DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRA Info Code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: **Eagle-Picher Technologies, LLC**
Facility Address: **P.O. Box 47, "C" and Porter Streets, Joplin, MO 64802**
Facility EPA ID #: **MOD046740148**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   __✓__ If yes **-** check here and continue with #2 below.

   ______ If no **-** re-evaluate existing data, or

   ______ If data are not available, skip to #8 and enter"IN" (more information needed) status code.

The Eagle-Picher Technologies (EPT) facility is located on about 57 contiguous acres at "C" and Porter Streets in Joplin, Missouri (see Figure 1). EPT has been operating at the Joplin location since at least 1880. It began as a lead processing and smelting facility but converted to lead chemicals manufacturing in the late 1930s or early 1940s (Dames & Moore [D&M] 1994). The EPT complex consisted of three separate and distinct facilities: (1) Chemicals, (2) Couples, and (3) Special Products. The chemicals division manufactured specialty lead chemicals for compounding lubricants, paint pigments, dye colors, and vinyl stabilizers, as well as other lead compounds. Beginning in 1940, the Chemicals division also manufactured fibers, but this segment of the business and manufacturing area was sold to another company in 1983 (D&M 1995). In June 2003, all remaining Chemicals division manufacturing was discontinued (Missouri Department of Natural Resources [MDNR] 2003b). The Chemicals division is associated with geographic Groups 2, 4, and 6, and the former lead chemicals settling pond. The Couples division began operations in 1950 and continues to produce and test batteries and power supplies for special military and space applications (D&M 1994, 1995). The Couples division is associated with geographic Groups 1, 3, and 5, and the former mercury waste impoundment. The Special Products division, located in geographic Group 7, began operations in the late 1970s and continues to produce battery systems for specialty applications and pyrotechnic heat sources (D&M 1994, 1995).

As part of manufacturing operations at the EPT facility, certain types of hazardous wastes are generated and managed at the facility. In August 1993, a hazardous waste management facility permit was issued by the MDNR to govern management of these wastes. The state permit addressed storage of hazardous waste generated on-site and post-closure care for two closed surface impoundments, the former Mercury Waste Surface (Mercury) Impoundment and the former Lead Chemicals Settling (Lead) Impoundment. In 1993, the U.S. Environmental Protection Agency (EPA) issued a Hazardous and Solid Waste Amendments permit to EPT at the same time as the state permit. The EPA permit includes provisions requiring EPT to investigate and remediate contaminant releases to the environment at the facility. These obligations are in addition to the requirements of the state permit. Subsequently, EPT requested a permit modification to shorten the post-closure care period for the former Mercury Impoundment. Therefore, in April 2003, MDNR modified the hazardous waste management facility state permit. Based on the nature of the proposed modification and Missouri’s status as a corrective action authorized state, concurrent modification of the EPA-issued permit was also completed. The final permit modifications terminated post-closure care for the former Mercury Impoundment, required a corrective action groundwater monitoring program at the former Lead Impoundment, and transitioned the corrective action requirements contained in EPA's permit into MDNR’s permit.

The EPT facility has been monitored and investigated since at least 1987, when the EPA conducted a RCRA facility assessment (RFA) to identify solid-waste management units (SWMU) and areas of concern (AOC). EPT submitted a workplan in 1994 that identified an additional four SWMUs and listed SWMUs that required investigation under the RFI (D&M 1994). The RFI was submitted in two phases, in 1995 and 1999 (D&M 1995, 1999). Additional investigations were conducted in 2000 to characterize groundwater in bedrock and determine the presence of historical mining features on EPT property (D&M 2000).

The RCRA facility investigation (RFI) work plan listed 128 SWMUs and four AOCs (D&M 1994). Of these, 104 SWMUs were determined to meet the definition of a SWMU. Of these 104 SWMUs, only a subset were considered for further investigation in the RFI. The remaining SWMUs were excluded from the RFI because they met one of the following criteria:

- Active permitted units that would be subject to closure sampling
- Never used for storage of hazardous constituents
- Included in a larger geographic area that would be investigated with another SWMU
- Part of previous investigations that had uncovered no hazardous constituents
- Not on EPT property
- Newly constructed units with adequate containment systems
- Subjected to the removal and cleanup action associated with the 1991 fire that destroyed Building 54

Of the four AOCs, one was reclassified as a SWMU, and one was not investigated in the RFI because evidence of a release was lacking. Except for the SWMUs associated with the closed surface impoundments, the SWMUs and AOCs were grouped into seven geographic areas to facilitate reporting. Figures 2 through 5 show the site layout, with SWMUs and AOCs. Except where noted, the descriptions of SWMUs are derived from the RFI work plan (D&M 1994). Only the SWMUs and AOCs that were subject to the RFI investigation are listed below.

