Hardwood Habitat Acquisition and Preservation

For the Wetland or Bottomland Hardwood Habitat Acquisition and Preservation action, the Trustees calculated the amount necessary to offset lost natural resource services from the Site. The Trustees also evaluated the cost and technical feasibility of the acquisition and preservation as part of the evaluation process. The scaling was based on current and project development risks and negative human use impacts in the potential restoration action area. Cost and technical feasibility was evaluated based on past Trustee experience with the costs and feasibility associated with implementing a conservation easement to protect the ecological values of the property in perpetuity.

#### 6.2.3.1 Wetland or Bottomland Hardwood Habitat Acquisition and Preservation Scaling

Preservation values were based on three projects to add additional property to existing TPWD Wildlife Management Areas (WMA) in east Texas. All three preservation projects were fee simple acquisitions of land at an estimated cost of \$4,000 per acre with protection in perpetuity through management by incorporation into the neighboring WMA, a conservation easement held by a recognized and established non-profit 501 (c)(3) organization with compatible goals, or through another equally protective measure. Preservation projects were considered at: 1) Big Lake Bottom WMA in Anderson County; 2) Richland Creek WMA in Freestone County; and 3)

Keechi Creek WMA in Leon County. Preservation values were scaled using HEA to determine the relative DSAYs provided by each project. An average preservation value was determined based upon the value of each project. Preservation was then scaled to injuries associated with the Site. Descriptions of the three preservation projects considered are presented in Section 7.

Each of the preservation projects was considered to have a similar lifespan; however, each of the projects provided varying levels of services depending on the habitat to be added to the WMA, development risks of the property, and potential negative human use impacts. Table 6.2.3.1-1 provides a detail of the services and credits provided by each of the preservation projects. The Trustees then determined the average DSAY gain provided by the three preservation projects to use in determining the amount of freshwater wetland or wet bottomland hardwoods that would be required to compensate for lost natural resource services at the Site. Using the average DSAY gain (5.61), a minimum of 402 acres of freshwater wetland or wet bottomland hardwood habitat would need to be preserved in order to completely compensate the public for lost resources (Table 6.2.3.1-2).

**Table 6.2.3.1-1: Wetland or Bottomland Hardwood Habitat Acquisition and Preservation (HEA) Inputs**

Area Restoration ( Acres)	1	Big Lake Bottom (WMA)	Richland Creek (WMA)	Keechi Creek (WMA)
<b>Restoration Input*</b>	<b>Year</b>		<b>% Service</b>	
<b>Initial Year of Restoration</b>	2012	10	20	0
<b>End of 1 Restoration Phase</b>	2062	10	30	30
<b>End of 2 Restoration Phase</b>	2102	10	40	40
<b>End of 3 Restoration Phase</b>	2309	10	40	40
<b>End of 4 Restoration Phase</b>	2309	10	40	40
<b>End of 5 Restoration Phase</b>	2309	10	40	40
<b>End Restoration Period</b>	2309			
<b>Discounted Service Acre Years (DSAY)</b>				
<b>Gain</b>		3.14	8.34	5.34
		<b>Average DSAY Gain</b>	5.61	
<b>*2009 Base Year</b>				

**Table 6.2.3.1-2: Wetland or Bottomland Hardwood Habitat Acquisition and Preservation Requirements**

<b>HEA Summary</b>	<b>Finfeather Lake</b>	<b>Municipal Lake</b>
<b>Total DSAY Loss</b>	1668.30	587.44
<b>Total DSAY Gain</b>	5.61	5.61
<b>Minimum Required Constructed Acres</b>	297	105
<b>Total Minimum Required Constructed Acres</b>	402	



### 6.2.3.2 Costs Associated with Wetland or Bottomland Hardwood Habitat Acquisition and Preservation

These costs are based on an assumption that the acquisition of the acreage needed will be purchased by the Trustees. Costs represent best estimates of the actual cost of procuring the acreage needed and the Trustees' projected implementation, oversight, and administration costs.

Trustee oversight and monitoring costs are included in the total project cost (Table 6.2.3.2-1). These monies are required to compensate the Trustees for future costs associated with Trustee oversight of the design, implementation, and monitoring of the restoration project as well as any corrective measures necessary to ensure restoration project success. The Trustees assumed an average cost of \$50,000 for a conservation easement with a land trust organization qualified to acquire and hold conservation easements and a 15% contingency was added to account for the risk of implementation including such factors as inflation and potential adaptive management adjustments required for project success. The total cost associated with the acquisition and preservation of 402 acres of freshwater wetlands or wet bottomland hardwood habitat is \$974,824 (Table 6.2.3.2-1).

**Table 6.2.3.2-1:** Total Costs for 402 Acres of Wetland or Bottomland Hardwood Habitat Acquisition and Preservation

Item	Cost Factor (Acre)	Acres	Total Cost
Land Acquisition	\$2,000	402	\$804,195
Conservation Easement (Including Closing Costs, Survey, Endowment)			\$50,000
Contingency (15%)			\$854,195
Total Cost			\$974,824

### 6.2.3.3 Determination of Wetland or Bottomland Hardwood Habitat Acquisition and Preservation

After performing a detailed evaluation of a number of factors, the Trustees determined that a minimum of 402 acres of existing open water, freshwater wetland, or bottomland hardwood habitat would be required to offset service losses at the Site. Using comparable land acquisitions along with current market values as well as actual and anticipated development pressures, the Trustees determined that it would cost approximately \$975,000 to preserve a minimum of 402 acres. In comparison to construction of wetland habitat, acquisitions and preservation is not only feasible but more cost effective in compensating for lost services. Therefore, the Trustees proposed the acquisition and preservation of existing high quality wetland and bottomland hardwood habitat as the preferred general restoration action.

### **6.3 Preferred General Restoration Action and Conclusions**

Based on the evaluations presented in this section, the Trustees have determined that the acquisition and preservation of a minimum of 402 acres of open water, freshwater wetlands, or bottomland hardwoods would be required to offset lost resources or services due to releases at or from the Facility. The Wetland or Bottomland Hardwood Habitat Acquisition and Preservation action meets all restoration selection criteria and is the preferred general restoration action, with construction of wetland habitat the second most feasible restoration action. Wetland Creation and Restoration, while not proposed as the preferred restoration action, was feasible and would only be considered as a secondary restoration action should a suitable preservation project not be identified. The Trustees agreed to settle Arkema's NRDA liability associated with releases at or from the Facility for \$1.4 million. This settlement reflects the anticipated costs to the Trustees for: 1) preservation of wetland habitat and 2) Trustees' past and future costs associated with the injury assessment and implementation of the preferred restoration alternative. Section 7 describes the Trustees' evaluation of potential preservation and acquisition projects that meet the restoration selection criteria and include meeting or exceeding the minimum natural resource services. In Section 7.1.6, the Trustees propose acreages, and a site-specific project to fully compensate the public for lost natural resources.

### **7.0 Proposed Restoration**

The Trustees evaluated numerous properties in Brazos and surrounding counties as potential acquisition, preservation, or construction projects. Consistent with the preferred restoration action, acquisition and preservation of at least 402 acres of freshwater wetlands and/or bottomland hardwoods, the Trustees principally considered acquisition and preservation projects. To ensure the long-term ecological services from the proposed project, the property preserved or created may be protected under a conservation easement held in perpetuity by a recognized and established non-profit 501(c)(3) organization with compatible goals or through another equally protective measure.

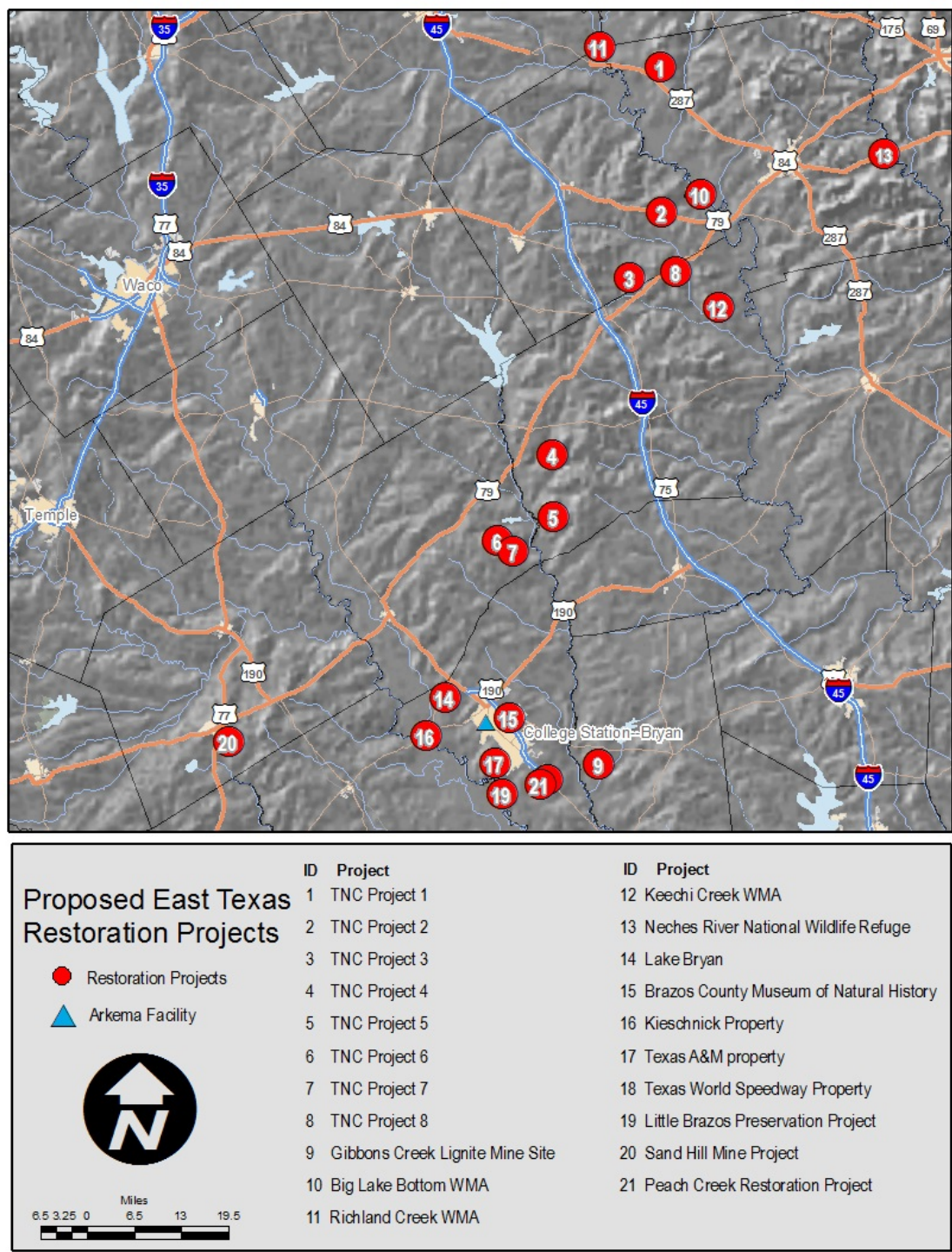
#### **7.1 Proposed Restoration Projects**

