PRE-ASSESSMENT SCREEN AND DETERMINATION

Tulsa County Smelter Complex Natural Resource Damage Assessment and Restoration Site Tulsa County, Oklahoma

Prepared by the
Natural Resource Trustees for
Tulsa County Smelter Complex Site

October 13, 2017

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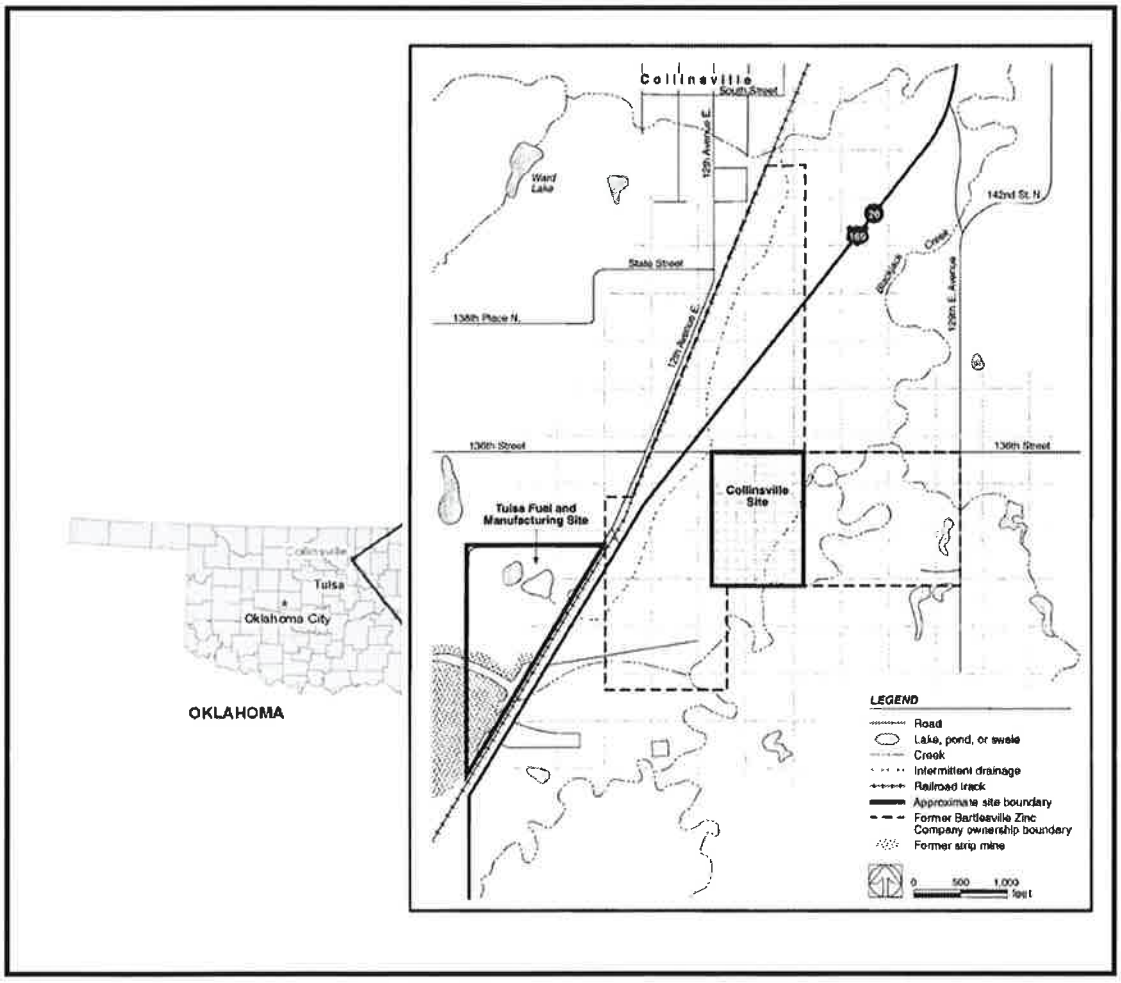
1.0 Introduction

This document concerns potential claims for injuries and damages to natural resources and resource services related to releases of hazardous substances from the Tulsa Fuel & Manufacturing (TFM) and the Collinsville Smelter facilities (See Appendix A) (hereinafter known as the "Facilities") to the environment in Tulsa County, Oklahoma. The natural resource Trustees have determined that the injuries and damages from the Facilities will be evaluated as one Natural Resource Damage Assessment and Restoration (NRDAR) site because the Facilities: 1) are across the highway from each other, 2) smelted the same ore, and 3) have overlapping and inseparable injury to trust resources that extend beyond their perimeters. The Trustees have named this site the Tulsa County Smelter Complex (TCSC) Site (Figure 1).

Figure 1. General locations of Tulsa Fuels Manufacturing and Collinsville Smelter Facilities



Exponent 2001

1.1 Background and location of Facilities

TFM Facility

The TFM Facility is a 60-acre former zinc smelter and lead roaster (Appendix A– Figure 3). The TFM Facility is located approximately 1.3 miles from the downtown area of Collinsville, Tulsa County, Oklahoma. It was operated from 1914-1925 by New Jersey Zinc Company. TCI Pacific Communications, Inc. (TCI) is the successor in-interest to New Jersey Zinc Company (Case 4:11 – cv-00252 CVE-PJC). The TFM facility consisted of nine furnaces and a mechanical kiln that were fueled by nearby natural gas wells. It was placed on the National Priorities List (NPL) in 1999 after a 1994 Oklahoma Department of Environmental Quality (ODEQ) site inspection listed arsenic, cadmium, lead, and zinc as the contaminants of potential concern (CoPC) (ODEQ 1994). Approximately 200,000 cubic yards of waste was remediated at the TFM Facility including broken retorts and equipment, slag, building debris, ash, and bricks (ODEQ 1997 and 2017).

Collinsville Smelter Facility

The Collinsville Smelter Facility is located approximately one mile south of Collinsville and across Old Highway 169 to the east-northeast of the TFM Facility (Appendix A – Figures 4 and 5). The Collinsville Smelter Facility was operated as a zinc smelter between 1911 and 1918 by the Bartlesville Zinc Company. Cyprus Amax Mineral Company (Cyprus) is the successor of the parent of the now dissolved Bartlesville Zinc Company (ODEQ 2012). Remedial Investigation (RI) activities were conducted at the Site in 1995, 1996, and 1998 as a cooperative assessment with Cyprus (Burns & McDonnell 2007).

The Facilities are located in a mostly rural area with agricultural land in the general vicinity. The TFM had a water filled impoundment at the facility with runoff into Blackjack Creek. This creek flows approximately 0.75 miles intermittently before becoming perennial (ODEQ 1994). Before remediation, the TFM was vegetated by various grass species, trees, and shrubs creating diverse habitat types. There were areas of dense vegetation interspersed with sparsely vegetated areas and patches of bare or rocky ground (Burns & McDonnell 2007). A large portion of the Collinsville Smelter facility is situated in either the 100 or 500-year flood hazard area of Blackjack Creek (Shaw 2012)

1.2 Purpose of the Pre-Assessment Screen

Federal Natural Resource Damage Assessment (NRDA) regulations, at 43 C.F.R. § 11.23(a), require natural resource trustees to complete a Pre-Assessment Screen (PAS) prior to conducting formal injury assessment activities. The purpose of the PAS is to provide a rapid review of readily available information on hazardous substance releases from the Site and the potential impacts to natural resources for which the trustees may assert trusteeship (42 U.S.C. § 9607(f)). The PAS review is intended to ensure a reasonable probability of making a successful NRDAR claim before monies and effort are expended to carry out a formal assessment. Additionally, the PAS documents the trustees' determination that further assessment efforts are warranted (43 C.F.R. § 11.23). This document fulfills that requirement for the Site and follows the structure of Federal Regulations at 43 C.F.R. Part 11. On behalf of the trustees, this allows the assessment of

natural resource damages to have the force and effect of rebuttable presumption in any administrative or judicial proceeding filed pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended (42 U.S.C. §§ 9601 *et seq.*) or the Federal Water Pollution Control Act (FWPCA) also known as the Clean Water Act (CWA), as amended (33 U.S.C. §§ 1251 *et seq.*) (42 U.S.C. § 9607(2)(C)).