Group 1 – Battery Testing Area. This group includes the SWMUs listed in the following table. The RFI found evidence of a release of lead and arsenic to soil (D&M 1995).

Group 1 SWMU Name	Status as of RFI Work Plan	Description
SWMU 28 - Former Battery Testing Pit	Active	Shallow, unlined, earthen pit that was used to test batteries. Pit backfilled after debris was removed. Currently used for non-destructive battery testing.
SWMU 29 - Concrete Block Testing Unit within the Battery Testing Area	Active	Unit constructed of concrete blocks in which lithium batteries are tested.
SWMU 30 - Stained Area in the Battery Testing Area	Inactive	Area in which two drums containing lithium thionyl chloride cells were stored.

Group 2 – Bunker Area. This group includes the SWMUs listed in the following table. The RFI did not find evidence of a release to soil (D&M 1995).

Group 2 SWMU Name	Status as of RFI Work Plan	Description
SWMU 66 - Former Hazardous Waste Storage Area	Inactive	Area in which a variety of wastes were stored, including lithium and iron potassium perchlorate hazardous wastes in 5-gallon buckets. Destroyed by a fire in November 1991.
SWMU 100 - Former Hazardous Waste Storage Area	Inactive	Portable building used to store lithium and iron potassium perchlorate wastes after the destruction of the storage pad (SWMU 66) by fire. Removed in 1992.
SWMU 115 - Former Hazardous Waste Storage Area	Inactive	Storage area for containers of hazardous wastes collected from the cleanup of the Building 54 fire.

Group 3 – Buildings 4, 10, and 11. This group includes the SWMUs listed in the following table. The RFI found evidence of releases of arsenic, barium, cadmium, chromium, lead, nickel, and silver to soil (D&M 1995, 1999).

Group 3 SWMU Name	Status as of RFI Work Plan	Description
SWMU 44 - Line to Couples Waste Water Treatment Plant	Active	Polyvinyl chloride pipe that originally connected to the former waste water plant in Building G (SWMU 52). In 1986, extended to drain process waste water from Building 10 and

		tied into the waste water treatment system in Building 1. In 1989, expanded to direct all process waste water from the Couples facility to the new waste water treatment plant.
SWMU 45 - Drain Line to Old Waste Water Treatment System in Building G	Inactive	Line that drained waste water from the nickel/cadmium process to the in-line settling basin (SWMU 53) and on to the wooden process tanks (SWMU 54). Flushed in 1989.
SWMU 47 - Satellite Waste Accumulation Area	Active	Satellite accumulation area on a covered concrete pad in Building 11, used to manage discharged lithium batteries, waste trichloroethene, waste dimethyl sulfite, and waste flammable liquids.
SWMU 48 - Former Gas-Fired Furnace	Inactive	Gas-fired, rotary furnace used to deactivate thermal battery components. Removed in 1990. Area now covered with asphalt.
SWMU 49 - Former Gas-Fired Furnace	Inactive	Gas-fired, two chamber furnace used to deactivate process paper and zinc/silver battery components. Removed and area now covered with concrete pad.
SWMU 50 - Former Waste Storage Pad	Active	Concrete pad used to store containers of waste nickel nitrate solution, waste acetone, acetone for reuse, and waste methanol. Now used to store acetone only.
SWMU 52 - Former Nickel-Cadmium Waste Water Treatment System	Inactive	Treatment system for nickel-cadmium waste water, removed in 1986, and a satellite accumulation area for drums of ethylene dichloride and trichloroethene waste.
SWMU 53 - Former Settling Basin	Inactive	Underground concrete tank used as a settling basin for waste water from the nickel/cadmium process. Inspected, cleaned, and removed in 1989.
SWMU 54 - Two Former Wooden Settling Tanks	Inactive	Two wooden tanks, located on bare ground, that were used as part of the former nickel/cadmium waste water treatment system.
SWMU 86 - Waste Water Trench and Drain Lines from Heat Paper Process	Active	Concrete trench and drain line used to direct waste water from the heat paper process for treatment at the Couples waste water treatment plant.
SWMU 104 - Former Satellite Accumulation Area	Inactive	Paved satellite accumulation area used to collect drums of fired thermal batteries that contained silver.
SWMU 112 - Staging Area in the Eastern Portion of Parking Area B	Active	Staging area used to collect material during the removal of debris remaining from the fire that destroyed Building 54.
SWMU 116 - Former Portable	Inactive	Portable building used to repackage lithium- contaminated