In coordination with Legacy, the Trustees evaluated 21 potential restoration projects in east central Texas (Figure 7.1-1). Of the 21 restoration projects, 6 were immediately removed from consideration for not meeting the minimum restoration requirements or other considerations that made preservation impossible or impractical (Table 7.1-1). The two construction projections the Trustees considered were presented by Legacy as potential restoration alternatives: Lake Bryan and the Brazos County Museum of Natural History Lake. The remaining restoration projects that acquired and/or preserved property through a conservation easement or similar mechanism

## **Damage Assessment and Restoration Plan Arkema**

and provided similar services to those lost at the Site were evaluated further for possible identification as the preferred restoration alternative. Section 7.1 provides a description of each of the projects evaluated, location of the project, the potential natural resource service gains from the project, and the Trustees' determination of feasibility. Section 7.2 presents the preferred restoration alternative and the Trustees' rationale for proposal.

Figure 7.1-1: Potential restoration projects



**Table 7.1-1: Potential Restoration Projects**

ID #	Project ID / Name	Description
Texas Nature Conservancy Eocene Sands Barrens Project (TNC) – composed of TNC sites 1-8 below:		
1	TNC 1	Sand hill, pitcher-plant bog, bottomland
2	TNC 2	Bogs, marsh wetlands, bottomland, pine forest
3	TNC 3	High-quality sand hill, large pitcher-plant bog, springs, natural lakes
4	TNC 4	Deep sand hills, natural springs, pitcher-plant bogs, bottomland, pine forest
5	TNC 5	Large sand hill, large bogs, sand-verbena and other rare species
6	TNC 6	Streamside bog, floodplain, sand hill
7	TNC 7	Sand hill with sand-verbena, pitcher plant bogs
8	TNC 8	Large bogs, sand hill, introduced
9	Gibbons Creek Lignite Mine	The 10,600-acre site in central Grimes County, about 30 miles east of College Station
10	Big Lake Bottom WMA, Anderson County	This project seeks to acquire a single-owner inholding
11	Richland Creek WMA, Freestone County	The purpose of this project is to acquire a 356-acre inholding
12	Keechi Creek WMA, Leon County	New property acquisition for the WMA
13	Neches River National Wildlife Refuge	Property acquisition, Anderson/Cherokee County
14	Lake Bryan	Potential for vegetation restoration only
15	Brazos County Museum of Natural History Lake	Drainage pond vegetation restoration
16	Private Property*	Potential easement on Little Brazos River
17	Texas A&M property*	Preservation of property adjacent to Texas A&M Fire Academy
18	Texas World Speedway*	Preservation of property adjacent to TX World Speedway
19	Little Brazos Preservation*	Private Property bottomland hardwood for conservation easement
20	Sand Hill Mine*	Lignite Mine near Rockdale, in Milam County.
21	Peach Creek Restoration*	Private Property easement along Peach Creek, Brazos County

\* Indicates Projects that did not meet basic restoration requirements or criteria and were not considered further.

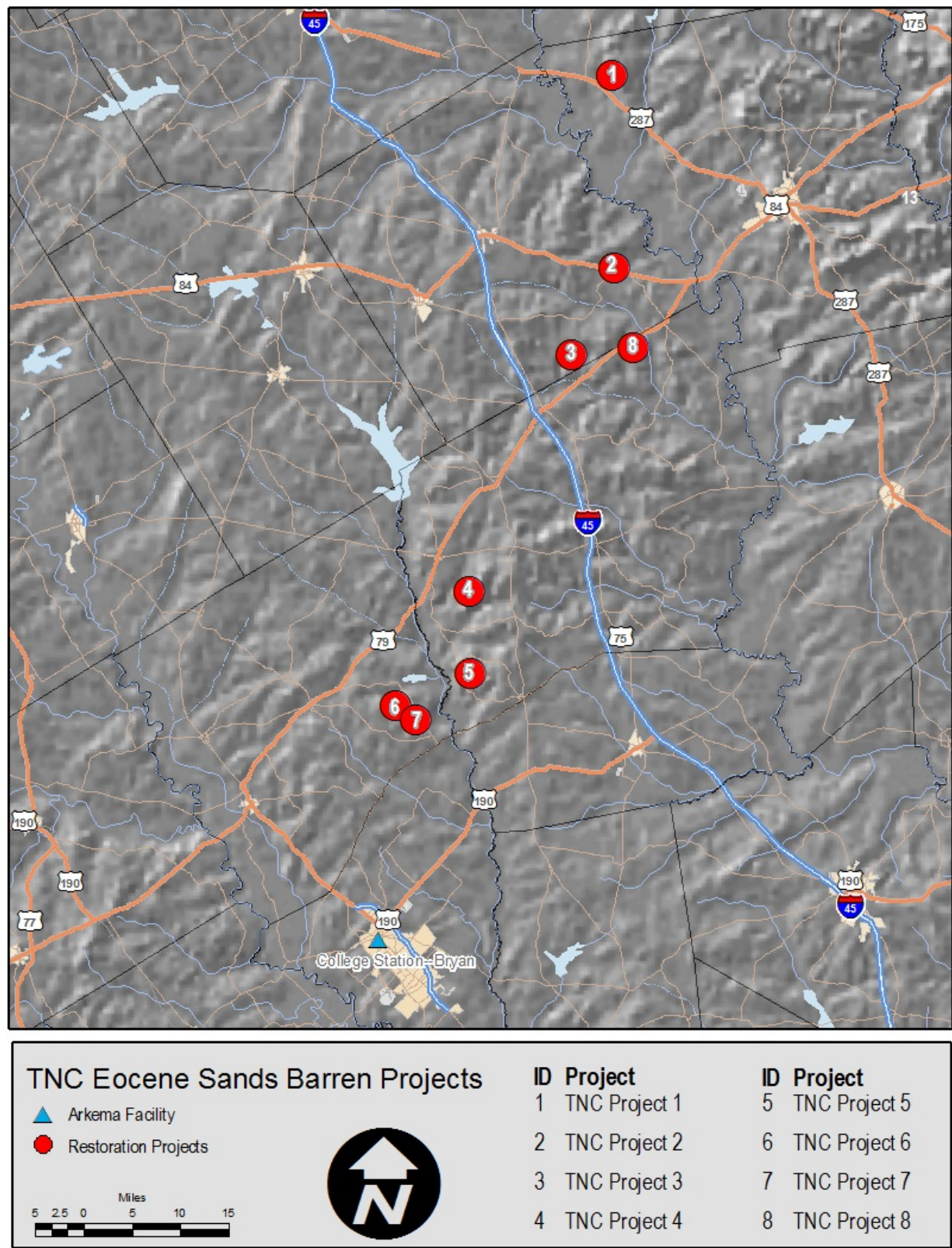
### 7.1.1 The Nature Conservancy of Texas Eocene Sands Barrens

The Eocene sands barrens of east central Texas provide a unique landscape for relic and endemic plant species. Occurring only in a few isolated locations within the post oak woodlands eco-region, this area supports clusters of endemic species, including rare and beautiful wildflowers like the federally listed large-fruited sand-verbena (*Abronia macrocarpa*). The area has numerous small natural springs, pitcher-plant bogs, pine forest, and small naturally occurring lakes. These outcrops are not protected and some are threatened by subdivisions. Most locales are small and could be preserved by conservation groups or through agreements with private landowners. The Nature Conservancy of Texas (TNC) proposed to the Trustees the preservation of several areas within the Eocene sand barrens in east central Texas as potential compensation for natural resource services lost at the Site (Figure 7.1.1-1).