1.3 Trusteeship

The CERCLA, CWA, and 40 C.F.R. § 300.600(2) authorizes the Secretary of the Interior to act as trustee for natural resources, and their supporting ecosystems, managed or controlled by the U.S. Department of the Interior (DOI). The CERCLA, CWA, and 40 C.F.R. § 300.605 authorizes State trustees to act on behalf of the public as trustees for natural resources, including their supporting ecosystems, within the boundary of, belonging to, managed by, controlled by, or appertaining to such state. The CERCLA, CWA, and 40 C.F.R. § 300.610 authorizes Indian tribes to serve as trustees for natural resources, including their supporting ecosystems, belonging to, managed by, controlled by, appertaining to such Indian tribe, held in trust for the benefit of such Indian tribe, or belonging to a member of such Indian tribe, if such resources are subject to a trust restriction on alienation.

Cherokee Nation - Trusteeship Based on Treaty Boundaries

By the Treaty with the Cherokee, May 6, 1828, 7 Stat. 311, the United States secured, to be conveyed by patent, some seven million acres in Oklahoma (west of the Arkansas territory, east and south of the location of the Seneca tribe to Grand Lake, west of the Choctaw land base, and west of the Osage land base), as well as an "outlet" securing "free and unmolested use of the Country lying West. . ." of the described land base. Id. at Art. 2. See also Treaty with the Western Cherokee, Feb. 14, 1833, 7 Stat. 414, Art. I (supplementary to the Treaty of 1828). The Treaty with the Cherokee of New Echota, Dec. 29, 1835, 7 Stat. 478, Art. 2, confirmed this acreage and also promised an option of an additional 800,000 acre tract of land between the Missouri border and east and south of the Osage Reservation if the original seven million acres proved insufficient to accommodate the whole Nation. The Nation subsequently took that option on additional land. Treaty with the Cherokee, Aug. 6, 1846, 9 Stat. 871, Art. 1. The Cherokee land base was deeded in a December 31, 1838 patent from the United States.

Claims may be pursued by the trustees for injury to, destruction of, or loss of natural resources against parties that have been identified as potentially responsible for the release of hazardous substances. The damages received will be used to restore, rehabilitate, replace, and/or acquire the equivalent natural resources to those harmed by the hazardous substance releases.

The natural resource trustees who have participated in the preparation of this PAS include the DOI, the State of Oklahoma, and the Cherokee Nation (collectively the "Trustees").

2.0 Information on the Release of Hazardous Substances

This section summarizes readily available information reviewed by the Trustees related to the release of hazardous substances from the Facilities. It should be noted that the Trustees may identify or collect additional information to adequately define the nature and extent of contamination and injuries associated with the hazardous substance releases at the Site.

2.1 Timing, Quantity, Duration, and Frequency of Releases

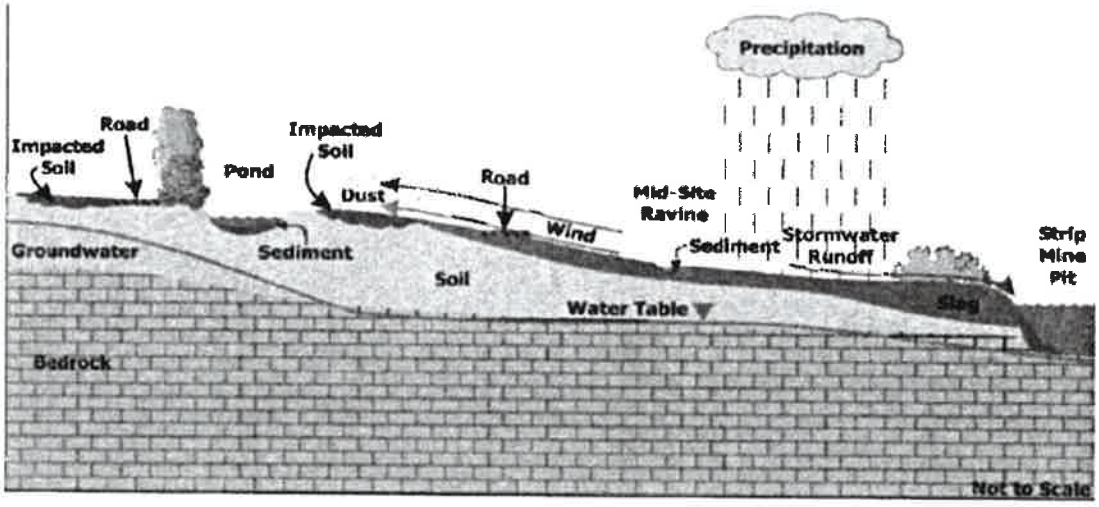
The TFM Facility began operation in 1914 and there was approximately 200,000 cubic yards of resulting waste onsite before remediation. This waste had been exposed for over 70 years with no protective cover material or any method to reduce runoff from the Site (ODEQ 1994). The lack of control measures has likely resulted in contaminant migration to offsite areas from the beginning of smelting operations until the present time.

The Collinsville Zinc Smelter operated a horizontal retort zinc smelter between 1911 and 1918 (Shaw 2010). In 1916 – 1917, the Collinsville Smelter had 13,440 retorts (USGS 1918). Air deposition of heavy metals from zinc smelter stacks has been extensively documented (Douay et al. 2008, Svendsen et al. 2007, Carline and Jobsis 1992). Due to the time period in which the Facilities operated, it is unlikely any air emission control devices were used and both onsite and offsite metal contamination occurred due to aerial deposition of stack emissions.

2.2 Description of the Hazardous Substances Released

The Facilities have been the subject of prior studies and investigations which have revealed elevated heavy metal concentrations in several potential media including, but not limited to, air, soils, surface waters and associated sediments, and groundwater surrounding.

Figure 2. Media and Potential Pathway of Migration from TFM and Collinsville Smelters



USEPA 2008

The Trustees have reviewed relevant information which indicates that CoPCs have been released at the TCSC Site. These CoPCs include, but are not limited to arsenic, cadmium, lead, and zinc. These CoPCs are hazardous substances as listed in Federal regulations found at 40 C.F.R. § 116.4 and as toxic pollutants pursuant to 40 C.F.R. § 401.15, as amended.

2.3 History, Current/Past Use, and Relevant Operations of the Site

At the TFM Facility, a zinc smelter and lead roaster was operated from 1914-1925 to satisfy the great demand for zinc during World War I. Historically, the smelter was know as the Prime Western Smelter and was sometimes called the Acme Brick Strip Mines due to the adjacent mining operation. The smelting operation utilized a 2-million gallon reservoir to support operations and large amounts of ore were stored onsite. Little is known about waste management during operation and it is unlikely any stack emission controls were used. No evident data exists to estimate the metal loading from stack emissions to the surrounding area (Burns & McDonnell 2007).

