

# NATURAL RESOURCE PROGRAMMATIC RESTORATION PLAN and ENVIRONMENTAL ASSESSMENT

FOR

THE OKLAHOMA PORTION OF THE TRI-STATE MINING DISTRICT NATURAL  
RESOURCE DAMAGE ASSESSMENT AND RESTORATION SITE, IN NORTHEAST, OK

DEVELOPED BY:  
THE TAR CREEK TRUSTEE COUNCIL

July 2017

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## **List of Acronyms**

BIA	Bureau of Indian Affairs
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
DOI	United States Department of the Interior
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
EO	Executive Order
HPO	Historic Preservation Officer
IEc	Industrial Economics
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOMNRDAR	Northeastern Oklahoma Mining and Natural Resource Damage Assessment and Restoration
NRD	Natural Resource Damages
NRDAR	Natural Resource Damage Assessment and Restoration
MBTA	Migratory Bird Treaty Act
ODWC	Oklahoma Department of Wildlife Conservation
OU	Operable Unit
OWRB	Oklahoma Water Resources Board
PRP	Potentially Responsible Party
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
T&E	Threatened and Endangered
TCTC	Tar Creek Trustee Council
TSMD	Tri-State Mining District
USFWS	U.S. Fish and Wildlife Service

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## Executive Summary

The Northeast Oklahoma Mining Natural Resource Damage Assessment and Restoration Site (NOMNRDAR Site) is located within the northeast Oklahoma section of the Tri-State Mining District (TSMD). The TSMD is an area covering more than 2,500 square miles across portions of southeast Kansas, southwest Missouri, and northeast Oklahoma. The TSMD was the site of commercial lead and zinc mining that began around 1848 and continued until the 1970s. Significant portions of the TSMD were and continue to be affected by releases of hazardous substances related to mining operations. The Tar Creek Superfund Site, one of four Superfund sites located within the TSMD, falls within the NOMNRDAR Site boundary. The NOMNRDAR Site is home to numerous wetlands and ponds. Several creeks run through the NOMNRDAR Site, including Tar Creek. The NOMNRDAR Site includes all areas in Northeastern Oklahoma, terrestrial and aquatic, where hazardous substances released from the TSMD have come to be located or where natural resources or the services they provide may have been affected by the releases of these hazardous substances.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 U.S.C. § 9601 *et seq.*) and its implementing regulations authorize federal and state agencies, as well as Indian tribes, to act as trustees of natural resources on behalf of the public. When hazardous substances are released into the environment and harm the public's natural resources, these trustees conduct assessments to determine the extent of injury, recover monetary and other damages from the responsible parties, and use these recovered damages to plan and implement restoration actions that will compensate the public for the loss of its natural resources and the services they would have provided but for the hazardous substance releases.

The natural resource trustees for the NOMNRDAR Site are the U.S. Department of the Interior, acting through the U.S. Fish and Wildlife Service and the Bureau of Indian Affairs; the State of Oklahoma, acting through the Oklahoma Secretary of the Environment, the Oklahoma Department of Wildlife Conservation, and the Oklahoma Department of Environmental Quality; the Cherokee Nation; the Eastern Shawnee Tribe of Oklahoma; the Miami Tribe of Oklahoma; the Ottawa Tribe of Oklahoma; the Peoria Tribe of Indians of Oklahoma; the Seneca-Cayuga Nation; and the Wyandotte Nation (collectively, the "Trustees" or the "Tar Creek Trustee Council").

The Trustees prepared this Programmatic Restoration Plan and Environmental Assessment (Programmatic RP/EA) to identify the restoration framework at the NOMNRDAR Site, as well as explain the process by which they will evaluate and select restoration projects to expend recovered restoration funds in order to restore, replace, rehabilitate, and/or acquire the equivalent of natural resources and their services injured by the releases of heavy metals. Through the CERCLA Natural Resource Damages Assessment and Restoration (NRDAR) process, the Trustees recovered cash settlements for natural resource damages to be used to restore, replace, rehabilitate, and/or acquire the equivalent of natural resources and their associated services injured at the NOMNRDAR

Site. At the time of publication, the available funds from these settlements approach \$34 million.

The Restoration Plan portion of this Programmatic RP/EA addresses the Trustees' obligations under the CERCLA NRDAR regulations (43 C.F.R. Part 11) to produce a restoration plan before commencing restoration. The Programmatic Environmental Assessment portion of this Programmatic RP/EA fulfills the requirement under NEPA that the Federal Trustees evaluate the environmental impacts of the restoration alternatives and provide for public participation in the consideration of these alternatives.

The Trustees evaluated four general restoration alternatives that address injuries associated with the terrestrial and aquatic habitats affected within the NOMNRDAR Site and identified one preferred alternative, Alternative 4: On- and Off-Site Restoration. This alternative proposes the use of a combination of on-site and off-site actions to restore, rehabilitate, replace, and/or acquire the equivalent of the injured natural resources and their associated services lost at the NOMNRDAR Site. These actions will include both terrestrial and aquatic projects and will be coordinated with the ongoing remedial actions at the NOMNRDAR Site to promote efficiency and long-term project effectiveness.

Lastly, this Programmatic RP/EA identifies the process by which the Trustees will involve the public in restoration project selection. It describes the criteria the Trustees will use in evaluating projects and sets out the process for the public to identify potential restoration projects, as well as how the Trustees will provide the public with notice of and opportunities to comment on specific proposed projects.



# Chapter 1: Introduction

This Northeast Oklahoma Mining Natural Resource Restoration Plan and Programmatic Environmental Assessment (Programmatic RP/EA) is designed to (1) coordinate the identification, selection, and implementation of restoration projects for the Oklahoma portion of the Tri-State Mining District (TSMD) (see Figure 1) and to (2) examine the environmental impacts of these restoration alternatives and provide for public participation in the planning and implementation of such alternatives. The Northeast Oklahoma Mining Natural Resource Damage Assessment and Restoration Site (NOMNRDAR Site) (see Figure 3) includes all areas in Northeastern Oklahoma where hazardous substances released from the TSMD have come to be located or where natural resources or the services they provide may have been affected by the releases of these hazardous substances (see Chapter 2.1 for a more complete description of the TSMD). Areas affected by releases of hazardous substances from mining operations include, but are not limited to: mining sites and mine waste (chat) storage sites; transition zones, tributaries, and floodplains impacted by releases from mining operations; and Grand Lake O' the Cherokees (Grand Lake). This Programmatic RP/EA will guide the Tar Creek Trustee Council (TCTC)<sup>1</sup> in developing and selecting projects that will restore, replace, rehabilitate, and/or acquire the equivalent of natural resources injured by the releases of heavy metals.

The TCTC prepared the Northeast Oklahoma Mining Natural Resource Restoration Plan (RP). The Department of the Interior (DOI) bureaus on the TCTC prepared the Programmatic Environmental Assessment with input from the other TCTC members. The U.S. Fish and Wildlife Service (USFWS), is the Authorized Official for DOI under Section 107(f) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9607(f), Section 311 of the Clean Water Act (CWA), 33 U.S.C. § 1321, and other applicable law, including Subpart G of the National Contingency Plan (NCP), 40 C.F.R. §§ 300.600-300.615. For the purposes of this Programmatic RP/EA, the members of the TCTC (see footnote 1) are collectively referred to as the “Trustees” and the tribal Trustees that are members of the TCTC (see footnote 1) are collectively referred to as the “Tribes.”

## 1.1 Overview of Natural Resource Damage Assessment and Restoration

Natural resource trustees act on behalf of the public to assess injuries and recover damages (funds) to develop and implement plans for restoring, rehabilitating, replacing, or acquiring the equivalent of the natural resources that have been negatively impacted by releases of hazardous substances. DOI has published regulations setting forth procedures

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<sup>1</sup> Tar Creek Trustee Council members: U.S. Department of Interior (U.S. Fish and Wildlife Service and Bureau of Indian Affairs), State of Oklahoma (Secretary of the Energy and Environment, Oklahoma Department of Wildlife Conservation, and Oklahoma Department of Environmental Quality), Cherokee Nation, Eastern Shawnee Tribe of Oklahoma, Miami Tribe of Oklahoma, Ottawa Tribe of Oklahoma, Peoria Tribe of Indians of Oklahoma, Seneca-Cayuga Nation, and Wyandotte Nation.

by which a natural resource trustee can determine compensation for injuries to natural resources and their services that have not been, nor are expected to be, addressed by response actions (CERCLA NRDAR regulations, 43 C.F.R. Part 11). The natural resource damage assessment and restoration (NRDAR) process involves both assessment activities and restoration activities. In general, the purpose of assessment activities is to determine whether there are injuries to natural resources and their services from release(s) of hazardous substance(s), quantify the extent and severity of the injuries, and determine and recover from potentially liable parties damages that will compensate the public for the loss of the natural resource(s). The purpose of restoration activities is to bring injured natural resources and their services to baseline condition (the condition where they can provide the level of services that would have existed but for the release) through restoring, rehabilitating, replacing, or acquiring the equivalent of the injured natural resources and resource services (42 U.S.C. 9611(i)). The first step in restoration is restoration planning, through which the natural resource trustees identify and evaluate alternatives for restoration and ultimately select a preferred alternative for restoration.

Federal, State, and Indian tribal natural resource trustees have jurisdiction over the natural resources that belong to, are managed by, appertain to, or are otherwise controlled by those trustees, including the resources' supporting ecosystems and their services (40 C.F.R. §§ 300.600, 300.605, and 300.610). Additionally, Indian tribal natural resource trustees have jurisdiction over natural resources that are held in trust for the benefit of that Indian tribe (40 C.F.R. § 300.610). CERCLA and its implementing regulations contemplate concurrent federal, state, and tribal trusteeship for certain natural resources. The natural resources and their services for which there is concurrent jurisdiction among trustees necessarily vary from site to site and are based on whether a trustee manages or controls the resource. Other authorities and legal requirements that may guide the Trustees in the development and implementation of the Programmatic RP/EA are found in Appendix C.

In developing the restoration approach for the NOMNRDAR Site, the TCTC took into account the remedies implemented to date and the proposed remedial action to be undertaken by the EPA and/or responsible parties. Although some injured natural resources may return to baseline condition over a natural recovery period once the hazardous substances either are removed or remediated, restoration activities accelerate the return to baseline condition. Other restoration activities may substitute for resources or services so that the overall baseline condition is achieved.

Restoration will be implemented consistent with this Programmatic RP/EA and supplemental restoration planning documents and environmental compliance analyses, such as under the National Environmental Policy Act (NEPA), Endangered Species Act (ESA), and National Historic Preservation Act (NHPA). This Programmatic RP/EA establishes the framework for restoration at the NOMNRDAR Site, while site-specific restoration projects will be proposed and evaluated in subsequent restoration documents that flow from, or "tier" from this Programmatic RP/EA. On-site restoration will occur concurrent with or following remedial actions.

### 1.1.1 Natural Resources, Services, Restoration Defined

CERCLA broadly defines “natural resources” to include land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States, any State or local government, or any Indian tribe (42 U.S.C. § 101(16)).

Natural resource services may be classified as follows:

- *Ecological services* - the physical, chemical, or biological functions that one natural resource provides for another. Examples include provision of food, protection from predation, and nesting habitat, among others; and
- *Human services* - direct and passive human uses of natural resources or “functions of natural resources.” Examples include fishing, hunting, nature photography, education, and tribal subsistence and cultural uses.

In considering both natural resources and services, the Trustees are addressing the physical and biological environment and the relationship of people with that environment.

CERCLA authorizes the Trustees to take action to restore, rehabilitate, replace, and/or acquire resources equivalent to those that were injured. “Restoration” or “rehabilitation” means actions undertaken to return an injured resource to its baseline condition, as measured in terms of the injured resource’s physical, chemical, or biological properties or the services it previously provided, when such actions are in addition to response action completed or anticipated, and when such actions exceed the level of response actions determine appropriate to the site pursuant to the NCP (43 C.F.R. § 11.14(II)).

Natural resource restoration may be classified as follows:

- *Primary restoration* - any action taken to return an injured natural resource and its services to its baseline condition. Restoration projects that directly restore natural resource injuries caused by releases of hazardous substances are considered primary restoration. An example of primary restoration is the removal of contaminated materials from an ecosystem where they are causing injury to natural resources; or
- *Compensatory restoration* - any action taken to offset the interim losses of natural resources from the date of the event until recovery (USBLM, 2008). An example of compensatory restoration is the removal of undesirable eastern red cedar trees from a glade habitat to compensate for injuries to substantially similar natural resources that occurred elsewhere.

“Acquisition of the equivalent” or “replacement” means the substitution for an injured resource with one that provides the same or substantially similar services (43 C.F.R. §§ 11.14(a) and (ii)). An example is the purchase of a property containing high-quality natural resources that is threatened with development or destruction to compensate for similar natural resources lost elsewhere.

### 1.1.2 Residual Injury after Response Actions

Restoration under the NRDAR process is designed to complement remedial responses that are underway or planned. The NRDAR process takes into account the extent to which response actions are expected to return natural resources and the services they provide to their baseline condition. Generally, the response action focuses on reducing risks to human health and the environment posed by hazardous contamination. Simultaneous or subsequent restoration activities initiated by the Trustees address injuries to natural resources and the services they provide due to release(s) of hazardous substances. Additionally, the Trustees may assess and restore resources injured during the remedial process. Consequently, restoration addresses residual injury and natural resource service losses that remain until and upon completion of a remedial response. For example, the remedial actions in the NOMNRDAR Site will include construction of permanent repositories for mining wastes that are designed to minimize and localize the effects of multiple tailings piles. Because these sites will be designated waste management areas, the portions of habitat in these areas will be permanently lost. Thus, there will be residual injury and natural resource service losses.

### 1.1.3 Coordination with EPA and Tri-State Trustee Councils

The TCTC is working with EPA to understand the timing of remediation. While some potential Oklahoma restoration projects cannot be implemented until remediation is complete, other on-site restoration projects could be implemented concurrent with remediation through coordination with EPA (see Section 2.3 for remediation history).

The TCTC is focused on assessing injuries, recovering damages, and implementing restoration in the Oklahoma portion of the TSMD. Trustee Councils in Kansas and Missouri are conducting similar actions in their respective states and the TCTC is coordinating with these Trustee Councils when appropriate.

## **1.2 Purpose and Need for Action**

The Trustees' proposed action is the development of a process to identify, evaluate and select restoration projects tailored to restore, replace, rehabilitate, and/or acquire the equivalent of natural resources at the NOMNRDAR Site (and the services they provide) that have been injured by the releases of hazardous substances from mining operations within the TSMD. The purpose of the proposed action is to identify the appropriate level and location for restoration. The proposed action is necessary in order to: 1) restore or rehabilitate injured natural resources to their baseline condition; 2) replace or acquire the equivalent of natural resources (and the services they provide) injured or destroyed by hazardous substance releases; and 3) ensure statutory compliance prior to expending any funds recovered to resolve natural resource damages (NRD) claims.

## **1.3 Programmatic RP/EA Background Information**

This document does not quantify the extent of restoration needed to satisfy claims under applicable law against parties deemed responsible for environmental injury. Rather, the TCTC is conducting restoration planning to determine the best techniques to restore, rehabilitate, replace, and/or acquire the equivalent of the injured natural resources and

their associated services. In addition, this plan serves to facilitate public involvement and to comply with environmental decision-making requirements. This Programmatic RP/EA follows the CERCLA (42 U.S.C. §§ 9601-9175) and natural resource damages regulation requirements (43 C.F.R. Part 11) for preparation of a restoration plan before implementation of restoration projects.

