PREASSESSMENT SCREEN AND DETERMINATION
Cherokee County Superfund Site, Cherokee County, Kansas

by

State of Kansas
U.S. Department of the Interior

This document is the Preassessment Screen for the Cherokee County Superfund Site, located in Cherokee County, Kansas, herein referred to as the "Cherokee County Site". This document has been prepared by the U.S. Department of the Interior (DOI) and the State of Kansas (individually and collectively referred to hereinafter as "Trustees") who are trustees for Natural Resources at the Cherokee County Site.

AUTHORITY

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended, 42 U.S.C. 9601 et seq., the Oil Pollution Act of 1990 (OPA), 33 U.S.C. 2701 et seq., and the Federal Water Pollution Control Act (FWPCA), as amended, 33 U.S.C. 1251 et seq., authorize the Federal Government, States and Indian tribes to recover, on behalf of the public, damages for injuries to natural resources and their supporting ecosystems, belonging to, managed by, appertaining to, or otherwise controlled by them.

In accordance with 42 U.S.C. 9607(f)(2)(A) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR § 300.600, the President has designated the Secretary of the DOI to act on behalf of the public as trustee for natural resources and their supporting ecosystems, managed or controlled by the DOI. The authorities under which the DOI may act include, but are not limited to: Endangered Species Act (ESA), as amended, 16 U.S.C. 1531 et. seq.; and the Migratory Bird Treaty Act (MBTA), as amended, 16 U.S.C. 701 et. seq. The official authorized to act on behalf of the Secretary at the Cherokee County Site, is the Regional Director for Region 2 of the U.S. Fish and Wildlife Service.

In accordance with 42 U.S.C. 9607(f)(2)(B) and the NCP, the Governor of the State of Kansas, in a letter to Robert Stewart, DOI, dated September 25, 1997, has designated the Secretary of the Kansas Department of Health and Environment (KDHE) as the natural resource trustee for the State of Kansas. In addition, KDHE has entered into a Letter of Intent with the Kansas Department of Wildlife and Parks (KDWP) (letter dated October, 2000) to cooperate on behalf of the public as trustee for natural resources, including their supporting ecosystems, within the boundary of the State of Kansas or belonging to, managed by, controlled by, or appertaining to the State of Kansas.

The authorities under which the State of Kansas may act include, but are not limited to:

Nongame and Endangered Species Conservation Act (Kansas Statute Annotated (K.S.A.) 32-957 et seq.); general authorities of the Secretary of Wildlife and Parks (K.S.A. 32-702, Policy Statement and K.S.A. 32-807, Powers of the Secretary of Wildlife and Parks); the general authority of the Secretary of Health and Environment (K.S.A. 65-161, 65-170 and 171 et. seq., water and public health; K.S.A. 65-3452a et seq. Hazardous Substances; K.S.A. 65-3430 et seq., Solid and Hazardous Waste; 65-3001 et seq. Air Quality).

PURPOSE

The purpose of this Preassessment Screen is to provide a rapid review of readily available information on discharges or releases of hazardous substances and the potential resulting impacts on natural resources at the Cherokee County Site for which the DOI or the State of Kansas may assert trusteeship under section 107(f) of CERCLA.

Federal Regulations at 43 CFR § 11.23 provide for the Trustees to complete a Preassessment Screen and make a determination as to whether there is a reasonable probability of making a successful claim for natural resource damages before assessment efforts are undertaken. This document fulfills that requirement and follows the structure of Federal Regulations at 43 CFR Part 11. These regulations provide a method for the assessment of natural resource damages resulting from a release of hazardous substances under CERCLA. Adherence to the methods set forth in these regulations is not mandatory and does not preclude the Trustees' use of alternate methods of assessing damages or arriving at a negotiated settlement with potentially responsible parties.

SITE INFORMATION (43 CFR §11.24 (a))

The Cherokee County Site is located within the Tri-State Mining District which encompasses the northwest edge of the Ozark Uplift in Missouri, west and south through Kansas and Oklahoma to the eastern fringe of the Great Plains (Figure 1-1). There are three separate but adjacent superfund sites within the Tri-State Mining District; the Oronogo-Duenweg Mining Belt Superfund Site, also known as, and referred to herein as, the Jasper County Superfund Site, located in Jasper County, Missouri, the Cherokee County Site and the Tar Creek Superfund Site in Ottawa County, OK.