The Collinsville Smelter Facility operated from 1911 to 1918. Smelter operations at the site include the distillation of zinc from prepared ore in horizontal retort furnaces and the recovery of silver from retort residues. The smelter operations resulted in vast amounts of waste including: fragmented retorts and condensers which are coated with residues containing heavy metals; slag containing heavy metals and fragmented bricks. Horizontal retort smelters produced large amounts of waste. During the roasting and sintering of the ore, large amounts of sulfur dioxide and sulfuric acid were produced (Exponent 2001).

2.4 Additional Hazardous Substances Potentially Released from the Site

Literature and data reviewed for this PAS do not indicate the release of any hazardous substances other than those listed previously in this document.

2.5 Potentially Responsible Parties (PRPs)

The TCSC Site is comprised of impacts from releases of hazardous substances from the TFM and Collinsville Smelter facilities. At the TFM Facility, TCI is a successor in interest to New Jersey Zinc Company (NJZ), the alter ego to Tulsa Fuels Management Company. There may be other owner/operators of the TFM site that may be considered PRPs. At the Collinsville Smelter Facility, Cyprus Amax is a successor to the Bartlesville Zinc Company (BZC) that operated a smelter at the Collinsville Smelter Facility between 1911 and 1918. There may be other successors to the BZC and other owners of the Collinsville smelter that may be considered PRPs. Other parties responsible for the hazardous substances may be discovered during the Assessment Phase of the NRDAR process and added to the list of PRPs.

3.0 Regulatory History

3.1 Past Remedial and Response Actions Taken

TFM Facility

The ODEQ conducted a Preliminary Assessment in November 1992 and a site inspection in September 1994. Based on the results, the metals arsenic, cadmium, lead, and zinc were found to be present in elevated amounts. The property was then referred to the U.S. Environmental Protection Agency (USEPA) for further action (USEPA 2008). The facility was proposed to the National Priorities List (NPL) in September 1998 and was finalized on January 19, 1999.

USEPA subsequently conducted a Removal Assessment in 1999 to determine the absence/presence of hazardous materials, types and concentrations of hazardous substances, and estimate waste pile volumes. The Agency of Toxic Substances and Disease Registry (ATSDR) finalized the Public Health Assessment for the facility in July 2000 followed by an emergency response in March 2004 by USEPA to install a partial perimeter fence to discourage trespassing onto the facility.

Prior to the start of the Remedial Investigation and Feasibility Study (RIFS), EPA and ODEQ negotiated a Cooperative Agreement under which the ODEQ was the lead agency for the TFM site with EPA acting as the supporting agency. A State can be granted status as the "lead agency" on a Superfund site, per 40 CFR 300.515. When a State is the lead agency, they perform work under Cooperative Agreement and all work plans are approved by the EPA. The ODEQ provides the EPA copies of all site documents and considers all comments provided by EPA on these documents.

From early 2005 through 2007, contractors (Burns & McDonnell Engineering Co. Inc.) for ODEQ conducted a RI/FS. The RI was conducted in two phases and identified the types, quantities, and locations of contaminants and the FS developed options to address the contamination. This Study was completed in August 2007 and in November 2008 the Record of Decision (ROD) addressing the entire facility as one Operable Unit (OU) was signed (USEPA 2008).

In 2008, ODEQ performed off-site soil sampling of residential areas on properties in the vicinity of the TFM, including properties encompassed by the BZC boundary as part of the *Supplemental Remedial Investigation Report* (CH2MHill 2008). The ROD for the TFM established preliminary remediation goals for residential and non-residential soil for the TFM (USEPA 2008) (See Table 1). The remedy for TFM was completed in 2017. The remedy included consolidating and capping source material on site (ODEQ 2017). Specifically the primary elements of the selected remedy, as documented in the ROD, are:

- Excavation and consolidation of materials, including materials from adjacent parcels that are north, west, and south of the TFM Superfund Site
- Stormwater control

- Dust control
- Capping
- Institutional Controls
- Site inspections
- Long Term Maintenance and Operation and Maintenance

Collinsville Smelter

The clean-up for the Collinsville Smelter facility is being completed by Cyprus through the ODEQ Voluntary Clean-up Program (VCP). The VCP provides a means for private parties and government entities to voluntarily investigate and, if warranted, clean up properties that may be contaminated. VCP utilizes a negotiated process for site activities. Sites in the VCP generally have the option to enter the Brownfields Program if the participant requests. VCP includes sites ranging from old oil refineries with multiples sources of contamination that affect hundreds of acres to sites less than an acre with a single source of contamination.

The clean-up at the facility included capping and removal of impacted soil (ODEQ personal communication). In addition, Cyprus and ODEQ addressed cleanup areas outside the Collinsville Smelter facility due to historic smelter emissions and the transport of smelter material off-site. Sampling of more than 200 residential properties in Collinsville was conducted in 2008 by the USEPA. Based upon this and other sampling results and the presence of visible smelter debris at some areas within Collinsville, ODEQ and EPA established a systemic, larger-scale soil program named the Collinsville Soil Program (CSP). Approximately 5% of the properties evaluated contain concentrations of one or more of these metals in excess of the CSP soil remediation standards (see Table 1) (ODEQ 2009, Shaw 2009). A total of 284 properties participated in the soil clean-up activities (GHD 2017).

Additional non-residential areas south of the facility will be addressed as described in the Phase 2 Remedial Action Work Plan. In general, Phase 2 will remove impacted soil from properties where unrestricted land use is necessary because Cyprus does not own the property, construct a 12-inch soil cover (cap) over impacted soil on Cyprus-owned properties, and remove smelter debris from Blackjack Creek. A portion of the soil in the existing soil repository will be reused as soil cover material on Cyprus-owned properties. Cyprus will then place institutional and administrative controls on the properties that it owns in order to support the constructed remedies. A new repository will be constructed from soil and smelter material removed from properties that Cyprus does not own (ARCADIS 2017).

Table 1. TFM and CSP Remediation Standards by Medium

	Arsenic	Cadmium	Lead
Soil, Residential (mg/kg) or	37	75	500
Soil, Nonresidential (mg/kg) or	200	560	1000
Sediment (mg/kg) or (ppm)	181	813	500
Surface Water (µg/L) or (ppb)		238	

4.0 Preliminary Identification of Resources Potentially at Risk

4.1 Preliminary Identification of Pathways

Onsite smelter waste has been exposed for over 70 years with no protective cover material or any method to reduce runoff from the Facilities to the TCSC Site (ODEQ 1994). Due to the time period in which the smelters were operated, it is unlikely any air emission control devices were used and both onsite and offsite metal contamination occurred due to aerial deposition of stack emissions (Burns & McDonnell 2007). The lack of control measures has likely resulted in contaminant migration via surface runoff, fugitive dusts, and infiltration to offsite areas from the beginning of smelting operations until the present time. In addition, due to the proximity of the two Facilities they share the air/particulate dispersion pathway.

4.1.1 Air Pathways

The historic unrestricted air emissions at the Facilities are an important mechanism of dispersal for the hazardous substances. Exhaust from the smelters released volatilized and fine particles of metals in dust directly into the air where they were transported and later deposited over the surrounding land and surface water.

4.1.2 Soil Pathways

Aerial deposition of heavy metal particulates, movement by erosion and other process has directly contaminated the soils at the TCSC Site (See Appendix B – Tables 2-5). Four metals were considered to be suitable soil CoPCs. These included, but are not limited to arsenic, cadmium, lead, and zinc (Burns & McDonnell 2007). These hazardous substances were transferred to soils near the smelters by deposition and have likely been transported to other soils by wind and water erosion. Soils make up an integral component of the terrestrial habitat. Biological resources such as plants, soil invertebrates, and wildlife may be exposed to these hazardous substances in soils through a number of subsequent pathways including dermal absorption, uptake by inhalation, or ingestion.