The Programmatic RP/EA was developed prior to completion of the natural resource damage assessment and final resolution of all damages claims. The total amount of restoration that will be implemented under this Programmatic RP/EA will depend upon the restoration funds made available through resolution of natural resource damages claims, among other myriad factors. As such, the Programmatic RP/EA is designed to be flexible, allowing existing and future recoveries of natural resource damages claims to be used to implement restoration activities that fit within the Trustees' Preferred Alternative (described further in Section 3.4.4).

This Programmatic RP/EA was developed pursuant to NEPA and its implementing regulations (40 C.F.R. Part 1500 and 43 C.F.R. Part 46). The programmatic nature of the Programmatic RP/EA is intended to expedite future site-specific projects and facilitate the preparation of subsequent project-specific environmental documents through the use of tiering. As specific projects are identified, with public participation, project-specific NEPA environmental evaluation documents will be prepared. These supplemental project evaluations will reference back to, or be "tiered" from, this Programmatic RP/EA. Any modifications or supplements to the Programmatic RP/EA will be provided for public review and comment, and finalized before any modifications will be implemented. (See Chapter 6 for information on public participation). Additional environmental compliance analyses, such as consultation under the Endangered Species Act and the National Historic Preservation Act, will also be completed on a project-by-project basis.

## **1.4 NRDAR Settlement History in Northeastern Oklahoma**

At the time of publication of this document, the Trustees have achieved several cash settlements for natural resource damages to be used for restoration activities (Table 1). These settlements provide the impetus for the creation of this Programmatic RP/EA. Table 1 below summarizes the existing restoration funding in the Oklahoma portion of the TSMD.

**Table 1 - NRDAR Settlements to date for Tar Creek<sup>2</sup>**

<b>NRD Settlement</b>	<b>Settlement Date</b>	<b>Available Funds*</b>
Eagle Picher (DOI only settlement)	February 1995	\$196,252
Asarco--(Tar Creek Trustee Council settlement)	December 2009	\$34,732,121

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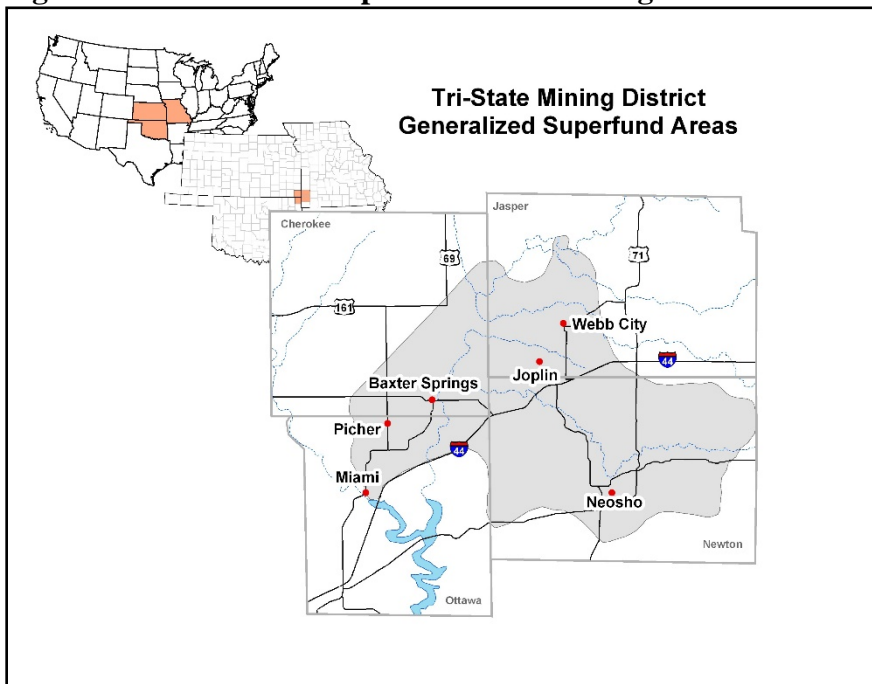
<sup>2</sup> Funds available as of June 2017. These amounts will change over time due to accrued interests and use of funds for projects.

## Chapter 2: Tri-State Mining District History and Background

### 2.1 Tri-State Mining District Description

The TSMD covers an area of more than 2,500 square miles and includes portions of southeast Kansas, southwest Missouri, and northeast Oklahoma. Because of the widespread mining, milling, and smelting activities, vast areas are impacted by mine-related waste, including hazardous substances. Currently there are four National Priority List Superfund Sites located in the TSMD: 1) Cherokee County site, Cherokee County, Kansas (EPA Region 7); 2) Oronogo-Duenweg Mining Belt site, Jasper County, Missouri (EPA Region 7); 3) Newton County Mine Tailings site, Newton County, Missouri (EPA Region 7); and 4) Tar Creek site, Ottawa County, Oklahoma (EPA Region 6). The expansive area incorporated in the TSMD sites includes portions of the Spring River and Neosho River watersheds. These watersheds include several streams that flow through mine impacted areas in Kansas, Missouri, and Oklahoma. The Spring and Neosho rivers converge at Grand Lake (see Chapter 4: Affected Environment for detailed description on streams and rivers).

**Figure 1 - Generalized map of Tri-State Mining District**



### 2.2 Tri-State Mining District History

Commercial mining began in about 1848 in Newton County, Missouri, and moved westward into Kansas and southward into Oklahoma. Commercial smelters occurred in all three states within the TSMD. Historically, lead was the ore of primary interest within the TSMD; however, the ore was rich in zinc deposits and zinc production became

increasingly important over time. The TSMD is identified as the fourth largest historic producer of lead and the number one historic producer of zinc within the United States.

Although mining and ore processing in the TSMD ceased in the 1970s, waste (bull rock, chat, and tailings) containing hazardous substances such as lead and zinc from mining operations of the preceding 150 years remain a prevalent feature of the landscape. Chat (coarse, pebble-like rock) and tailings (fine, sand-like material) were deposited on the ground near the mines. Tailings with high concentrations of lead and zinc were also deposited in impoundments formed behind coarser grained chat, which served as a dam or berm. Chat piles range from one acre to hundreds of acres in area and from one foot to several hundred feet tall. For some piles, the bulk of the volume of the chat has been removed, leaving only a footprint or chat base of a once much larger pile. The chat footprint may extend several feet into the ground due to the weight of the larger pile compressing the chat into the ground over time. Additionally, chat and tailings migrated and continue to migrate to the surrounding land and the many tributaries, streams, and rivers flowing through the TSMD. (See generally, *In re ASARCO, LLC, R. Bull and A. Medine Expert Reports*).

### **2.3 NOMNRDAR Site**

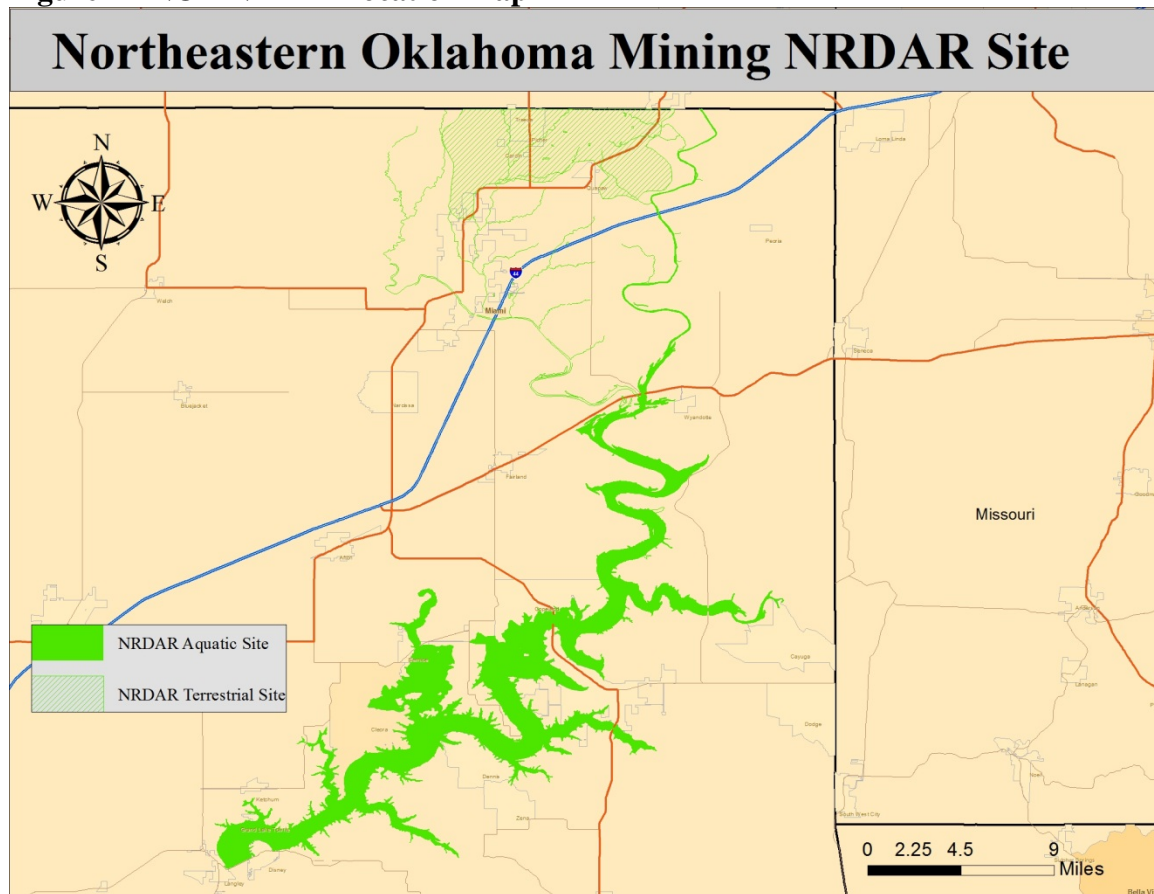
As stated previously, the NOMNRDAR Site (see Figure 3) includes all areas in Northeastern Oklahoma where hazardous substances released from the TSMD have come to be located or where natural resources or the services they provide may have been affected by the releases of these hazardous substances. (For more information on the injured resources see section 2.6). The NOMNRDAR Site includes an Aquatic Site component, a Terrestrial Site component, and a Tribal lost Use Site component. The Terrestrial Site component is comprised of the contaminated upland habitats in and around the chat piles in Ottawa County, as well as contaminated riparian and floodplain adjacent to the streams and creeks. The Aquatic Site component includes the Spring River, Neosho River, and tributaries, including Elm Creek, Tar Creek, and Grand Lake. Finally, there is also a Tribal lost Use component to the NOMNRDAR site, which includes recreational and Tribal uses of natural resources.

### **2.4 Tribal Presence in the TSMD**

United States Indian policy began removing tribes to present day Oklahoma in 1803; a practice that continued through 1867. Removed tribes established their homes and communities in accordance with their tribal cultural settlement patterns. The new settlements exhibited a transitory material culture assemblage between traditional and European goods. The Dawes Act in 1896 (and subsequent amendment by the Curtis Act in 1898) brought a checkerboard pattern of property ownership of fee, restricted, and trust tribal lands to eastern Oklahoma through the creation of individual allotments. This historic period created a mosaic of cultural values among tribal and non-tribal members.



**Figure 2 - NOMNRDAR location map**



## **2.5 Tar Creek Superfund Site Remediation History**

The Tar Creek Superfund Site, as defined by EPA, is located in Ottawa County, Oklahoma. The Tar Creek Site includes areas where mining took place and mine wastes containing hazardous substances have been deposited and still remain. An estimated 50 million cubic yards or 75 million tons of chat remain in Ottawa County, covering roughly over 5,000 acres (Figure 2). The EPA and State of Oklahoma have initiated a number of remedial investigations and identified five Operable Units (OUs) at the Tar Creek Superfund Site:

- Operable Unit 1: Certain Surface water and ground water releases
- Operable Unit 2: Remediation of certain contaminated residential properties
- Operable Unit 3: Removal of mining chemicals from the Eagle Picher plant
- Operable Unit 4: Remediation of chat piles and mill ponds in nonresidential areas
- Operable Unit 5: Spring and Neosho rivers and their tributaries sediment/surface water

EPA Records of Decision (RODs) in Oklahoma were signed for OU 1 in June 1984, OU 2 in August 1997, and OU4 in February 2008.<sup>3</sup> For more information on the RODs at the Tar Creek Superfund site go to <http://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0601269>

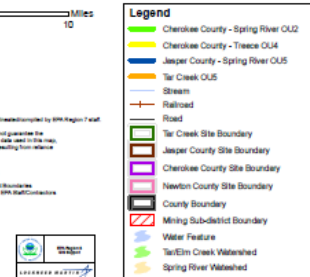
#### 2.5.1 Tar Creek OU Sediment/Surface water connection to other sites

EPA Regions 6 and 7 are coordinating on the multi-region sediment/surface water OU. In EPA Region 6, the sediment OU is designated at OU5 and includes the Spring River in Oklahoma to Twin Bridges State Park in Grand Lake. It also includes the Neosho river watershed, including Tar and Elm creeks, in Oklahoma to the Twin Bridges State Park. In EPA Region 7, the Cherokee County Superfund site sediment/surface water OU is designated OU2 and the Jasper and Newton County Superfund sites sediment/surface water OU is designated OU5. Both EPA regions are proceeding with remedial investigations (RI) for the combined sites simultaneously. No other actions have taken place under OU5

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<sup>3</sup> OU3 was an Emergency Removal action and did not have a ROD.

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## **2.6 Injured Resources and Services from Releases of Heavy Metals from TSMD**

The injury assessment is on-going, and as such, the Trustees have not yet completed the quantification of injury and service loss. This information is needed to determine the amount of restoration required to make the public whole. However, the Trustees believe that the injury studies completed to date have sufficiently demonstrated the types of injury and service loss that have occurred to enable identification of appropriate types of restoration actions (if not amounts), to compensate for the losses. Here we provide an overview of the categories of injury and service loss that have been characterized by the Trustees to date:

- Terrestrial habitat and natural resources
- Aquatic habitat and natural resources
- Groundwater resources
- Tribal services

Each category is briefly described below.

### **Terrestrial Habitat and Natural Resources**

Terrestrial habitats within the NOMNRDAR site include:

- Uplands – injured from releases from chat piles
- Floodplain and Riparian corridors – injured from contamination from flooding events

The NOMNRDAR site is located in the transition from the Cherokee lowlands (western side) to the Ozark Plateau (eastern side). The Cherokee lowlands to the west are dominated by tallgrass prairie, and give way to the oak-hickory hardwood forests of the Ozark Plateau to the east. These upland habitats are cut by the Neosho and Spring Rivers and their tributaries. Terrestrial habitats found within the bottomlands of the river corridors include riparian and floodplain habitats (Grand Lake O’ the Cherokees Watershed Alliance Foundation, 2008).

These terrestrial habitats, and many biological resources that utilize them, are injured as a result of the historical mining activities. Chat piles that are devoid of vegetation are dominant landscape features across much of the uplands of the NOMNRDAR site. The chat piles and the chat bases (the footprint underlying piles that have been removed as a part of remedial activities) have covered natural habitat, and contain elevated levels of metals compared to background (AATA 2005, EPA 2008, and Richards et al. 2012). In addition, the Trustees demonstrated that habitats surrounding the piles, “transition zones”, have also been exposed to hazardous substances, transported from the piles by wind and rain erosion. The transition zones are comprised of upland habitats adjacent to many chat pile locations (FWS, 2013). Hence, the piles have resulted in both a defined footprint of injured terrestrial habitat, as well as the exposure to metals, and injury of surrounding natural resources.