While the Eocene sands barrens provide a unique and valuable ecological resource, the natural resource services provided by these relic habitats were not directly comparable to those lost at the Site. Many of the projects were small areas scattered over Brazos and Leon counties that would require multiple easements and agreements with private landowners to acquire enough habitat to offset losses. Because these projects did not provide direct resource compensation and due to the cost of acquiring multiple easements, TNC Eocene Sands Barrens projects were not selected as the preferred restoration project.



Figure 7.1.1-1: TNC Eocene Sands Barren

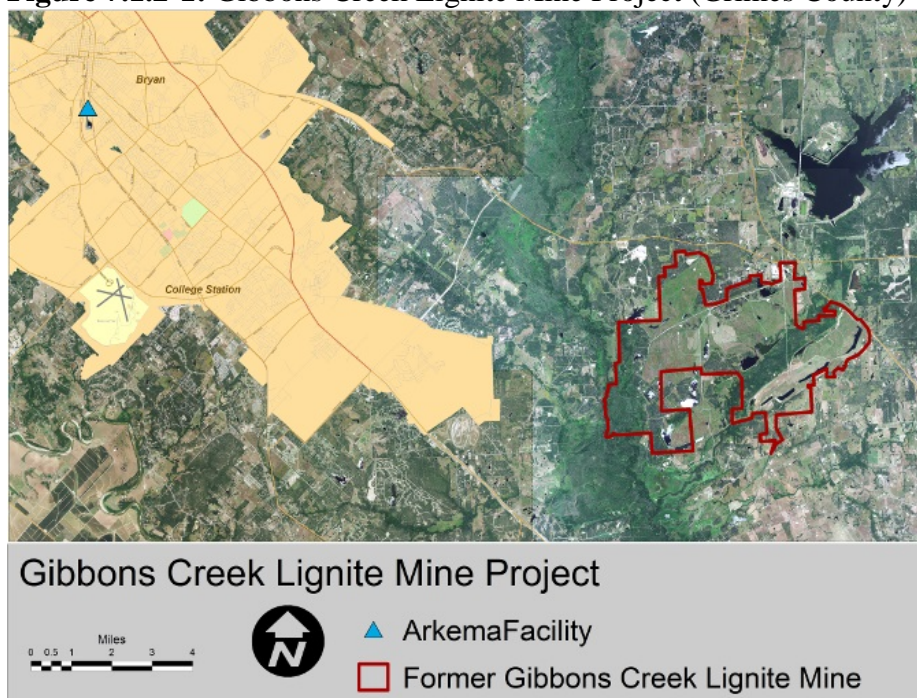


### 7.1.2 Gibbons Creek Lignite Mine (Grimes County)

The 10,600-acre former Gibbons Creek Lignite Mine in central Grimes County is about 30 miles east of Bryan-College Station (Figure 7.1.2-1). The Texas Municipal Power Agency (TMPA) owns and operated the Gibbons Creek Lignite Mine that was the original source of fuel for the Gibbons Creek steam electric station power plant. Between 1980 and 1996, approximately 6,000 acres of the area were surface mined for lignite coal. The mine was abandoned in 1996. Since that time, TMPA has been reclaiming the land mined at the site in compliance with a mine closure plan monitored by the Railroad Commission of Texas and the TCEQ.

The mine closure plan divides the mine site into three tracts, or “phases” based on the schedule under which completion of mine reclamation and release of all performance bonds are to be completed. Most of the large construction projects, such as the reclamation of final open pits, have been completed; and the mine has been converted to a post-mining land use that consists of pasture land, ponds, and woodlands. Currently, over 60% of the mined area has met performance standards and been released partially from its performance bond. The site is now in the process of being monitored and being released from mine reclamation obligations as it meets regulatory performance standards. However, delays in meeting some regulatory standards may move this date further into the future.

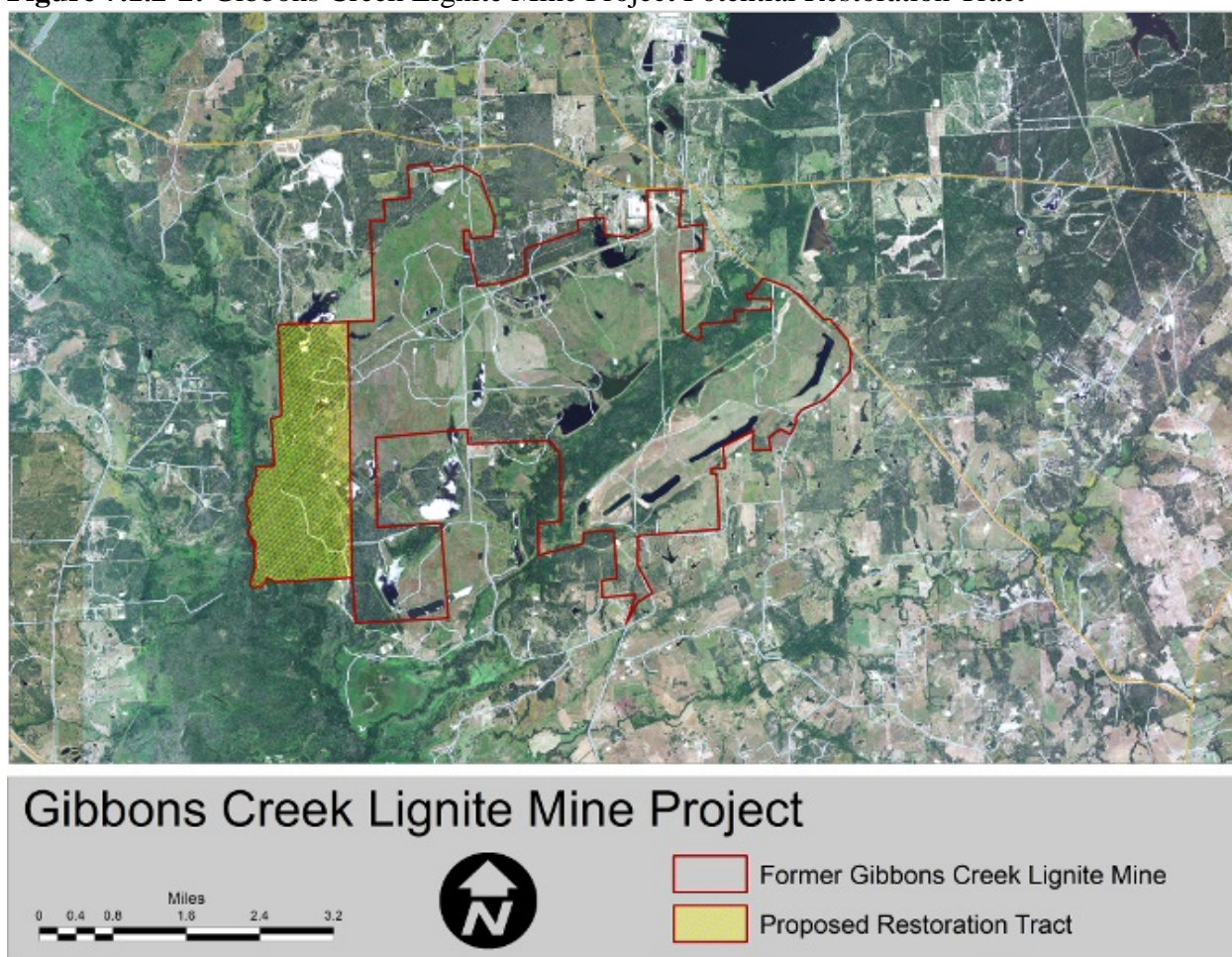
**Figure 7.1.2-1: Gibbons Creek Lignite Mine Project (Grimes County)**





The 4,609-acre Phase I tract, which includes approximately 2,000 acres of forested Navasota River wet bottomland hardwoods, was the first of the three reclamation tracts anticipated to meet performance criteria and would potentially be available as a restoration project to compensate for natural resource services lost at the Site. The wet bottomland hardwoods adjacent to the Navasota River would have provided similar ecological services to those lost at the Site. The preservation of the wet bottomland hardwoods would provide for long-term improvements to water quality and increased fisheries and wildlife habitat as well as nesting habitat for some of the avian species potentially affected at the Site. The Trustees considered acquisition and preservation of 402 acres of wet forested Navasota River bottomland hardwoods from the Phase I tract to offset natural resource services lost at the Site (Figure 7.1.2-2).