Mechanical transport (by humans) of materials containing site related CoPCs could have occurred by three general mechanisms: spillage of ore concentrates, use of smelter residue for fill or road and railroad ballast, and reworking of surface soils during mine reclamation activities (Exponent 2001).

4.1.3 Surface Water Pathways

Surface waters at the TCSC Site have been directly exposed to metals through aerial deposition, erosion of contaminated soils, through movement and re-suspension of contaminated sediments. In addition, observations were made of smelter residue used for streambank stabilization (Exponent 2001). Surface water sampled from both onsite and offsite areas contained cadmium, lead, and zinc at levels exceeding background and/or screening levels (See Appendix B- Tables 6 and 7). Surface water is an integral component of the aquatic habitat. Biological resources such as aquatic plants, invertebrates and wildlife may be exposed to hazardous substances in surface through a

number of subsequent pathways including dermal absorption, uptake by inhalation, or ingestion.

4.1.4 Sediment Pathways

Sediment contamination has occurred at the TCSC Site by the deposition of hazardous substances from smelters to sediments (settlable solids), precipitation of hazardous substances from surface water (dissolved fraction), and erosion from contaminated soils. These contaminated sediments can serve as an ongoing source of contamination to the TCSC site. Sediment samples were collected from onsite surface water drainages and/or impoundments. Sediment from these areas contained arsenic, cadmium, lead, and zinc at levels exceeding background and/or screening levels (See Appendix B – Tables 8-10). Sediments are an integral component of the aquatic habitat. Biological resources such as aquatic plants, invertebrates and wildlife may be exposed to hazardous substances in sediments through a number of subsequent pathways including dermal absorption, uptake by inhalation, or ingestion.

4.1.5 Groundwater Pathways

There is no major bedrock or alluvial aquifer beneath the TCSC Site (USEPA 2008). The Pennsylvanian-aged Seminole Formation, designated as a Class IIB minor use general basin, comprises the upper bedrock aquifer beneath the Site. Activities from the RI indicate that groundwater is located ubiquitously at the Site; however, the Seminole Formation yields only small amounts of fair to poor quality water (OAC 2004). Groundwater samples were collected from nine temporary piezometers and seven monitoring wells at the TFM Facility. Arsenic, cadmium, lead, and zinc were detected at levels that exceeded background and/or screening levels (See Appendix B – Table 11)

4.1.6 Food Chain Pathways (bio-accumulation)

Hazardous substances at the TCSC Site have accumulated in abiotic media and have potentially been transferred through the food chain by dermal contact or ingestion of soil, sediment, surface water, and prey. Potential terrestrial receptor species include native vegetation (e.g. blackberry bushes), invertebrates, small mammal communities (e.g. short-tailed shrew and white-footed mouse), and raptors (e.g. red-tailed hawks, owls). Potential aquatic receptor species include benthic macro-invertebrate assemblages (e.g. gastropods, crayfish, and various insect larva), several fish communities (e.g. mosquitofish, sunfish, spotted and largemouth bass), and piscivorous birds such as great blue herons and belted kingfishers. Based on levels of CoPCs in soil, sediment, water, and fish tissue, it is likely biota have been directly and indirectly exposed.

4.2 Exposed Areas

4.2.1 Exposed Soil Estimates and Concentrations

Soils, categorized as a geologic resource, provide ecological services such as habitat for soil organisms, the nutrients and water holding capacity necessary to sustain vegetative cover, and substrate for litter decomposition. Soils are essential for the cycling of elements, minerals, and nutrients through the environment. The soils at the TCSC Site are important in providing a medium for vegetation, invertebrates, microbes, and other biota that migratory birds and other wildlife need for forage and prey. Since the soils were

highly contaminated at the TCSC Site, the potential to expose the other biological resources and surface water to the contamination is highly likely.

Injury to terrestrial soils has occurred when concentrations of a hazardous substance are sufficient to cause:

> *Injury...to surface water, groundwater, air, or biological resources when exposed to the substances (43 C.F.R. 11.62(e)(11)).*

CoPC concentrations of arsenic, lead, cadmium, and zinc found the remedial studies generally exceeded background concentrations.

Soil sample locations from onsite the TFM Facility included "waste" and "non-waste" areas. The maximum concentrations onsite were 1,170 mg/kg of arsenic, 1,620 mg/kg of cadmium, 71,700 mg/kg of lead, and 165,000 mg/kg of zinc (See Appendix B- Tables 2 and 3). Soil samples from offsite areas were targeted to determine the presence and extent of soil contamination due to aerial deposition of CoPC's from smokestack emissions during TFM smelting operations Offsite maximum concentrations were 538 mg/kg of arsenic, 147 mg/kg of cadmium, 15,900 mg/kg of lead, and 42,500 mg/kg of zinc (See Appendix B- Table 4) (Burns & McDonnell 2007).

The onsite maximum concentrations at the Collinsville Smelter were 757kg of arsenic, 141 mg/kg of cadmium, 11,200 mg/kg of lead, and 47,900 mg/kg of zinc (See Appendix B – Table 6). The offsite maximum concentrations were 93.5 mg/kg of arsenic, 21.8 mg/kg of cadmium, 7,090 mg/kg of lead, and 3,690 mg/kg of zinc (See Appendix B – Table 7) (Exponent 2001).

4.2.2 Exposed Surface Water Estimates and Concentrations

Surface water resources at the TCSC Site provide ecological services such as habitat for aquatic biota and a water supply for the vegetation. Under DOI regulations, injury to surface water from the release of hazardous substances has occurred when concentrations and the duration of exposure to substances are:

> *In excess of applicable water quality criteria established by...the CWA, or by other Federal or State laws or regulations, in surface water that before the...release met the criteria and is a committed use...as a habitat for aquatic life, water supply, or recreation (43 C.F.R. 11.62(b)(iii)).*

The CoPCs for the aquatic environment include, but are not limited to arsenic, cadmium, lead, and zinc. Surface water was sampled from five ponds and a ravine located on the Site (Figure 1). A cistern was located near the ravine and was also sampled. Background surface water samples were taken at Collinsville City Lake, a farm pond several miles northwest of the city, and a farm pond near the northwest boundary of the Site (Figure 1).

CoPC's detected in surface waters were compared to multiple screening levels. These include: USEPA Region VI screening levels for chronic exposure of ecological

freshwater receptors, Oklahoma Water Quality Criteria screening levels for fish and wildlife propagation for acute and chronic exposures, and Oklahoma Water Quality Criteria screening levels for human health protection based on fish consumption. All sample sites with the exception of the strip mine pit exceeded one or more of these criteria for at least one CoPC (See Appendix B- Tables 8 and 9) (Burns & McDonnell 2007).

4.2.3 Exposed Sediment Estimates and Concentrations

Sediments provide ecological services such as habitat for benthic organisms and substrate for aquatic vegetation. Benthic flora and fauna are integral to maintaining the structure and function of the aquatic ecosystem (e.g. base of the aquatic food web) and play a vital role in ecosystem energy and nutrient cycling. Injury to sediments is defined as a component of injury to surface water resources, and has occurred when:

> *Concentrations and duration of hazardous substances [are] sufficient to have caused injury...to groundwater, air, geologic, or biological resources, when exposed to surface water, suspended sediments, or bed, bank, or shoreline sediments (43 C.F.R. 11.62(b)(1)(v)).*

CoPC's detected in sediment samples were compared to USEPA Region VI screening levels for ecological receptors, industrial outdoor workers, and residential soil. For the purposes of this PAS, only the comparison of sediment CoPC concentrations to screening levels for ecological receptors and background levels will be presented.

