PREASSESSMENT SCREEN AND DETERMINATION
Madison County Mines Site, Madison County, Missouri
by
U.S. Fish and Wildlife Service
Missouri Department of Natural Resources

This is the Preassessment Screen (PAS) and determination for the Madison County Mines Superfund Site and surrounding area located in Madison County, Missouri. This document has been prepared by the U.S. Fish and Wildlife Service and the Missouri Department of Natural Resources (MDNR) who are Trustees for natural resources at the Madison County Mines Superfund Site (collectively referred to hereinafter as "Trustees") in accordance with Natural Resource Damage Assessment (NRDA) procedures, 43 C.F.R. Part 11.

I. 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 -2762 (2013), and the Federal Water Pollution Control Act (FWPCA), as amended, 33 U.S.C. §§ 1251-1387 (2013), authorize the United States, States and Indian tribes to recover damages for injuries to natural resources and their services, belonging to, managed by, appertaining to, or otherwise controlled by them.

In accordance with 42 U.S.C. § 9607(f)(2)(B) and the National Contingency Plan, 40 C.F.R. § 300.600 (NCP), the Director of the MDNR has been designated the natural resource trustee by the Governor of Missouri. The MDNR acts on behalf of the public as Trustee for natural resources, including their supporting ecosystems, and their services within the boundary of Missouri or belonging to, managed by, appertaining to, or otherwise controlled by Missouri.

The U.S. Fish and Wildlife Service (Service) is acting on behalf of the Secretary of the Interior as Trustee for natural resources. The President has designated the Secretary of the Department of the Interior (DOI) to act on behalf of the public as Trustee for natural resources, including their supporting ecosystems and their services, managed or otherwise controlled by the DOI. Executive Order 12580, Section 1(c), January 23, 1987; 40 C.F.R. § 300.600. The official authorized to act on behalf of the Secretary at the Madison County Mines Superfund Site and surrounding area is the Regional Director for Region 3 of the U.S. Fish and Wildlife Service.

PURPOSE

The purpose of this PAS is to provide a review of readily available information on discharges or releases of hazardous substances and the potential resulting impacts on natural resources at the Madison County Mines Superfund Site and surrounding area for which the DOI and/or MDNR may assert trusteeship under section 107(f) of CERCLA.

Federal regulations at 43 C.F.R. § 11.23(a) provide for the Trustees to complete a PAS and make a determination as to whether there is a reasonable probability of making a successful claim for natural resource damages before additional assessment efforts are

undertaken. This document fulfills that requirement and follows the structure of Federal regulations at 43 C.F.R. Part 11. These regulations provide a method for the assessment of natural resource damages resulting from releases 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.

II. SITE INFORMATION

The Madison County Mines (MCM) Superfund Site is located near Fredericktown, Missouri at the southern end of the Old Lead Belt Mining District of Southeast Missouri on the southeastern edge of the Ozark Uplift in Missouri. Topography in the Old Lead Belt is characterized by rolling hills dissected by narrow floodplain, creek, and river valleys. Hills and ridges are generally steep sided with flat tops consisting of thin mantles of clayey soils. The major physical features of the area are the St. Francois Mountains on the western side of the county and the dissected topography of the Salem Plateau on the eastern side of the county (Benham and Childress 2005). The principal drainage system for the MCM site is the south flowing Little St. Francis River and its tributaries.

The MCM site contains six operable units.

- OU1 – Northern Madison County Unit, including Mine LaMotte Recreational Area (MLMRA), Harmony Lake, Copper Mines, Lindsey Mine, Offset Mine, and Old Jack Mine
- OU2 – Anschutz Sub-Site, including A, B, C, D, and E Tailings Areas (historically Madison Mine)
- OU3 – Madison County wide Residential, including Little St. Francis River Chat
- OU4 – Conrad Tailings and Ruth Mine
- OU5 – Catherine and Skaggs Piles
- OU6 – Hickory Nut Mines and Silver Mine
- OU7 – Little St. Francis River Watershed

This PAS addresses three of the major mine, mill, and/or smelter sites in the Madison County Mines Superfund Site with which potentially responsible parties (PRP) are affiliated. The Trustees will focus assessment efforts on these portions of the site:

1. Mine La Motte Recreational Area (MLMRA)
2. Anschutz Property
3. Hickory Nut Mines

(Appendix B, Figure 1 and Figure 2)

Streams draining these sites including Little St. Francis River, Tollar Branch, Logtown Branch, Saline Creek, Shays Creek, Village Creek, and possibly other named and unnamed tributaries to the Little St. Francis River are also included in this PAS. For purposes of the PAS, this entire geographic area is referred to as "MCM site".

In 2009 Trustees received compensation for injuries to natural resources and the services they provide at the Little St. Francis River Chat Pile and Catherine Mine under the ASARCO Bankruptcy settlement.

1) Time, quantity, duration and frequency of the discharge or release

The Trustees reviewed relevant information which indicates that hazardous substances have been discharged, allowed to escape, disposed or otherwise released at the MCM site.