Building in the Northeast Corner of Parking Area E		debris from the Building 54 fire. Removed to SWMU 100, then removed from the property.
SWMU 120 - Former Battery Storage Area East of Building G	Inactive	Paved storage area used for containers of silver/zinc batteries before metals reclamation and disposal.

Group 4 – Building 7. This group includes the SWMUs listed in the following table. The RFI found evidence of releases of lead and silver to soil (D&M 1995).

Group 4 SWMU Name	Status as of RFI Work Plan	Description
SWMU 94 - Former Wooden Tank	Inactive	Wood tank located on bare ground that may have been used to store waste liquid from the silver process. Removed in March 1991.
SWMU 98 - Former Furnace	Inactive	Rotary-kiln furnace used to remove plastic covers from batteries to facilitate recovery of silver. Has been removed.

Group 5 - Buildings 1 and 87. This group includes the SWMUs and AOC listed in the following table. The RFI found evidence of releases of chromium, lead, and mercury to soil (D&M 1995).

Group 5 SWMU or AOC Name	Status as of RFI Work Plan	Description
SWMU 7 - Mercury Chloride Solution Pretreatment Tanks	Active	Two 250-gallon open-top tanks used for pretreatment of mercury chloride solution.
SWMU 13 - Former Mercury Process Waste Water Drain Line	Inactive	Drain line that conducted waste water to the former mercury waste water treatment system in Building 1. Replaced with another line in 1989.
SWMU 14 - Former Zinc/Silver Process Waste Water Drain Line	Inactive	System of buried clay tile pipes and open concrete trench drains used to transfer rinse water from processing area to treatment system in Building 1.
SWMU 15 - Former Mercury Process Waste Water Treatment System	Inactive	Concrete basin and several process tanks used to treat waste water. Removed and capped with concrete.
SWMU 16 - Former Zinc/Silver Process Waste Water Treatment System	Inactive	Concrete basin and several process tanks used to treat waste water. Removed and capped with concrete.
SWMU 40 - Former Line to Mercury Waste Surface Impoundment	Inactive	Polyvinyl chloride pipe used to direct mercury waste to the former surface impoundment (SWMU 1). Removed when SWMU 1 was closed.

SWMU 44 - Line to Couples Waste Water Treatment Plant	Active	Polyvinyl chloride pipe originally connected to the former waste water plant in Building G (SWMU 52). In 1986, extended to drain process waste water from Building 10 and tied into the waste water treatment system in Building 1. In 1989, expanded to direct all process waste water from the Couples facility to the new waste water treatment plant.
SWMU 51 - Cyclone	Active	Permitted unit used to collect particulate matter from air emissions from the silver/zinc process.
SWMU 55 - Former Waste Methanol Storage Pad	Inactive	Concrete pad used to store drums of waste methanol. Demolished, removed, and paved with asphalt.
SWMU 58 - Former Blotter Paper Storage Area	Inactive	Area in which boxes of blotter paper were stored.
SWMU 68 - Former Thermal Battery Accumulation Area	Inactive	Area used to accumulate drums of expended chromate/lithium batteries.
SWMU 107 - Satellite Accumulation Area	Active	Paved and covered satellite accumulation area used to collect drums of mercury-contaminated oil generated in the mercury process area.
SWMU 108 - Former Battery Storage Area	Inactive	Paved storage area used to collect drums of silver/zinc batteries prior to metals reclamation.
SWMU 109 - Former Battery Storage Area	Inactive	Paved storage area used to collect containers of silver/zinc batteries after the destruction of Building 54 by fire.
SWMU 127 - Drain Line to New Couples Waste Water Treatment Plant from Building 108	Active	Polyvinyl chloride drain lines that run from Building 108 to the Couples waste water treatment plant.
AOC C - Exhaust Fam Discharge Area for the Former Silver Plating Area	Inactive	Area in which the exhaust fan from the silver plating area discharged. Now the paved area under some aboveground tanks.

