DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS Code (CA 750)

Migration of Contaminated Groundwater Under Control

Facility Name: Lake Shore Foundry Co., Inc.
Facility Address: Waukegan, Illinois
Facility EPA ID#: ILR 000 111 591

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?

   X 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 ~~"I~~N" (more information needed) status code.

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 ~~"M~~igration of Contaminated Groundwater Under Control" EI determination (~~"Y~~E" status code) indicates that the migration of ~~"c~~ontaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original ~~"a~~rea of contaminated groundwater" (for all groundwater ~~"c~~ontamination" 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 ~~"M~~igration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater 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, where practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration/Applicability of EI Documentation

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS 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) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

___X___ 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 an "IN" status code.

Rationale:

Facility Background and Investigations

Lakeshore Foundry (LSF) is a 0.77 acre site located in Waukegan, Illinois on a bluff along the shoreline of Lake Michigan, approximately 40 miles north of Chicago (Figure 1). Established in 1900, the foundry produced non-ferrous alloys, including brass, bronze, and aluminum castings. Also, LSF historically manufactured red brass and tin bronze, which may have contained lead. In 2006, the U.S. EPA and Lakeshore Foundry signed an Administrative Order on Consent to address contamination resulting from over 100 years of foundry operations. The site investigation included sampling and analysis of soil, groundwater, and sediments from the site and an adjacent beach area on Lake Michigan. Samples were also analyzed for volatile organic contaminants (VOCs) and semi-volatile organic contaminants (SVOCs), which were shown not to be an issue at the site. To address the source of lead, the main site contaminant, LSF implemented Interim Measures as required by the Administrative Order to excavate lead-contaminated soils. Also, seven rounds of groundwater sampling were conducted.

There are five groundwater monitoring wells on site (see Figure 1). Groundwater was encountered at around 10 feet below ground surface (bgs). Table 1 (below) lists the maximum concentration of each contaminant found in groundwater from June 2008 through January 2012.

Analytical results from these groundwater sampling events were compared to Illinois EPA (IEPA) Class I and Class II groundwater standards (35 IAC Part 620) and to U.S. EPA conservative drinking water standards or "maximum contaminant levels" (MCLs), although groundwater in this area is not used as a drinking water source. VOCs were not detected at levels above the screening criteria.

As shown in Table 1, groundwater at the site was contaminated with metals at concentrations that exceeded applicable groundwater criteria for total metals. MW-02 is closer to the source area that was addressed by the interim measure soil excavation. Samples from MW-02 typically have shown higher concentrations of metals, including lead and copper. Table 2 shows dissolved metals data, which are compared to the U.S. EPA Maximum Contaminant Levels for drinking water.

There are no on-site or nearby groundwater users. The City of Waukegan's groundwater ordinance prohibits installation and use of private water supply wells within the South Lakefront Development area, which includes the LSF property.

In July 2007, LSF conducted an Interim Measures Investigation to evaluate the levels of total lead, to determine the extent of lead-contaminated soil above the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit of 5 mg/L, and to develop an interim measures removal and soil treatment plan for the facility.

In January 2008, LSF completed interim measures to control the source of the contamination. Over 500 tons of lead-impacted soils were excavated, treated, and disposed of at an off-site landfill. Confirmation samples were

analyzed for Appendix IX metals. One additional small isolated area of elevated TCLP lead remained, which was removed in July and August 2008.

To evaluate potential human health exposures, LSF sampled sediment at the adjacent Lake Michigan beachfront area. Soil was sampled on the small beaches north and south of the property. The sediments and beach soil sample results did not exceed IEPA Tier 1 standards.

References:

See end of document.

Table 1: Maximum Concentrations of Constituents in Groundwater (Total metals)

	Sample Date (total metals concentrations in mg/L)								IEPA Groundwater Standard[a]
Constituent	Jun-08	Dec-08	Mar-09	Jun-09	Mar-11	Jun-11	Jan-12	Mean concentration	Class I (mg/L)
Antimony	0.013[b]	0.0084	0.0053[c]	0.0059	0.0014[d]	0.0043	0.0031	0.0059	0.006
Arsenic	0.17[b]	0.013[c]	0.0057[b]	0.0033[c]	< 0.010	< 0.010	< 0.010	0.027	0.05
Cadmium	0.017	0.0092	0.0026	0.0037	0.0015	0.0072	0.0053	0.0066	0.005
Chromium	0.13[b]	0.027	0.0082[b]	< 0.010	< 0.010	0.0050	< 0.010	0.024	0.1
Copper	9.0	1.7	0.35	0.53	0.74	0.76	0.51	1.9	0.65
Lead	2.8	0.26	0.026[b]	0.012	0.0067	0.025	0.0037	0.45	0.0075
Nickel	0.27[b]	0.097	0.039	0.046	0.027	0.078	0.039	0.085	0.1
Vanadium	0.16[b]	0.016[e]	0.015[b]	< 0.0050	0.0037[f]	0.0058	0.0053[g]	0.029	0.049
Zinc	5.3	2.2	0.93	1.2	0.72	2.0	1.5	2	5