Floodplain and riparian habitats bridge the gap between upland terrestrial and aquatic habitats. For the purposes of this Programmatic RP/EA, floodplain and riparian habitats are considered as terrestrial habitats because the base of their ecosystem is supported by soils, and these habitats support many of the same species found in upland habitats. Floodplain and riparian habitats are exposed to hazardous substances through flooding events that mobilize, transport, and deposit contaminated stream sediments to floodplains and riparian corridors. To a lesser extent, these areas may also be exposed directly to mining waste or contaminated soils transported through wind and runoff.

Examples of biological resources that are known to have been injured as a result of exposure to metals released from the chat piles include:

- **Vegetation:** The loss of vegetation due to phytotoxicity is an injury under the CERCLA NRDAR regulations 43 C.F.R. § 11.62 (e)(10). Evidence suggests that contamination in areas affected by mine wastes is sufficiently toxic to cause decreases in plant biomass, productivity, changes in species diversity, and/or changes in species composition (for example, Pierzynski and Schwab, 1993; Novak et al., 2003). The Trustees also demonstrated that plants within the NOMNRDAR Site are injured based on the DOI regulations at 43 CFR § 11.62(f)(1)(ii) and § 11.64(f)(3), with metals concentrations in collected plant tissue samples exceeding consumption-based tolerance limits by several fold (Garvin et al., 2012). The absence of a healthy flora also impacts the animals and birds that depend on plants for food and shelter, and represents a loss of habitat for these species.
- **Birds:** Birds in the TSMD and NOMNRDAR have been impacted by mining wastes both through the direct toxic effects of metal exposure and also through the loss of habitat. Direct injuries include zinc poisoning of free-ranging wild birds and elevated lead levels consistent with lead poisoning (Sileo et al. 2003, Beyer et al. 2004, Carpenter et al. 2004, and Van Der Merwe et al. 2011). The elevated metals in the soil impair plant growth which means fewer insects, fruit, and seeds for smaller birds to consume. Plants also provide food and habitat for small mammals, which in turn are the prey of larger birds.
- **Mammals:** The lack of vegetation in barren or sparsely vegetated mine-impacted areas limits habitat and food resources for some mammals. In addition, mammals may experience direct toxic effects from exposure to metals in the mining wastes, similar to birds. For example, Conder and Lanno (1999) measured elevated lead concentrations in the mandibles of white-tailed deer (*Odocoileus virginianus*) harvested in northeastern Oklahoma compared to control areas, confirming exposure and potential injury to this species. Phelps and McBee (2009; 2010) found reduced weight, dental condition, and species diversity in small mammal communities in mine-impacted sites, compared to control sites.

## **Aquatic Habitat and Natural Resources**

Aquatic habitats within the NOMNRDAR Site include (see Figure 3):

- Lytle and Tar Creeks and tributaries
- Elm Creek
- Neosho River
- Spring River and tributaries
- Grand Lake O' the Cherokees and tributaries

Data collected within these aquatic habitats have demonstrated that both abiotic (surface water and sediment) and biological resources are injured as a result of exposure to hazardous substances released from mining activities in the TSMD. Here we provide illustrative examples of both abiotic and biological injuries.

Examples of injury to abiotic resources include:

- **Surface water:** Surface water is an essential natural resource. In addition, surface water provides habitat for aquatic species, such as aquatic insects and fish, and supports non-aquatic organisms, such as birds and mammals, by providing habitat for prey species, vegetation used for food and nesting materials, and resting locations along migratory routes. Injury to surface water has been determined in the NOMNRDAR Site for example, by the exceedence of applicable water quality criteria [43 C.F.R. 11.62 (b)(1)(iii)]. Substantial water quality injuries are present in several NOMNRDAR waterbodies based on exceedences of water quality criteria, including Spring River, Neosho River, Elm Creek, Tar Creek, Lytle Creek, and Beaver Creek (Oklahoma State Department of Health 1983, Parkhurst 1987, DeHay 2006 and MacDonald et al. 2010).
- **Sediment:** Injury to sediment occurs when concentrations of a contaminant in sediment are sufficient to cause adverse effects to biota (43 C.F.R. §§ 11.62 (b)(1)(iv-v)). Injury to sediment resources was determined using multiple approaches, including the use of sediment quality guidelines (SQGs) commonly applied in natural resource damage assessments and obtained from relevant technical literature. Numerous studies have demonstrated that sediment concentrations are sufficient to cause adverse effects to biota. For example, Besser et al. (2015) found reduced survival for both an amphipod (*Hyaella azteca*) and a freshwater mussel, (fatmucket, *Lampsilis siliquoidea*) as well as reduced biomass for a midge (*Chironomus dilutes*) when exposed to sediments collected from the NOMNRDAR Site.

Examples of injury to biological resources include:

- **Macroinvertebrates:** Macroinvertebrate communities are essential to the health and sustainability of any aquatic ecosystem. These communities provide myriad ecological services, including, but not limited to, nutrient cycling and provision of a prey base for higher trophic level organisms. Injuries to macroinvertebrate

communities in the NOMNRDAR site have been documented by researchers using several metrics, including decreases in the abundance and diversity of macroinvertebrate communities in the NOMNRDAR site linked to cadmium, lead, and zinc concentrations. Multiple studies have shown reduced diversity and abundance in macroinvertebrate communities (for example, Aggus et al. 1982, Angelo et al. 2007, and Bergey and White 2016). Bergey and White (2016) demonstrated that areas upstream of mine effluent had a greater taxonomic abundance and richness of aquatic macroinvertebrates. Angelo et al. (2007) reported that mussel communities are severely degraded, and in some cases completely absent, due to metals. In addition, elevated metals concentrations have been measured in tissue samples of crayfish in the NOMNRDAR Site (Wildhaber et al. 1997 and Schmitt 2006), at levels that have been demonstrated to exceed injury threshold tolerance limits. For example, crayfish tissue concentrations in exceed FDA tolerance limits, confirming injury according to [43 CFR § 11.62(f)(1)(ii), and §11.64(f)(3)] (Schmitt, 2006).

- **Fish:** Fish communities in general have been adversely impacted by metals contamination. For example, studies have shown reduced abundance and species diversity at impacted sites in the NOMNRDAR Site (e.g., Aggus et al. 1982 and Franssen et al. 2006). Aggus et al. (1982) reported that fish communities in Tar Creek were severely reduced when compared to other similar sites. Franssen et al. (2006) reported a shift in species composition between impacted and non-impacted sites and reduced species richness at impacted sites. Metals concentrations in fish tissue samples, in particular lead in carp, freshwater drum, redhorse sucker, and smallmouth bass have also exceeded action levels and tolerance limits, indicating injury to fish (ODEQ, 2003; 2007 and Schmitt et al., 2006). As a result of these elevated fish tissue concentrations, the State of Oklahoma has issued advisories for limited consumption of fish for waterbodies within the NOMNRDAR, including the Spring and Neosho rivers, and Grand Lake (e.g., consume no more than nine eight-ounce boneless fish fillets per month or three eight-ounce portions of fish preparations with bones from Neosho and Spring River) (ODEQ 2008).

### **Groundwater Resources**

Potentially injured groundwater resources in the NOMNRDAR site include the shallow Boone aquifer and the deeper Roubidoux aquifer. The Boone aquifer is within the Boone Formation (the formation targeted for mining activities), which is composed of limestones and cherts (OWRB, 1983a; Christenson, 1995; Dames & Moore, 1995). The unconfined water table of the Boone aquifer is generally near the ground surface (Osborn, 2001). The Roubidoux aquifer is about 900 - 1,000 ft below ground in northeastern Oklahoma (OWRB, 1983), and is the main municipal and industrial water supply aquifer in the area (Christenson, 1995). Because of extractions from the municipal wells, the hydraulic head of the deep aquifer is now lower than the head in the shallow aquifer. This gradient indicates a potential for vertical groundwater flow from the shallow to the deep

aquifer (Christensen, 1995), with wells drilled into the Roubidoux potentially acting as conduits.

Examples of groundwater injury include:

- Boone- Metals concentrations in the Boone aquifer are elevated above background and injury thresholds, including EPA Maximum Contaminant Levels (MCLs) for cadmium, secondary MCLs (SMCLs) for zinc, and Action Levels for lead. Sampling of abandoned mineshafts and other mine workings within the NOMNRDAR has shown that zinc, cadmium and lead concentrations have exceeded standards by several fold (Payton et al., 1980; OWRB 1983b; Parkhurst, 1987; DeHay et al., 2004).
- Roubidoux – Elevated concentrations of metals have been measured in private and municipal wells near Commerce and Quapaw, and particularly Picher (Christenson, 1995; ODEQ, 2002), in some cases exceeding injury thresholds. The likely source of the contamination was the overlying shallow aquifer, via leaking abandoned wells or natural conduits such as fractures (ODEQ, 2002).

### **Tribal Services**

Natural resources within the NOMNRDAR site provide Tribal services, as well as recreational uses to Tribal members and citizens.

**Tribal services** – There have been Tribal service losses as a result of the released hazardous substances and injured resources within the NOMNRDAR Site. Natural resources within the NOMNRDAR site provide a multitude of services to Tribal members and citizens, including in subsistence and cultural practices. These Tribal services have been reduced (ie – there has been a Tribal service loss), as a result of the released hazardous substances, and associated biological injuries. Tribal members and citizens have drastically reduced or fully eliminated traditional sustenance harvesting of natural resources and the culturally associated harvesting practices, because of the contamination. As a result, they have been denied the ability to provide their families with healthy traditional foods; fulfill their traditional tribal cultural obligations toward the land and environment, plants, and animals; or pass on practical, philosophical, theoretical, and linguistic knowledge of what it means to be a tribal member or citizen. The reduction in Tribal services provided by injured biological resources is quantified in a survey of Tribal members and citizens on their uses of natural resources that was conducted in 2009 (Garvin, 2009).

**Recreational use by Tribal members and citizens-** In the Grand Lake O' the Cherokees Restoration and Compensation Determination Plan (IEc, 2014), the Trustees estimated recreational fishing damages for Tribal members and citizens due to fish consumption limits. Other members of the general public may have suffered similar recreational lost use(s), though these have not been formally quantified by the Trustees.



## Chapter 3: Restoration Alternatives

### 3.1 Goals and Objectives of Restoration

CERCLA authorizes the Trustees to assess and to recover damages for injuries to, destruction of, and loss of natural resources and their services resulting from releases of hazardous substances into the environment and to restore, rehabilitate, replace, and/or acquire the equivalent of the injured natural resources and their services. Consistent with CERCLA, the TCTC intends to use damages recovered for natural resource injury and service losses resulting from releases of hazardous substances to implement restoration projects that replace those resources and/or restore those lost services. The objective of the Programmatic RP/EA is to evaluate restoration concepts and provide information to the public about the project selection.

The TCTC proposes the Preferred Alternative in this Programmatic RP/EA as Alternative 4: On- and Off –site Restoration. This Alternative allows a combination of restoring, replacing, rehabilitating, and acquiring the equivalent of injured resources and services both on- and off-site.

### 3.2 Restoration Alternatives

This Programmatic RP/EA includes four alternatives for evaluation; 1) No Action, 2) On-site restoration, 3) Off-site restoration, and 4) Combination of on- and off-site restoration.

#### 3.2.1 Restoration Definitions

As stated previously, the NOMNRDAR Site (see Figure 3) includes all areas in Northeastern Oklahoma where hazardous substances released from the TSMD have come to be located or where natural resources or the services they provide may have been affected by the releases of these hazardous substances. Future site-specific projects, which will be developed by the Trustees in subsequent restoration plans, will be either “on-site” or “off-site” projects.

“On-site” projects are those projects that occur within the NOMNRDAR Site (i.e., where contamination has come to be located). “Off-site” projects are those that occur outside of the NOMNRDAR Site boundary and could include areas in Northeastern Oklahoma and areas within adjacent states that will restore, replace, rehabilitate, and/or acquire the equivalent of injured resources and services. Most projects will be in areas of Craig, Ottawa, Mayes, and Delaware counties in Northeastern Oklahoma. Appropriate off-site projects could occur in other counties in Oklahoma or portions of adjoining states that are in or near the TSMD, but restoration at those sites must provide unique or competitive opportunities to replace and/or rehabilitate resources or services that have been impacted at the NOMNRDAR site.

Furthermore, as used in this Programmatic RP/EA:

- “Terrestrial restoration” refers to projects in areas that are, or would naturally be, predominately:

- Upland habitat (i.e., lands rarely saturated or covered by water and not classified as wetlands, streams, or lakes), such as upland forests and prairies
- River corridor habitat (i.e., lands that are intermittently saturated, or covered by water), such as riparian and floodplain habitat
- “Aquatic restoration” refers to projects that are located predominantly within the river and stream channel; or “in-stream” projects.
- “Tribal use” restoration refers to projects that will provide Tribal services recreational use by Tribal members and citizens.

### 3.2.2 Restoration Project Types

Examples of specific *types* of restoration that will restore, replace, rehabilitate, and/or acquire the equivalent of injured resources and services are contained in Appendix B. The specific projects that will *actually be accomplished* will be identified through public participation in supplemental restoration planning and environmental compliance analyses. The Trustees will identify and evaluate specific projects in future site-specific restoration plans, which will be made available to the public for review and comment prior to final selection and implementation.

At this time, the TCTC has not identified parcels for projects or identified organizations that would hold the titles to areas that may be purchased upon which conservation easements may be established. Acquisition of land or easements for preservation and enhancements of habitats will only be from willing sellers. Land purchases or easements may be conducted with entities selected by the TCTC (e.g., State agency, non-profit), using settlement monies, or directly by settling with PRPs.

It should be noted that the Trustees have not settled with all of the potentially responsible parties at the NOMNRDAR Site and cannot predict the amount or timing of funding that will be available for restoration projects. The total amount and availability of restoration funds could affect the types and quantity of both on- and off-site projects.

### 3.2.3 No Action: Alternative 1

Under Alternative 1, no direct action to restore injured natural resources or compensate for interim loss of natural resource services would take place. Rather, this Alternative relies on natural recovery (i.e., no active restoration implemented). Natural recovery would allow, over time, for gradual improvement to impacted resources and resource services through succession, dilution, erosion, decomposition, natural building of soils, and movement of contaminated materials via wind and water to other locations. Recovery of natural resources and cultural services under this Alternative would be incomplete or occur over hundreds of years. Under this alternative, some injured resources would slowly and partially recover over time, but some residual level of injury would persist. There would be no restoration for the interim losses of natural resources and their associated services. This alternative is the basis of comparison for all other actions or alternatives.

#### 3.2.4 On-Site Restoration: Alternative 2

On-site restoration would focus on restoring, rehabilitating, replacing, and/or acquiring the equivalent of the injured natural resources and resource services within the NOMNRDAR Site. On-site terrestrial restoration projects could address areas where metals in the soil are still present at high enough concentrations to injure wildlife after OU4 remedial actions are implemented. On-site terrestrial restoration projects could be initiated prior to remedial actions or concurrent with these actions where efficiencies or complementary benefits could be achieved. However, the Trustees will want to ensure the long-term effectiveness of a restoration project through coordination with EPA and/or the PRPs.

The Trustees do not foresee implementing aquatic restoration projects in contaminated streams until after remedial actions are finalized for OU5. At the time of this document's publication, neither EPA Region 6 nor Region 7 has issued a ROD for OU5. The TCTC has no information as to if, when, where, or how much contaminated sediment will be remediated, nor the direct impacts of any such remediation. Once EPA issues the OU5 ROD, the TCTC will evaluate the totality of benefits and impacts of any selected actions to remediate contaminated streams. If the remedy selected by EPA for OU5 does not fully address the injured sediments, the TCTC will evaluate the potential for primary and compensatory restoration as part of on-site restoration, and will complete appropriate restoration planning and environmental compliance analyses, including NEPA, for any identified restoration projects.