This Preassessment Screen addresses only the Cherokee County Site portion of the Tri-State Mining District and the various Operable Units that comprise the Cherokee County Site. The Trustees recognize that there may be injuries to natural resources,

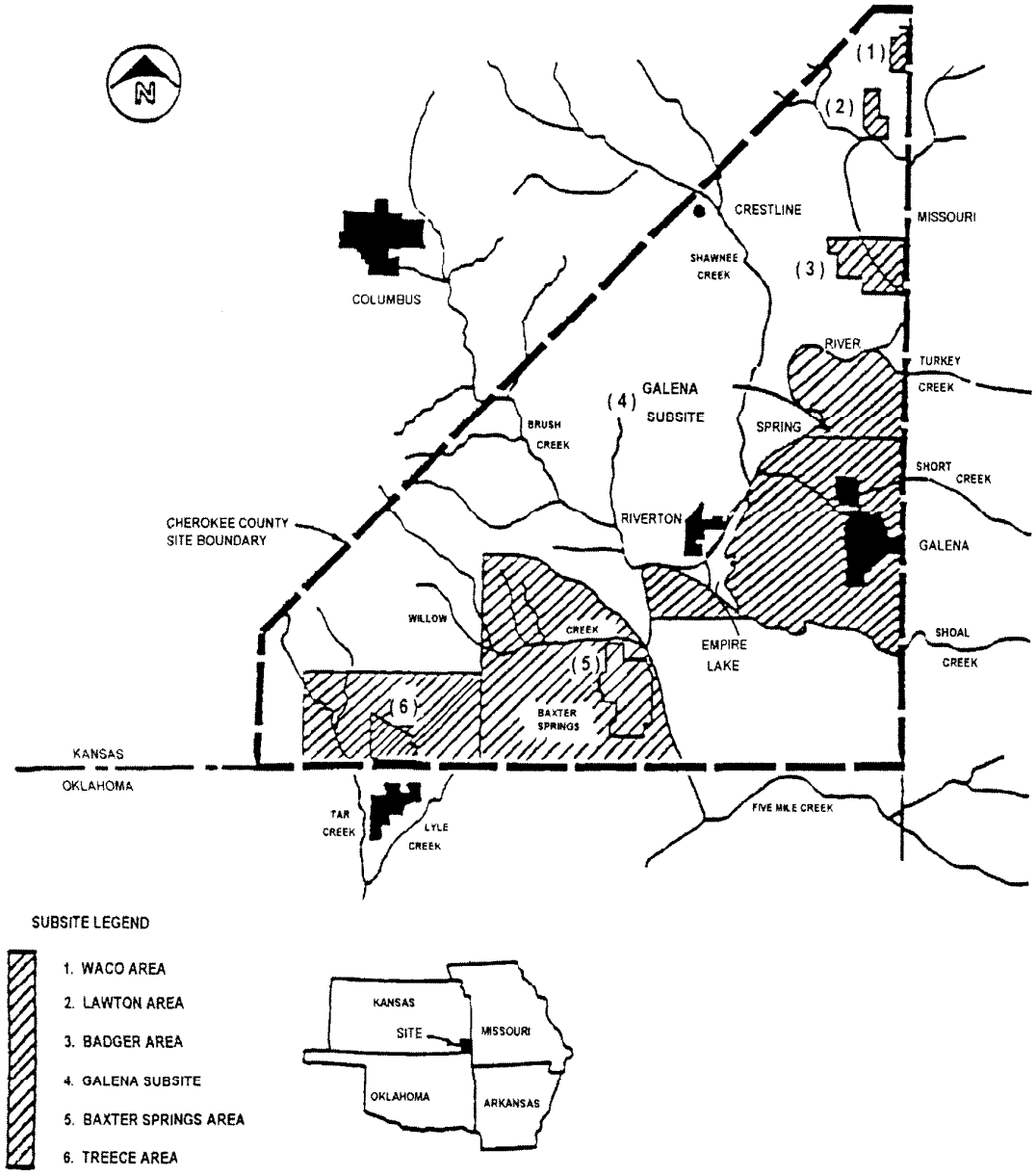

Figure 1: Cherokee County Superfund Site, Cherokee County, Kansas.