Data shown are from Monitoring Well 2 (MW-02) unless otherwise marked.
a Groundwater standards(35 IAC Part 620) based on total metals analysis.
b Data shown are for MW-01.
c Data shown are for MW-04.
d Data shown are for MW-02 and MW-03 (equal concentrations).
e Data shown are for MW-03.
f Data shown are for MW-01 and MW-02 (equal concentrations).
g Data shown are for MW-04 and MW-05 (equal concentrations).
h Groundwater standards (federal Maximum Contaminant Levels) based on dissolved metals analysis.
Non detects were counted as 0 for calculation of the mean.

Table 2: Maximum Concentrations of Constituents in Groundwater (Dissolved metals)

	Sample Date (dissolved metals concentrations in mg/L)								U.S. EPA Maximum Contaminant Level[h]
Constituent	Jun-08	Dec-08	Mar-09	Jun-09	Mar-11	Jun-11	Jan-12	Mean concentration	mg/L
Cadmium	< 0.0020	0.0050	0.0022	0.0037	0.0011	0.0067	0.0059	0.0035	0.005
Copper	0.065	0.44	0.28	0.48	0.57	0.63	0.45	0.42	1.3
Zinc	0.099	1.6	0.85	1.2	0.60	2.0	1.4	1.1	NA

Data shown are from Monitoring Well 2 (MW-02) unless otherwise marked.
a Groundwater standards(35 IAC Part 620) based on total metals analysis.
b Data shown are for MW-01.
c Data shown are for MW-04.
d Data shown are for MW-02 and MW-03 (equal concentrations).
e Data shown are for MW-03.
f Data shown are for MW-01 and MW-02 (equal concentrations).
g Data shown are for MW-04 and MW-05 (equal concentrations).
h Groundwater standards (federal Maximum Contaminant Levels) based on dissolved metals analysis.
Non detects were counted as 0 for calculation of the mean.
NA = Not applicable.

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)?

____X__ 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 an ―IN" status code.

Rationale:

Migration of contaminated groundwater at LSF has stabilized and is expected to remain within the existing area of contaminated groundwater. Table 1 (above) shows the January 2012 total metals concentrations compared to the applicable Illinois groundwater standards. Cadmium is the only constituent which exceeded the IEPA Class I Groundwater Standard for total metals in January 2012. Table 2 shows that dissolved concentrations of copper were below the MCL, while dissolved cadmium exceeded the MCL slightly. There is no MCL for zinc. All constituents other than cadmium were below their respective EPA Maximum Contaminant Levels (MCLs). In January 2012, the concentration of dissolved cadmium in MW-02 (0.0059 mg/L) slightly exceeded the MCL of 0.005 mg/L. Concentrations of metals generally decreased over the course of the seven sampling events.

The point of compliance for meeting the groundwater standards is the subset of wells closest to Lake Michigan (MW-01, MW-04, and MW-05). Several rounds of data show that no exceedences of the IEPA Class I standards were detected in MW-01 and MW-04. MW-05 also did not exceed the IEPA Class 1 standards. Interim measures removed approximately 500 tons of contaminated soil, thereby removing much of the source.

Footnotes:

[1]"Contamination" and ―contaminated" describes media containing contaminants (in any form, Non Aqueous Phase Liquid – 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.

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

___X___ 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:

The site groundwater flows eastward and discharges to Lake Michigan. Therefore, U.S. EPA evaluated the potential for groundwater contamination from LSF to impact Lake Michigan.

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)?

___X__ 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 key 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 judgment/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 each 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.

Rationale:
The discharge of "contaminated" groundwater into surface water is currently acceptable. This is demonstrated by comparing the dissolved metals groundwater concentrations to the MCLs, which are based on dissolved quantities. Also, the sediments data support the line of reasoning that groundwater is not impacting the surface water. The primary constituent of concern for the site, lead, had sediment concentrations which did not exceed the U.S. EPA Region 5 Ecological Screening Levels.