#### 3.2.5 Off-Site Restoration: Alternative 3

Off-site restoration would focus on restoring, rehabilitating, replacing, and/or acquiring the equivalent of the injured natural resources and their associated services at locations outside of the NOMNRDAR Site. This alternative would focus on both terrestrial and aquatic restoration projects on native habitats that are not impacted by mining wastes. Off-site terrestrial restoration projects would concentrate on opportunities located on relatively large tracts of terrestrial habitats, such as uplands or riparian areas, with the potential for restoration or preservation of natural resources and their related services. Off-site aquatic restoration projects would concentrate on opportunities to improve aquatic habitat, including restoring riparian corridors and floodplains to improve the quality of adjacent aquatic habitat; improving surface water quality; and possibly restoring specific resources, such as fish and mussels. Depending on their location, off-site projects could be initiated independent of the scheduled remedial actions. A portion of the off-site projects may be held in public or tribal ownership and open to public use, consistent with the purposes of CERCLA.

#### 3.2.6 On- and Off-Site Restoration: Alternative 4 (Preferred Alternative)

This alternative would use a combination of on-site and off-site actions or projects to restore, rehabilitate, replace, and/or acquire the equivalent of the injured natural resources and their associated services lost at the NOMNRDAR Site. All types of actions described under Alternatives 2 and 3 have the potential to be implemented under Alternative 4. In addition, under Alternative 4, terrestrial and aquatic restoration projects may take advantage of opportunities as they occur prior to, during, and after the remediation.

**Table 2 - Comparison of Alternatives**

<b>Actions</b>	<b>Alternative 1: (No Action)</b>	<b>Alternative 2: On-Site Restoration</b>	<b>Alternative 3: Off-Site Restoration</b>	<b>Alternative 4: On- and Off- Site Restoration (Preferred)</b>
Restore injured upland resources	No	Yes	No	Yes
Preserve and/or improve existing high-quality upland resources	No	No	Yes	Yes
Restore injured wetland, floodplain, and riparian corridor and associated resources	No	Yes	No	Yes
Preserve and/or improve existing high-quality wetland, floodplain, and riparian corridor resources	No	No	Yes	Yes
Restore injured surface water systems and aquatic resources	No	Yes	No	Yes
Preserve and/or improve existing high-quality surface water systems and aquatic resources	No	No	Yes	Yes
Restore injured groundwater, cave, and karst systems	No	Yes	No	Yes
Preserve and/or improve existing high-quality groundwater, cave, and karst systems	No	No	Yes	Yes
Improve outdoor recreational opportunities and/or enhance public awareness	No	Yes	Yes	Yes

### 3.3 Restoration Project Packages Process

The TCTC will identify time periods during which it will accept restoration project packages for consideration (“Restoration Project Packages Period”). A Trustee who is a member of the TCTC can itself propose a restoration project package for consideration by the TCTC during a Restoration Project Packages Period, following the criteria identified below in Section 3.5 and in Appendix A. In addition, a non-Trustee project proponent can propose a restoration project package for consideration by the TCTC during a Restoration Project Packages Period by submitting a project package through a sponsoring Trustee member of the TCTC, following the criteria identified below in Section 3.5 and in Appendix A.

The TCTC will provide public notice in advance of Restoration Project Packages Periods to allow time to develop projects to submit to the TCTC. This notice will also include additional information, such as whether there is a particular restoration focus for that period. For example, a Restoration Project Packages Period could focus on projects that would mostly benefit aquatic resources, or supporting habitat for migratory birds, or a culturally-significant resource. The TCTC will publish notice of Restoration Project Packages Periods on the U.S. Fish and Wildlife Service website (<https://www.fws.gov/southwest/es/oklahoma/nrdar.htm>), in local newspapers, and on other TCTC member websites as available.

### 3.4 Evaluation Criteria and Process for Evaluating Potential Projects

The following information in the three tables below describes criteria the TCTC will use to evaluate restoration project packages submitted to the TCTC according to the project packages process discussed above in Section 3.4. For more detailed information on project packages see Appendix A.

Table 3 describes the criteria that must be met by all projects for consideration by the TCTC, in addition to timely submission of project packages during an officially identified Restoration Project Packages Period. If any single criterion in table 2.4 is not met, the project package will be returned to the project proponent. A project package can be resubmitted to the TCTC once amended to meet all these criteria.

**Table 3 - Basic Acceptability Criteria for Restoration Planning**

Criteria	Interpretation
Addresses injured natural resource and services	Project must restore, rehabilitate, replace, and/or acquire the equivalent of injured natural resources or lost services that have been targeted for restoration within the Restoration Plan/Programmatic Environmental Assessment (e.g., project addresses tribal cultural services losses from injured natural resources, project restores habitat for federally protected migratory species, project restores state regulated upland game species) (also see Section 2.4).

	In addition, projects should address/incorporate restoration of targeted natural resources and services identified in the corresponding Restoration Project Packages Period, as documented by Trustee mandates, priorities, and resolutions.
Compliance with applicable/relevant laws, policies, and regulations	Project must be legal and adhere to federal, state, and tribal laws, policies and regulations.
Technically feasible	Technology and management skills necessary to implement [a restoration project] are well known and that each element of the [project] has a reasonable chance of successful completion in an acceptable period of time. 43 C.F.R. § 11.14(qq)
Cost Effective	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. 43 C.F.R. § 11.14(j)
Cost Benefit	The relationship of the expected costs of the proposed actions to the expected benefits from the restoration, rehabilitation, replacement, and/or acquisition of equivalent resources. 43 C.F.R. § 11.82(d)(2)

Tables 4 and 5 include information the TCTC will consider when evaluating restoration project packages. The information provided in the project description submitted will be weighed against these criteria and used to determine which projects are best suited to replace resources and resource services that were injured by the releases of hazardous materials from the TSMD.

**Table 4 – Natural Resource and Services Criteria for Restoration Planning**

Criteria	Interpretation
Injured resources and services restored by project	Evaluation will be based on the specific natural resource or service that benefits from the project. Projects must benefit the injured natural resource(s) or service(s) identified in the corresponding Restoration Project Packages Period. Projects that benefit more than one injured natural resource or service are preferred. In addition, projects that avoid or minimize additional natural resource injury or environmental degradation will be given priority.
Proximity of project to injured resources and services	Project location must be identified for Trustee consideration. Both on-site and off-site projects will be considered. (See Section 3.3.1). For off-site projects, all

	else being equal, restoration in closer geographic proximity to the NOMNRDAR Site is preferred.
Benefits to resources and services	Project will be evaluated in terms of whether the expected benefits can be quantified and the success of the project determined. Projects can be scaled to provide restoration of appropriate magnitude. Small projects that provide only minimal benefits relative to injured resources or larger projects that cannot be appropriately scaled to meet the goals of the Restoration Plan are less favorable.
Equity and Environmental Justice	Restoration projects that benefit low-income and ethnic populations (including Native Americans) in proportion to the impacts to these populations are preferred. Restoration should not have disproportionately high costs or low benefits to low-income or ethnic populations. Further, where there are specific service losses to these populations, such as impacts on subsistence fishing, hunting, gathering, restoration should target benefits to these populations.
Cost effective and established technologies	Projects with a high ratio of expected benefits to costs are preferred. This includes using established technologies that have a high success rate. Projects with experimental or unproven technologies are not preferred.
Monitoring plans	For most projects (e.g., planting of native prairie, removal of invasive vegetation) the Trustees will expect the project plans to include a monitoring plan that covers the timeframe needed for restored resources and habitats to gain full functionality, which is generally anticipated to be no less than 5 years. Monitoring plans establish monitoring and reporting provisions to ensure the specific restoration actions are conducted as intended and are effectively restoring injured resources and services. Such provisions include monitoring techniques, performance standards and criteria, guidelines for implementing corrective actions, and a schedule for frequency and duration of monitoring.
Adverse impacts from project	Identify the adverse impacts, short and/or long term, from the project. Some short term adverse impacts from implementation are expected, however, projects with large or long term adverse impacts are not preferred.

**Table 5 - Implementation Criteria for Restoration Planning**

Criteria	Interpretation
Timing of restoration completion	Identify if the project will take longer than 5 years to implement. If so, identify completion timeframe. Projects that provide restoration benefits earlier are preferred.
Land manager (if applicable)	Projects will be evaluated based on the availability and costs of a long-term land manager (e.g., Federal, State, or Tribal government) involved in managing the project.
Accessibility	Projects will be evaluated based on accessibility. Depending on the type of project and the resources and services being restored, open access may or may not be required or preferred (e.g., restrictions during bird nesting season).
Matching funds	Projects with matching funds will be given preference during evaluation. If matching funds are available identify the source of funding and if there is a matching ratio (e.g., 1:1) or other restrictions.
Provides benefits not being provided by other projects/programs	Preference will be given to projects not already being implemented, have no planned funding, or are insufficiently funded by other programs. Preference is given to projects that would not be implemented without NRDAR restoration funds.
Implementation proficiency of restoration projects	Projects that use techniques that have been demonstrated proficient elsewhere are preferred.

### 3.4.1 Climate Change

In addition to the criteria above, the project packages will be evaluated in the context of climate change—both its implications for and its adaptability to climate change. The Trustees will rely on current and future literature and policy guidance to aide them in their evaluation. For example, the USFWS climate change strategy, titled “Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change,” establishes a basic framework within which the USFWS will work as part of the larger conservation community to help ensure the sustainability of fish, wildlife, plants and habitats in the face of accelerating climate change (USFWS 2012). Further information about the USFWS’ perspective and plan for climate change can be found at: <http://www.fws.gov/home/climatechange/index.html>.



## **Chapter 4: Affected Environment**

In general terms, this chapter describes the existing resources that may be affected by the restoration alternatives under consideration. Because this Programmatic RP/EA is programmatic in nature and does not identify specific restoration projects, subsequent project-specific restoration plans will address the site-specific affected environment in more detail. Several reports have summarized the general conditions of natural resources throughout the NOMNRDAR Site and are cited by reference. This chapter also includes a section, Section 4.5, about the tribal special relationship to these resources.

### **4.1 Terrestrial Resources**

The geographic scope of the terrestrial resources is generally within the Ozark Highlands and Cherokee Plains ecoregions. The Cherokee Plains ecoregion makes up the western portion of the area. It is a nearly flat erosional plain, dominated by clayey soils with low permeability, and underlain by shale and sandstone. Natural vegetation is mostly tall grass prairie, and riparian areas are typically wooded. Today, large portions of this ecoregion are converted to cropland and rangeland. Main crops are soybeans, wheat, alfalfa hay, and sorghum; land use also includes cattle and broiler chicken farms (Woods et al., 2005; US EPA, 2013).

The eastern portion of the area falls within the Springfield Plateau of the Ozark Highlands ecoregion. This plateau is underlain by cherty limestones. The major soil in the Springfield Plateau is the Bodine-Baxter soil. It is a low fertility, low water-holding capacity soil, containing an abundance of coarse chert fragments. Typical of limestones, karst features, such as sinkholes, caves and springs, are common in the Springfield Plateau. Prior to the 19<sup>th</sup> century, uplands were dominated by oak–hickory forest, savanna and tall grass prairie. Today, much of the forest and prairie has been replaced by agriculture and residential areas. Poultry and livestock farming are the main land uses. (USDA, 1964; OWRB, 1971; Woods et al., 2005; Osborn, 2001)

### **4.2 Aquatic Resources**

Water resources within the affected environment include both surface and groundwater. The shallow groundwater frequently becomes surface water via springs in this area of limestone bedrock and karst geology (Petersen, 1998; Davis and Bell, 1998; ODEQ, 2006). Water resources in the area provide habitat for several unique species and are important sources of water for municipal, recreational, and tribal cultural uses.

#### **4.2.1 Surface Water Resources**

Surface water resources include both surface water and sediments suspended in water or lying on the bank, bed, or shoreline. Surface waters include the Spring and Neosho rivers systems and Grand Lake in Oklahoma (see Figure 3). The Spring River and its tributaries drain the eastern portion of the TSMD and flow from Missouri into Kansas and southward into Oklahoma. Neosho tributaries including Tar Creek and Elm Creek also drain portions of the TSMD (Adamski et al., 1995; U.S. EPA, 2005; EPA, 2015).

Streams in the Spring River watershed are more typical of Ozark streams: low turbidity, higher gradient, with gravel to cobble sediments (Adamski et al., 1995; Davis and Bell, 1998). The Spring River watershed has numerous tributary streams that converge with the Spring River before it, in turn converges with the Neosho River, including Center Creek that is wholly located within the state of Missouri and flows westerly towards the confluence with Spring River. Shoal, Turkey, and Short creeks flow generally westerly toward the Spring River in Missouri with Short Creek flowing through Missouri and then into Kansas before joining the Spring River. Bitter Creek, Brush Creek, and Willow Creek in Kansas flow generally easterly to the Spring River. There is a small impoundment on the Spring River in Kansas, Empire Lake, which is formed by the Riverton Dam on the Spring River arm. In Oklahoma, Beaver Creek flows easterly to the Spring River (US EPA, 2005; National Water Quality Monitoring Council, 2017).

The Neosho River and its tributaries drain the western portion of the TSMD and flow from Kansas into Oklahoma. Streams in the Neosho River watershed are meandering, with gravel to muddy sediments. The Neosho River watershed also has numerous tributaries including Tar and Elm creeks that originate in Kansas and flow south through Oklahoma to the Neosho River. Lytle, Quapaw, and Garrett creeks drain westerly into Tar Creek before flowing into the Neosho River (Adamski et al., 1995; Osborn, 2001; US EPA, 2005).

The Neosho and Spring rivers converge at Grand Lake, a large reservoir that was completed in 1940, with 46,500 surface acres of water and 1,300 miles of shoreline when at the top of its conservation pool. The Grand Lake watershed is made up of three major river systems: the Neosho, Spring, and Elk rivers. Other streams that drain into Grand Lake include Lost and Sycamore creeks (US EPA, 2005; Luza and Keheley, 2006; Grand Lake O' the Cherokees Watershed Alliance Foundation, 2008; Grove Oklahoma, 2017; Oklahoma Historical Society, 2017).

#### 4.2.2 Groundwater Resources

Groundwater resources in the area include the shallow Boone aquifer, and the deeper Roubidoux aquifer. The Boone aquifer is within the Boone Formation (the formation targeted for most mining activities in the TSMD), which is mainly composed of limestones and cherts. The thickness of the Boone aquifer varies throughout the area with a reported average thickness of 300 to 370 feet. The water level of the unconfined Boone aquifer is generally near the ground surface, and recharge is via brecciated (fractured) carbonate rocks at the surface, as well as abandoned mine shafts. The regional direction of flow is westerly (OWRB, 1983a; Christenson, 1995; Dames & Moore, 1995; DeHay et al., 2004).

In this area, lower permeability units, including the Northview and Chattanooga Shales, and the Compton Limestone, separate the shallow Boone aquifer from the deeper Roubidoux aquifer. The Roubidoux aquifer is about 900 - 1,000 feet below the ground surface in northeastern Oklahoma, and ranges in thickness from 65-250 feet. This deeper

aquifer recharges at outcroppings to the east, in the Ozarks. The only known discharges from the Roubidoux in this area are via municipal and industrial wells. In general, the water in the deep aquifer flows from east to west (OWRB, 1983a; Christenson, 1995; Dames & Moore, 1995; DeHay et al., 2004).

### 4.3 Biological Resources

The Ozark Highlands and Cherokee Plains ecoregions support diverse and abundant wildlife. In particular, the karst features present in the region support many highly specialized and sensitive fish and wildlife species, such as bats, amphibians, fish, and crustaceans (USFWS, 2000; Woods et al., 2005; Grand River Dam Authority, 2008).