**Figure 7.1.2-2: Gibbons Creek Lignite Mine Project Potential Restoration Tract**



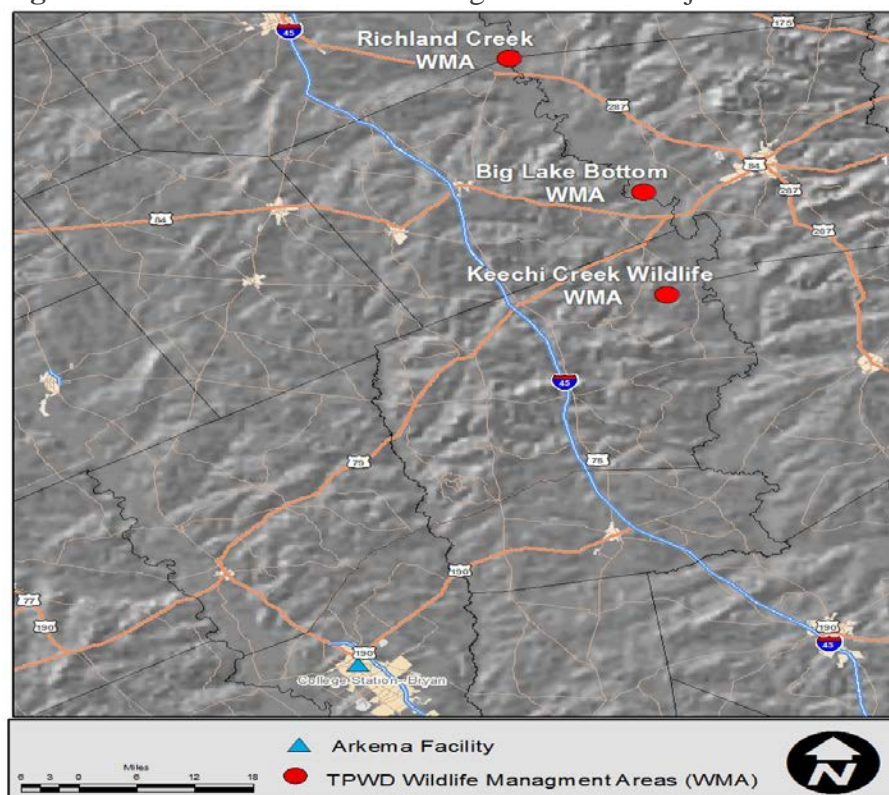
The Gibbons Creek Lignite Mine has long been identified by TPWD, Navasota and Grimes counties, the Cities of Bryan and College Station, as well as a number of land trusts as a potential park and nature preserve. Minimally impacted wet bottomland hardwood acreage along the Navasota River provides excellent preservation and recreational opportunities to offset natural

resource service losses at the Site. The Trustees, as part of their evaluation of this project as possible compensation for natural resource service losses at the Site, met with the coordinating land trust to evaluate the current reclamation project and future acquisition of the property. The Trustees became aware of several issues that directly impacted the feasibility of the Gibbons Creek Lignite Mine site as a restoration project to compensate for injuries at the Site. The Phase I tract had significant delays in meeting full performance standards. While portions of the tract were in compliance, TMPA would not consider early release of these areas until full performance was met and it is unclear how long it would be before the Phase I tract would fully meet performance standards. Further discussions with TMPA also indicated that they were not willing to subdivide the Phase I tract. Acquisitions of the entire Phase I tract exceed the required restoration requirements and partnership funding for the remaining Phase I tract acreage is not available at the time. The uncertainty of obtaining full funding for the acquisition of the Phase I tract and an undetermined delay in when this tract could be purchased have led the Trustees to determine that the Gibbons Creek Lignite Mine site was not feasible as a restoration project for natural resource service losses at the Site.

### 7.1.3 TPWD Wildlife Management Area (WMA) Projects

The Trustees evaluated three potential restoration projects on TPWD WMA properties. The evaluation of these projects follows in section 7.1.3.1-3.

**Figure 7.1.3:** TPWD Wildlife Management Area Projects



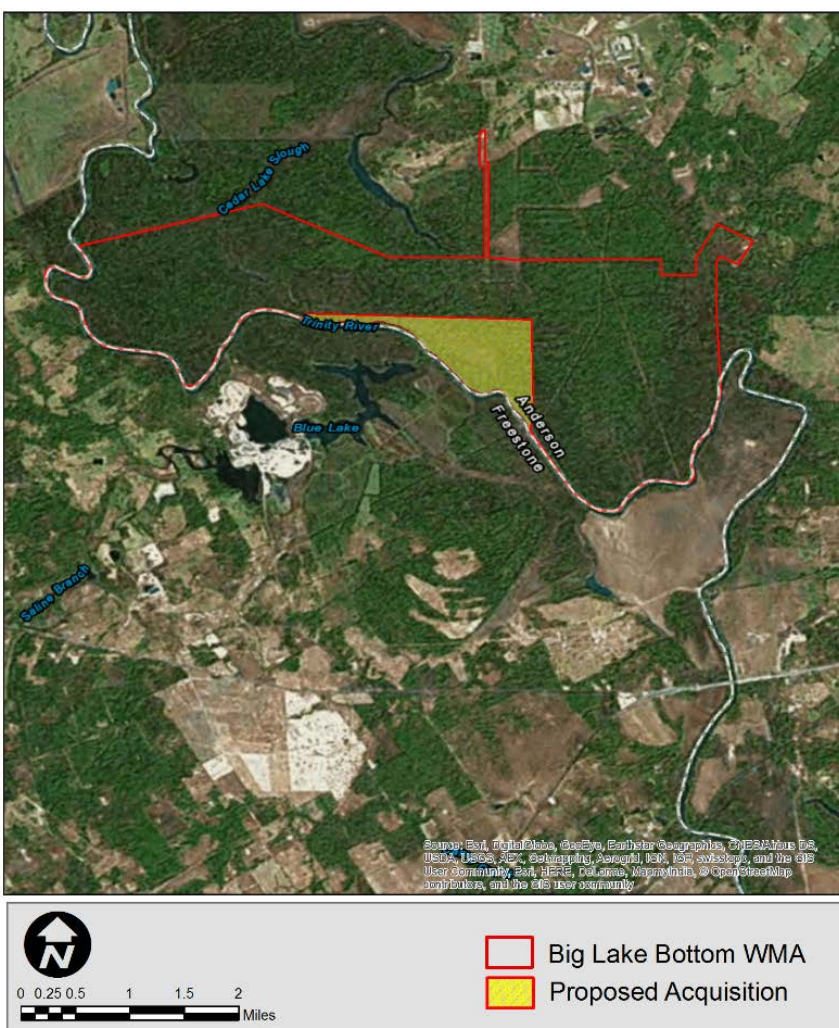
### **7.1.3.1 Big Lake Bottom WMA**

The Big Lake Bottom WMA is a 2,870-acre management area that lies adjacent to the Trinity River, about 10 miles southwest of Palestine and 76 miles northeast of the Facility in Anderson County. It was purchased by TPWD to preserve the rapidly disappearing post oak savannah bottomland hardwood habitat. Currently the entire WMA is accessible and open for public use. The management area is not totally contiguous, but fragmented by private tracts of land. It is accessible from county roads at two locations.

TPWD seeks to acquire a single-owner inholding on the Trinity River, surrounded by the WMA. The tract has high biological value, including seasonal overbank flooding, jurisdictional wetlands, and mature bottomland forest. The acquisition of the subject tract would eliminate the only inholding within Big Lake Bottom WMA and preserve approximately 450 acres of highly fragmented Trinity River bottomland (Figure 7.1.3.1). The tract is dominated by mature bottomland hardwoods and would not require reforestation efforts.



**Figure 7.1.3.1:** Big Lake Bottom WMA, Anderson County



This hardwood forest tract includes more than a mile of Trinity River frontage, including the riparian zones and bottomlands associated with the river. Because it is surrounded by the WMA, the tract would be incorporated into the existing management plan for the WMA and would be managed for indigenous habitat and wildlife values. Additionally, the area would have controlled public access for recreation, including hunting. The ecological services provided by this tract would be comparable to those lost at the Site.

The Trustees evaluated this project as a potential restoration project to compensate for natural resource services lost at the Site; however, the owner of the tract is not willing to transfer, sell, or place a conservation easement on the property at this time. The Big Lake Bottom WMA preservation project was removed from further consideration.



### **7.1.3.2 Richland Creek WMA**

The Richland Creek WMA (RCWMA) located in Freestone and Navarro counties was named for Richland Creek, a tributary to the Trinity River, which flowed through the property prior to the construction of the Richland-Chambers Reservoir. RCWMA is located approximately 88 miles north, northeast of the Facility and was created to compensate for habitat losses associated with the construction of Richland-Chambers Reservoir. The mission of RCWMA is to develop and manage populations of indigenous and migratory wildlife species and their habitats and to provide quality consumptive and non-consumptive public use in a manner that is not detrimental to resources.

RCWMA is located in an ecotone separating the post oak savannah and blackland prairie ecological regions, and lies almost entirely within the Trinity River floodplain. The WMA is subject to periodic and prolonged flooding. Average annual rainfall is 40 inches. The vast bottomland hardwood forests serve as nesting and brood rearing habitat for many species of neotropical birds. The WMA has numerous marshes and sloughs, which provide habitat for migrating and wintering waterfowl, wading birds, and shore birds as well as diverse aquatic life.

TPWD desires to acquire a 356-acre inholding and add it to the WMA (Figure 7.1.3.2). This property is located completely within the management area along the Trinity River. Vegetation is dominated by mature bottomland hardwoods within the 35-acre opening in the center of the property. This inholding is of critical importance not only because of its importance in preserving fragmented forested areas within the Trinity River watershed but also in its proximity adjacent to the Raw Water Wetland Treatment Project on the North Unit of RCWMA. The tract has a range of habitats, from clearings, to secondary forest growth, to mature forest and riparian habitat. The tract would be managed consistent with the management plan for the WMA, which emphasizes restoration of bottomland forest and maintenance of hydrology which results in wetlands, marshes, and habitat for migratory waterfowl.

**Figure 7.1.3.2: Richland Creek WMA, Freestone and Navarro counties**



The Trustees evaluated this project as a potential restoration project to compensate for natural resource services lost at the Site. One half of the desired inholding was recently acquired by TPWD and the owners of the remaining half were not willing to transfer, sell, or place a conservation easement on the property at this time. Conservation services on other available tracts, while similar to those lost at the Site, lacked sufficient aquatic habitat to be fully comparable to those lost in the Finfeather watershed. The RCWMA preservation project was removed from further consideration.