Table 2 (above) compares the maximum concentrations of each dissolved contaminant to the MCL. As previously stated, cadmium slightly exceeded the MCL but is within the 10x dilution standard. Copper was below the MCL. There is no MCL for zinc, although the National Secondary Drinking Water Regulations set a Secondary Standard of 5 mg/L for zinc.

For the final remedy, the dissolved metals concentrations must be less than the IL Water Quality Standards. The 10 times dilution criteria will not be allowed for the final remedy. Over the seven rounds of groundwater monitoring from June 2008 to present, total and dissolved metals concentrations show a decreasing trend, which is most clearly shown in the lead and copper data from MW-02.

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

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 and 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-system), 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 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 cannot be shown to be **"currently acceptable"**) - skip to #8 and enter the –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:

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 ~~"e~~xisting area of contaminated groundwater?"

__X__ 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 ~~"e~~xisting area of groundwater contamination."

_____ If no, enter a ~~"N~~O" status code in #8.

_____If unknown - enter an ~~"I~~N" status code in #8.

Rationale:

Ongoing groundwater monitoring will be required to verify that the discharge of groundwater to the surface water of Lake Michigan remains acceptable. For the final remedy, the dissolved metals concentrations must be less than the IL Lake Michigan Basin Water Quality Standards (Great Lakes Initiative or ~~"G~~LI" numbers). The 10 times dilution criteria will not apply for the final remedy. Exceedences of the GLI numbers were seen in monitoring wells MW-02, 03, 04 and 05.

For the first semiannual monitoring event following this EI, all five wells shall be sampled. For subsequent semiannual monitoring events, the data from the preceding two monitoring events shall determine which wells will be sampled. Once a monitoring well has met the standards for two successive monitoring events, then it will no longer be required to be sampled. Dissolved metals, including cadmium, copper, and zinc will be required for the analyses in order to compare the data to the IL Lake Michigan Basin Standards (GLI numbers). Once the groundwater data show that there are no longer exceedences of the GLI numbers, monitoring may cease upon written agreement between U.S. EPA and the facility.

References:

- August 31, 2007—Interim Measures Report approved by U.S. EPA in letter dated October 26, 2007
- January 24, 2008— Interim Measures Completion Report
- March 20, 2008 -- Description of Current Conditions (DOCC) Report
- May 28, 2008-- U.S. EPA Comments on DOCC Report
- June 12, 2008-- Summary of Agreed DOCC Field Sampling Plan
- August 12, 2008-- Description of Current Conditions Report Addendum; First Round of Groundwater Data Reported
- January 6, 2009. Description of Current Conditions Report Addendum 2; Second Round of Groundwater Sampling/Analysis, Lake Shore Foundry, Waukegan, IL (ILR 000 111 591).
- March 20, 2009 – Third Round of Groundwater Data Reported
- June 22, 2009 – Fourth Round of Groundwater Data Reported
- February 22, 2011-- Re: Former Lake Shore Foundry, Waukegan, IL (ILR 000 111 591), 653 S. Market St.
- March 29, 2011 – DOCC Report Addendum, Fifth Round of Groundwater Data Reported
- July 20, 2011-Description of Current Conditions (DOCC) Report Addendum, Sixth Round of Groundwater Sampling/Analysis, Former Lake Shore Foundry, Waukegan, IL (ILR 000 111 591).
- January 30, 2012. Description of Current Conditions (DOCC) Report Addendum, Seventh Round of Groundwater Sampling/Analysis, Former Lake Shore Foundry, Waukegan, IL (ILR 000 111 591).

- 8. Check the appropriate RCRIS 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).

___X__ 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 Lake Shore Foundry Co., Inc. facility, EPA ID# ILR 000 111 591, located at 653 Market Street, Waukegan Illinois. 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) Christine McConaghy Date December 11, 2012

(print) Christine McConaghy

(title) Physical Scientist

Supervisor (signature) Tammy Moore Date December 7, 2012

(print) Tammy Moore

(title) Supervisory Environmental Scientist

U.S. EPA Region 5

Locations where References may be found:
U.S. EPA Region 5 RCRA Records Center 77 West Jackson Boulevard, 7th Floor Chicago, Illinois 60604 (312) 886-0902 Hours: 8:00 a.m. to 4:00 p.m., Monday-Friday

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Figure 1: June 2011 Map showing groundwater contours