resulting from releases within the Cherokee County Site that occur outside of the State of Kansas. This Preassessment Screen does not cover those injuries or damages outside of the State of Kansas that have or may result from releases or discharges from within the Cherokee County Site. Injuries or damages outside of the State of Kansas that have or may result from releases or discharges from within the Cherokee County

Site may be addressed as part of separate actions at the other appropriate sites. The Trustees are Partners of the Tri-State Mining District Natural Resource Restoration Inter-governmental Partnership. As such, the Trustees are communicating, coordinating, and cooperating with other Partners and Natural Resource Trustees throughout the Tri-State Mining District.

1) The time, quantity, duration, and frequency of the discharge or release
Contaminants at the Cherokee County Site are consistent with waste produced through the mining, milling and smelter processes that took place at this location for over 100 years. Sources of hazardous substances at the Cherokee County Site include subsurface sources associated with underground mine workings, and surface sources associated with emplacement and disposal of mine wastes. Underground mine workings have exposed mineralized areas, leading to the contamination of ground water as it has come into contact with ore and subsurface wastes. Contaminated ground water, in turn, serves as a surficial source in the form of seeps, springs, and drainage from abandoned mine shafts. Other surficial sources include chat piles, tailings sites, development and waste rock piles, mixed waste piles, subsidence ponds and contaminated soils.

2) The hazardous substances released
Much of this waste is highly contaminated with hazardous substances, including lead (Pb; Chemical Abstracts Service (CAS) # 7439921), cadmium (Cd; CAS # 7440439), and zinc (Zn; CAS #7440666). These compounds have been identified under CERCLA §101(14) as hazardous substances (40 CFR §302, Table 302.4).

3) History, current/past use
Commercial-grade lead and zinc ores were originally discovered in southwest Missouri in the late 1830s. Large-scale mining activities began in this area in the 1850s, then spread to Cherokee County, Kansas in the 1870s, and finally to Ottawa County, Oklahoma by the 1890s. Mine production peaked in Missouri in about 1916, and then shifted to Kansas and Oklahoma. Output from the Cherokee County mines peaked in the 1920s and 1930s and diminished thereafter, until it ceased entirely in the 1970s. The number of operating mines in the early 1900s was estimated to be in the hundreds. Mining activity continued until closure of the last active mine near Baxter Springs, Kansas in 1970. As a result of the release of hazardous substances, the Cherokee County Site was added to the National Priorities List on September 8, 1983.

4) Relevant operations occurring at or near the Site.
Mining operations in the Tri-State Mining District were principally underground and involved sinking shafts to subsurface ore bodies. In general, the raw ore was brought to the surface and crushed in stages with the metals being separated by gravity separation or flotation. Waste rock, development rock, chat, and tailings materials were dumped at the surface in waste piles. Early extraction efficiencies were somewhat low,

resulting in high concentrations of hazardous substances remaining in the waste rock. Over time, some of the waste rock piles with higher metal concentrations have been re-milled using more efficient techniques. However, all of the techniques used have left concentrations of hazardous substances in the waste piles. Initially there may have been crude log smelters associated with each mine. However, these smelters were consolidated in the late 1800's with the construction of larger and more advanced smelters in and around the Cherokee County Site and the Tri-State Mining District.

After over 100 years of mining and smelting, chat piles, tailings sites, development and waste rock piles, and subsidence pits are prominent features of the landscape. While much of the total volume of surface mine wastes has been removed over the last few decades to provide materials for building and roads, thousands of acres of wastes still remain on the surface of the ground.

5) Additional hazardous substances potentially released from the Site
Because of their relative volume, concentration and toxicity, the principle hazardous substances released at the Cherokee County Site are lead, cadmium, and zinc. Other hazardous substances known to be present in elevated concentration may include, but are not limited to, nickel (Ni; CAS #7440-02-0), copper (Cu, CAS #7440-50-8), and selenium (Se; CAS #7782-49-2).