Group 6 - Greenfield Area. This group includes the SWMUs listed in the following table. The RFI found evidence of releases of cadmium, lead, and polycyclic aromatic hydrocarbons to soil (D&M 1995).

Group 6 SWMU Name	Status as of RFI Work Plan	Description
SWMU 9 - Chemical Storage Area	Active	Paved storage area for drums of raw materials and lead process waste powder.

SWMU 10 - Former Drum Storage Area	Inactive	Unpaved storage area for drums, contents unknown.
SWMU 12 - Former Drum Storage Area	Inactive	Storage area for drums containing lead residue powder.
SWMU 18 - Waste Water Drainage Line	Active	Polyvinyl chloride pipe used to direct process waste water from the lead peroxide plant to settling basins.
SWMU 19 - Settling Basins for the Chemicals Waste Water Treatment System	Active	Two poured concrete basins used in series to settle solids from waste water generated in the chemicals plant.
SWMU 20 - Chemicals Waste Water Treatment System	Active	Concrete basin subdivided into treatment units and used to treat process waste water from the Chemicals plant.
SWMU 21 - Former Settling Basin	Inactive	Primary settling basin for Chemicals operations waste water before transfer to the former lead chemicals settling pond (SWMU 2). Cleaned out and filled with demolition rubble.
SWMU 22 - Former Process Waste Water Drainage Ditch	Inactive	Unlined open ditch used to collect waste water from the Chemicals plant for discharge to the former lead chemicals settling pond (SWMU 2).
SWMU 24 - Former Collection Sump	Inactive	Waste water collection sump. Cleaned, washed out, and filled with rubble when Building 37 was demolished.
SWMU 41 - Former Drainage System	Inactive	System of underground drainage tiles connected to the former process waste water drainage ditch (SWMU 22).
SWMU 70 - Former Flow-Through Sump	Inactive	Part of the drainage system directing waste water from the Chemicals plant to the settling pond. Now covered with asphalt.
SWMU 90 - Former Settling Basins	Inactive	Concrete settling basins used for clarification of waste water from the lead chemicals facility. Cleaned, filled, and capped with concrete.
SWMU 92 - Former Brick Pile	Inactive	Pile of brick rubble from the demolition of buildings formerly located on the eastern portion of the site. Graded, covered, and seeded.
SWMU 93 - Former Burn Area	Inactive	Area used to burn old pallets and other scrap wood. Regraded and seeded.
SWMU 95 - Lead Peroxide Storage Area	Active	Area in which off-specification lead peroxide product was stored. Significant amount of this product removed, but some remains.
SWMU 117 - Former Waste Storage Area East of Building	Inactive	Paved storage area used for containers of nickel nitrate solution, non-hazardous waste water sludges, and containers of

89		debris from the Building 54 fire.
SWMU 118 - Heat Paper Excavation Area	Inactive	Area for burying 750 gallons of waste heat paper, contained in plastic bags.

Group 7 - Special Products. This group includes the SWMUs and AOC listed in the following table. The RFI found evidence of releases of lead and silver to soil (D&M 1995).

Group 7 SWMU or AOC Name	Status as of RFI Work Plan	Description
SWMU 4 - Loading Dock of Building 82	Inactive	Concrete loading dock used as a transfer point for wastes.
SWMU 85 - Former Drum Storage Area	Inactive	Fenced area used to store raw materials and empty product drums.
SWMU 128 - Drain Line to New Couples Waste Water Treatment Plant from Special Products	Active	Drain lines from the Special Products division to the Couples waste water treatment plant.
AOC A - Former Storm Water Outfall	Inactive	Formerly permitted outfall that enters a stream south of the EPT property.