Fish species in the area include sportfish such as largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), largemouth bass (*Micropterus salmoides*), spotted bass (*Micropterus punctulatus*), white bass (*Morone chrysops*), and white crappie (*Pomoxis annularis*). Additional fish species targeted for consumption include carp (*Cyprinus carpio*), freshwater drum (*Aplodinotus grunniens*), redhorse sucker (*Moxostoma robustum*), smallmouth buffalo (*Ictiobus bubalus*), paddlefish (*Polyodontidae* spp.), blue catfish (*Ictalurus furcatus*), channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), and sunfish species (Woods et al., 2005; ODEQ, 2007; Grand River Dam Authority, 2008).

Notable reptile and amphibian species found in local habitats include the American toad (*Anaxyrus americanus*), spadefoot toad (*Scaphiopodidae*), tree frog species, snapping turtles (*Chelydra serpentina*), mud turtles (*Kinosternon*), softshell turtle species, slender glass lizard (*Ophisaurus attenuatus*), collard lizard (*Crotaphytus collaris*), Texas horned lizard (*Phrynosoma cornutum*), copperhead snakes (*Agkistrodon contortrix*), western cottonmouth snake (*Agkistrodon piscivorus leucostoma*), timber rattlesnake (*Crotalus horridus*), and western pygmy rattlesnakes (*Sistrurus miliarius streckeri*) (Grand River Dam Authority, 2008).

Avian species such as raptors, barred owl (*Strix varia*), red-tailed (*Buteo jamaicensis*) and red-shouldered hawks (*Buteo lineatus*), tangers (*Thraupidae* spp.), nuthatches (*Sittidae* spp.), warblers (*Parulidae* spp.), and woodpeckers (*Picidae* spp.) are present in upland and bottomland forested areas (Grand River Dam Authority, 2008). Grassland birds such as horned lark (*Eremophila alpestris*), grasshopper sparrow (*Ammodramus savannarum*), dickcissel (*Spiza americana*), and bobolink (*Dolichonyx oryzivorus*) are also present in the region (Grand River Dam Authority, 2008). In addition, bald eagles (*Haliaeetus leucocephalus*) are known to winter at Grand Lake and are an important species identified by the Tribes (Grand River Dam Authority, 2008; Cherokee Nation, 2010).

Terrestrial mammals are widely present in the region, and include a mix of woodland, wetland, and grassland species. Some notable species include white-tailed deer (*Odocoileus virginianus*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), fox squirrel (*Sciurus niger*), Virginia opossum (*Didelphis virginiana*), eastern cottontail (*Sylvilagus floridanus*), armadillo (*Dasypodidae*), red fox (*Vulpes vulpes*), muskrat (*Ondatra zibethicus*), beaver (*Castor spp.*), least shrew (*Cryptotis parva*), deer mouse

(*Peromyscus keeni*), black-tailed jack rabbit (*Lepus californicus*), badger (*Taxidea taxus*), and a number of bat species (Grand River Dam Authority, 2008).

#### 4.4 Threatened and Endangered and Other Protected Species

Several federally-listed T&E species and candidates for listing occur in or near the restoration areas includes (USFWS, 2016; USFWS, 2017):

- the candidate **Arkansas darter** (*Etheostomas cragini*),
- the threatened **Neosho madtom** (*Noturus placidus*),
- the threatened **Northern long-eared bat** (*Myotis septentrionalis*);
- the threatened **Ozark cavefish** (*Amblyopsis rosae*),
- the threatened **rabbitsfoot** (*Quadrula cylindrica*),
- the endangered **Neosho mucket** (*Lampsilis rafinesqueana*),
- the endangered **Winged mapleleaf** (*Quadrula fragosa*),
- the endangered **gray bat** (*Myotis grisescens*),
- the endangered **Indiana bat** (*Myotis sodalist*),
- the endangered **Ozark big-eared bat** (*Plecotus townsendii ingens*), and
- the endangered **American burying beetle** (*Nicrophorus americanus*).

Information for these species is subject to change and current information is available at the USFWS Oklahoma Field Office website (USFWS, 2016; USFWS) and other sources.

State-listed T&E species in northeastern Oklahoma include all federally-listed species and one additional species:

- the endangered **Oklahoma Cave Crayfish** (*Cambarus tartarus*)

Information for these species is subject to change and current information is available at the Oklahoma Department of Wildlife Conservation (ODWC) website (Oklahoma Department of Wildlife Conservation, 2017) and other sources.

Tribally-Listed Protected Species in northeastern Oklahoma include, but are not limited to the following species, which have been designated by the Cherokee Nation as culturally protected species (Cherokee Nation, 2010; Cherokee Nation Environmental Protection Commission, 2012):

- the **bald eagle** (*Haliaeetus leucocephalus*),
- the **American black bear** (*Ursus americanus*), and
- the **mountain lion** (*Puma concolor*),
- **river cane** (*Arundinaria gigantea* Muhl.).

In addition to the species identified above, other wildlife and protected migratory birds may occur throughout Northeastern Oklahoma.

## **4.5 Tribal Cultural Resources**

This description of cultural resources is a general overview for compliance with NEPA and does not represent a complete description of all tribal cultural resources for all tribes. The seven named Tribes historically and currently hunt, gather, and provide educational opportunities on cultural practices, and recreate in woodland, prairie, and riparian locations within the NOMNRDAR Site. Plant and animal resources continue to be a major contributor to tribal members' daily life. Tribal members continue to utilize biological resources - plant and wildlife species - for subsistence and for tribal cultural practices. Some plant species are of particular cultural significance to the Trustee Tribes. Certain plants, herbs, shrubs, and woody plants found in the NOMNRDAR Site serve tribal cultural functions in the production of crafts, basket weaving, flutes, hunting accessories, etc. Fruit and nut bearing trees, persimmon, paw-paw, oak, walnut, pecan, hickory, etc., provide for sustenance, crafts, lumber, firewood, etc. Tribal members utilize fish, mussels, crustaceans, amphibians, and turtles as subsistence resources, and the shells of turtles and mussels in tribal ceremonies. Wildlife, such as deer, raccoon, rabbit, squirrel, bobcat, beaver, mink, muskrat, ducks, geese, quail, greater prairie chicken, etc., provide subsistence resources, as well as cultural resources through their hides, hair, feathers, and such. Tribal members also use soils for many traditional and cultural purposes. The soil supports wildlife, plants (including important crops), and is used directly for pottery and cultural purposes. Water resources and associated water quality have cultural significance to the Tribes. In addition to providing recreation, water supplies, and habitat for aquatic biota, the surface water is used for spiritual purposes by tribal members and citizens. Through subsistence, cultural, and religious affiliation, and as tools for teaching upcoming generations, tribal members depend upon a healthy, uncontaminated environment and natural resources to maintain their way of life (personal communications from Trustee Tribes 2011).

The Tribes value all the natural resources in the NOMNRDAR Site. The Tribes consider the services provided by many natural resources to be culturally important, for example: the Tribes consume and use fish, mammals, amphibians and reptiles (e.g., turtles), birds, and plants in their cultural practices. Many species of wildlife and their qualities or attributes are directly tied to families or clans within Tribes and relate directly to tribal history, education, story-telling and seasonal activities (e.g., Turtle Clan, Deer Clan). Many plants relate directly to cultural and health practices of individuals within Tribes (e.g., willow, sassafras, wild garlic, etc.). Many of these cultural resources play prominent roles in ceremonies, tribal history, tribal education, and creation stories (personal communications from Trustee Tribes 2011).

## **4.6 Climate**

According to research conducted by the Oklahoma Water Survey (Hong, year unknown), drought indices under status quo scenario suggest that more drought events might be expected to occur in the second half of the 21st century. Predicted precipitation shows a descending trend, while the temperature will increase. The Oklahoma Water Survey report indicates it is very likely that future drought in the Blue River Basin, which was the subject of the report and used as an indicator for climate change within Oklahoma,

will be more severe and intense compared to the 1950–1999 period, especially for the second half of the 21st century (Hong, year unknown). In Oklahoma, climate change will increase water vapor contents in atmosphere, which could likely result in more intense rainfall events and potentially higher flood risk (Hong, year unknown).

# **Chapter 5: Evaluation of Alternatives and Environmental Consequences**

## **5.1 Overview**

The purpose of this chapter is to evaluate and explain the potential environmental impacts of the selection of a particular Alternative. The four alternatives reviewed in this document are discussed here to reveal their differences and to provide insight into the selection of the Trustees' Preferred Alternative. This evaluation of environmental consequences describes direct, indirect, and cumulative environmental impacts to determine whether the proposed alternative has a significant effect on the human environment. "Significance" is determined by considering both the intensity and context of the impact of a particular alternative (40 C.F.R. § 1508.27).

The descriptions of the alternatives in this Programmatic RP/EA are general and impacts will be estimated based on information available for similar actions. Prior to implementation of individual restoration projects, a restoration project package will undergo more detailed, site-specific NEPA and other environmental compliance actions necessary to comply with other applicable statutes and regulations (e.g., Natural Historic Preservation Act, ESA). A summary and comparison of potential environmental consequences associated with the alternatives is presented in Table 6.

In addition to the resources listed in Chapter 4, the Trustees evaluated the restoration alternatives in light of the consequences to recreation, socio-economics, and environmental justice, as well as the foreseeable cumulative impacts from each alternative. Each of these categories is described below.

### **5.1.1 Recreation**

Outdoor recreation in Northeast Oklahoma includes boating, fishing, hunting, hiking, bird watching other wildlife observation and photography, fall foliage tours, and other forms of outdoor recreation that contribute to the quality of life for residents and tourists. The scenic Ozark landscape and Grand Lake attract visitors, retirees, and seasonal residents that are interested in outdoor recreation. However, most of the land ownership is private and public access to lands and streams for outdoor recreation is limited. Public land and waters include Grand Lake (and a narrow area of associated shoreline property owned and managed by Grand River Dam Authority, a state agency), and a few small state parks. To the south of Grand Lake in Mayes and Delaware Counties, additional public outdoor recreational opportunities are available at Hudson, Spavinaw, and Eucha Reservoirs; associated state and city parks; Spavinaw Wildlife Management Area (state, ODWC managed); and portions of the Ozark Plateau National Wildlife Refuge (federal, USFWS managed).

### 5.1.2 Socio-Economics

The predominant land use in the area is arable agriculture (mainly wheat, sorghum, corn, soybeans, and hay) and pastureland for livestock grazing. Agriculture accounts for approximately 60-70% of the land use (Dames & Moore, 1995).

### 5.1.3 Cumulative Impact

Cumulative impact is the incremental environmental impact or effect of the proposed action, together with impacts of past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 C.F.R. § 1508.7).

### 5.1.4 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 Federal Register 7629 (1994)), directs federal agencies to develop strategies to identify and address, as appropriate, any disproportionately high and adverse human health and environmental effects of their programs, policies, and activities on minority or low-income populations.

There are minority and low income populations in Northeast Oklahoma. Based on recent data from the U.S. Census, approximately 18% to 22% of the population in areas where most restoration projects will occur (Ottawa, Craig, Delaware and Mayes Counties) lived below the poverty level for 2009-2013, and approximately one-third of individuals in the restoration area identified with minority populations in 2014 (<http://quickfacts.census.gov/qfd/states/40000.html>).

## **5.2 Evaluation of Alternative 1 (No Action)**

The No Action Alternative provides for natural recovery after completion of EPA's remedial actions, with no restoration being initiated. Both remediation and natural recovery are anticipated to be extremely long in duration (IEc 2004).

### 5.2.1 Terrestrial Resources / Habitat Impacts

Under this Alternative, natural resources would not be restored, enhanced, or acquired beyond what is currently being done within mandates, policies, and budgets. The public would not be compensated for injuries to natural resources from the releases of hazardous substances into the environment because no restoration linked to the injuries would occur.

### 5.2.2 Aquatic Resources / Habitat Impacts

Under this Alternative, natural resources would not be restored, enhanced, or acquired beyond what is currently being done within mandates, policies, and budgets. The public would not be compensated for injuries to natural resources from the releases of hazardous substances into the environment because no restoration linked to the injuries would occur.



### 5.2.3 Biological Resources Impacts

Under this Alternative, biological resources harmed by the releases of hazardous substances into the environment would not be restored, rehabilitated, replaced, or the equivalent acquired. Local populations of fish and wildlife species, including migratory birds, through the restoration areas that rely on streams and associated upland, wetland, floodplain, and riparian corridor, surface water, and ground water habitats would not increase sufficiently to compensate for past losses. In addition, ongoing residual injury would occur.

### 5.2.4 T&E Species Impacts

Under this Alternative, T&E and Candidate species would not be restored, rehabilitated, replaced, or have the equivalent acquired.

### 5.2.5 Tribal Cultural Resources Impacts

Under this Alternative, tribal cultural resources and services would not be altered from their current condition.

### 5.2.6 Recreation Impacts

Under this Alternative, recreation access and opportunities would not be altered from its current condition.

### 5.2.7 Socio-Economic Impacts

Under this Alternative, the current socio-economic status would remain in its current condition.

### 5.2.8 Climate Change Impacts

Under this Alternative, no impacts to climate change will occur.

### 5.2.9 Cumulative Impacts

Under this Alternative, there are no cumulative impacts from projects because no projects would be implemented under this alternative.

### 5.2.10 Environmental Justice Impacts

Under this Alternative, the local environment would remain impacted while natural recovery occurs. Communities would continue to be affected by the contamination and loss of resources and services.

The No Action alternative will produce no significant benefits to natural resources or resources services. In addition, it does not support the use of recovered settlement funds to restore, rehabilitate, replace, and/or acquire the equivalent of the impacted resources 43 C.F.R. Part 11. Because of these factors, restoration of injured resources under the No Action Alternative was not considered further under this analysis of alternatives.

### **5.3 Elements Common to Alternatives 2, 3, and 4**

Alternatives 2 (on-site restoration), 3 (off-site restoration), and 4 (combination of on- and off-site restoration) have multiple types of impacts that are common. These common impacts are discussed below, to simplify review.

#### **5.3.1 Socio-Economic Impacts**

Alternatives 2 through 4 could cause potential changes in land ownership and land use, whether the action occurs on- or off-site. The TCTC examined the alternatives and determined that none had the potential to substantially affecting the socioeconomic status of the affected area. The relative limited NRDAR funding and area associated with the Preferred Alternative would not be large enough to affect the economy of the local area. To the extent that the Trustees acquire property, it is unlikely that such transactions would be large enough in scope to affect the socioeconomic status of the area (personal communication Shidler 2011). Similarly, to the extent that the Trustees implement habitat restoration or rehabilitation—either aquatic or terrestrial—there is unlikely to have an effect on the socioeconomic status of the area. There are low-income and minority people living in the Northeast Oklahoma (<http://quickfacts.census.gov>); however, it is not anticipated that any of the activities carried out under alternatives 2 through 4 would result in any adverse or disproportionate negative environmental impacts to minority or low income persons or populations.

Agricultural uses, such as grazing, haying, and farming would be reduced on restoration lands in order to create habitat/replace injured natural resources. Some beneficial impacts to low income populations may occur as recreational opportunities on the restored lands become available, such as enhanced hunting and fishing opportunities.

#### **5.3.2 Climate Change Impacts**

Alternatives 2 through 4 may benefit climate change due to increase in carbon sequestration on restored and/or rehabilitated areas that are devoid of biomass currently. Although no significant impacts are anticipated, restoration designs will take into consideration local and regional climate variables.

#### **5.3.3 Cumulative Impacts**

The overall impacts of restoration projects completed under Alternatives 2 through 4 are expected to be beneficial to resources in or near the restoration areas. However, some restoration projects may occur concurrently with EPA remedial activities and may produce increased road traffic and associated increases in road degradation and fugitive dust on unpaved roads. As discussed in 5.4.1, actions will be taken to minimize these impacts. Overall, Alternative 3 will provide cumulative benefits to the environment and to human uses of the environment, together with long-term impacts of the remedial actions. Cumulatively, such actions would result in long-term net improvement in aquatic and terrestrial habitats, the restoration of natural stream processes that have been altered by human disturbance, and in improvement in the human use and non-use services provided by fish and wildlife in the region.