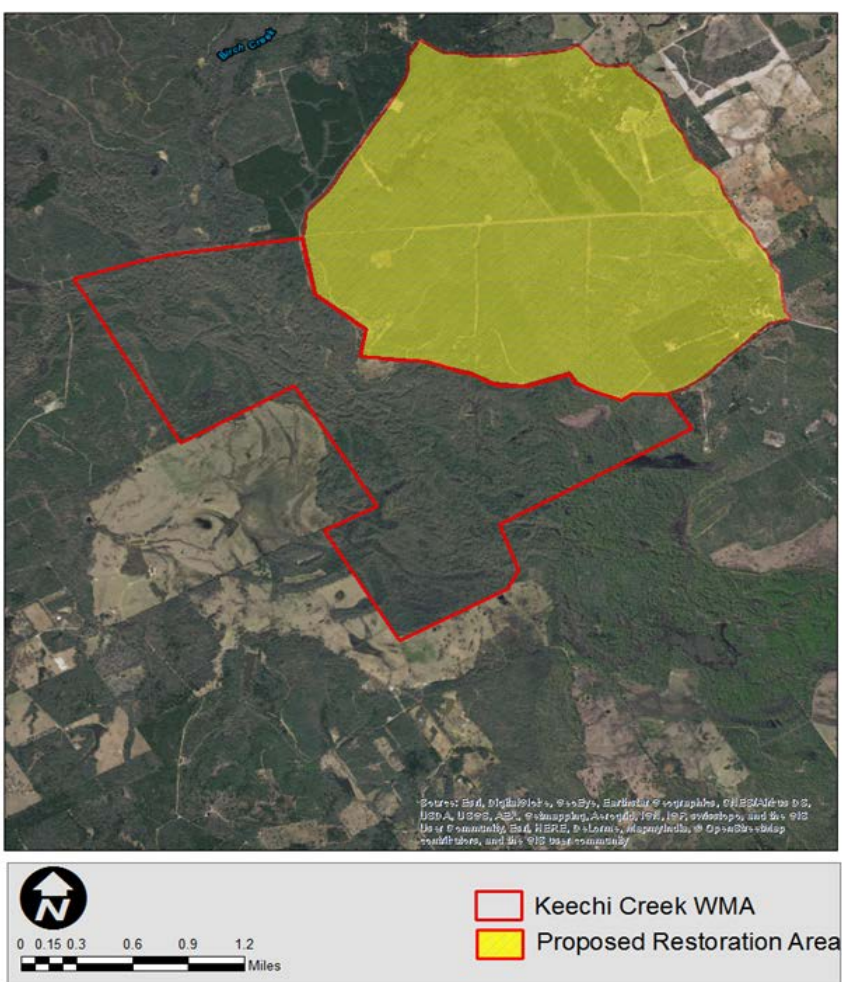
### 7.1.3.3 Keechi Creek WMA

Keechi Creek WMA consists of 1,500 acres located approximately 10 miles south of Oakwood, in Leon County, and 62 miles northeast of the Facility. Roughly 80% of the area is bottomland

hardwood forest containing numerous standing sloughs. Vegetation includes willow, water and overcup oaks, elm, and sweetgum. Wildlife includes deer, squirrels, feral hogs, and waterfowl.

TPWD desires to expand the Keechi Creek WMA, increasing the value of the current 1,500-acre area by adding to the habitat, adding buffers and transitional habitats, and improving access for management, research, and public use. About 3,500 acres of prime bottomland hardwood and marsh are needed to complete the long-term project objectives, secure wildlife conservation in the future, and operate efficiently (Figure 7.1.3.3). The immediate area around the current Keechi Creek WMA still contains much quality wildlife habitat, but the distant region around the Keechi Creek WMA has been cleared, overgrazed, and planted in coastal bermudagrass.

**Figure 7.1.3.3:** Keechi Creek WMA, Leon County



The historic and potential natural vegetation of much of the area is bottomland hardwood forest. The preservation, regeneration, and enhancement of this habitat type are important for the conservation of regional biodiversity. This conservation can be accomplished primarily through natural succession and increasing stand age, and this is occurring. With the addition of adequate additional lands, substantial habitat enhancement for waterfowl and wetland wildlife habitat could potentially be feasible and efficient.

The Trustees evaluated this project as a potential restoration project to compensate for natural resource services lost at the Site. This project involved a number of land owners, some of whom could not be identified or located. Many of the land owners were not willing to transfer, sell, or place a conservation easement on their property at this time. Natural resource services, while similar to those lost at the Site, lacked sufficient aquatic and open water habitat to be fully comparable to those lost in the Finfeather watershed. The Keechi Creek WMA preservation project was removed from further consideration.

### **7.1.4 Lake Bryan**

Lake Bryan is a power plant cooling reservoir in Brazos County, 5 miles (8 km) west of Bryan, Texas (Figure 7.1.4-1). The dam and 830-acre lake are managed by Bryan Texas Utilities which uses the reservoir as a coolant source for the electrical generators in the Dansby Power Plant. The reservoir was officially impounded in 1974. Lake Bryan is a popular recreational destination for various outdoor activities including boating and fishing. Lake Bryan is home to the Texas A&M University Rowing, Sailing Team, and Sailing Club; and the Brazos Valley Mountain Bike Association maintains a series of bike trails surrounding the lake.

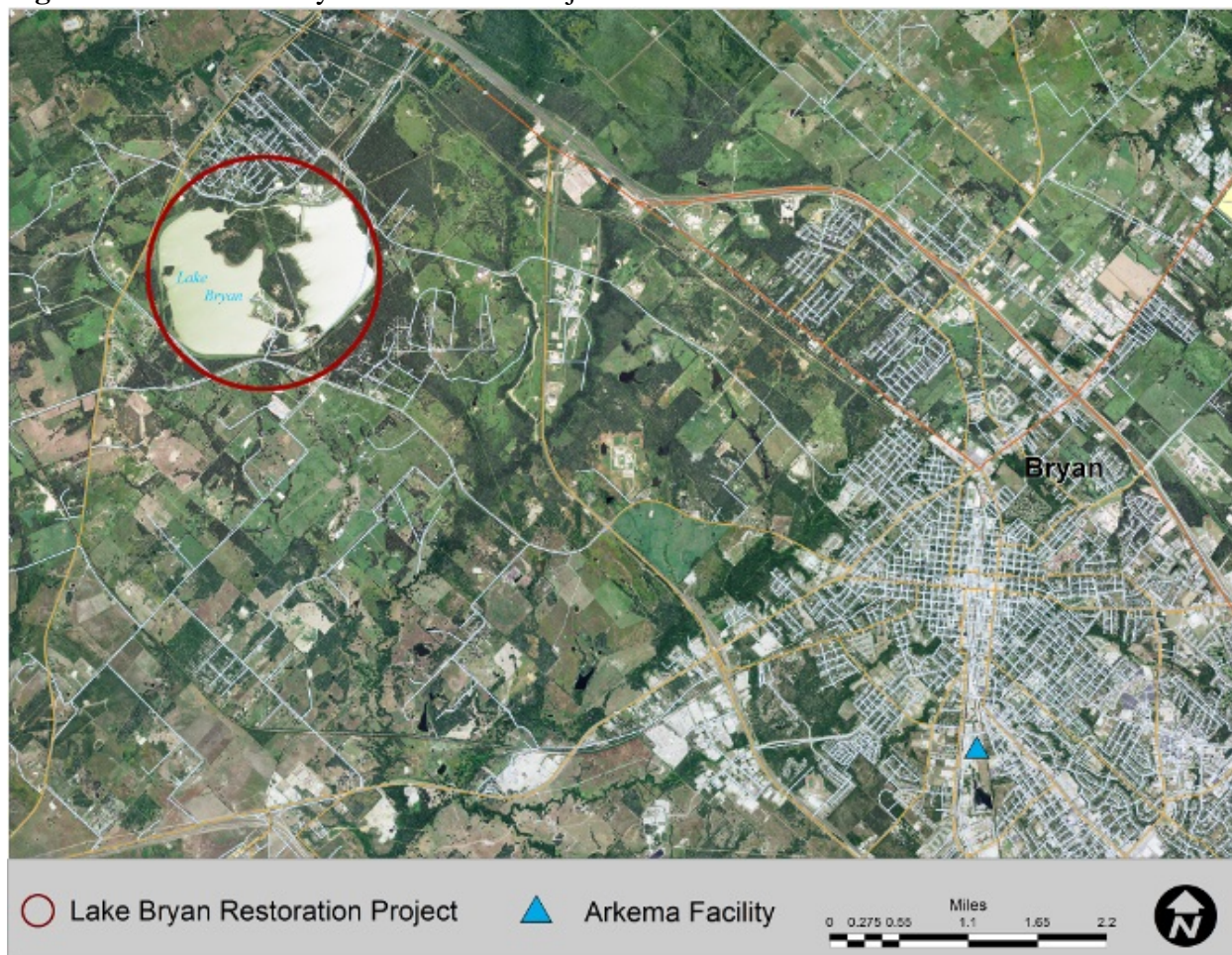
Lake Bryan is a typical Texas cooling reservoir lacking significant aquatic macrophyte communities or structure that would sustain fish and aquatic communities. Since the lake is maintained primarily as a cooling reservoir, fringe wetlands or flooded bottomland hardwood that would support a self-sustaining aquatic ecosystem are limited.