Former Mercury Waste Surface Impoundment. The SWMUs listed in the following table are associated with the area around the former mercury waste surface impoundment. The area is associated with releases of arsenic, barium, cadmium, lead, and mercury to soil (D&M 1994, 1995).

Mercury Impoundment SWMU Name	Status as of RFI Work Plan	Description
SWMU 1 - Former Mercury Waste Surface Impoundment	Closed	Surface impoundment used to manage waste water generated by the mercury production process. Closed in 1989 in accordance with a MDNR- approved closure plan.
SWMU 34 - Former Check Valve on the Former Mercury Waste Surface Impoundment	Inactive	Check valve on former mercury waste surface impoundment (SWMU 1). Closed with SWMU 1.
SWMU 38 - Tailings Pile	Inactive	Tailings pile on eastern portion of the complex. Removed and regraded.

Former Lead Chemicals Settling Pond. Although the former lead settling pond (SWMU 2) is in the area of geographic Group 6, it is considered a separate entity in the RFI work plan and investigation. SWMU 2 was a settling pond used to allow secondary gravity sedimentation of suspended solids. It was closed in 1989 in accordance with a MDNR-approved closure plan.

The area is associated with releases of cadmium and lead (D&M 1994).

Tailings Pile. A pile of mine tailings (SWMU 38) previously was located on the eastern portion of the property, in the fork of Lone Elm Branch. This pile was regraded some time before 1994, probably in the late 1980s (D&M 1994). Samples collected during the RCRA facility assessment in 1987 showed evidence of a release of cadmium and lead.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non- aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRA Info national database ONLY as long as they remain true (i.e., RCRA Info status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be **"contaminated'**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act]) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

__✓__ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

______ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

______ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

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Groundwater samples at the EPT facility have been collected since at least 1987, when the two surface impoundments were closed. At the time of the RFI work plan, 27 monitoring wells were at the facility; 10 around the former mercury waste impoundment, completed at a depth of 16 to 30 feet bgs, and 17 in the area of the former lead chemicals settling pond and in geographic Group 6, completed at a depth of about 13 to 33 feet bgs (D&M 1994). During the two phases of the RFI, an additional five wells were installed, completed at depths ranging from 13 to about 30 feet bgs (D&M 1994, 1999). Finally, as part of the investigation of groundwater flow in shallow bedrock, three bedrock wells were installed in 2000 and 2001; these wells were completed at depths ranging from about 75 to 90 feet bgs (D&M 2000; Environ 2001; AMA 2003). Permit modifications resulted in the removal of the wells around the former mercury waste impoundment from the regular monitoring program (MDNR 2003a). In 2002, 25 wells were monitored on a semiannual basis (AMA 2003). Table 1 shows groundwater results from 2001 and 2002, including all constituents that exceeded the EPA maximum contaminant levels (MCL) or the MDNR target concentrations for groundwater. Values in bold exceed the MCL or target concentration (EPA 2002; MDNR 2001).

The most contaminated groundwater samples were collected from AW-4, AW-1, and Pb-2A, which are downgradient from and closest to the former lead chemicals settling pond (see Figure 2). However, samples collected from most wells at the facility have concentrations of lead that exceed EPA's action level of 15 micrograms per liter. Groundwater collected by EPT is only analyzed for constituents other than metals every 5 years; the next scheduled analysis is in 2006. During Phase I of the RFI, groundwater was analyzed for volatile organic compounds (VOC) and semivolatile organic compounds (SVOCs). There were no significant detections of either VOCs or SVOCs in groundwater (D&M 1995).

Table 1 – Maximum Concentrations of Compounds Detected in Groundwater Samples, 2001 and 2002