6) Potentially responsible parties
The Potentially Responsible Parties (PRP's) at the Cherokee County Site include, but are not limited to: AMAX, Inc.; ASARCO, Inc.; Blue Tee Corporation; E.I. DuPont de Nemours and Company; Gold Field American; Gold Field Mining; NL Industries, Inc.; Paramount Communications, Inc.; St. Joe Minerals Corporation; and, Sun Company, Inc.

DAMAGES EXCLUDED FROM LIABILITY (43 CFR §11.24 (b), (c))
Damages resulting from the discharge or release of the hazardous substances at the Cherokee County Site were not identified in any environmental impact statement, pursuant to the National Environmental Policy Act (NEPA), as amended (42 U.S.C. 4321 et seq.) or any similar review or document.

Releases of hazardous substances at the Cherokee County Site are ongoing and did not occur wholly before enactment of CERCLA, nor the 1977 amendments to the FWPCA. Injuries to natural resources and resultant damages to the public from the release or discharge of the hazardous substances are ongoing and did not occur wholly before enactment of CERCLA, nor the 1977 amendments to the FWPCA.

The hazardous substances at the Cherokee County Site are not pesticide products registered under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)(7

U.S.C. 135-135k). Damages resulting from the discharge or release of the hazardous substances at the Cherokee County Site did not result from the application of a FIFRA registered pesticide product.

Damages resulting from the discharge or release of the hazardous substances at the Cherokee County Site did not result from any federally permitted release as defined in CERCLA §101(10).

The hazardous substances are not recycled oil products as described in CERCLA §107(a)(3) or (4). Damages resulting from the discharge or release of the hazardous substances at the Cherokee County Site did not result from release of a recycled oil product.

PRELIMINARY IDENTIFICATION OF PATHWAYS (43 CFR §11.25 (a))

Surficial mine and mill wastes, soils, and ground water all act as sources of hazardous substances (including Cd, Pb, and Zn) to the environment at the Cherokee County Site. Hazardous substances can be released directly from these sources into the air, ground water, surface water, and soils.

Smelters can release metals directly into the air, where they can potentially be moved and later deposited in another location. In addition, air can entrain metals as it flows over fugitive dust sources such as chat piles.

Underground, as oxygen and water come into contact with the exposed metallic sulfide ores, a chemical reaction known as "sulfidic oxidation" occurs. This reaction results in lowered water pH and the release of metals to the ground water. Ground water, in turn, affects surface waters by filling in subsidence pits or by flowing out of the many remaining shafts and adits or providing natural recharge of ground water to the local streams and rivers during base flow periods.

Surface water can receive hazardous substances directly from erosion of various types of mine waste products during runoff. In addition, infiltration of water into waste piles can mobilize hazardous substances into solution, resulting in contaminated runoff to surface water or the leaching of hazardous substances into the soil beneath the waste pile.

The metal-bearing materials removed from the underground deposits and piled at the surface as part of the mining process, were and are a source of hazardous substances to natural resources. Chat piles in the Cherokee County Site do not support normal stands of terrestrial vegetation. In addition, terrestrial vegetation has been significantly altered because of hazardous substances at sites where chat piles formerly existed but have since been removed. Finally, hazardous substances can be washed from the waste rock piles by precipitation events and carried to other natural resources.

Air, ground water, surface water, and soils may receive hazardous substances not only directly from the sources, but also from each other. Air can transport hazardous substances and deposit them directly into surface water or onto soils. Hazardous substances can also move back and forth between ground and surface water through discharge and recharge.

Terrestrial and aquatic biota may be exposed to contaminants in environmental media either directly (for example, plants exposed directly to hazardous substances in soils) or indirectly through food chain transfer.

EXPOSED AREAS (43 CFR §11.25 (b))

Areas exposed or potentially exposed to the released hazardous substances include the waters, wetlands, banks, sediments, soil and biota of the Cherokee County Site. In addition, areas downstream of the Cherokee County Site may be impacted.