The Trustees considered a restoration proposal that would include the construction and preservation of freshwater wetlands, fish habitat structure, and the introduction of freshwater macrophytes to improve the diversity and sustainability of the aquatic community in Lake Bryan. However, since Lake Bryan is operated primarily as cooling source for the power plant, these potential restoration actions were determined to be in conflict with the lake's primary use. Since the utility needs the ability to raise, lower, and expand the cooling pool as operations increase or for facility maintenance, Bryan Texas Utilities was reluctant to consider a conservation easement or introduction of aquatic plants that may impact operations. Therefore, this project could not provide the required ecological services or guarantee the long-term protection of any services



derived from the conservation of existing habitat. In addition, the Lake Bryan project was proposed as a construction and restoration project which did not meet the preferred general restoration action, acquisition, and preservation of wetlands and/or bottomland hardwoods. Therefore, the Lake Bryan restoration project was removed from further consideration.

**Figure 7.1.4-1: Lake Bryan Restoration Project**



### **7.1.5 Brazos County Museum of Natural History Lake**

Located in southeast Bryan, Texas, the Brazos County Museum of Natural History provides recreational, science education, natural and cultural history opportunities for the cities of Bryan and College Station (Figure 7.1.5-1). In cooperation with the Arts Council of the Brazos Valley, the facility exhibits nature art and conducts programs on science and archaeology. Through activities at the museum and through outreach to schools and community organizations, the museum teaches respect and appreciation for the region's natural and cultural history. Each year, the museum reaches about 50,000 children and adults with science programs, exhibits, special events, and affiliated programs such as the Arts Council of the Brazos Valley, Center for the

Study of the First Americans, and the Texas Cooperative Wildlife Collections. The museum is responsible for managing and providing guided tours of the adjacent Carter's Creek Nature Trail, picnic area, and restored wildlife habitats.

Immediately adjacent to the Carter's Creek Nature Trail and the museum are a series of detention ponds created to accept stormwater runoff from a large shopping mall complex. The ponds are typical stormwater detentions, with three low-flow chambers and are approximately 7 acres in size. The ponds are steep banked with little or no structure or aquatic vegetation, but because of their proximity to Carter's Creek and the nature trail, they provide an opportunity to enhance local fish and wildlife resources, as well as adding additional educational opportunities. The proposed enhancement project would restructure the ponds, creating a stepped wetland system while maintaining the stormwater carrying capacity. Native vegetation planting and colonization would be used to introduce freshwater aquatic plants into the system. Fish and benthic invertebrate species would be expected to naturally colonize from the Carter's Creek connection to the system.

The Trustees considered the restoration proposal that would include the construction, enhancement and preservation of freshwater wetlands, fish and benthic invertebrate habitat structure, and the introduction of freshwater macrophytes to improve the diversity, water quality and sustainability of the aquatic community in the detention pond complex adjacent to the Brazos County Museum of Natural History. While this project would provide comparable ecological services to those lost in the Finfeather Lake watershed, the 7-acre complex would not meet the minimum requirement of 166 acres of constructed wetlands (see HEA Table 4.4-1) to replace those services lost. Insufficient open space adjacent to the museum and ponds is available to expand the project to meet the minimum restoration requirements; and, therefore, an additional restoration project would be required to fully compensate for lost natural resource services if this project were selected as a restoration alternative. Additionally, in order to maintain its primary function as a stormwater detention pond, the system would need to be periodically serviced and dredged to ensure adequate retention volume was maintained. Because the restoration of the detention pond system back to a wetland following any maintenance in the future could not be guaranteed and this project could not provide the minimum required ecological services or guarantee the long-term protection of any services derived from the conservation of the constructed habitat, the Trustees determined this project could not meet the minimum construction and restoration project requirements. This project is not feasible as it would require extensive maintenance to ensure long-term sustainability and would not meet the minimum habitat required to offset the services lost (i.e. the preferred selection criteria (Section 6.1)); therefore the Brazos County Museum of Natural History restoration project was not selected as a feasible restoration alternative.



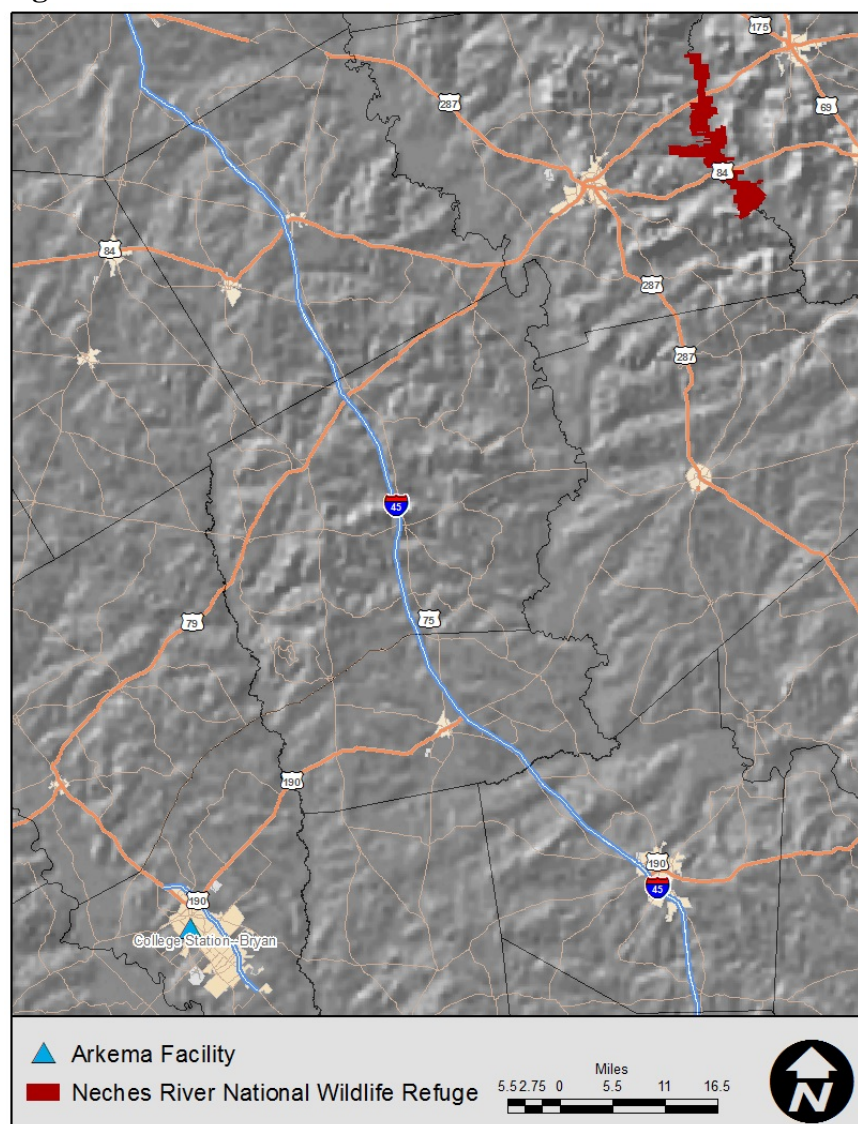
**Figure 7.1.5-1: Brazos County Museum of Natural History Wetland Restoration Site**



### 7.1.6 Neches River National Wildlife Refuge (NWR)

The USFWS has recently been authorized to establish a new NWR in east Texas along a 38-mile reach of the upper Neches River dividing Anderson and Cherokee counties (Figure 7.1.6-1). As planned, the refuge will be approximately 35 miles south-southeast of Tyler, 100 miles southeast of Dallas, and 102 miles northeast of the Facility. The refuge will be located on both sides of the Neches River and includes overflow bottomlands and adjacent pine and pine/hardwood forests. The USFWS will manage acquired lands in order to conserve, protect, and enhance a diversity of habitats and wildlife resources. Such management will be in accord with the authorities granted to the USFWS under the National Wildlife Refuge System (NWRS) Improvement Act of 1997 and other statutes governing the management of fish and wildlife resources on NWRS lands. The purposes of the refuge is to: (1) protect nesting, wintering, and migratory habitat for migratory birds of the Central Flyway; (2) protect the bottomland hardwood forests for their diverse biological values and wetland functions of water quality improvement and flood control assistance; and (3) provide for compatible wildlife-dependent recreation opportunities in accordance with the NWRS Improvement Act of 1997.