Mining activities commenced at the Mine La Motte site in the early 1720s which was the major mine in the area in the 18th and 19th centuries, producing 9,500 tons of lead from 1838 to 1850. The Anschutz property (original Madison Mine site) has been used for mining since the mid-1840s. St. Louis Smelting Company and Refining Division of the National Lead Company (NLC – late NL Industries, Inc.) operated the mine from 1942 to 1961, building a cobalt refinery in 1952. The U.S. Environmental Protection Agency (USEPA) listed the MCM site on the National Priorities List (NPL) in 2003.

Based on a review of topographical maps and aerial photos, there exists over 850 acres of chat[1], tailings[2] and transition zone soils contaminated primarily with lead (Pb) in and around the three (3) operable units of the MCM site focused on in this document (See Table 1). The number of impacted acres is based on a review of topographical maps and aerial photography. Soils contaminated by runoff from tailings and chat represent a transition area around the piles. The transition zone acreages were calculated using a buffer of 167 feet which is the mean transition zone width based on EPA action levels in the Missouri portion of the Tri-State Mining District (TSMD) (USFWS 2013).

[1] Chat is the waste product of early gravity based milling processes and consists of grain sized particles typically 0.06 to 2.4 mm in diameter (USEPA, 2006).
[2] Tailings are the waste product of a chemical floatation process that produces particles 0.004 to 0.06 mm in diameter (USEPA, 2006).

Table 1. Tailings and Chat Distribution in the MCM Site

Site	Estimated Tailings/Chat Acreage	Estimated Transition Zone Acreage	Total Acreage
OU1	431	146	579
- Mine La Motte	399	102	501
- Copper Mines	5	10	15
- Harmony Lake	27	30	57
- Lindsey Mine*	NA	2	2
- Offset Mine*	NA	2	2
- Old Jack Mine*	NA	2	2
OU2 (Madison Mine)	146	118	265
- A Tailings	3	8	11
- B Tailings	4	9	13
- C Tailings	44	28	72
- D Tailings	70	49	119
- E Tailings	18	15	33
- Small Chat Pile	7	9	16
OU6*	NA	6	6
- Hickory Nut 1*	NA	2	2
- Hickory Nut 2*	NA	2	2
- Hickory Nut 3*	NA	2	2

* Mine wastes no longer visible from aerial photography.

Due to the construction of the mines and mills in riparian or near riparian areas and the constant discharge of waste products from uncontrolled piles, releases from mine waste areas have been continuing since mining activities began in the 18th century. Ore mining and primary crushing took place at many sites in Madison County using gravity to separate Pb from its host rock. The milling process at Mine La Motte, the Madison Mine, and Ruth Mine (OU4) employed crushing and various chemical floatation techniques after 1930, resulting in massive quantities of tailings. It has also been reported that mine waste may have been used as fill material on residential properties and private driveways, used as aggregate for road construction and used to control snow and ice on public roads (USEPA 2008).

Numerous sources (Duchrow and Trial 1980; Wixon et al. 1983; MDNR 1986; Jacobs 1995) have documented mine waste in the streams of the MCM site. Incremental releases continue to occur to terrestrial and aquatic environs on a regular basis due to the forces of water and wind erosion as well as human disturbance of the chat and tailings disposal areas. Permitted and unpermitted off-road vehicle use on the piles and impoundments has destroyed the minimal existing vegetation, aggravating erosion at some sites.

2) The hazardous substances released

The hazardous substances released at the MCM site include cadmium (CAS # 7440439), lead (CAS # 7439921), zinc CAS # 7440666), copper (CAS # 7440-50-8), cobalt (CAS # 7440-48-4) and nickel (CAS # 7440-02-0). These compounds or mixtures have been identified under CERCLA §101 (14) as hazardous substances (40 CFR §302, Table 302.4). Lead (Pb) is by far the most common contaminant of concern at the MCM site.

3) History of the current and past use of the Site

The current and past land uses in the county are un-impacted natural land, mining-related, agricultural crop and pasture land. Industrial activities consist of light manufacturing, aggregate production and construction. Mining began in Madison County in the early-18th century and reached peak production during the Second World War. Mine wastes have been used for the construction of public roads, private driveways, construction fill, and also to control snow and ice, but the tailings at the MLMRA site and the Anschutz property do not appear to have been excavated leaving approximately 850 acres of contaminated wastes still on the surface (USEPA 2011).

4) Relevant operations occurring at or near the Site

Lead ore was discovered near Fredericktown in 1715 and mining commenced on a small basis throughout the early 18th century. Early mining operations in Madison County were principally surface mines. The surface deposits of Pb lay in veins of pure ore and were hand dug to depths of up to 40 feet. Mining activities increased significantly in the mid-1840s and expanded throughout Madison County following the Civil War with the introduction of the diamond bit core drill in 1869. Ore mining and primary crushing took place at many sites in the MCM site. In general, the raw ore was brought to the surface and crushed in stages with the metals being separated by gravity separation or chemical flotation. Waste rock, development rock, chat, and tailings materials were usually dumped on the surface in waste piles or impoundments. Many wastes were re-milled as more efficient separation techniques became available.