Additional potential impacts to and from site-specific variables (e.g., resources on adjacent lands and waterways, utility lines, pipelines and pipeline rights-of-way, and housing on adjacent lands) will be assessed in context with specific proposed restoration projects in subsequent environmental analyses.

#### 5.3.4 Environmental Justice Impacts

As specific restoration projects are identified, with public participation, project-specific NEPA environmental evaluation documents will be prepared, including identification and consideration of impacts to minority and low-income populations.

### **5.4 Environmental Consequences of Alternative 2: On-Site Restoration**

This alternative includes restoration projects that would focus on restoring natural terrestrial and aquatic resources and associated services within the NOMNRDAR Site boundary (“on-site”). While some on-site areas will likely be appropriate for restoration, restoration of impacted terrestrial resources and their related services under Alternative 2 is limited to those parcels with chat piles, bases, and transition zones within the NOMNRDAR Site where landowners are willing to undertake restoration. Timing of the restoration would be extenuated and limited by the 30 year remediation schedule, causing additional interim losses. Because limiting restoration projects to only those occurring on-site would be unlikely to meet the needs of the Trustees, Alternative 2 is not the Preferred Alternative.

#### 5.4.1 Terrestrial Resources / Habitat Impacts

Terrestrial restoration project implementation will depend on willing landowner participation through perpetual easements or the sale of remediated acres. In addition, EPA remediation on the OU4 area is scheduled over a 30 year period. With the lengthy EPA remediation schedule, restoration under this alternative would be slow and probably fragmented, resulting in potential individual projects being initiated over 30 or more years.

#### 5.4.2 Aquatic Resources / Habitat Impacts

For aquatic restoration, Alternative 2 would allow for enhancements to the riparian areas along the streams, rivers, and Grand Lake. Riparian enhancement would benefit surface water resources by reducing runoff from other pollution sources such as sheet erosion to surface waters. However, the EPA has not issued a ROD for the remediation of sediment/surface in OU5. The TCTC has no information as to if, when, or how much contaminated sediment will be remediated as part of OU5. As such, on-site, in-stream restoration cannot be fully evaluated at this time.

In addition, Alternative 2 would benefit groundwater resources by reducing mining material from migrating into the ground water in areas where surface water flows to groundwater during times of drought.

#### 5.4.3 Biological Resources Impacts

Alternative 2 would enhance the recovery of fish and wildlife resources, such as migratory birds and mussels, impacted from the mining wastes that may not be fully addressed by the EPA remedial actions. Supporting ecosystems for these resources would be rehabilitated for the benefit of the injured species

#### 5.4.4 T&E Species Impacts

Most of the existing candidate and federally-listed species that occur in the NOMNRDAR Site are aquatic or aquatic dependent. Alternative 2 would potentially reduce metal concentrations in runoff to surface waters and improved condition of vegetation on remediated sites. Thus, on-site restoration projects would provide benefit to T&E species. The TCTC will comply with the Endangered Species Act in selecting individual restoration projects.

#### 5.4.5 Tribal Cultural Resources Impacts

Alternative 2 would seek to allow access for Tribes to gather cultural natural resources in areas that they traditionally used. However, the 30 year timeline and possible fragmentation of the remedy would increase the time it takes to restore tribal cultural resources.

#### 5.4.6 Recreation Impacts

A portion of the on-site restored lands may be held in public ownership and open to public use. Public access to these lands would increase local recreational opportunities and economic benefits under all alternatives other than Alternative 1. Alternative 2 may provide less public recreation and access than Alternatives 3 and 4 because on-site restoration projects are expected to cost more to address the residual metals in soils.

### **5.5 Environmental Consequences of Alternative 3: Off-Site Restoration**

As discussed in section 3.3.1, off-site restoration would focus on restoring, replacing, enhancing, and acquiring equivalent natural terrestrial and aquatic resources and associated services outside of the NOMNRDAR Site (see Figure 3) that may be near, but not directly affected by or associated with mining activities, and may include restoration in different states (“off-site”). Types of restoration projects in this alternative include protecting and improving terrestrial areas or restoration and enhancement of streams and riparian and floodplain areas that have not been impacted by hazardous substances releases from mining activities.

Depending upon the nature of the restoration actions, in addition, off-site restoration projects may be initiated prior to, or concurrent with, EPA remedial actions at the Tar Creek Superfund Site. Alternative 3 would not provide any restoration of sites directly impacted by the releases of hazardous substances from mining wastes. Implementation of only off-site projects would limit the TCTC’s ability to restore injured terrestrial and aquatic resources or replace services provided historically by the resources located at the NOMNRDAR Site. Therefore, Alternative 3 is not the Preferred Alternative.

#### 5.5.1 Terrestrial Resources / Habitat Impacts

Alternative 3 allows for terrestrial restoration projects that will restore, rehabilitate replace and/or acquire resources or services that were injured at the NOMNRDAR Site in areas not impacted by hazardous substances from mine wastes. Impacts from restoration of native habitats could involve soil disturbance and cause some temporary adverse effects (such as dust stirred during construction or installation of structures and site preparation). These temporary effects could be minimized by implementation of best management practices for dust control and other adverse impacts. In addition, Alternative 3 would benefit groundwater resources by protecting groundwater recharge areas off-site that are at risk of degradation

#### 5.5.2 Aquatic Resources / Habitat Impacts

Alternative 3 allows for aquatic restoration such as stream projects that restore, rehabilitate, replace and/or acquire resources or services that were injured at the NOMNRDAR Site in areas not impacted by hazardous substances from mine wastes. Projects accomplished under this broad restoration category could involve some soil/sediment disturbance during implementation; however, adverse impacts would be minimized by use of best management practices such as erosion control. Even with such controls there may be some temporary adverse effects. In addition, Alternative 3 would benefit groundwater resources by protecting groundwater recharge areas off-site that are at risk of degradation.

#### 5.5.3 Biological Resources Impacts

Alternative 3 would enhance fish and wildlife resources and related services at sites that are not affected by metals contamination. This could include restoration of a variety of native habitats that have potential to be more diverse than Alternatives 1 and 2, leading to significant beneficial impacts. Off-site restoration of native habitats not impacted by mining could attract wildlife away from contaminated sites, and would accelerate replacement of natural resources and their related services. Off-site restoration may be the only feasible option to replace some of the aquatic resources. There may also be direct restoration of biological resources.

Temporary adverse impacts may occur during implementation of restoration projects, through disturbance of wildlife and/or habitat. However these adverse effects could be minimized by project design or schedule. For example, disturbance of migratory bird nesting areas could be minimized by project design and by scheduling construction activities outside of the breeding season.

#### 5.5.4 T&E Species Impacts

Alternative 3 would allow for projects that will benefit T&E species outside of the mining impacted area. Temporary adverse effects may occur during implementation of specific restoration projects, through disturbance of wildlife and/or their habitat. However these adverse effects could be minimized by project design and by implementing projects around migration patterns when possible.

#### 5.5.5 Tribal Cultural Resources Impacts

Alternative 3 could provide new and/or enhancements to traditional gathering areas that are outside the contaminated area. Utilizing off-site restoration increases the potential for rehabilitation of cultural resources in those areas to which Tribes already have access.

#### 5.5.6 Recreation Impacts

A portion of the off-site restored lands may be held in public ownership and open to public use consistent with the purposes of CERCLA. These added opportunities would increase local recreational opportunities and provide economic benefits.

### **5.6 Environmental Consequences of Alternative 4: Combination of On-Site and Off-Site Restoration (Preferred Alternative)**

Under this alternative, both terrestrial and aquatic restoration projects could be implemented on-site or off-site to restore, rehabilitate, replace, and/or acquire the equivalent of the injured natural resources and their associated services. All benefits and adverse impacts described for Alternatives 2 and Alternative 3 would also occur under this alternative.

This alternative allows the Trustees the ability to utilize restoration funds in a manner that is not solely dependent on EPA's remedy schedule. In addition, the Trustees can implement restoration projects with willing land owners as opportunities arise. Therefore, as a result of the increased opportunities for restoration actions geographically and within a shorter period of time, Alternative 4 is the Preferred Alternative.

#### 5.6.1 Terrestrial Resources / Habitat Impacts

Alternative 4 allows for terrestrial restoration that that can reduce residual metals in impact areas and allows for enhancements and protection of existing terrestrial habitats to improve habitats outside of the impact area. No long-term or significant adverse effects to terrestrial resources beyond those discussed in Alternatives 2 and 3 are expected with Alternative 4.

#### 5.6.2 Aquatic Resources / Habitat Impacts

Alternative 4 allows for aquatic restoration to restore the natural functions of riparian areas, with indirect benefits for surface water quality both on-site and off-site, resulting in improved habitat for natural resources depending upon aquatic habitat. No long-term or significant adverse effects to aquatic resources beyond those discussed in Alternatives 2 and 3 are expected with Alternative 4.

#### 5.6.3 Biological Resources Impacts

Alternative 4 would restore on-site and off-site fish and wildlife resources. This could include restoration of a variety of native habitats and increased habitat diversity relative to Alternatives 2 and 3 as well as the direct reintroduction and/or restocking of species, such as fish and mussels. No long-term or significant adverse effects to biological resources beyond those discussed in Alternatives 2 and 3 are expected with Alternative 4

#### 5.6.4 T&E Species Impacts

No long-term or significant adverse effects to T&E Species beyond those discussed in Alternatives 2 and 3 are expected with Alternative 4.

#### 5.6.5 Tribal Cultural Resources Impacts

Alternative 4 would potentially allow for Tribes to gather cultural natural resources in restored areas where they traditionally gathered in the past. In addition, Alternative 4 would potentially allow for new and/or enhancements to traditional gathering areas outside the NOMNRDAR Site by providing for uncontaminated, healthy natural resources that are used in cultural practices.

#### 5.6.6 Recreation Impacts

At least some portion of the restored areas may be in public ownership and open to public use, consistent with the purposes of CERCLA to restore natural resources to their baseline condition. These added opportunities for public recreation related to natural resources would increase local recreational opportunities. Alternative 4 is likely to provide more public recreation opportunities and public access than Alternative 2, but possibly less than Alternative 3, because restoration costs (per acre) are likely to be lower for off-site areas.

### **5.7 Summary: Restoration Alternatives Evaluation**

Alternative 4 is selected as the Preferred Alternative because it allows the Trustees to implement restoration in a reasonable time frame and cost effective manner. Performing restoration, both on-site and off-site, will allow the Trustees the flexibility to restore, rehabilitate, replace, and/or acquire the equivalent of the impacted resources as designated in the CERCLA NRDAR regulations (43 C.F.R. Part 11).

As specific restoration projects are identified, with public participation, project-specific NEPA environmental evaluation documents will be prepared. These supplemental project evaluations will be referenced back to, or “tiered” from, the Programmatic RP/EA. Any modifications or supplemental document to the Programmatic RP/EA will be provided for public review and comment, and finalized before any modifications will be implemented. (See Chapter 6 for information on Public participation).

**Table 6 - Comparison of Potential Environmental Consequences**

<b>Attributes</b>	<b>Alternative 1: No Action</b>	<b>Alternative 2: On-Site</b>	<b>Alternative 3: Off-Site</b>	<b>Alternative 4: On- and Off-Site</b>
Terrestrial Resources	Gradual improvements through natural recovery with no benefits to resources from restoration projects.	Some temporary terrestrial habitat disturbance and longer-term improvements	Some temporary disturbance but long term improvements in terrestrial habitat quality and stability.	Some temporary disturbance with on- and off-site projects but long term improvements in terrestrial habitat quality and stability.
Water Resources	Gradual improvements through natural recovery with no benefits to resources from restoration projects.	Surface water - Some temporary soil disturbance in riparian areas. Long - term improvements from run-off.  Groundwater – reduction of movement of mining material into groundwater on site	In-stream and/or Riparian Corridor projects would improve aquatic habitat with some temporary soil/sediment disturbance. Long -term improvements to run-off.  Groundwater – possible improvements to recharge areas off-site	In-stream and/or Riparian Corridor – improvements to aquatic habitat with some temporary soil/sediment disturbance. Long-term improvements to run-off.  Groundwater – improvements to groundwater on- and off-site
Biological Resources	Gradual improvements through natural recovery with no benefits to resources from restoration projects.	Some temporary habitat and wildlife disturbances. Habitat and wildlife improvements for on-site restoration	Some temporary habitat and wildlife disturbances but long term improvements for off-Site restoration	Some temporary habitat and wildlife disturbances but long term improvements for on- and off-site restoration
T&E Species	Gradual improvements through natural recovery with no benefits to resources from restoration projects	Some habitat improvements are possible,	Opportunities for long term benefit to T&E species	Opportunities for long term benefit to T&E species



Attributes	Alternative 1: No Action	Alternative 2: On-Site	Alternative 3: Off-Site	Alternative 4: On- and Off-Site
Tribal Cultural Resources	Gradual improvements through natural recovery with no benefits to resources from restoration projects.	Improvements to access culturally significant sites and increase in abundance of cultural resources	Off-site restoration would restore cultural resources and services in a shorter timeframe	Important traditional on-site locations can be restored and off-site restoration can replace lost services that are important to tribal culture in a shorter timeframe
Recreation	Gradual improvements through natural recovery with no benefits to resources from restoration projects.	Increased recreational opportunities for on-site locations	Increased recreational opportunities for off-site locations	Increased recreational opportunities for on- and off-site locations
Socio-Economic	None	Potential changes in land ownership and land use through acquisition or easements with willing landowners. Agricultural uses would be reduced on restoration lands in order to replace injured natural resources	Potential changes in land ownership and land use. Agricultural uses would be reduced on restoration lands in order to create habitat.	Potential changes in land ownership and land use. Agricultural uses would be reduced on restoration lands in order to create habitat/replace injured natural resources
Climate Change	None	Possible benefits due to increase in carbon sequestration on areas that are devoid of biomass currently.	Possible local benefits due to increase in carbon sequestration from additional planting. However, the conversion in habitat cover from non-native to native will not have a significant increase or decrease in overall biomass or carbon sequestration potential.	Possible local benefits due to increase in carbon sequestration on areas that are devoid of biomass currently.

Attributes	Alternative 1: No Action	Alternative 2: On-Site	Alternative 3: Off-Site	Alternative 4: On- and Off-Site
Cumulative Impacts	None	<p>Cumulative impacts from restoration projects are expected to have an overall benefit to natural resources.</p> <p>Some restoration projects may occur concurrent with EPA remedial activities and may produce increased road traffic and associated increases in road degradation and fugitive dust on unpaved roads</p>	<p>Cumulative impacts from restoration projects are expected to have an overall benefit to natural resources.</p>	<p>Cumulative impacts from restoration projects are expected to have an overall benefit to natural resources.</p> <p>Some on-site restoration projects may occur concurrent with EPA remedial activities and may produce increased road traffic and associated increases in road degradation and fugitive dust on unpaved roads</p>

## **Chapter 6: Consultation and Coordination with Public**

Public participation is an integral component of NEPA analysis and the restoration planning process under CERCLA. The Trustees sought public comment on the Draft Programmatic RP/EA through a 30-day public comment period in May 2017 and did not receive any comments. In the future, as the Trustees select projects subsequent project-specific NEPA analyses will be completed, including a similar public review and comment process. Notification of all comment periods will be made available on the USFWS website and in local newspapers.