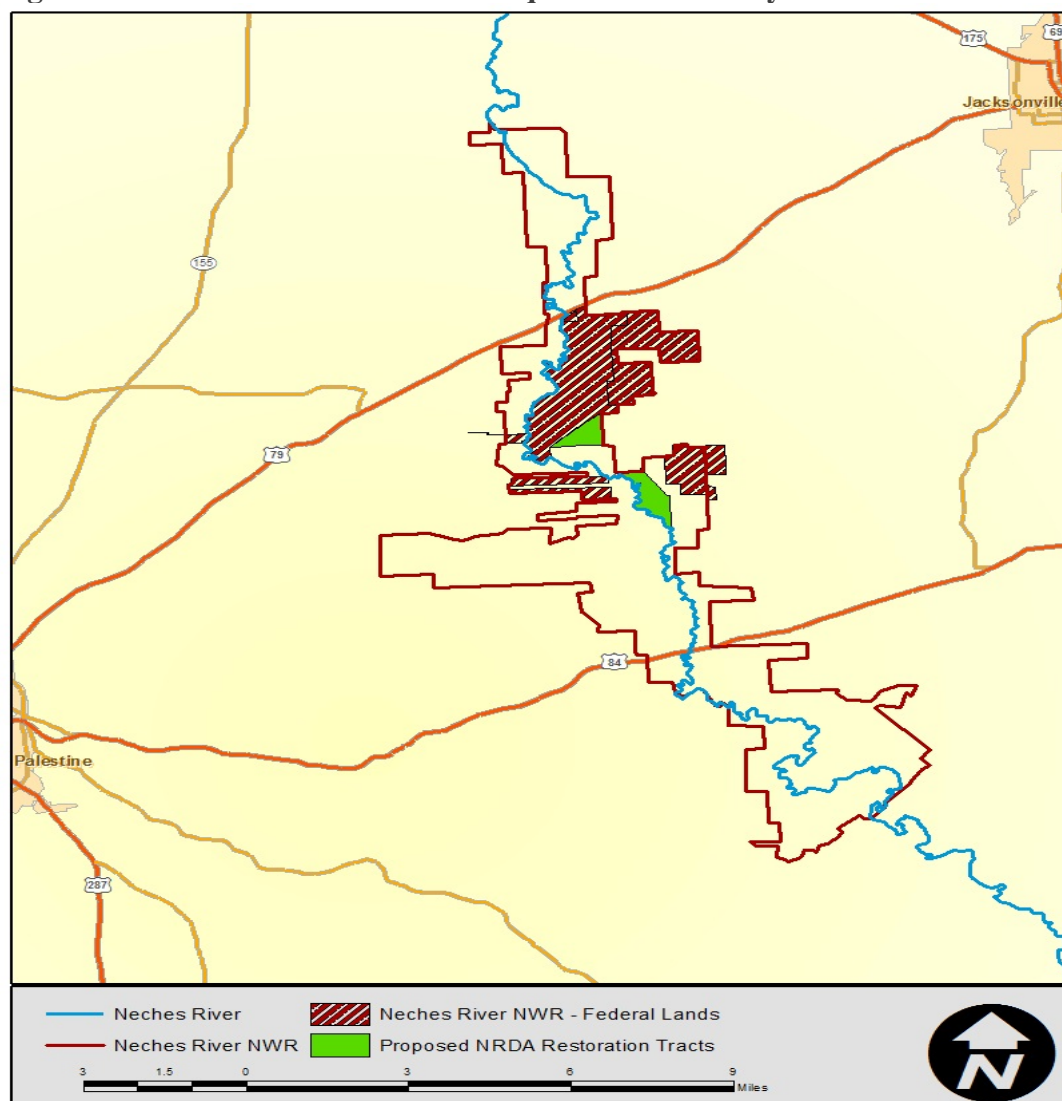
**Figure 7.1.6-1: Neches River NWR**



The Neches River NWR is one of four refuges located within the Little River NWR Complex, which includes the 15,000 acre Little River NWR in McCurtain County, Oklahoma, the 8,500 acre Caddo Lake NWR in Harrison County, Texas, the 3,802 acre Little Sandy NWR in Wood County, Texas, and the 25,300 acre Neches River NWR located in Cherokee and Anderson counties, Texas. The acquisition boundary was approved in 2006. The scope and dimensions of the acquisition boundary (Figure 7.1.6-2) have been addressed through a separate environmental assessment (USFWS 2006). As approved, the refuge acquisition boundary allows the USFWS to initiate proposals for the acquisition of lands within the boundary. The approved acquisition boundary consists of 25,300 and USFWS has acquired approximately 4,400 acres to date. This proposed project is to acquire wetland and bottomland hardwood habitat to be preserved by the USFWS as part of the Neches River NWR.



Figure 7.1.6-2: Neches River NWR Acquisition Boundary



Two tracts that have been identified for sale and inclusion in the Neches River NWR total approximately 600 acres with 402 acres of bottomland hardwoods, open water, and Neches River riparian habitat along the Anderson/Cherokee County line. While these tracts have limited commercial value, they do provide significant ecological services from the dense wet bottomland hardwoods and riparian river front along the Neches River. The bottomland areas and floodplains are mainly made up of bottomland hardwood species typical of east Texas. Common tree species on the proposed preservation property can be found in Table 7.1.6-1. With over 3 miles of Neches River frontage, this property has a diverse aquatic and wildlife population. Diverse bottomland hardwoods interspersed by wetlands and open lowland fields support a variety of small mammal and bird species. This mixed wetland, open water, bottomland hardwood habitat provides important breeding habitat for migratory and year round avian residents. Open water and wetlands within this complex provide high-quality habitat for

wintering waterfowl, while fringe upland and oak hardwoods provide habitat suitable for numerous woodpeckers and other woodland species. During the Trustee inspection of the proposed tracts, great blue heron (*Ardea herodias*) were observed foraging. Braided and interconnected water ways and wetlands support a significant fish, reptile, and amphibian community including largemouth bass (*Micropterus salmoides*), green sunfish (*Lepomis cyanellus*), and water moccasin (*Agkistrodon piscivorus*). The Trustees, having evaluated these tracts and having identified significant ecological services similar in nature to those lost at the Site and in sufficient quantity (upwards of 600 acres, with a minimum of 402 acres) to compensate for those losses, identified the acquisition of the identified property within the Neches NWR as the preferred restoration alternative.

**Table 7.1.6-1:** Common tree species on Preservation Property

Common Name	Scientific Name
red maple	<i>Acer rubrum</i>
river birch	<i>Betula nigra</i>
black hickory	<i>Carya texana</i>
green ash	<i>Fraxinus pennsylvanica</i>
red cedar	<i>Juniperus virginiana</i>
sweetgum	<i>Liquidambar styraciflua</i>
blackgum	<i>Nyssa sylvatica</i>
post oak	<i>Quercus stellata</i>
southern red oak	<i>Q. falcata</i>
overcup oak	<i>Q. lyrata</i>
blackjack oak	<i>Q. marilandica</i>
basket oak	<i>Q. michauxii</i>
water oak	<i>Q. nigra</i>
willow oak	<i>Q. phellos</i>
American elm	<i>Ulmus americana</i>

## 7.2 Preferred Restoration Alternative

The NRDA regulations require the Trustees to identify a reasonable range of restoration alternatives and meet certain criteria in the selection of the preferred restoration type and project selected to replace lost natural resource services. The Trustees determined that the Neches River NWR project would protect at least 402 acres of open water, wetland, and bottomland hardwoods along the Neches River NWR which would provide adequate compensation for lost natural resource services at the Site.

As discussed in section 1.3, agencies must consider the environmental effects of their actions in terms of NEPA. These effects may include, among others, impacts to social, cultural, and

economic resources as well as natural resources, except where a categorical exclusion or other exception to NEPA applies. The Neches River NWR project is intended in part to preserve the watershed and improve local water quality, and the existing habitat acquisition will not adversely affect floodplains, wetlands, or municipal watersheds. A search of the Texas Historical Commission's online Atlas Map did not indicate the presence of American Indian religious or cultural sites, archaeological sites, or historic properties within the preferred restoration alternative. The land acquisition does not encompass congressionally designated areas, such as wilderness, wilderness study areas, or national recreation areas; inventoried road-less areas or potential wilderness areas; or research natural areas and does not contain potential habitat for federally listed species. As such, the land acquired through this project would have no adverse effect on federally listed, threatened, or endangered species or their designated critical habitat; species proposed for federal listing; or proposed critical habitat. Therefore, based upon the information provided above, the proposed Neches River NWR land acquisition was consistent with the category described in 36 C.F.R. § 220.6(d)(6), "Acquisition of land or interest in land."

The Trustees evaluated the ecological value and environmental effects of this project, and presented the Neches River NWR Project as the proposed preferred restoration alternative within the Draft DARP for public review and comment. Having received no comment, the Trustees determined that this preferred restoration alternative, if completed in accordance with all requirements of this DARP, would fully compensate for ecological injuries and service losses until the system returns to baseline condition.

### **8.0 ENVIRONMENTAL COMPLIANCE AND CONSISTENCY WITH OTHER KEY STATUTES, REGULATIONS AND POLICIES**

The two major environmental statutes that guide the restoration of the injured resources and lost services resulting from releases of hazardous substances at or from the Facility are CERCLA and CWA. These statutes set forth a specific process of environmental impact analysis and public review. Compliance with the NEPA has been previously discussed in section 1.2 and 7.2 and determined to be categorically excluded as described in 36 C.F.R. § 220.6(d)(6). Additionally, the Trustees must comply with several additional federal, state, and local applicable statutes, regulations and policies. Relevant and potentially relevant statutes, regulations, and policies are discussed below.

In addition to compliance with these statutes and regulations, the Trustees consider relevant environmental or economic programs or plans that are ongoing or planned in or near the affected environment, and they should ensure that restoration projects neither impede nor duplicate such programs or plans. By coordinating restoration projects identified in this document with other relevant restoration programs and plans, the Trustees enhanced the overall effort to restore and

improve the environment and resources affected by releases of hazardous substances at or from the Facility. The preferred restoration alternative identified in this DARP, acquisition and preservation of wetland and bottomland hardwood habitat for addition to the Neches River NWR, involves activities conducted in wetlands and waters of the United States. Therefore, these activities are subject to review and approval by the appropriate regulatory agencies. Compliance with other key statutes, regulations, and policies are presented in the following subsections.