All sample taken from the TFM Facility exceeded USEPA ecological screening level and background levels for at least one metal. The highest concentration of metals was seen in sediment from TFM Facility ponds 1-3 and the Mid-Site Ravine. (See Appendix B - Tables 10-12) (Burns & McDonnell 2007). Samples taken from the Collinsville Smelter exceeded the USEPA ecological screening levels See Appendix B– Table 13) (Exponent 2001).

4.3 Potentially Affected Resources and Resource Services

The natural resources potentially affected by the hazardous substances include surface water, soils, sediments, groundwater, biotic, and cultural resources. Some of these resources include threatened and endangered species, migratory birds and their habitats, protected by the DOI or the State of Oklahoma under the Federal and State species protection laws, and plants or animals used in cultural practices. These resources exist, or formerly existed, within the Site. Potentially affected trust resources include, but are not limited to:

- Surface waters and sediments including, riverine, riparian, and wetland habitats;
- Riparian, terrestrial, and aquatic plant and animal species;
- Geologic resources (soils) including Tribally owned Indian lands (or lands held in trust);
- Air resources;
- Migratory and non-migratory birds;

- Culturally significant plants and resources.

Natural resource services are defined as "the physical and biological functions performed by the resources including the human uses of those functions. These services are the result of the physical, chemical, or biological quality of the resource (43 CFR § 11.14(nn)). The services that the Trustees believe have been potentially impaired or lost from resource injuries from the Facilities releases include, but are not limited to:

- Beneficial uses of surface waters and associated sediments including fish and wildlife propagation and recreation (fishing);
- Aquatic habitat functions such as nutrient cycling and contaminant sequestration;
- Plant habitat, and native plants;
- Migratory bird habitat;
- Native American historical and cultural uses.

Hazardous substances are present at concentrations sufficient to cause toxicity to food organisms, which indirectly reduce the ability of the surrounding ecosystem to provide supporting services required by trust natural resources. Evidence of fishing and waterfowl hunting had been noted in areas shown to be contaminated on the TCSC site. In addition, CoPC concentrations in soil both onsite and offsite present a hazard to native biota and human health from exposure to heavy metals.

5.0 Preliminary Determination Regarding Pre-Assessment Screen Criteria

Criterion #1: A discharge of oil or release of a hazardous substance has occurred [43 C.F.R. § 11.23(e) 1].
The Trustees have reviewed readily available information which indicates that hazardous substances have been emitted, emptied, discharged, allowed to escaped, disposed, or otherwise released from the Facilities into the surrounding environment. These hazardous substances include arsenic, cadmium, lead, and zinc.

Criterion #2: Natural resources for which the Trustees may assert trusteeship under CERCLA have been or are likely to have been adversely affected by the release [43 C.F.R. § 11.23(e) 2].
Natural resources for which the Trustees may assert trusteeship under CERCLA that have been or are likely to have been adversely affected by the hazardous substance releases include, but are not limited to, migratory birds, federally-listed threatened and endangered species, and their supporting ecosystems and culturally significant resources of the Cherokee Nation.

Criterion #3: The quantity and concentrations of the released hazardous substances are sufficient to cause or potentially cause injury to natural resources [43 C.F.R. § 11.23(e) 3].
The remedial documents revealed that soil, sediment, surface water, and other media are contaminated by hazardous substances, in elevated concentrations, over a relatively widespread area surrounding the Facilities. The elevated concentrations of contaminants in sediment samples widely exceed published sediment quality toxicity guidelines and surface water criteria exhibiting the potential to injure natural resources in the area.

Criterion #4: Data sufficient to pursue an assessment is readily available or likely to be obtained at a reasonable cost [43 C.F.R. 11.23(e) 4].
Data gathered by previous studies and investigations is readily available and useful for the injury assessment. The data from USEPA, ODEQ, and PRP's field investigations provide pre- remedial data. Other information from USEPA records will also be helpful in documenting the release of hazardous substances. Additional studies and data collections may be necessary to effectively determine the extent and nature of the injuries to other natural resources and resource services. This will be accomplished in the Assessment Phase of the NRDAR process.

Criterion #5: Response actions, if any, carried out or planned, do not or will not sufficiently remedy the injury to natural resources without further action [43 C.F.R. § 11.23(e) 5].
It is the opinion of the Trustees that there is injury to natural resources and their supporting ecosystems at the TCSC site. It is also the Trustees opinion that the remedial actions did not fully address the injuries to vegetation, aquatic and terrestrial biota, threatened or endangered species, migratory birds or culturally significant resources of the Cherokee Nation from historic, cumulative, and long-term exposure.

6.0 Conclusions

Following the review of information described in this Pre-Assessment Screen, the Trustees have determination that the criteria specified in the NRDAR regulations, 43 C.F.R. § 11, have been met. The Trustees have determined that proposed remedial actions at the Facilities will not sufficiently remedy the injuries to natural resources without further restoration actions. The Trustees have also determined that there is a reasonable probability of making a successful claim for damages with respect to natural resources over which the Trustees can exhibit trusteeship. Therefore, it has been determined by the Trustees that an assessment of natural resource damages is warranted.

Pre-Assessment Screen Determination - Tulsa County Smelter Complex, Oklahoma

Approval Signature:

Date: 2/8/17

Regional Director, Region 2
U.S. Fish and Wildlife Service
Authorized Official for the Department of the Interior

Pre-Assessment Screen Determination – Tulsa County Smelter Complex, Oklahoma

Approval Signature:

Date: 12Dec17

Oklahoma Secretary of Energy and Environment

Pre-Assessment Screen Determination – Tulsa County Smelter Complex, Oklahoma

Approval Signature:

Date: 12/28/18

Sara Hill

~~Principal Chief~~, Cherokee Nation
Secretary of Natural Resources

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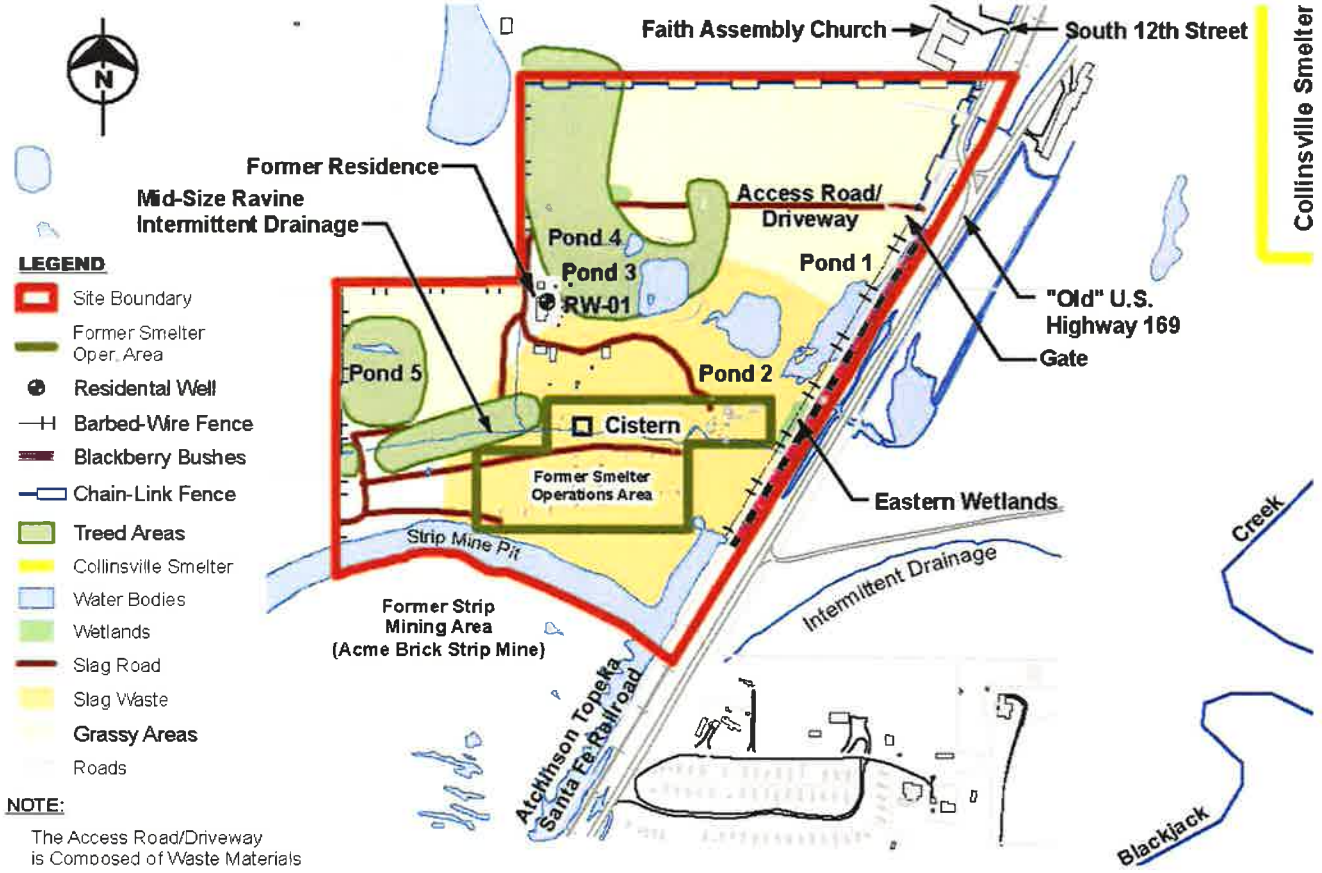
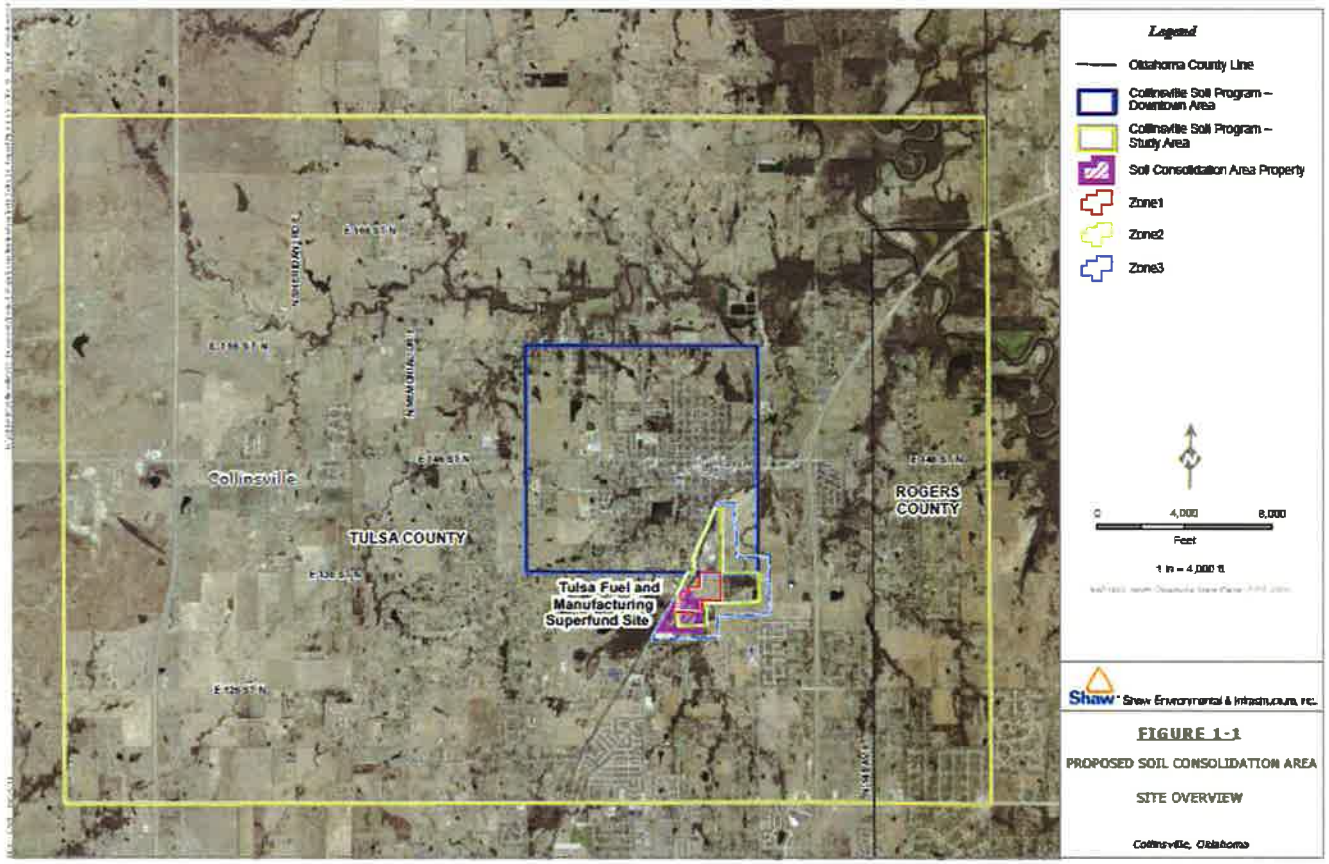
Appendix A - Figures

Figure 3. Map of Tulsa Fuel & Manufacturing Superfund Site.