5) Additional hazardous substances potentially released from the MCM site

Other hazardous substances potentially released from the MCM Superfund Site include arsenic (CAS # 7440-38-2), iron (CAS # 7439-89-6), and manganese (CAS # 7439-96-5).

6) Potentially Responsible Parties

The Potentially Responsible Parties at this site include, but are not limited to,
National Lead Industries, Inc., The Doe Run Resources Company d/b/a The Doe Run Company, Delta Companies, Inc. and Anschutz Mining Corporation.

III. NO STATUTORY EXCLUSIONS FROM LIABILITY UNDER CERCLA APPLY AT THIS SITE

Injuries to natural resources and damages resulting from the discharge or release of the hazardous substances at the MCM site were not identified in any environmental impact statement, pursuant to the National Environmental Policy Act (NEPA), as amended (42 U.S.C. §§ 4321-4370h (2013)), or any similar review or document.

The release or discharge of the hazardous substances at the MCM site are ongoing and did not occur wholly before enactment of CERCLA, nor the 1977 amendments to the FWPCA. Injuries to natural resources and their services and 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 MCM site are not pesticide products registered under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended (7 U.S.C. §§135-135k). Injuries to natural resources and their services and damages resulting from the discharge or release of the hazardous substances at the MCM site did not result from the application of a FIFRA registered pesticide product.

Injuries to natural resources and their services and damages resulting from the discharge or release of the hazardous substances at the MCM site did not result from any federally permitted release as defined in CERCLA Section l01 (10).

The hazardous substances are not recycled oil products as described in CERCLA Section 107(a)(3) or (4). Injuries to natural resources and their services and damages resulting from the discharge or release of the hazardous substances at the MCM site did not result from release of a recycled oil product.

No exclusion from damages is applicable to this site, pursuant to the CERCLA and FWPCA.

IV. PRELIMINARY IDENTIFICATION OF RESOURCES POTENTIALLY AT RISK

1) Preliminary identification of pathways

Surficial mine and mill wastes, soils, and surface water all act as sources of hazardous substances (including Pb, Zn, and Cd) to the environment at the MCM site. Hazardous substances can be released directly from these sources into the air, surface water, groundwater, and soils. Additionally, air can entrain and transport metals as it flows over fugitive dust sources such as chat piles and tailings impoundments. Mine and mill wastes have also been transported by people for various uses.

Surface water can receive hazardous substances directly from erosion of various types of mine waste during runoff. Direct exposure to suspended and dissolved metals can occur to aquatic organisms dwelling in the water column. Stream sediment is habitat for a wide-variety of

benthic invertebrates and fish. Contaminated sediment provides exposure through incidental ingestion and by increasing metal concentrations in the pore water of the sediment. Contaminated pore-water is a direct exposure pathway through the gills of aquatic organisms.

Rain water percolating through the mine waste piles can leach hazardous substances into the soil beneath the waste pile. Groundwater can also be affected as it flows through underground mine workings and comes into contact with exposed ore bodies. Additionally, groundwater can be injured from contaminated losing streams within the watershed.

Air, surface water, groundwater, 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. For example, contaminated soils may provide an exposure pathway to heavy metals contamination for migratory birds. Depending upon the species, migratory birds will feed on terrestrial seeds and berries, soil invertebrates, fish, aquatic invertebrates, or aquatic plants (Galbraith, 2007).

An Ecological Risk Assessment (ERA) completed by the USEPA in 2011 found adverse impacts to terrestrial and aquatic habitat from mining activities throughout the MCM site. The ERA indicated that the MLMRA Slime Pond, the wetland at Copper Mines and the Met Pond on the Anschutz Property all pose an acute and chronic toxicity risk to benthos. Sediment samples analyzed from tributaries to the Little St. Francis River around Fredericktown were also found to have metal concentrations that could adversely impact aquatic life communities.

2) Exposed Areas

Areas exposed to the released hazardous substances include the waters, wetlands, stream banks, sediments, soil and biota of the MCM site. Over 850 acres of contaminated mill waste and soil provides an exposure pathway for wildlife. In addition, areas downstream of the MCM site are impacted from releases of hazardous substances attributable to the mining operations within the Superfund Site.

3) Exposed Water Estimates

The principal drainage system for MCM site is the Little St. Francis River and its tributaries. Based on sampling conducted by Environmental Strategies Corporation (ESC) in 2000, the Little St. Francis River has at least 4 miles, from the confluence of Logtown Branch to just below the confluence of Sweetwater Brach, of contaminated sediment which exceeds applicable the Probable Effect Concentration. A sample taken approximately 0.2 miles below City Lake was also above the PEC. Many of the tributaries to the Little St. Francis River were also above the PEC including 1.4 miles of Sweetwater Branch (above and below Mine La Motte Lake),

approximately 1 mile of Village Creek, and 6.6 miles of Shays Creek (above and below Slime Pond).