### **8.1 RIVERS AND HARBORS ACT OF 1899, 33 U.S.C. § 401 ET SEQ.**

The Rivers and Harbors Act (RHA) regulate development and use of the nation's navigable waterways. Section 10 of the RHA prohibits unauthorized obstruction or alteration of navigable waters and vests the U. S. Army Corps of Engineers with authority to regulate discharges of fill and other materials into such waters. Restoration actions that must comply with the substantive requirements of CWA Section 404 must also comply with the substantive requirements of Section 10. Compliance with the RHA is addressed as part of the CWA Section 404 permitting process. The acquisition and preservation of wetland and bottomland hardwood habitat for addition to the Neches River NWR will not require a Section 404 permit.

### **8.2 FISH AND WILDLIFE CONSERVATION ACT, 16 U.S.C. § 2901 ET SEQ.**

This Act encourages all federal agencies to use their statutory and administrative authorities, to the maximum extent practicable and consistent with their statutory responsibilities, to conserve and to promote the conservation and protection of non-game fish and wildlife species and their habitats. The acquisition and preservation of wetland and bottomland hardwood habitat for addition to the Neches River NWR is consistent with the Act and will promote and conserve, and have no adverse effect on, fish and bird habitat, including non-game fish and wildlife and their habitat.

### **8.3 FISH AND WILDLIFE COORDINATION ACT, 16 U.S.C. § 661 ET SEQ.**

The Fish and Wildlife Coordination Act (FWCA) requires that federal agencies consult with the USFWS, NOAAs National Marine Fisheries Service, and state wildlife agencies regarding activities that affect, control, or modify waters of any stream or bodies of water, in order to minimize the adverse impacts of such actions on fish and wildlife resources and habitat. For restoration projects that move significant amounts of material into or out of coastal waters or wetlands, these consultations are generally incorporated into the process of complying with Section 404 of the CWA, the RHA, or other required federal permit, license, review, or consultation requirements.



The Trustees coordinated directly with the USFWS and the TPWD (the appropriate state wildlife agency under the FWCA) in developing the DARP and believe that the acquisition and preservation of wetland and bottomland hardwood habitat for addition to the Neches River NWR will have a positive effect on fish and wildlife resources.

#### **8.4 MIGRATORY BIRD TREATY ACT, 16 U.S.C. § 703 – 712**

The Migratory Bird Treaty Act provides for the protection of migratory birds. The acquisition and preservation of wetland and bottomland hardwood habitat for addition to the Neches River NWR will have no adverse effect on migratory birds. No migratory birds will be pursued, hunted, taken, captured, killed, attempted to be taken, captured or killed, possessed, offered for sale, sold, offered to purchase, purchased, delivered for shipment, shipped, caused to be shipped, delivered for transportation, transported, caused to be transported, carried, or caused to be carried by any means whatever, received for shipment, transported or carried, or exported, at any time, or in any manner.

#### **8.5 MIGRATORY BIRD CONSERVATION ACT, 16 U.S.C. § 715 ET SEQ.**

The Act provides authority for the DOI to acquire and manage lands for conservation of migratory birds. The acquisition and preservation of wetland and bottomland hardwood habitat for addition to the Neches River NWR will occur within lands that are managed for the conservation of migratory birds and other wildlife. The preferred restoration alternative will preserve and create habitats that are important to the USFWS' efforts to conserve migratory birds and wildlife, consistent with this Act.

#### **8.6 NATIONAL HISTORIC PRESERVATION ACT, 16 U.S.C. § 470 ET SEQ, & ARCHAEOLOGICAL RESOURCES PROTECTION ACT, 16 U.S.C. § 470AA-MM.**

These statutes require federal agencies, or federally funded entities, to consider the impacts of their proposed actions on historic properties and cultural or archaeological resources. The preferred restoration alternative does not involve and will not occur near any site listed on the National Register of Historic Places; and the Trustees have no information indicating that there are known sites or properties eligible for listing on the National Register of Historic Places or any cultural or archaeological resources in the vicinity of the project area. No federally recognized Texas Tribes are located in the vicinity of the acquisition property; thus, a consultation was not necessary.

#### **8.7 INFORMATION QUALITY ACT, PUBLIC LAW 106-554**

Information disseminated by federal agencies to the public after October 1, 2002, is subject to guidelines developed by each agency pursuant to Section 515 of Public Law 106-554 that are intended to ensure and maximize the quality of information (i.e., the objectivity, utility and integrity) each agency disseminates to the public. This DARP is an information product covered by information quality guidelines established by DOI for this purpose. The quality of the information contained has been certified to be consistent with applicable guidelines.

## **8.8 EXECUTIVE ORDER NUMBER 11514 (35 FED. REG. 4247) – PROTECTION AND ENHANCEMENT OF ENVIRONMENTAL QUALITY**

This Executive Order directs federal agencies to monitor, evaluate, and control their activities in order to protect and enhance the quality of the nation's environment, to inform and seek the views of the public about these activities, to share data gathered on existing or potential environmental problems or control methods, and cooperate with other governmental agencies. The preferred restoration alternative and the release of this DARP are consistent with the goals of this Order. The acquisition and preservation of wetland and bottomland hardwood habitat for addition to the Neches River NWR is the product of inter-governmental cooperation and will protect and enhance the environment. The restoration planning process has and continues to provide the public with information about the restoration effort.

## **8.9 EXECUTIVE ORDER 12898 (59 FED. REG. 7629) - ENVIRONMENTAL JUSTICE**

This Executive Order directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. There are no low-income or ethnic minority communities that would be adversely affected by the acquisition and preservation of wetland and bottomland hardwood habitat for addition to the Neches River NWR. The preferred restoration alternative will enhance the quality of the environment for all populations.

## **8.10 EXECUTIVE ORDER NUMBER 11988 (42 FED. REG. 26,951) – FLOODPLAIN MANAGEMENT**

This Executive Order requires federal agencies to reflect consideration of flood hazards and the natural and beneficial values served by floodplains in carrying out responsibilities involving federally financed or assisted construction and improvements and federal activities and programs affecting land use. While the acquisition and preservation of wetland and bottomland hardwood habitat for addition to the Neches River NWR will take place within a floodplain, it is consistent with this Order as it involves activities that will serve only to restore, expand, and preserve the beneficial values of the floodplain.

### **8.11 EXECUTIVE ORDER NUMBER 11990 (42 FED. REG. 26,961) - PROTECTION OF WETLANDS**

This Executive Order directs federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands in carrying out agency responsibilities for acquiring, managing, and disposing of federal lands and facilities; providing federally undertaken, financed, or assisted construction and improvements; and conducting federal activities and programs affecting land use, including water and related land resources planning, regulating, and licensing activities. The acquisition and preservation of wetland and bottomland hardwood habitat for addition to the Neches River NWR is compliant with this Executive Order as it will protect existing wetlands and the services it provides.

### **8.12 EXECUTIVE ORDER NUMBER 12962 (60 FED. REG. 30,769) - RECREATIONAL FISHERIES**

This Executive Order directs federal agencies to, among other things, foster and promote restoration that benefits and supports viable, healthy, and sustainable recreational fisheries. The acquisition and preservation of wetland and bottomland hardwood habitat for addition to the Neches River NWR will protect habitat that will help support and sustain recreational fisheries in the Neches River watershed.

### **8.13 TEXAS WATER CODE**

The Texas Water Code provides the State with a cause of action to recover the costs to assess impacts on the environment of a spill or discharge of hazardous substances and to restore land and aquatic resources held in trust or owned by the State (Tex. Water Code § 26.265).

CERCLA and the Texas Water Code establish similar liability schemes. CERCLA holds owners and operators liable for “damages for injury to, destruction of, or loss of natural resources, including reasonable costs of assessing injury, destruction, or loss resulting from such a release. . .” 42 U.S.C. § 9607(a)(4)(C). The Texas Water Code § 26.265 imposes joint and several liability against “responsible persons,” who include the owner or operator of a facility from which a spill emanates. Liability under CERCLA is also joint and several unless a responsible party proves that the injury or damage is divisible. Based on the terms of this NRDA settlement, the preferred restoration alternative fulfills the Texas Water Code requirements.

## **9.0 Conclusion**

This DARP has been prepared by state and federal natural resource Trustees to address natural resources and services injured or lost due to releases of hazardous substances at or from the Facility. As described in this DARP, the overall objective of the restoration process is to make the environment and public whole for injuries to natural resources and/or service losses resulting from the release of hazardous substances at or from the Facility. To achieve this fundamental objective, the Trustees determined that the preferred restoration alternative must have an ecological and a geographical relationship to injured resources and lost services. The Trustees approached restoration planning with the view that the injured natural resources/lost services are part of an integrated ecological system and that the preferred restoration action is the acquisition and/or preservation of 402 acres of mixed, contiguous aquatic/wetland habitat. The Trustees, having reviewed 21 potential restoration projects in east central Texas, proposed a restoration project that would acquire a minimum of 402 acres of open water, wetland, and bottomland hardwoods along the Neches River. The acquired property would be added to the Neches River NWR and managed in accordance with the approved refuge management plan. It is anticipated that this acquisition will provide the most relevant ecological benefits within the geographical area targeted for restoration actions. Other properties evaluated within Brazos County and the surrounding counties, while more proximal to the injured resources, were determined to be technically less feasible and less cost effective than the preferred restoration alternative. The Trustees, having evaluated this and the other available restoration projects, have further determined to the best of their ability that this assessment and the preferred restoration alternative are in compliance with all applicable federal and state statutes, including NEPA. In the event that the Neches River NWR Project becomes unavailable or infeasible, the Trustees at their discretion may implement another similar acquisition for the Neches River NWR or propose replacement projects as an amendment to this DARP.

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