EXPOSED WATER ESTIMATES (43 CFR §11.25 (c)).

A water quality database, developed and maintained by KDHE, documents the widespread occurrence of mining related injuries to the surface water resources of Cherokee County (Kansas Water Database). Over the past twenty years, Zn concentrations in Tar, Center, Turkey and Short Creeks have exceeded AWQC from 90 to 100 percent of the time. Similarly, Zn levels in the Spring River at Baxter Springs have exceeded AWQC more than 60 percent of the time, Cd levels in Tar and Short Creeks have exceeded AWQC more than 80 percent of the time, and Pb levels in Center Creek and the Spring River at Baxter Springs have exceeded AWQC more than 70 percent of the time. Other streams (e.g., Shoal and Willow creeks) have also frequently exceeded applicable water quality criteria. Various published studies have independently confirmed widespread Cd, Pb and Zn contamination problems in streams draining the Cherokee County Site or entering Kansas from the Missouri portion of the mining district (e.g., Barks, 1977; Spruill, 1984; Ferrington et al., 1989; Davis and Schumacher, 1992; Dames & Moore, 1995). Empire Lake has been similarly impacted (Ferrington et al., 1989; Kansas Water Database).

In addition, injured ground water estimates at the Cherokee County Site range between 225,000 to 550,000 acre-feet.

ESTIMATES OF CONCENTRATIONS (43 CFR §11.25 (d))

Aquatic resources in the Spring River Basin in Kansas have been injured by the release of hazardous substances from Jasper and Newton counties in Missouri, as well as from the Cherokee County Site in Kansas. Affected streams include, but are not limited to: Tar Creek; Shoal Creek, Short Creek, Turkey Creek, and Center Creek. In Kansas, the

Spring River is affected from at least the mouth of Center Creek downstream through Empire Lake to the Oklahoma border. Elevated concentrations of Cd, Pb and/or Zn have reduced biological diversity and productivity within these impacted stream reaches (e.g., Lewis et al., 1983; Cope, 1985; Ferrington et al., 1989; Obermeyer et al., 1997; Wildhaber et al., 2000). The published studies describing these impacts are augmented by extensive water quality and stream biological databases maintained by KDHE.

Sediment concentrations of Cd, Pb and/or Zn in Short Creek and other impacted streams exceed published toxicity benchmarks for the protection of aquatic life (Allen and Wilson, 1992; Ferrington et al., 1989; Jones et al. 1997). Water and/or sediment pore-water samples collected from Short, Tar and Willow Creeks have elicited toxic responses in fish and aquatic invertebrates during laboratory tests (Baumgartner et al., no date; Dames & Moore, 1995; Allert et al., 1997). Biological diversity and biomass are generally reduced in these and other streams relative to the background condition, consistent with injury from metal exposure (e.g., Baumgarter et al, no date; Ferrington, 1989).

Cadmium, lead, and zinc are present in the mine wastes at the Cherokee County Site in concentrations above national background concentrations (Adriano, 1986) and concentrations that exceed controlled laboratory experiments shown to be toxic to plants (Kabata-Pendias and Pendias, 1992). The cadmium, lead and zinc mean concentrations in mine wastes are two orders of magnitude above the U.S. background numbers and are one order of magnitude above the phytotoxicity threshold (U.S. EPA, 1988; CH2M Hill,1989; Dames & Moore, 1993b; and Veith, 1994). The data indicates that cadmium, lead, and zinc mean concentrations in mine wastes at the Cherokee County Site greatly exceed national average soil concentrations and concentrations thought to be toxic to vegetation.

Ground water from the affected portions of the Boone Aquifer in Cherokee County contains concentrations of hazardous substances that are several times higher than background and contain concentrations of hazardous substances that exceed the following criteria; Safe Drinking Water Act; Clean Water Act; and, State of Kansas water quality. (Dames & Moore 1993, 1993b, Parkhurst 1987).