4) Estimates of Concentrations

a. Chat, Tailings, and Soil

Samples from the three main tailings piles collected in the MCM site by the EPA in 2010 had maximum Cd, Cu, Ni, Pb, and Zn concentrations of 1.95 mg/kg, 5,360 mg/kg, 7,710 mg/kg, 23,400 mg/kg, and 140 mg/kg, respectively (Appendix A, Table 1). Soil samples from throughout the MCM site had maximum Cd, Cu, Ni, Pb, and Zn concentrations of 35.6 mg/kg, 39,700 mg/kg, 6,840 mg/kg, 67,400 mg/kg, and 7,400 mg/kg, respectively (Appendix A, Table 2) with samples also coming from the Mine La Motte Processing Area (MLMPA). The ecological screening values (ESVs) for soils are EPA's Ecological Soil Screening Levels (Eco SSLs) and are summarized in Table 2 below. The average Pb concentration from soil exceeded the Eco SSLs from all sites except Hickory Nut Mine.

Table 2: USEPA's Ecological Soil Screening Levels (mg/kg)

Cadmium			
Plants	**Soil Invertebrates**	**Wildlife**	
		Avian Vermivores	**Mammalian Vermivores**
32	140	0.77	0.36
Lead			
Plants	**Soil Invertebrates**	**Wildlife**	
		Avian Vermivores	**Mammalian Vermivores**
120	1,700	11	56
Zinc			
Plants	**Soil Invertebrates**	**Wildlife**	
		Avian Vermivores	**Mammalian Vermivores**
160	120	46	79
Copper			
Plants	**Soil Invertebrates**	**Wildlife**	
		Avian Vermivores	**Mammalian Vermivores**
70	80	28	49
Nickel			
Plants	**Soil Invertebrates**	**Wildlife**	
		Avian Vermivores	**Mammalian Vermivores**
38	280	NA	NA

Source: USEPA, 2011.

b. Sediment

MacDonald et al. (2000) identified consensus-based freshwater sediment quality guidelines: the Probable Effect Concentrations (PECs) and Threshold Effect Concentrations (TECs). PECs represent concentrations of contaminants above which adverse effects on sediment-dwelling organisms are expected to occur frequently. TECs represent concentrations of contaminants in sediment below which adverse effects on sediment-dwelling organisms are expected to occur infrequently. The TEC and PEC values for cadmium, lead and zinc appear below in Table 3.

Table 3: TEC and PEC Values for Cd, Pb and Zn

Contaminant	TEC Value ppm	PEC Value ppm
Cadmium	0.99	4.98
Lead	35.8	128
Zinc	121	459
Copper	31.6	149
Nickel	22.7	48.6

Sediment samples collected in the MCM site had maximum concentrations of Cd at 34.6 mg/kg, Cu at 10,100 mg/kg, Ni at 5700 mg/kg, Pb at 13,000 mg/kg, and Zn at 2900 mg/kg (Appendix A, Table 3). The highest concentration of Pb was found in sediment in the Little St. Francis River near the Little St. Francis River Chat pile, the highest concentration of Zn in Mill Creek near the Conrad Tailings Drainage and the highest concentrations of Cd, Cu and Ni on the Anschutz Property (USEPA 2011).

c. Surface Water

The most recent surface water sampling from the Little St. Francis River and its tributaries was conducted by the USEPA in 2006. The National Ambient Water Quality Criteria (NAWQC) for Cd, Cu, Ni, Pb and Zn was calculated using site specific hardness data collected from the water sample. Maximum concentrations of dissolved Pb (21.5 µg/l) in Sweetwater Branch near the Harmony Lake tailings pile exceeded the chronic NAWQC for Pb (4 µg/l). Dissolved Cu (25.3 µg/l) from Spiva Branch exceeded the chronic NAWQC for Cu (7 µg/l) and the chronic NAWQC for Ni (113 µg/l) was also exceeded with dissolved Ni (3480 µg/l) from an unnamed creek on the north end of the Anschutz Property. No surface water samples exceeded the Cd (0.4 µg/l) or Zn (255 µg/l) NAWQC at any sampling sites (Appendix A, Table 4).

Additionally, the MDNR listed 5 miles of Village Creek and 1.7 miles of Saline Creek, tributaries of the Little St. Francis River that flow through mine impacted areas, as impaired on the state's water quality report (Section 305(b) of the Clean Water Act), but neither stream was approved for the state impaired waters (Section 303(d) of the Clean Water Act). The 5 miles of Village Creek, from Mine La Motte to the confluence with the Little St. Francis River, are listed because of dissolved Pb and inorganic sediments. The 1.7 miles of Saline Creek, from just east of Fredericktown to the confluence with the Little St. Francis River, are listed because of dissolved Ni.

d. Potentially Affected Resources

Natural resources, their supporting ecosystems and their services that have been or potentially have been affected by the release of hazardous substances, include but are not limited to terrestrial environments; surface water, sediments, and biological resources including aquatic and terrestrial plants and microorganisms; aquatic and aquatic dependent mammals; fish; aquatic invertebrates; terrestrial invertebrates; and migratory birds including waterfowl, shorebirds, raptors and songbirds.