Compound	Concentration (μg/l)	Location	Collection Date	EPA MCL (μg/l)
Arsenic	**64.8**	AW-4	April 2001	50
Arsenic	36.5	AW-4	October 2001	50
Arsenic	**68.0**	AW-4	April 2002	50
Arsenic	22.9	MW-4	October 2002	50
Barium	947.0	Pb-2	April 2001	1,000
Barium	236.0	AW-4	October 2001	1,000
Barium	288.0	Pb-1A	April 2002	1,000
Barium	142.0	AW-4	October 2002	1,000
Cadmium	**106.0**	Pb-2A	April 2001	5
Cadmium	**17.4**	AW-1	October 2001	5
Cadmium	**109.0**	Pb-2A	April 2002	5
Cadmium	**14.3**	AW-1	October 2002	5
Chromium	14.8	Pb-4A	April 2001	50
Chromium	< 10	all	October 2001	50
Chromium	< 10	all	April 2002	50
Chromium	< 10	all	October 2002	50
Lead	**4,890.0**	Pb-2	April 2001	15*
Lead	**1,480.0**	AW-4	October 2001	15*
Lead	**955.0**	Pb-2A	April 2002	15*
Lead	**487.0**	AW-4	October 2002	15*
Mercury	0.830	Pb-4A	April 2001	2
Mercury	0.951	AW-4	October 2001	2
Mercury	0.3	MW-4	April 2002	2
Mercury	0.3	AW-4	October 2002	2
Nickel	65.2	AW-10	April 2001	100**
Nickel	60.2	AW-10	October 2001	100**

Nickel	69.1	AW-10	April 2002	100**
Nickel	69.0	AW-10	October 2002	100**

Notes:
Table derived from the 2002 annual groundwater report Allgeier, Martin, and Associates, Inc., 2003).
Values in bold exceed the MCL or MDNR target concentration.
* EPA specifies an action level for lead, rather than an MCL (EPA 2002).
** EPA does not specify a MCL for this compound (EPA 2002). This value is MDNR target concentration for groundwater (MDNR 2001).
EPA: U.S. Environmental Protection Agency
MCL: Maximum contaminant level
MDNR: Missouri Department of Natural Resources
μg/l: micrograms per liter

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

__✓__ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

______ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

______ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The geological sequence at the EPT facility consists of about 20 feet of clay-rich soil and mine rubble overlying Mississipian-age limestone bedrock, which acts as an aquifer (D&M 1995). This shallow aquifer extends to a depth of about 300 feet below ground surface (bgs) (EPA 1998). Depth to groundwater at the EPT facility ranges from about 8 feet to about 16 feet bgs (MDNR 1999; Allgeier, Martin, and Associates, Inc. [AMA], 2002, 2003). Groundwater generally flows west to east across the facility (AMA 2002, 2003). The Mississippian limestone is underlain by about 400 feet of Mississipian and Devonian shales, which act as a permeability barrier, and deeper Cambrian and Ordovician limestones, which act as an aquifer (EPA 1998). Water yields in the shallow bedrock aquifer are variable and depend on the presence of secondary permeability features, such as solution pores, fractures, or mine workings. The shallow aquifer is used for watering livestock and gardens, but most residents who relied on the shallow aquifer for drinking water have been given the option to hook up to available public water supplies (EPA 1998). Yields are higher in the deep aquifer, which supplies drinking water to several communities and about 1,800 rural residents. The city of Joplin derives its drinking water from Shoal Creek (EPA 1998).

Although groundwater at EPT is contaminated with metals, levels of contamination do not appear to be increasing over time, and previously uncontaminated wells have not become contaminated in the last two years. Moreover, groundwater in many areas surrounding the facility are already contaminated as a result of historic lead and zinc mining and smelting practices in Jasper County. As a result, any further contaminant migration that might occur from the EPT facility would not generally be migrating into previously uncontaminated areas and, given the nature of the primary constituents of concern in groundwater (lead and cadmium), it may be difficult to discriminate that contamination which is attributable to releases from SWMUs/AOCs at the EPT facility versus that which was caused by historical mining activities and smelter fallout in the area.

Analytical data collected as part of EPT's ongoing groundwater monitoring program suggests that the migration of contaminated groundwater at EPT has stabilized. Table 1 shows that the maximum concentrations of contaminants in groundwater collected at EPT have remained steady for the sampling period (April or October) or have declined over the last two years. Variability between maximum concentrations for October and April may be related to differences in sampling frequency (only a subset of wells are sampled in the October events) or to changes in water level. In addition, the identity of the wells from which the most contaminated samples are collected has not changed, suggesting that the center of the plume or the direction of migration has not changed. Moreover, groundwater collected from the deeper bedrock wells has chemistry similar to that collected from shallower wells, and the concentrations of contaminants in the most contaminated deep well (MW-5D) have not changed significantly over time (Environ 2001; AMA 2002, 2003).