POTENTIALLY AFFECTED RESOURCES (43 CFR §11.25 (e))

Natural resources and their supporting ecosystems, as well as the services of the natural resources identified, that have been or potentially have been affected by the discharge or release of the hazardous substances, include but are not limited to: ground water, surface water (including sediments) and biological resources including aquatic and terrestrial plants and microorganisms; aquatic and aquatic dependent mammals; fish; and migratory birds including waterfowl, shorebirds, raptors and

songbirds.

Specifically, these natural resources include or may include; the bald eagle (*Haliaeetus leucocephalus*), Neosho madtom (*Noturus placidus*), and Ozark cavefish (*Amblyopsus rosae*) which are species listed as Threatened under the ESA. The gray bat (*Myotis grisescens*) is listed as Endangered under the ESA. The Arkansas darter *(Etheostoma cragini*) is a candidate for listing under the ESA. Migratory birds protected by the MBTA, as amended, exist throughout the site. Habitats supporting species protected under the ESA and MBTA exist or formerly existed throughout the site.

Several species of fish and shellfish occurring (or historically occurring) in the Cherokee County Site, or in streams entering Kansas from Missouri, are also assigned special conservation status under K.S.A. 32-957 et seq. State endangered mussel species include but are not limited to the elktoe (*Alasmidonta marginata*), rabbitsfoot (*Quadrula cylindrica*), western fanshell (*Cyprogenia aberti*), Neosho mucket (*Lampsilis rafinesqueana*) and ellipse (*Venustaconcha ellipsiformis*). State threatened fish species include, but are not limited to, the redspot chub (*Necomis asper*), Neosho madtom (*Noturus placidus*), and Arkansas darter (*Etheostoma cragini*), and two mussel species, the flutedshell (*Lasmigona costata*) and Ouachita kidneyshell (*Ptychobranchus occidentalis*) (K.A.R. 115-15-1; Collins et al., 1995).

The Cherokee County Site also provides (or historically provided) habitat for the following state endangered, semiaquatic and terrestrial species. These species include but are not limited to the cave salamander (*Eurycea lucifuga*), many-ribbed or graybelly salamander (*Eurycea multiplicata*), grotto salamander (*Typhlotriton spelaeus*), gray myotis bat (*Myotis grisescens*), and possibly the least tern (*Sterna antillarum*) and whooping crane (*Grus americana*). State threatened species include (or historically included), but are not limited to, the eastern or central newt (*Notophthalmus viridescens*), dark-sided or longtail salamander (*Eurycea longicauda*), spring peeper (*Pseudacris crucifer*), green frog (*Rana clamitans*), eastern narrowmouth toad (*Gastrophryne carolinensis*), bald eagle (*Haliaeetus leucocephalus*), redbelly snake (*Storeria occipitomaculata*), and possibly the broadhead skink (*Eumeces laticeps*) and spotted skunk (*Spilogale putorius*) (K.A.R. 115-15-1; Collins et al., 1995).

Elevated levels of Cd, Pb and/or Zn in streams draining the mining district appear to have adversely impacted the region's aquatic wildlife. While upper reaches of the Spring River possess one of the richest mussel communities in Kansas, freshwater mussel communities have been largely eliminated from the Spring River below the mouth of Center Creek. (Cope, 1985; Obermeyer et al., 1997; KDHE Stream Biological Database). Mussels have also been extirpated from Short, Turkey, Willow and Tar Creeks and from Shoal Creek from the Kansas-Missouri State line to Empire Lake (Lewis et al., 1983; Cope, 1985; Obermeyer et al., 1997; KDHE Stream Biological Database). Statistically significant differences occur between the upper and lower reaches of the Spring River relative to macroinvertebrate taxa richness, the Kansas

biotic index (metals component), and the Ephemeroptera Plecoptera Trichoptera index (KDHE Stream Biological Database; Spruill, 1984). When compared to potential reference locations, a general reduction occurs in the diversity and abundance of metal sensitive mayflies, stoneflies and caddisflies in the downstream reaches of Center, Shoal, Short and Turkey Creeks (Dames & Moore, 1995; Allert et al., 1997; Schmitt et al., 1997; KDHE Stream Biological Database). Fish populations in Short Creek and the Spring River are limited, in large part, by prevailing concentrations of Cd, Pb and Zn (Ferrington, no date; Wildhaber et al., 2000). Representatives of the fish family Cyprinidae are reportedly absent from metal-enriched reaches of Willow and Tar Creeks (Dames & Moore, 1993).