Plant communities in the MCM site have been highly modified to the extent that they now provide limited wildlife habitat. The phytotoxic effects of hazardous substances in mine wastes may be responsible for some or all of the observed injuries to the vegetative communities (Kaputska 2007). Kapustka (2007) developed a set of lower and upper threshold values for phytotoxic response to the three metals of concern, as detailed below.

Table 4. Phytotoxicity Threshold Values (mg/kg dry weight soil)

Element	Lower Threshold	Upper Threshold
Cadmium	3	100
Lead	100	1,000
Zinc	70	500

Source: Kaputska, 2007.

When compared to the average concentrations of Pb found at the MCM site (Appendix A; Table 1 and Table 2), the phytotoxicity thresholds established by Kaputska have clearly been exceeded, often by an order of magnitude. The 2006 Ecological Risk Assessment indicated that the primary risk to the fitness of plants exhibited at the MCM site is the potential adverse impacts on the proper cycling and function of nutrients in the ecosystem. Struckhoff et al. (2013) performed a study on the effects of Pb and Zn concentrations on native floristic quality in southeast Missouri. They determined a 10% reduction in floristic quality occurs at Pb concentrations of 663 mg/kg and Zn concentrations of 311 mg/kg. Based on averages, only the MLMPA exceeds the Zn concentration (385 mg/kg), but all of the sites exceed the Pb concentration (Appendix A; Table 1 and Table 2).

Surface water represents another potentially injured natural resource. Surface waters provide habitat for aquatic species such as aquatic insects and fish, 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 is determined by exceedances of applicable water quality criteria, 43 C.F.R. § 11.62 (b)(1)(iii), and as discussed in the previous section, "Surface Water."

In addition to high concentrations of metals contaminating the sediments in the Little St. Francis River watershed, studies have shown that the metals are generally bioavailable. For example, fish tissues collected from the watershed have accumulated high levels of metals in their system, but tissue from mussels, macroinvertebrates and algae have not been collected (Wooster-Brown 2006). Further, the watershed is not a carbon-rich ecosystem and the acid volatile sulfide (AVS) is low, both facts support the finding that the metals are bioavailable (Schmitt 1987 and 2007).

Direct contact with dissolved metals in surface water, ingestion of metals in prey species and incidental ingestion of sediment are hazards to fish. The combination may contribute to a chronic low-level stress on the fish that may be displayed by decreased growth and/or decreased immunity to disease (Wooster-Brown 2006).

Freshwater fish communities may have been impacted by the release of contaminants from the MCM site. Wooster-Brown (2006) mentions a documented fish kill in Tollar Branch and the Little St. Francis River which was associated with the occurrence of a storm event that lead to a ruptured tailings pond dam. Amphipod toxicity tests show a significant difference in growth (as low as 0.15 mg/amphipod) and survival (as low as 5%) when comparing samples taken from the MCM site to a laboratory control and reference samples from the Castor River. Macroinvertebrate taxa diversity was reduced in mining affected streams and was slanted towards pollution tolerant species when compared to the reference site in the 2006 Ecological Risk Assessment.

The Missouri Department of Natural Resources (2005) studied the 24-hour mortality of *Ceriodaphnia* based on metal concentrations at five locations within the MCM site. The study had mixed results, but did have 100% 24-hour mortality in Mill Creek near Route 205 (Pb 1363 mg/kg, Zn 557 mg/kg, and Co (103 mg/kg) and in Logtown Branch just upstream from the confluence with the Little St. Francis River (Ni 1925 mg/kg, Co 1184 mg/kg, and Zn 323 mg/kg). The Little St. Francis River near the mouth of Saline Creek had a 55% 24-hour mortality rate and a 70% 48-hour mortality rate (Pb 1097 mg/kg, Ni 32 mg/kg). Another site on Mill Creek (near Route E) had high Pb concentrations (3099 mg/kg) but 0% mortality; however, it was noted that the *Ceriodaphnia* were in decline (small, pale, and moving erratically). The last site, Saline Creek above the mouth of Goose Creek, had low metal concentrations and a 5% mortality rate for both 24-hour and 48-hour.

V. PRE-ASSESSMENT 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 with regard to the MCM site:

1. Discharges or releases of hazardous substances have occurred;
2. 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;
3. The quantity and concentration of the released hazardous substances are sufficient to potentially cause injury to natural resources;
4. Data sufficient to pursue an assessment are readily available or likely to be obtained at a reasonable cost; and
5. Response actions planned will not sufficiently restore, replace, or provide compensation for injured natural resources without further action.

The Trustees hereby determine that further investigation and assessment is warranted and should be carried out at this site in accordance with federal regulations at 43 C.F.R. §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 C.F.R. Part 11, generally, and 43 C.F.R. §§ 11.23(a)-(g), §11.24 and § 11.25, specifically, have been satisfied.

The information provided and conclusions made in this Preassessment Screen 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.

This Preassessment Screen may be executed in counterparts. A copy with all original executed signature pages affixed shall constitute the Preassessment Screen. The date of execution shall be the date of the final Trustee signature.