Because the most contaminated wells are on the most downgradient part of the EPT facility, the boundary of contaminated groundwater cannot be drawn with precision, but downgradient wells do not show evidence of increasing contamination. Table 2 shows the concentrations of metals in groundwater collected from AW-1, one of the most downgradient wells at the facility (see Figure 2). Groundwater collected from this well is contaminated with cadmium and lead. However, concentrations have not changed substantially in the last two years. Lead demonstrates a decreasing trend.

In addition, all of Jasper County has been declared a special area by the Missouri Well Construction Code (10 CSR 23-3.100). Because of historical mining and metal processing in Jasper County, much of the groundwater in the county has been contaminated by lead, cadmium, and other constituents. As a result, the Well Construction Code requires more stringent well construction guidelines in designated impact areas within Jasper County. There are currently no designated impact areas within roughly 2 miles of the EPT facility, although such areas may be designated in the future. Because of the widespread groundwater contamination in Jasper County, it may be difficult to distinguish any contamination that might be migrating from the EPT facility from that caused by historical mining and smelting activities in the area.

Table 2 – Concentrations of Compounds Detected in Well AW-1, 2001 and 2002

Compound	Concentration (µg/l)	Collection Date	EPA MCL (µg/l)
Arsenic	12.0	April 2001	50
Arsenic	29.3	October 2001	50
Arsenic	< 5.0	April 2002	50
Arsenic	< 5.0	October 2002	50
Barium	126.0	April 2001	1,000
Barium	100.0	October 2001	1,000
Barium	65.9	April 2002	1,000
Barium	< 50.0	October 2002	1,000
Cadmium	**22.6**	April 2001	5
Cadmium	**17.4**	October 2001	5
Cadmium	**29.9**	April 2002	5
Cadmium	**14.3**	October 2002	5
Chromium	< 10.0	April 2001	50
Chromium	< 10.0	October 2001	50
Chromium	< 10.0	April 2002	50

Chromium	< 10.0	October 2002	50
Lead	**570.0**	April 2001	15*
Lead	**408.0**	October 2001	15*
Lead	**81.4**	April 2002	15*
Lead	**63.1**	October 2002	15*
Mercury	0.224	April 2001	2
Mercury	< 0.2	October 2001	2
Mercury	< 0.2	April 2002	2
Mercury	< 0.2	October 2002	2
Nickel	22.3	April 2001	100**
Nickel	15.2	October 2001	100**
Nickel	24.1	April 2002	100**
Nickel	< 10.0	October 2002	100**

Notes:
Table derived from the 2002 annual groundwater report (Allgeier, Martin, and Associates, Inc., 2003).
Values in bold exceed the MCL or MDNR target concentration.
* EPA specifies an action level for lead, rather than an MCL (EPA 2002).
** EPA does not specify a MCL for this compound (EPA 2002). This value is MDNR target concentration for groundwater (MDNR 2001).
EPA: U.S. Environmental Protection Agency
MCL: Maximum contaminant level
MDNR: Missouri Department of Natural Resources
μg/l : micrograms per liter

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

______ If yes **-** continue after identifying potentially affected surface water bodies.

__✓__ If no **-** skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

______ If unknown **-** skip to #8 and enter "IN" status code.

Rationale and Reference(s):

No perennial surface water bodies exist on the property, but Lone Elm Branch, an ephemeral stream, runs through the eastern part of the property. This stream receives surface runoff during periods of precipitation and periodic discharges from nearby mine shafts, particularly the A-Street shaft. (D&M 1994). Lone Elm Branch runs north and enters Turkey Creek about 1 mile north of the EPT property (see Figure 1). In 1995, EPT entered into a settlement agreement with EPA in which EPT resolved its liability for all areas beyond the property line of the Joplin complex. The only exception to this agreement was the possible exchange of contaminated groundwater with surface water (Environ 2002). As part of the Phase II RFI, EPT attempted to show the relationship of shallow groundwater to surface water by comparing the elevation of groundwater to that of water in Lone Elm Branch (D&M 1999). Based on hydraulic monitoring performed in 1999, EPT's contractors concluded that shallow groundwater did not communicate directly with surface water at the facility (D&M 1999). Cross-sections generated by this investigation are included as Attachment 1.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