Sediment concentrations of Cd, Pb and/or Zn in the Spring River, Short Creek, Shoal Creek, and certain other streams in Cherokee County, or entering the Cherokee County Site from the Missouri portion of the mining district, exceed published toxicity benchmarks for the protection of aquatic life (e.g., Allen and Wilson, 1992; Ferrington et al., 1989; Jones et al., 1997). Water and/or sediment pore-water samples collected from Short, Tar and Willow Creeks have elicited toxic responses in fish and aquatic macroinvertebrates during laboratory tests (Baumgartner et al., no date; Dames & Moore, 1995). Biological diversity and biomass are generally reduced in these and other metal-contaminated stream reaches relative to the background condition, consistent with injury from metal exposure (e.g., Baumgartner et al., no date; Cope, 1985; Ferrington, 1989; Dames & Moore, 1995; Allert et al., 1997; Obermeyer et al., 1997; Schmitt et al., 1997; Wildhaber et al., 2000; Kansas Water Database; KDHE Stream Biological Database).

Vegetation communities also appear to be injured have been injured in the Cherokee County Site. The Trustees have estimated that approximately 4,000 acres have been affected by mining activities. These communities have been highly modified to the extent that they now provide little habitat for wildlife. The evidence also indicates that vegetation communities adjacent to mine wastes have also been affected, though to a lesser extent, and it is likely that their ability to provide wildlife habitat may also have been impaired.

OTHER CONSIDERATIONS

a) Data are readily available or likely to be obtained at a reasonable cost

A substantial amount of information pertaining to the injury of natural resources currently exists for the Cherokee County Site. This includes, but is not limited to, RI/FS, ecological risk assessments, and other documents prepared by or for EPA in relation to

remedial activities at the various subsites and OUs within the Cherokee County Site, as well as data collected by researchers independent of the CERCLA action. This information is readily available. The toxicological properties of the released hazardous substances are fairly well understood. Any additional data required to complete this case can be obtained at a reasonable cost.

b) Response actions will not sufficiently remedy the injury to natural resources

Response actions which have been completed within the Cherokee County Site have not, and will not, sufficiently remedy the injury to natural resources caused by the release of hazardous substances. The remaining response actions propose to use similar techniques and likely will have similar results.

PREASSESSMENT SCREEN DETERMINATION

Based upon a review of readily available data and an evaluation of the preassessment determination criteria summarized in this document, the Trustees have reached the following conclusions:

- Discharges or releases of hazardous substances have occurred;
- Natural resources for which the trustees may assert trusteeship under CERCLA and FWPCA have been adversely affected by the discharge or release of hazardous substances;
- The quantity and concentration of the released hazardous substances are sufficient to potentially cause injury to natural resources;
- Data sufficient to pursue an assessment are readily available or likely to be obtained at a reasonable cost, and;
- Response actions planned will not sufficiently remedy the injury to natural resources without further action.

The Trustees hereby determine that further investigation and assessment is warranted and should be carried out at the Cherokee County Site in accordance with Federal Regulations at 43 CFR §11, Subparts C and E. The Trustees further determine that current information indicates that there is a reasonable probability of making a successful natural resources damage claim pursuant to section 107 of the CERCLA and section 311 of the FWPCA and that all criteria and requirements in 43 CFR part 11, generally, and 43 CFR § 11.23(a)-(g), § 11.24 and § 11.25, specifically, have been satisfied.

The information provided and conclusions made in this PAS shall be used to direct further investigations and assessments and is not intended to preclude consideration of other resources later found to be affected or other parties found to be responsible for releases.

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KANSAS DEPARTMENT OF HEALTH AND THE ENVIRONMENT

Clyde D. Graeber
State of Kansas
Secretary of Health and Environment
Trustee

Date 11/6/02

UNITED STATES DEPARTMENT OF THE INTERIOR

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10/21/02
Date

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