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Appendix A

Concentrations of COPECs at the MCM sites

Table 1. Cadmium, Lead, and Zinc in MCM Site Tailings

Site (Tailings)	Number of Samples	Detection Frequency	Maximum mg/kg	Average
Lead				
MLMRA	27	100%	3970	1116
Copper Mines	6	100%	10,200	4545
Anschutz	24	100%	23,400	2463
Cadmium				
MLMRA	-	-	-	-
Copper Mines	-	-	-	-
Anschutz	24	8%	1.95	1.82
Zinc				
MLMRA	27	100%	80	22.9
Copper Mines	6	100%	52	21.7
Anschutz	7	100%	140	58.6
Copper				
MLMRA	3	100%	326	195
Copper Mines	-	-	-	-
Anschutz	24	100%	5360	854
Nickel				
MLMRA	3	100%	152	123
Copper Mines	-	-	-	-
Anschutz	24	100%	7710	679

Table 2. Cadmium, Lead, and Zinc in MCM Site Soil

Site (Soil)	Number of Samples	Detection Frequency	Maximum mg/kg	Average
Lead				
MLMRA	60	100%	24,400	1754
*MLMPA	31	100%	67,400	9846
Old Jack Mine	2	100%	22,000	20,550
Copper Mine	22	100%	10,200	3059
Offset Mine	3	100%	5030	3320
Hickory Nut Mine	4	100%	3200	1583

Anschutz Mine	28	100%	20,300	3405
Cadmium				
MLMRA	60	2%	5.6	0.378
*MLMPA	31	64.5%	35.6	6.89
Old Jack Mine	-	-	-	-
Copper Mine	22	5%	0.9	0.456
Offset Mine	-	-	-	-
Hickory Nut Mine	4	50%	0.59	0.421
Anschutz Mine	28	32%	5.1	1.25
Zinc				
MLMRA	61	100%	1960	70.9
*MLMPA	31	100%	7400	385
Old Jack Mine	-	-	-	-
Copper Mine	22	100%	203	45.4
Offset Mine	3	100%	97.3	57.8
Hickory Nut Mine	4	100%	50.4	38.9
Anschutz Mine	28	93%	856	148
Copper				
MLMRA	14	93%	206	48.62
*MLMPA	18	100%	1590	268
Old Jack Mine	-	-	-	-
Copper Mine	1	100%	1040	1040
Offset Mine	3	100%	33.8	24.2
Hickory Nut Mine	4	75%	60.1	38.9
Anschutz Mine	28	100%	39,700	3164
Nickel				
MLMRA	14	100%	125	27.38
*MLMPA	18	100%	433	89.3
Old Jack Mine	-	-	-	-
Copper Mine	1	100%	277	277
Offset Mine	-	-	-	-
Hickory Nut Mine	4	100%	68.2	36.3
Anschutz Mine	28	96%	6840	1244

*Mine La Motte Processing Area

Table 3. Cadmium, Lead, and Zinc in MCM Site Sediment

Site (Soil)	Number of Samples	Detection Frequency	Maximum mg/kg	Average
Lead				
MLMRA	18	100%	5450	1184
Old Jack Mine	-	-	-	-
Copper Mine	13	100%	9920	2836
Anschutz Mine	11	100%	3680	1089
Other Streams/Ponds	102	100%	13,000	748
Cadmium				
MLMRA	-	-	-	-
Old Jack Mine	-	-	-	-
Copper Mine	-	-	-	-
Anschutz Mine	11	100%	34.6	8.14
Other Streams/Ponds	102	55%	9.4	1.69
Zinc				
MLMRA	-	-	-	-
Old Jack Mine	-	-	-	-
Copper Mine	13	100%	323	46.8
Anschutz Mine	11	100%	425	147
Other Streams/Ponds	102	99%	2900	120.7
Copper				
MLMRA	3	100%	622	267
Old Jack Mine	-	-	-	-
Copper Mine	3	100%	1220	725
Anschutz Mine	5	100%	10,100	4389
Other Streams/Ponds	63	100%	2600	168
Nickel				
MLMRA	3	100%	117	62.7
Old Jack Mine	-	-	-	-
Copper Mine	7	100%	1930	398
Anschutz Mine	11	100%	5700	1224
Other Streams/Ponds	102	100%	1930	134