______ If yes **-** skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of <u>key</u> contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

______ If no **-** (the discharge of "contaminated" groundwater into surface water is potentially significant) **-** continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of <u>each</u> contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

______ If unknown **-** enter "IN" status code in #8.

<u>Rationale and Reference(s)</u>:

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

______ If yes **-** continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment[5], appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim- assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

______ If no **-** (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") **-** skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

______ If unknown **-** skip to 8 and enter "IN" status code.

Rationale and Reference(s):

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

__✓__ If yes **-** continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

______ If no - enter "NO" status code in #8.

______ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

As outlined in the most recent permit modifications of EPT's Missouri Hazardous Waste Management Facility Permit, EPT will continue to monitor groundwater in the area around the closed lead chemicals settling pond, which is the area of the facility with the highest detections of hazardous constituents in groundwater (MDNR 2003a). Groundwater corrective action monitoring will continue until the Groundwater Protection Standard maximum concentration limits established in the Permit have not been exceeded for a period of three consecutive years at and beyond the point of compliance.

8. Check the appropriate RCRA Info status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

__✓__ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the Eagle-Picher Technologies, LLC facility, EPA ID # MOD046740148, located at "C" and Porter Streets, Joplin, Missouri. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

______ IN - More information is needed to make a determination.

Completed by: (Signature) Original signed by Natalie Roark ______________ Date

9/30/03

(Print) Natalie Roark, P.E.
(Title) Environmental Engineer III

Supervisor: (Signature) Original signed by Richard A. Nussbaum Date 9/30/03
(Print) Richard A. Nussbaum, P.E., R.G.
(Title) Chief, Corrective Action Unit
(State) Missouri Department of Natural Resources
Hazardous Waste Program

Locations where References may be found:
EPA and the Missouri Department of Natural Resources have received copies of all reports and correspondence in reference to this facility. The EPT facility files are located at:

Missouri Department of Natural Resources
Hazardous Waste Program
1738 East Elm Street
Jefferson City, MO 65101
and
U.S. Environmental Protection Agency, Region VII
RCRA Corrective Action and Permits Branch
Air, RCRA, and Toxics Division
901 N. 5th Street
Kansas City, KS 66101

Contact telephone number and e-mail:

(Name): Natalie Roark
(Phone #): (573) 751-3553
(E-mail): nrroarn@mail.dnr.state.mo.us

REFERENCES

Allgeier, Martin, & Associates, Inc. (AMA). 2002. "Annual Groundwater Corrective Action Monitoring Report, Eagle-Picher Chemicals Department Facility." February.

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Dames & Moore (D&M). 1994. "Phase I Revised Workplan for RCRA (Resource Conservation and Recovery Act) Facility Investigation at Eagle-Picher Industries, Inc., Joplin, Missouri." November 1.

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Environ. 2001. "Data Transmittal Bedrock Groundwater Investigation and Draft Table of Contents Outline for the Final RFI Report, Eagle Picher Technologies, LLC, Joplin, Missouri." April 23.

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Environmental Protection Agency, U.S. (EPA). 1998. "Record of Decision, Ground Water Operable Unit 04, Oronogo/Duenweg Mining Belt Site, Jasper, County, Missouri.

EPA. 2002. "List of Contaminants and their MCLs (Maximum Contaminant Levels)." EPA 816-F-02-013. July.

Missouri Department of Natural Resources (MDNR). 1999. "Comprehensive Groundwater Monitoring Evaluation, Eagle-Picher Industries, Inc., Joplin, Missouri." September.

MDNR. 2001. "Cleanup Levels for Missouri." September 1.

MDNR. 2003a. "Eagle-Picher Technologies, LLC, Final Class 3 Permit Modification for the Missouri Hazardous Waste Management Facility (Part I) and the Environmental Protection Agency's Hazardous and Solid Waste Amendments (Part II) Permits." April 21.

MDNR. 2003b. Electronic mail regarding Eagle Picher Technologies. From Natalie Roark. To Stephanie Doolan, EPA. July 8.

FIGURES

ATTACHMENT 1

1999 HYDRAULIC MONITORING GRAPHS AND CROSS-SECTION

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.