### **List of Preparers**

#### *Federal:*

Suzanne Dunn, USFWS  
Mosby Halterman, BIA  
Mary Lynn Taylor, Office of the Solicitor, DOI  
Amy Horner Hanley, Office of the Solicitor, DOI  
Brian Ferrasci-O'Malley, Office of the Solicitor, DOI  
Kelly Bakayza, Office of the Solicitor, DOI  
Steve Barclay, Office of the Solicitor, DOI

#### *State:*

Jay Wright, ODEQ  
Curtis Tackett, ODWC  
Clayton Eubanks, Oklahoma Attorney General's Office

#### *Tribal:*

Nancy John, Cherokee Nation  
Jason White, Cherokee Nation  
Kristi Laughlin, Eastern Shawnee Tribe of Oklahoma  
Justin Burris, Eastern Shawnee Tribe of Oklahoma  
Heather Webb, Miami Nation  
Jennifer Shallenburger, Miami Nation  
Cheryl Stafford, Ottawa Tribe of Oklahoma  
Lori Bailey, Ottawa Tribe of Oklahoma  
Tabitha Panvelle, Ottawa Tribe of Oklahoma  
Larry Tippit, Peoria Tribe of Oklahoma  
Rick DuBois, Seneca-Cayuga Nation  
Christen Lee, Wyandotte Nation  
Kathy Welch, Wyandotte Nation  
Brian Cleary, Tribal Advisor, The Cleary Law Group PC  
Shannon Work, Tribal Advisor, Shannon D. Work PC  
Kaylene Ritter – Abt and Associates

### **List of Agencies, Organizations, and Parties Consulted for Information**

DOI – Restoration Support Unit: Susan Kennedy, John Isanhart, and Rebecca MacEwen.

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## Appendix A – Restoration Evaluation Criteria

Below are the Evaluation Criteria that the Trustees will use to evaluate restoration project packages submitted to the TCTC during a Restoration Project Packages Period. Project proponents should use these criteria when developing their project packages. Non-Trustee project proponents will submit a project package through a Trustee of the TCTC as a sponsor for the project (see contact list at the end of this section) during a Restoration Project Packages Period. The Trustee sponsor will ensure that the project packages are complete before submitting them to the TCTC. In addition, individual Trustees can put forward project packages for consideration by the TCTC. The TCTC will use the information provided in the packages to evaluate the proposed restoration projects using the Evaluation Criteria.

Table A-1 identifies Acceptability Criteria that each project must meet for the project to be reviewed by the TCTC. Tables A-2 and A-3 include information that the TCTC will weigh when evaluating restoration projects. The TCTC will use these criteria to determine which projects are best suited to replace resources and resource services that were injured by the releases of hazardous materials from the TSMD.

In addition to a detailed description of the project, each project package must include a 1) map, 2) timeline for project implementation, 3) detailed budget with costs for personnel, equipment, and overhead in separate line items, 4) identification of land owner and/or manager, specify if the project includes purchase or easement, 5) specifically identify which resources the project will benefit, and 6) include the following information on the first page of the package:

**Project title** \_\_\_\_\_

**Author of Project Package** \_\_\_\_\_

**Estimated funds needed from TCTC** \_\_\_\_\_

**Overall goal of project** \_\_\_\_\_

**Tar Creek Trustee Sponsor or Trustee** \_\_\_\_\_

**Date of submission** \_\_\_\_\_

**Table A-1: Basic Acceptability Criteria for Restoration Planning**

Criteria	Interpretation
Addresses injured natural resource and services	<p>Project must restore, rehabilitate, replace, and/or acquire the equivalent of injured natural resources or lost services that have been targeted for restoration within the Restoration Plan/Programmatic Environmental Assessment (e.g., project addresses tribal cultural services losses from injured natural resources, project restores habitat for federally protected migratory species, project restores state regulated upland game species) (also see Section 2.4).</p> <p>In addition, projects should address/incorporate restoration of targeted natural resources and services identified in the corresponding Restoration Project Packages Period, as documented by Trustee mandates, priorities, and resolutions.</p>
Compliance with applicable/relevant laws, policies, and regulations	Project must be legal and adhere to federal, state, and tribal laws, policies and regulations.
Technically feasible	Technology and management skills necessary to implement [a restoration project] are well known and that each element of the [project] has a reasonable chance of successful completion in an acceptable period of time. 43 C.F.R. § 11.14(qq)
Cost Effective	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. 43 C.F.R. § 11.14(j)
Cost Benefit	The relationship of the expected costs of the proposed actions to the expected benefits from the restoration, rehabilitation, replacement, and/or acquisition of equivalent resources. 43 C.F.R. § 11.82(d)(2)

**Table A-2: Natural Resource and Services Criteria for Restoration Planning**

Criteria	Interpretation
Injured resources and services restored by project	<p>Evaluation will be based on the specific natural resource or service that benefits from the project. Projects must benefit the injured natural resource(s) or service(s) identified in the corresponding Restoration Project Packages Period.</p> <p>Projects that benefit more than one injured natural resource or service are preferred. In addition, projects that avoid or minimize additional natural resource injury or</p>

	environmental degradation will be given priority.
Proximity of project to injured resources and services	Project location must be identified for Trustee consideration. Both on-site and off-site projects will be considered. (See Section 3.3.1). For off-site projects, all else being equal, restoration in closer geographic proximity to the NOMNRDAR Site is preferred.
Benefits to resources and services	Project will be evaluated in terms of whether the expected benefits can be quantified and the success of the project determined. Projects can be scaled to provide restoration of appropriate magnitude. Small projects that provide only minimal benefits relative to injured resources or larger projects that cannot be appropriately scaled to meet the goals of the Restoration Plan are less favorable.
Equity and Environmental Justice	Restoration projects that benefit low-income and ethnic populations (including Native Americans) in proportion to the impacts to these populations are preferred. Restoration should not have disproportionately high costs or low benefits to low-income or ethnic populations. Further, where there are specific service losses to these populations, such as impacts on subsistence fishing, hunting, gathering, restoration should target benefits to these populations.
Cost effective and established technologies	Projects with a high ratio of expected benefits to costs are preferred. This includes using established technologies that have a high success rate. Projects with experimental or unproven technologies are not preferred.
Monitoring plans	For most projects (e.g., planting of native prairie, removal of invasive vegetation) the Trustees will expect the project plans to include a monitoring plan that covers the timeframe needed for restored resources and habitats to gain full functionality, which is generally anticipated to be no less than 5 years. Monitoring plans establish monitoring and reporting provisions to ensure the specific restoration actions are conducted as intended and are effectively restoring injured resources and services. Such provisions include monitoring techniques, performance standards and criteria, guidelines for implementing corrective actions, and a schedule for frequency and duration of monitoring.
Adverse impacts from project	Identify the adverse impacts, short and/or long term, from the project. Some short term adverse impacts from implementation are expected, however, projects with large

	or long term adverse impacts are not preferred.
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**Table A-3: Implementation Criteria for Restoration Planning**

Criteria	Interpretation
Injured resources and services restored by project	Evaluation will be based on the specific natural resource or service that benefits from the project. Projects must benefit the injured natural resource(s) or service(s) identified in the corresponding Restoration Project Packages Period. Projects that benefit more than one injured natural resource or service are preferred. In addition, projects that avoid or minimize additional natural resource injury or environmental degradation will be given priority.
Proximity of project to injured resources and services	Project location must be identified for Trustee consideration. Both on-site and off-site projects will be considered. (See Section 3.3.1). For off-site projects, all else being equal, restoration in closer geographic proximity to the NOMNRDAR Site is preferred.
Benefits to resources and services	Project will be evaluated in terms of whether the expected benefits can be quantified and the success of the project determined. Projects can be scaled to provide restoration of appropriate magnitude. Small projects that provide only minimal benefits relative to injured resources or larger projects that cannot be appropriately scaled to meet the goals of the Restoration Plan are less favorable.
Equity and Environmental Justice	Restoration projects that benefit low-income and ethnic populations (including Native Americans) in proportion to the impacts to these populations are preferred. Restoration should not have disproportionately high costs or low benefits to low-income or ethnic populations. Further, where there are specific service losses to these populations, such as impacts on subsistence fishing, hunting, gathering, restoration should target benefits to these populations.
Cost effective and established technologies	Projects with a high ratio of expected benefits to costs are preferred. This includes using established technologies that have a high success rate. Projects with experimental or unproven technologies are not preferred.
Monitoring plans	For most projects (e.g., planting of native prairie, removal of invasive vegetation) the Trustees will expect the project plans to include a monitoring plan that covers the timeframe needed for restored resources and habitats to

	gain full functionality, which is generally anticipated to be no less than 5 years. Monitoring plans establish monitoring and reporting provisions to ensure the specific restoration actions are conducted as intended and are effectively restoring injured resources and services. Such provisions include monitoring techniques, performance standards and criteria, guidelines for implementing corrective actions, and a schedule for frequency and duration of monitoring.
Adverse impacts from project	Identify the adverse impacts, short and/or long term, from the project. Some short term adverse impacts from implementation are expected, however, projects with large or long term adverse impacts are not preferred.



## **Sponsor contact information for the Tar Creek Trustee Council**

### **State of Oklahoma:**

Deputy Secretary of Environment  
The Office of the Secretary of Energy & Environment  
204 N. Robinson, Suite 1010  
Oklahoma City, OK 73102  
Telephone: (405) 522-7099  
Email address: [ee@ee.ok.gov](mailto:ee@ee.ok.gov)

### **U.S. Department of the Interior:**

Suzanne Dunn, Senior Contaminants Specialist  
U.S. Fish and Wildlife Service  
9014 E. 21<sup>st</sup> Street  
Tulsa, OK 74129  
Telephone: (918) 382-4521  
Email: [Suzanne\\_Dunn@fws.gov](mailto:Suzanne_Dunn@fws.gov)

### **Cherokee Nation:**

Nancy John, Environmental Director  
Cherokee Nation  
206 East Allen Road,  
Tahlequah OK 74464  
Telephone: (918) 453-5102  
Email: [Nancy-John@cherokee.org](mailto:Nancy-John@cherokee.org)

### **Eastern Shawnee Tribe of Oklahoma:**

Kristi Laughlin, Environmental Director  
Eastern Shawnee Tribe of Oklahoma  
10080 South Bluejacket Rd.  
Wyandotte, OK 74370  
Telephone: (918) 666-5151  
Email: [klaughlin@estoo.net](mailto:klaughlin@estoo.net)

### **Miami Tribe of Oklahoma:**

Heather Webb, Environmental Programs Coordinator  
Miami Tribe of Oklahoma  
PO Box 1326  
Miami, OK 74355  
Telephone: 918-541-1373  
Email: [hwebb@miamination.com](mailto:hwebb@miamination.com)

### **Ottawa Tribe of Oklahoma:**

Tabitha Panvelle, Environmental Specialist  
Ottawa Tribe of Oklahoma  
PO Box 110  
Miami, OK 74355

Telephone: (918) 541-1902  
Email: [tabitha.oto@gmail.com](mailto:tabitha.oto@gmail.com)

**Peoria Tribe of Indians of Oklahoma:**

Larry Tippit, Peoria Environmental Department  
Peoria Tribe of Indians of Oklahoma  
PO Box 1527  
Miami, OK 74355  
Telephone: (918) 540-2535 ext. 17  
Email: [ltippit@peoriatribes.com](mailto:ltippit@peoriatribes.com)

**Seneca-Cayuga Nation:**

Rick DuBois, CFM, Environmental Director  
Seneca-Cayuga Nation  
PO Box 453220  
Grove, OK 74345-3220  
Telephone: (918) 787-5452 x341  
Email: [rdubois@sctribes.com](mailto:rdubois@sctribes.com)

**Wyandotte Nation:**

Christen Lee, Environmental Director  
Wyandotte Nation  
64700 East Highway 60 Wyandotte OK 74370  
Telephone: (918) 678-6341  
Email: [clee@wyandotte-nation.org](mailto:clee@wyandotte-nation.org)

## **Appendix B - Examples of Restoration Projects**

Below are examples of restoration projects that could restore, replace, rehabilitate, and/or acquire the equivalent of injured resources and services at the NOMNRDAR Site. These are merely examples – the specific projects that the Trustees will actually undertake will be identified and evaluated in future site-specific restoration plans developed with public participation and made available to the public for review and comment prior to final selection and implementation.

### **Terrestrial Restoration Projects**

#### Land Acquisition

Preservation of native habitats can be accomplished either by purchase of the land or through the purchase of easements. The TCTC has not identified parcels to restore or purchase at this time. Nor has it identified organizations that would hold the titles to any purchases or easements. However, examples of organizations that could hold easements or manage restoration projects for the TCTC include federal and state agencies, tribes, or non-governmental organizations. Land purchases or easements may be conducted by entities selected by the Trustees using settlement monies, or directly by settling with PRPs. Any restoration project that is undertaken by the TCTC will require purchase or easement for protection of the project.

#### Terrestrial Primary Restoration

Terrestrial primary restoration could include deep-tilling soil amendments into remediated areas (i.e. chat base) that have residual metals. The soil amendments bind the metals remaining in the soil, allowing the soil to support a healthy native plant community. In addition to the application of soil amendments, the remediated areas could be planted with appropriate native plant or seed combinations.

#### Terrestrial Upland Improvements

Compensatory terrestrial upland improvements, described in more detail below, can be implemented on-site to address impacts from other activities (e.g., agriculture), in conjunction with primary restoration of mining-related contamination, or off-site as stand-alone projects.

*Native Prairie Restoration* - The goal of native prairie restoration is to improve/transform the quality of existing, low quality habitat to native, high quality habitat (i.e. natural prairie). Prairie restoration begins with any existing lower quality habitat, including some existing native prairie, agricultural land, non-native pasture, Conservation Reserve Program (CRP) grasslands, or unvegetated or former mine waste areas. However, it may be more cost effective and feasible to restore high quality grasslands on sites that are somewhat degraded, but currently support a variety of native prairie species. Such conditions are more likely to occur off-site.

*Savanna and Forest Restoration* - Restoration of savanna habitat is very similar to native prairie restoration, but includes incorporation of scattered trees (e.g., fire tolerant species). Upland forests are dominated by a mixture of native tree species, but may include a grass component. Site conditions will dictate the variety of native trees and

shrubs to be planted and savanna and upland forest restoration site selection will be dependent on recommendations from the USDA, state agencies, professional organizations and societies, Indian tribes, and universities.

#### Restoration, Preservation, and Enhancement of Riparian and Floodplain Areas

Riparian and floodplain restoration projects can be implemented both on-site and off-site. On-site restoration could include removal or deep tilling of contaminated floodplain soils (contaminated sediment can be deposited in the floodplain during high water flow events). Soil cores can be taken and analyzed by X-ray fluorescence (XRF) and other reliable techniques to determine the need for soil removal and/or deep tilling treatment. Preservation and enhancement of riparian and floodplain areas would protect the ecosystem health of a watershed. The protection and enhancement of the riparian corridors will promote the recovery of aquatic organisms and in some cases federally- and state-listed, candidate, and other rare or sensitive aquatic or aquatic-dependent species (i.e., Neosho madtom, Neosho mucket, rabbitsfoot mussel, gray bats). In addition, riparian and floodplain restoration projects could include watershed improvements such as wetland and/or bottomland hardwood restoration. These types of projects can benefit aquatic natural resources in addition to terrestrial resources, for example, by reducing sedimentation and improving habitat conditions for aquatic or aquatic-dependent species.

### **Aquatic Restoration Projects**

#### Stream Habitat Improvements

Stream habitat improvements could be implemented in areas not affected by mining-related metals contamination or after effective remediation of contaminated sediments. Restoration may include projects to improve stream habitat and streambank stability through fluvial geomorphology. Stream habitat can be restored or enhanced using geomorphic principles to restore the stream channel and its connection to the floodplain.