Table 4. Cadmium, Lead, and Zinc in MCM Site Surface Water

Site (Surface Water)	Number of Samples		Maximum µg/L		Average µg/L	
	Total (Detection)	Dissolved (Detection)	Total	Dissolved	Total	Dissolved
Lead						
MLMRA	17 (76%)	6 (83%)	90.2	9.01	14.8	2.97
Old Jack Mine	1 (100%)	-	4	-	4	-
Copper Mine	12 (75%)	6 (83%)	206	8.4	31.2	2.56
Offset Mine	1 (100%)	1 (100%)	13.4	6.1	13.4	6.1
Anschutz Mine	11 (91%)	11 (55%)	60.2	7.9	14.3	1.35
Other Streams/Ponds	87 (67%)	53 (68%)	337	21.5	26.03	4.19
Cadmium						
MLMRA	-	-	-	-	-	-
Old Jack Mine	-	-	-	-	-	-
Copper Mine	-	-	-	-	-	-
Offset Mine	-	-	-	-	-	-
Anschutz Mine	-	-	-	-	-	-
Other Streams/Ponds	87 (1%)	53 (0%)	0.49	< 1	0.521	0.231
Zinc						
MLMRA	-	-	-	-	-	-
Old Jack Mine	-	-	-	-	-	-
Copper Mine	-	-	-	-	-	-
Offset Mine	-	-	-	-	-	-
Anschutz Mine	11 (64%)	11 (100%)	121	114	33.6	25.1
Other Streams/Ponds	87 (45%)	53 (79%)	127	99.2	13.61	8.208
Copper						
MLMRA	3 (100%)	3 (33%)	11.5	3.4	6.07	1.8
Old Jack Mine	-	-	-	-	-	-
Copper Mine	3 (100%)	3 (67%)	38.4	20.6	15.4	9.03
Offset Mine	-	-	-	-	-	-
Anschutz Mine	-	-	-	-	-	-
Other Streams/Ponds	49 (22%)	15 (20%)	79	25.3	12.78	4.09
Nickel						
MLMRA	6 (83%)	6 (100%)	58.8	42.4	21.5	21

Old Jack Mine	-	-	-	-	-	-
Copper Mine	6 (100%)	6 (100%)	151	129	63.2	56.5
Offset Mine	1 (100%)	1 (100%)	106	94.9	106	94.9
Anschutz Mine	11 (100%)	11 (100%)	3640	3480	750	700
Other Streams/Ponds	87 (60%)	53 (81%)	2910	2830	161.2	142.7

Appendix B

Maps of Madison County Mining Sites OU1, OU2, OU6

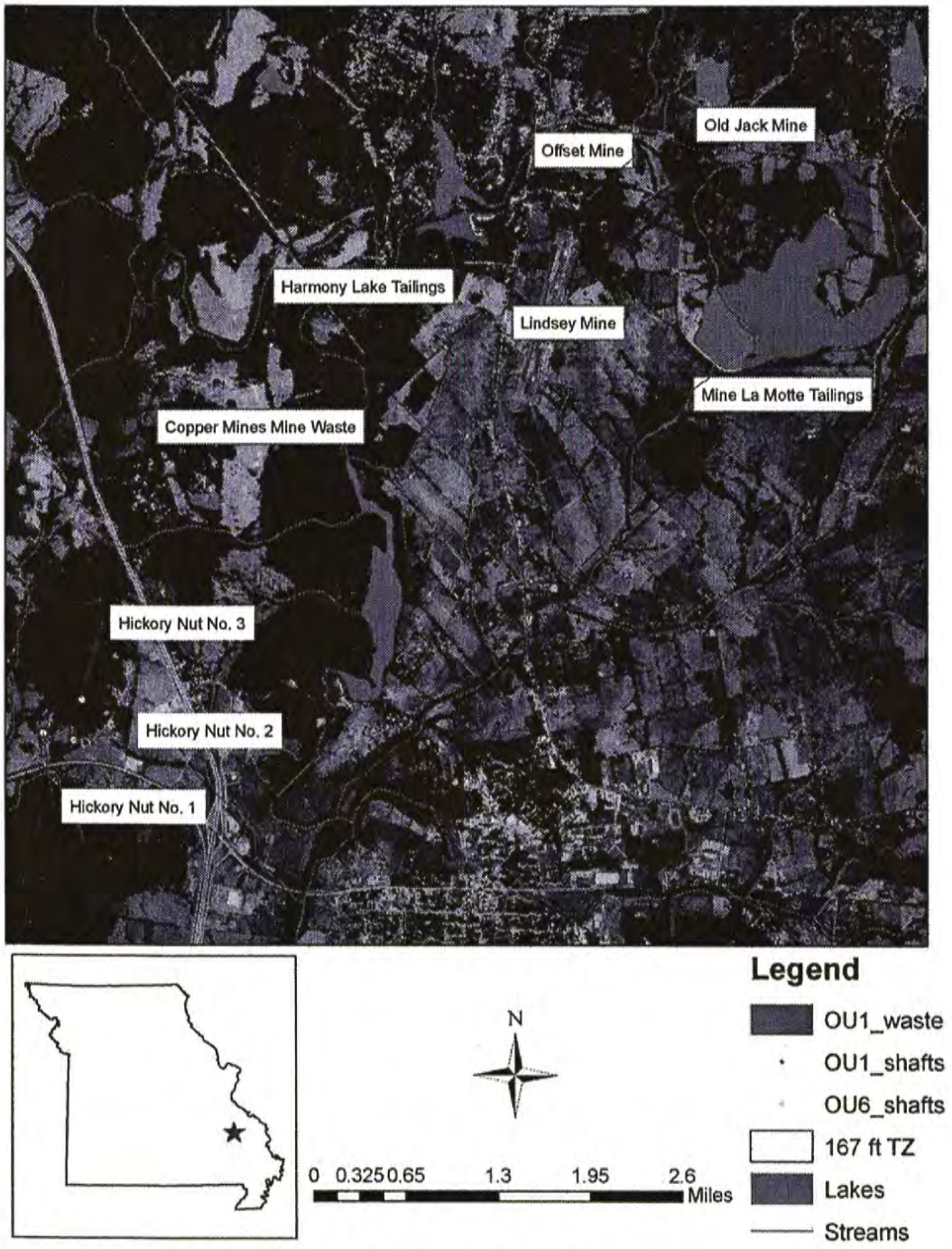

Figure 1. Map of Madison County Mining Site showing mine waste of OU1, mine shafts of OU1 and OU6 with transition zone buffer of 167 feet.