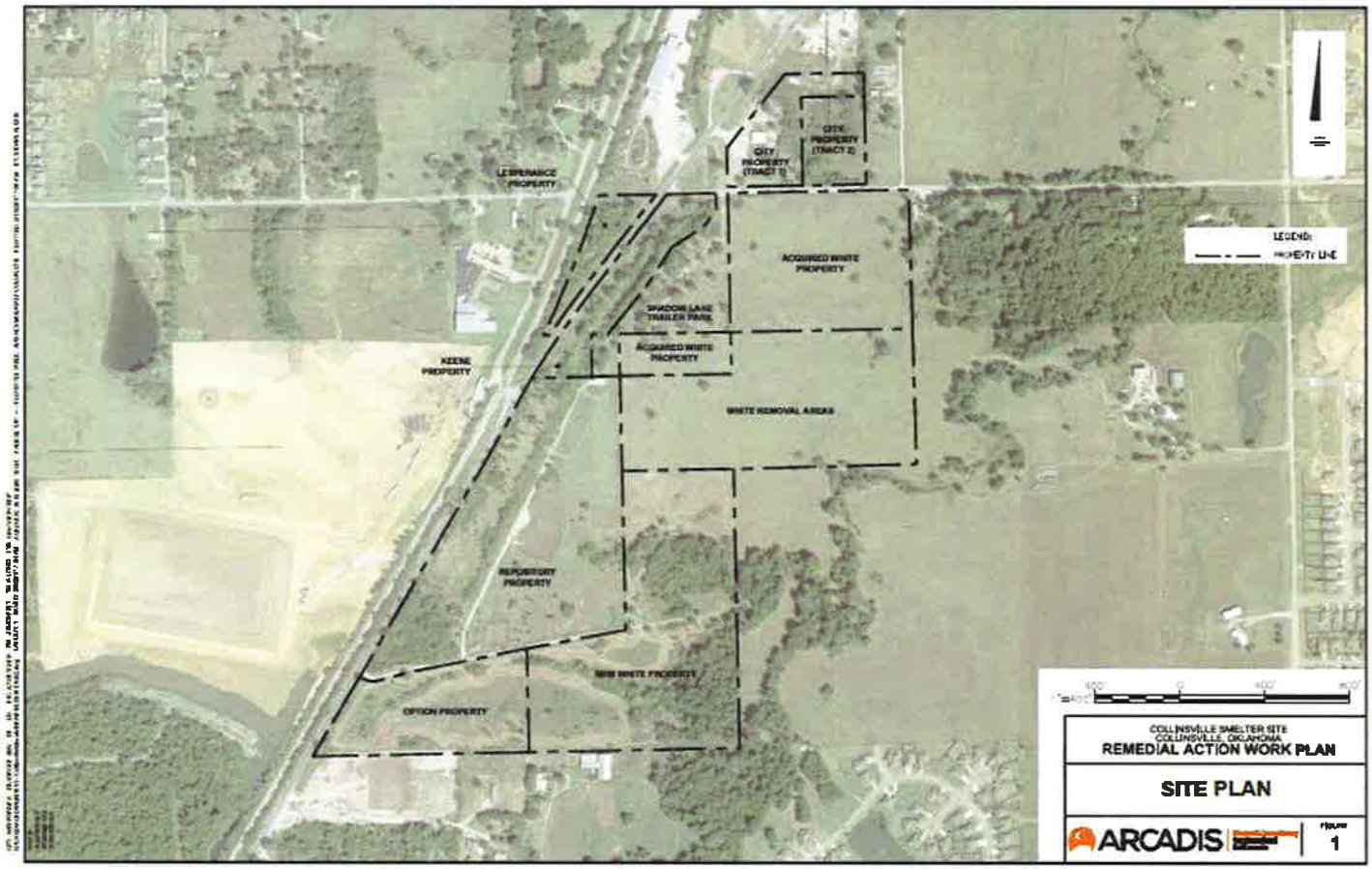
USEPA 2008

Figure 4. Collinsville Smelter: Phase 1 Soil Consolidation map



Shaw 2012

Figure 5 Collinsville Smelter: Phase 2 Remedial Action Area map



Arcadis 2017

Appendix B - Tables

Summary of soils data from TFM Remedial Investigation

Table 2. Soil Metal Concentration and Exceedance Summary from Onsite Waste Areas of TFM Smelter Facility.

	Arsenic	Cadmium	Lead	Zinc
Depth of Sample (bgs)	0-0.5ft	0-0.5ft	0-0.5ft	0-0.5ft
Concentration Range (mg/kg)	39-1,170	U-1,620	705-61,600	2,030-165,000
Background Range (mg/kg)	U-10	U	U-40	U-196
95% Upper Confidence Limit (UCL) of Background (mg/kg)	6.67	U	17.1	103
Ecological Screening Levels for Soils (mg/kg)	31	0.4	15	120
Number of Samples (including duplicates)	40	40	40	40
Number of Detections	40	39	40	40
Number of Samples> 95% UCL	40	39	40	40
Number of Samples >Ecological Screening Levels[1]	40	39	40	40

Burns & McDonnell 2007

[1]Ecological Soil Screening Levels. U.S. EPA: http://www.epa.gov/ecotox/ecossl/

Table 3. Soil Metal Concentration and Exceedance Summary from Onsite Non-Waste Areas of TFM Smelter Facility.

	Arsenic	Cadmium	Lead	Zinc
Depth of Sample (bgs)	0-0.5ft	0-0.5ft	0-0.5ft	0-0.5ft
Concentration Range (mg/kg)	10-416	U-799	U-5,170	460-41,400
Background Range (mg/kg)	U-10	U	U-40	U-196
95% Upper Confidence Limit (UCL) of Background (mg/kg)	6.67	U	17.1	103
Ecological Screening Levels for Soils (mg/kg)	31	0.4	15	120
Number of Samples (including duplicates)	57	57	57	57
Number of Detections	41	50	55	57
Number of Samples> 95% UCL	41	50	55	57
Number of Samples >Ecological Screening Levels[1]	29	50	55	57

Burns & McDonnell 2007

[1]Ecological Soil Screening Levels. U.S. EPA: http://www.epa.gov/ecotox/ecossl/

Table 4. Soil Metal Concentration and Exceedance Summary from Offsite Areas Impacted by Aerial deposition and Surface Runoff/Erosion From TFM Smelter Facility.

	Arsenic	Cadmium	Lead	Zinc
Depth of Sample (bgs)	0-3"	0-3"	0-3"	0-3"
Concentration Range (mg/kg)	U-538	U-147	U-15,900	U-42,500
Background Range (mg/kg)	U-10	U	U-40	U-196
95% Upper Confidence Limit (UCL) of Background (mg/kg)	6.67	U	17.1	103
Ecological Screening Levels for Soils (mg/kg)	31	0.4	15	120
Number of Samples (including duplicates)	111	111	111	111
Number of Detections	67	31	102	110
Number of Samples> 95% UCL for 0-0.5ft bgs	67	22	101	90
Number of Samples >Ecological Screening Levels[1]	20	31	101	101

Burns & McDonnell 2007
[1]Ecological Soil Screening Levels. U.S. EPA: http://www.epa.gov/ecotox/ecossl/

Table 5. Soil Metal Concentration and Exceedance Summary from Offsite areas Impacted by Historical Use of TFM Smelter Waste for Construction.

	Arsenic	Cadmium	Lead	Zinc
Depth of Sample (bgs)	0-3"	0-3"	0-3"	0-3"
Concentration Range (mg/kg)	U-21	33	U-303	142-1,160
Background Range (mg/kg)	U-10	U	U-40	U-196
95% Upper Confidence Limit (UCL) of Background (mg/kg)	6.67	U	17.1	103
Ecological Screening Levels for Soils (mg/kg)	31	0.4	15	120
Number of Samples (including duplicates)	6	6	6	6
Number of Detections	3	2	5	6
Number of Samples> 95% UCL for 0-0.5ft bgs	3	2	5	6
Number of Samples >Ecological Screening Levels[1]	0	2	5	6

Burns & McDonnell 2007
[1]Ecological Soil Screening Levels. U.S. EPA: http://www.epa.gov/ecotox/ecossl/

Table 6. Soil Metal Concentration Summary from onsite at the Collinsville Smelter.

	Arsenic	Cadmium	Lead	Zinc
Depth of Sample (bgs)	0-6"	0-6"	0-6"	0-6"
Concentration Range (mg/kg)	11.1-757	3.6-141	38-11,200	984-47,900
Background Range (mg/kg)	U-10	U	U-40	U-196
Ecological Screening Levels for Soils (mg/kg)[1]	31	0.4	15	120

Exponent 2001
[1]Ecological Soil Screening Levels. U.S. EPA: http://www.epa.gov/ecotox/ecossl/

Table 7. Soil Metal Concentration Summary from offsite at the Collinsville Smelter.