Fluvial geomorphology uses hydrologic characteristics such as channel morphology, river discharge and flood frequency, sediment transport, and others to design stream channel and habitat improvements. These improvements help restore the natural functions of a stream, accelerate natural recovery, make projects more sustainable, and reduce maintenance costs.

#### Re-Introduction/Stocking of Native Fish and Mussel Species

Re-introduction/stocking could be implemented in uncontaminated or successfully remediated areas. Re-introductions of native fish and mussels could be implemented to restore the species and related services lost due to hazardous mining releases. Re-introduction/stocking of species would take place in appropriate habitat where species numbers or diversity had been reduced. Local propagation centers have the potential to culture injured mussel species and injured fish species for restocking/reintroduction at the time when streams, water bodies, and habitat are clean enough to support healthy organisms.

### **Cultural Restoration Projects**

Restoration of specific areas or resources that can provide valuable services to Native American tribes of the area is important to the Trustees. The goal of these projects is to

restore, rehabilitate, replace, and/or acquire the equivalent of injured resources or resource services that are significant to tribal trustee members for cultural and/or subsistence uses. Individual projects will be evaluated for their tribal cultural importance, and the cultural value of such sites will be considered in the evaluation process detailed in Appendix A. Below is a non-exhaustive list of cultural restoration project examples:

- Terrestrial and Riparian restoration enhancements – include culturally significant plants in terrestrial and riparian restoration projects including: big blue bluestem and smooth sumac in the terrestrial areas and river cane, pawpaw, and chinquapin oak in riparian areas. The enhancement of remediated or uncontaminated terrestrial and riparian areas with native culturally significant plants would encourage the return of, and promote species health and diversity of native songbirds, game birds, small mammals, reptiles, etc. associated with tribal culture. In addition, improved terrestrial and riparian habitat would provide traditional hunting and gathering opportunities according to tribal members.
- Apprenticeship programs – develop project that would support the Tribal communities through the teaching and preservation of traditional cultural practices, knowledge, and values. These may include a library to preserve cultural language related to plants lost from impacts from metals, a seed bank of uncontaminated seeds for use by tribal members, and habitat space in which to teach and learn traditional hunting/gathering/fishing practices.
- Protection of culturally significant caves and springs.
- Stock fish or mussels in area water bodies as a replacement for injured fish and mussels that are used subsistence resources and are culturally significant to Tribes.
- Restoration of cultural gathering areas – enhance or create areas on uncontaminated land with culturally significant plants and wildlife and provide access for tribal members consistent with the purposes of CERCLA.

## Appendix C – Authorities and Legal Requirements

The following federal, state, local, and tribal laws, regulations, and policies could affect the planning, design, and completion of restoration projects. All restoration project sponsors, including the Trustees, would be responsible for obtaining necessary permits and complying with local, state, and federal laws; policies; and ordinances.

### **Federal Laws and Policies**

#### **Comprehensive Environmental Response Compensation and Liability Act**

The CERCLA, as amended, 42 U.S.C. §§ 9601-9675, authorizes the Federal Government, States, and Indian Tribes to recover damages for injuries to natural resources and their supporting ecosystems, belonging to, managed by, appertaining to, or otherwise controlled by them.

#### **Clean Water Act of 1972, as amended**

The Federal Water Pollution Control Act (Clean Water Act (CWA)), as amended, 33 U.S.C. §§ 1251-1387, authorizes the Federal Government, States, and Indian Tribes to recover damages for injuries to natural resources and their supporting ecosystems, belonging to, managed by, appertaining to, or otherwise controlled by them. The CWA mandates that any NRD recoveries are used to restore, rehabilitate, or acquire the equivalent of the injured natural resources.

#### **Migratory Bird Treaty Act**

Congress has delegated to the USFWS, as the bureau within DOI, the responsibility for conservation of migratory birds in the United States. The United States is a member of a treaty with Canada and Mexico to conserve migratory bird populations in the Western Hemisphere. The MBTA, 16 U.S.C. § 703 *et seq*, associated federal regulations, and Executive Orders establish the federal government and the USFWS's authorities for migratory bird programs.

#### **Endangered Species Act**

The ESA requires Federal agencies to determine whether their actions may adversely affect any federally listed or proposed threatened or endangered species. If so, formal consultation pursuant to Section 7 of the ESA is initiated. Congress has also delegated responsibility to the USFWS for the conservation, including recovery of federally-listed endangered or threatened species, except for marine mammals. The Endangered Species Act, 16 U.S.C. § 1531 *et seq*, and associated federal regulations establish the USFWS's authorities for endangered species programs.

#### **National Environmental Policy Act of 1969**

The National Environmental Policy Act (NEPA) requires federal agencies to consider the environmental effects of proposed federal actions. While the Programmatic RP/EA includes an Environmental Assessment for restoration planning, the federal Trustees will conduct additional NEPA analysis for subsequent restoration planning and implementation that falls under the Programmatic RP/EA.

National Historic Preservation Act of 1966, as amended

The National Historic Preservation Act (NHPA) is intended to preserve historical and archaeological sites. Compliance with the NHPA would be undertaken through consultation with the Michigan State Historic Preservation Officer. If an eligible historic property is within the area of the proposed restoration project, then an analysis would be made to determine whether the project would have an adverse effect on this historic property. If the project would have an adverse effect on historic properties, then the agency proposing the restoration project would consult with the SHPO to minimize the adverse effect.

Cultural resources are those parts of the physical environment, natural and built, that have cultural value to some socio-cultural groups and human social institutions. Cultural resources include historic sites, archeological sites and associated artifacts, sacred sites, traditional cultural properties, cultural items, and buildings and structures. Most cultural resources concerns can be identified through the Section 106 process of the NHPA.

Absent objections from Historic Preservation Officers (HPOs) or from other interested persons the NHPA recognizes as having legal standing (36 C.F.R. §§ 800.2(c)(3), (4), and (5)) in land acquisition projects, projects involving ground disturbance, and projects impacting buildings and structures 50 years and older.

Protection and Enhancement of Environmental Quality, as Amended by Executive Order 11911 Relating to Protection and Enhancement of Environmental Quality

These EOs require federal agencies to monitor, evaluate, and control their activities to protect and enhance the quality of the nation's environment. These Executive Orders also require agencies to inform the public about these activities and to share data on environmental problems or control methods, as well as to cooperate with other governmental agencies.

Executive Order 11988, Floodplain Management

This EO directs all Federal agencies to take action to avoid, to the extent possible, the long-and short-term impacts associated with the occupancy and modification of floodplains.

Executive Order 11990, Protection of Wetlands

This EO instructs each Federal agency to avoid, to the extent possible, the long- and short-term adverse effects associated with the destruction or modification of wetlands

Executive Order 12898, Environmental Justice

This EO directs Federal agencies to assess whether their actions have disproportionately adverse human health or environmental effects on minority or low-income populations.

Executive Order 12962, Aquatic Systems and Recreational Fisheries

This EO directs Federal agencies to add additional public access to fisheries nationwide by conserving, restoring, and enhancing aquatic systems.

Executive Order 13112, Invasive Species

This EO requires that federal agencies, where practicable and permitted by law, should identify any actions that may affect the status of invasive species and take actions to address the problem within their authorities and budgets. Agencies also are required not to authorize, fund, or carry out actions that they believe are likely to cause or promote the introduction or spread of invasive species, unless a determination is made that the benefits of actions outweigh potential harms and measures are taken to minimize harm. The Trustees would not expect to select any restoration projects that would promote the introduction or spread of invasive species.

#### Executive Order 13186, Protection of Migratory Birds

This EO requires federal agencies to evaluate the effects of their actions on migratory birds, to take actions to avoid or minimize the impacts of their actions on migratory birds, and to help promote conservation of migratory birds if actions are likely to have a measurable negative effect on migratory bird populations. The proposed action would not be expected to have a negative effect on migratory bird populations.

#### DOI Departmental Manual, Parts 517 and 609, Pesticides and Weed Control

Consistent with DOI policy, implementation of any alternative in this Programmatic RP/EA will use integrated pest management strategies.

#### DOI Departmental Manual, Part 518, Waste Management

Projects will seek to prevent the generation and acquisition of hazardous wastes, but when waste generation or acquisition is unavoidable, sound waste management practices will be used. Also consistent with DOI policy, aggressive measures will be used to clean up and restore these areas.

#### DOI Departmental Manual Part 602: Land Acquisition, Exchange and Disposal

If the federal government acquires any real property through implementation of these restoration projects, the acquiring agency would comply with appropriate pre-acquisition standards – particularly the American Society for Testing and Materials standard for Environmental Site Assessments for Commercial Real Estate.

#### Pre-Acquisition Environmental Site Assessments

Environmental site assessment requirements, including pre- and post-acquisition requirements, Level I, II, or III assessment, assessment standards and conditions, retention of records, and time limits will be met.

#### USFWS Mitigation Policy

This policy of the USFWS seeks to ensure “no net loss” of fish and wildlife habitat as a result of USFWS actions. The Trustees would not anticipate that the proposed action would result in long-term adverse impacts on habitat.

#### **State of Oklahoma Laws and Policies**

Title 27A O.S. 1-1-101 et. seq. Oklahoma Environmental Quality Act and Oklahoma Environmental Quality Code



27A O.S. § 2-6-105 (A): It shall be unlawful for any person to cause pollution of any waters of the state or to place or cause to be placed any wastes in a location where they are likely to cause pollution of any air, land or waters of the state. Any such action is hereby declared to be a public nuisance.

27A O.S. § 2-1-102 (12) "Pollution" means the presence in the environment of any substance, contaminant or pollutant, or any other alteration of the physical, chemical or biological properties of the environment or the release of any liquid, gaseous or solid substance into the environment in quantities which are or will likely create a nuisance or which render or will likely render the environment harmful or detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life, or to property;

Title 29 O.S. § 1-101 et. seq. Oklahoma Wildlife Conservation Code

Title 29 O.S. § 2-109. Oklahoma Endangered Species Act - State-listed T&E species include all federally-listed species and additional species listed by the state. See section 2.1.5 for more information on state-listed species.

### **Summary of Cherokee Nation's Legal Authorities Relating to Natural Resource Damages**

1. Cherokee Nation Environmental Code, 63 CNCA Sections 50 et seq. (LA 31-04)
  - a. Section 201 defines "environment" to include air, land, water, cultural and archaeological resources, and wildlife
  - b. Section 101D establishes the authority of the Cherokee Nation Environmental Protection Commission to enforce the laws of the Cherokee Nation related to the environment, including but not limited to: promulgating rules, issuing permits, taking enforcement actions and other measures deemed appropriate to protect natural resources
  - c. Section 1001 authorizes the Commission to do whatever is necessary to ensure that requirements under federal environmental laws are met in Indian Country, including RCRA, CWA, CAA, NEPA, TSCA and other environmental laws and federally approved water quality standards of adjacent states and nations. They can also adopt more stringent requirements.
  - d. Section 1002 lists the Commission's authorities over any potential source of pollution and such activities as mining, dredge and fill, discharges, water quality, water use, hazardous waste storage, treatment, disposal and transportation, air, and under paragraph(12) to establish and implement programs and enforce requirements for protection of or regulation of fish and wildlife
  - e. Section 1003 gives the Commission authority to enter and inspect, sample and obtain administrative warrants if necessary
  - f. Section 1004 gives the Commission broad authority over anything that might cause pollution and to issue cease and desist orders

- g. Section 1005(B)((2) provides that the Commission may utilize administrative enforcement orders to “mandate corrective actions, assess damages for injuries to natural resources of the Cherokee Nation and/or require mitigation”
  - h. Section 1006(A) provides penalties for violations of the Code.
  - i. 1006 (F)(1) provides authority to the Commission to bring an action in Court for injunctive relief and for recovery of natural resource damages, costs of mitigation and corrective action
  - j. Section 1006(F)(2) gives the Court the authority to grant mandatory or prohibitive relief, assessment of natural resource damages, costs of corrective action and mitigation and costs of any measure necessary to protect the environment or public health
2. Cherokee Nation Water Quality Code 63 CNCA Section 900 et seq (LA 35-04)
    - a. Section 901(C)- the Commission has the authority to take all actions necessary to “assert and defend the Cherokee Nation’s legal rights and claims to waters and related natural resources”
    - b. Section 903 defines the term “waters of the Cherokee Nation” broadly, similar to the state’s definition and broader than the Clean Water Act – it includes groundwater and all surface waters
    - c. Section 903 – The Commission has the authority to issue swimming and fishing advisories, adopt water quality standards, require monitoring, develop programs, require information, issue permits and orders, as necessary to prevent, control or abate pollution or to enforce the Code and rules promulgated thereunder
    - d. Section 905 et seq is the Cherokee Nation Discharge Elimination and Control Act, establishing requirements and authorities comparable to the OPDES program DEQ, deemed adequate for EPA to authorize the state discharge permit program, but extending to all types of wastes (jurisdiction comprehensive for municipal, all industrial and other sources of discharges)
    - e. Section 910 et seq is the Cherokee Nation Water Supply Systems Act authorizing protection of public water supplies and wellheads, etc.
    - f. Section 930 et seq is the Cherokee Nation Waste Storage, Treatment, Transportation and Disposal Act that gives the Commission authority to regulate impoundments and land application of wastes, etc.
  3. The Cherokee Nation Hazardous Waste Code, 63 CNCA Sections 1301 et seq is a comprehensive regulatory act comparable to the Oklahoma Hazardous Waste Code, which was deemed adequate authority by EPA for authorizing the state hazardous waste program
  4. Cherokee Nation Hunting and Fishing Code, 29 CNCA Section 101 et seq, mirrors the state wildlife code and has additional authorities specified.
    - a. Section 103(A)- the Nation may adopt by reference and enforce fish and wildlife laws of adjacent states and nations
    - b. Section 103(B) – adopts by reference as minimum requirements, the requirements of applicable federal laws such as the Migratory Bird Treaty Act and Endangered Species Act

- c. Section 103(C) provides that the state wildlife code and rules apply unless otherwise specified
- d. Section 105 7-204 – fish and wildlife are the property of the nation
- e. Section 105 7-402 - the Principal Chief and Attorney General can take legal action to address activities in other states or nations which may be injurious to plants, fish, birds or any wildlife species in the Cherokee Nation
- f. Section 109 – Department in charge of wildlife has authority to manage fish and wildlife resources and their habitats
- g. Section 111, 112 and 113 – provide authority for enforcement by the Cherokee Nation and authority for the Court to assess costs, fines, attorney fees, require remediation, restitution and payment of damages, issue injunctive relieve and issue orders in any civil or criminal enforcement proceeding.

### **Highlights from the Peoria Tribe of Indians of Oklahoma Constitution and Peoria Tribe Codes and Ordinances**

#### **ARTICLE II - JURISDICTION**

The authority and jurisdiction of the Peoria Tribe of Indians of Oklahoma shall extend to all the territory within the boundaries now known as Peoria Lands, and to all lands which may be acquired for the Peoria Tribe by the United States Government or which may be acquired by the Peoria Tribe for its land base and to all Indian country of the Peoria Tribe and its citizens as of now or hereafter as defined by Federal law. The Peoria Tribe of Indians of Oklahoma may exercise its authority and jurisdiction outside the territory described to the fullest extend not prohibited by Federal law.

#### **ARTICLE VIII - POWERS**

SECTION 2. The Business Committee shall serve as the legislative body of the Tribe and shall have the authority to act on and on all matters and subjects upon which the Tribe is empowered to act, now or in the future, including, but not limited to the following:

...

- (e) To regulate and provide for permits, leases, assignments of land for business, homesite, and other purposes, and generally to provide for proper use and development of all Tribal lands, natural resources, and other Tribal property.

...

- (h) To protect and preserve the wildlife and natural resources of the Tribe; to regulate hunting, fishing, and trapping on Tribal lands.