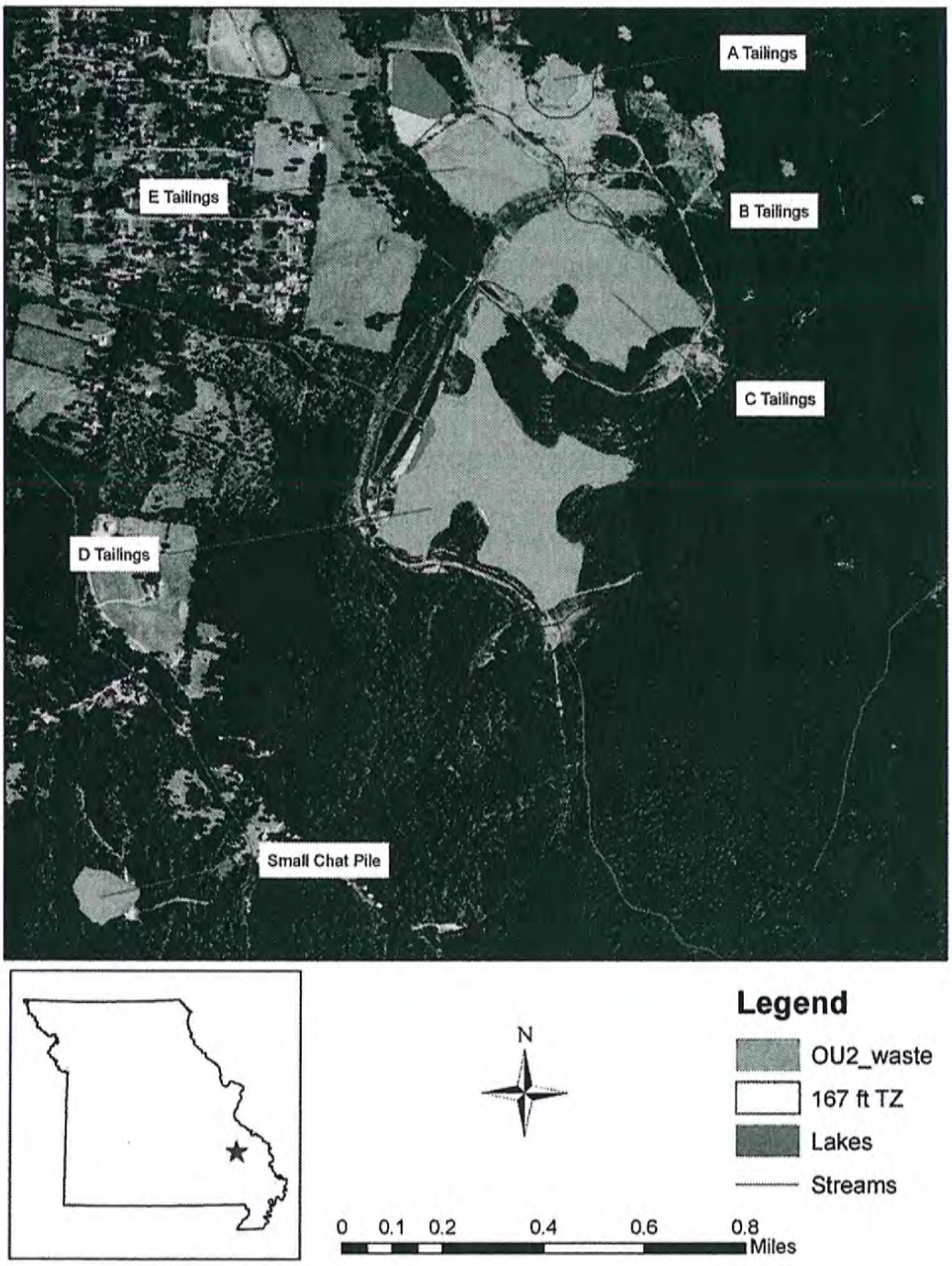

Figure 2. Map of Madison County Mining Site showing mine waste of OU6 with transition zone buffer of 167 feet.

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MISSOURI DEPARTMENT OF NATURAL RESOURCES

Sara Parker Pauley, Director
Missouri Department of Natural Resources

6/20/2014
Date

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U.S. DEPARTMENT OF THE INTERIOR

Charles M. Wooley
Acting Regional Director

5/28/14
Date

Thomas O. Melius, Director
~~Region~~ 3
U.S. Fish and Wildlife Service
U.S. Department of the Interior