	Arsenic	Cadmium	Lead	Zinc
Depth of Sample (bgs)	0-3"	0-3"	0-3"	0-3"
Concentration Range (mg/kg)	.24-93.5	0.7-21.8	36.6-7,090	78.7-3,690
Background Range (mg/kg)	U-10	U	U-40	U-196
Ecological Screening Levels for Soils (mg/kg)[1]	31	0.4	15	120

Exponent 2001
[1]Ecological Soil Screening Levels. U.S. EPA: http://www.epa.gov/ecotox/ecossl/

Summary of surface water data from TFM Remedial Investigation

Table 8. Surface Water Metal Concentration and Exceedance Summary for Ponds on TFM Facility.

	Pond 1				Pond 2				Pond 3				Pond 4				Pond 5			
	As	Cd	Pb	Zn	As	Cd	Pb	Zn	As	Cd	Pb	Zn	As	Cd	Pb	Zn	As	Cd	Pb	Zn
Conc. Range (µg/L)	U	U-37	U-56		U-17	22-Dec	17-75	299-781	U	U-8	U-30	U-375	U	16	U	1,060	U	U	U	261
Number of samples (includes duplicates)	5	5	5	5	2	2	2	2	3	3	3	3	1	1	1	1	1	1	1	1
USEPA Ecological Screening Level [1](µg/L)	190	0.25	2.5	58	190	0.25	2.5	58.1	190	0.25	2.5	58.1	190	0.25	2.5	58.1	190	0.25	2.5	58
Samples > Ecological Screening Level	0	2	2	2	0	2	2	2	0	1	1	1	0	1	0	1	0	0	0	1
Ok Criteria Wildlife Propagation-acute[2]	360	19.4	43.9	77	360	19.4	43.9	77.4	360	19.4	43.9	77.4	360	19.4	44	77.4	360	19.4	44	77
Samples > OK WQ Criteria for Fish & Wildlife Prop-Acute	0	0	0	2	0	0	0	2	0	0	0	1	0	0	0	1	0	0	0	1
Ok Criteria Wildlife Propagation-chronic[2]	190	0.77	1.71	70	190	0.77	1.71	70.1	190	0.77	1.71	70.1	190	0.77	1.7	70.1	190	0.77	1.7	70
Samples > OK WQ Criteria for Fish & WildlifeProp-Chronic	0	2	2	2	0	2	2	2	0	1	1	1	0	1	0	1	0	0	0	1
Ok WQ Criteria-Fish Consumption[2]	205	84.1	25	n/a	205	84.13	25	n/a	205	84.1	25	n/a	205	84.1	25	n/a	205	84.1	25	n/a
Samples > OK WQ Criteria for Fish & Wildlife Human Health-Fish Consumption	0	0	1	n/a	0	0	1	n/a	0	0	1	n/a	0	0	0	n/a	0	0	0	n/a

Burns & McDonnell 2007
[1]TAC 2000
[2]OAC 2004

Table 9. Surface Water Metal Concentration and Exceedance Summary for Strip Mine Pit and Mid-Site Ravine.

	Strip Mine Pit				Mid-Site Ravine & Cistern			
	As	Cd	Pb	Zn	As	Cd	Pb	Zn
Conc. Range (µg/L)	U	U	U	U	U	U-184	U-20	260-8,250
Number of samples (includes duplicates)	7	7	7	7	5	5	5	5
USEPA Ecological Screening Level[1] (µg/L)	190	0.25	2.5	58.1	190	0.25	2.5	58.1
Samples > Ecological Screening Level	0	0	0	0	0	4	1	5
Ok Criteria Wildlife Propagation-acute[2]	360	19.4	43.9	77.4	360	19.4	43.9	77.4
Samples > OK WQ Criteria for Fish & Wildlife Propagation-Acute	0	0	0	0	0	4	0	5
Ok Criteria Wildlife Propagation-chronic[2]	190	0.77	1.71	70.1	190	0.77	1.71	70.1
Samples > OK WQ Criteria for Fish & Wildlife Propagation-Chronic	0	0	0	0	0	4	1	5
Ok WQ Criteria-Fish Consumption[2]	205	84.13	25	n/a	205	84.13	25	n/a
Samples > OK WQ Criteria for Fish & Wildlife Human Health-Fish Consumption	0	0	0	0	0	1	0	n/a

Burns & McDonnell 2007
[1]TAC 2000
[2]OAC 2004

Summary of Sediment data from TFM Remedial Investigation

Table 10. Sediment Metal Concentration and Exceedance Summary for Ponds on TFM Facility.

	Pond 1				Pond 2				Pond 3				Pond 4				Pond 5			
	As	Cd	Pb	Zn	As	Cd	Pb	Zn	As	Cd	Pb	Zn	As	Cd	Pb	Zn	As	Cd	Pb	Zn
Conc. Range (mg/kg)	26-195	151-1,400	445-2,740	6,220-44,700	52-84	44-330	942-1,200	4,840-9,590	20-68	43-220	375-1,060	2,770-9,700	57	121	975	7,140	U	U	239	808
Number of sampling Locations	3	3	3	3	2	2	2	2	3	3	3	3	1	1	1	1	1	1	1	1
Number of Locations with Detections	3	3	3	3	2	2	2	2	3	3	3	3	1	1	1	1	0	0	1	1
USEPA Ecological Screening Level[1] (mg/kg)	5.9	0.596	35	123	5.9	0.596	35	123	5.9	0.596	35	123	6	0.6	35	123	6	0.6	35	123
Locations > Ecological Screening Level	3	3	3	3	2	2	2	2	3	3	3	3	1	1	1	1	0	0	1	1

Burns & McDonnell 2007
[1]Smith et al. 1996

Table 11. Sediment Metal Concentration and Exceedance Summary for the Strip Mine Pit and Mid-Site Ravine.

	Strip Mine Pit				Mid-Site Ravine & Cistern			
	As	Cd	Pb	Zn	As	Cd	Pb	Zn
Conc. Range (mg/L)	14-32	10-49	180-425	1,080-3,500	199-588	255-702	2,940-8,150	20,700-34,700
Number of sampling Locations	7	7	7	7	3	3	3	3
Number of Locations with Detections	7	7	7	7	3	3	3	3
USEPA Ecological Screening Level[1] (mg/kg)	5.9	0.596	35	123	5.9	0.596	35	123
Locations > Ecological Screening Level	7	7	7	7	3	3	3	3

Burns & McDonnell 2007
[1]Smith et al. 1996

Table 12. Sediment Metal Concentration and Exceedance Summary for the Drainage ditches near Old US Hwy 169 and Railroad.

	Samples East of Railroad Tracks				Samples West of Railroad Tracks			
	As	Cd	Pb	Zn	As	Cd	Pb	Zn
Conc. Range (mg/L)	19-238	U-975	259-3,940	1,390-26,900	U-197	U-215	119-3,120	699-15,100
Number of sampling Locations	7	7	7	7	4	4	4	4
Number of Locations with Detections	7	6	7	7	3	2	4	4
USEPA Ecological Screening Level[1] (mg/kg)	5.9	0.596	35	123	5.9	0.596	35	123
Locations > Ecological Screening Level	7	6	7	7	3	2	4	4

Burns & McDonnell 2007
[1]Smith et al. 1996

Table 13. Sediment Metal Concentration and Exceedance Summary Collinsville Smelter.

	Samples East of Railroad Tracks			
	As	Cd	Pb	Zn
Conc. Range (mg/L)	2.2-22.4	0.15-3.7	13.6-78.8	52-283
USEPA Ecological Screening Level[1] (mg/kg)	5.9	0.596	35	123

Exponent 2001
[1]Smith et al. 1996