Final Decision

Soil and Groundwater Cleanup

For

Lakeshore Foundry Co., Inc. Site

Waukegan, Illinois

EPA I.D. No. ILR 000 111 591

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
FINAL DECISION

August 2014

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INTRODUCTION

The U.S. Environmental Protection Agency (EPA), Region 5, presents this Final Decision (FD), which identifies the final remedies selected for the Lakeshore Foundry Co., Inc. Site (LSF) located in Waukegan, Illinois, pursuant to the Resource Conservation and Recovery Act (RCRA) Section 3008(h). Included in this FD is a summary of conditions found at the Site, the risks posed by those conditions, the interim measures taken, and the final corrective action alternatives that EPA has selected. Additional details relating to the Site conditions, the measures taken and all the alternatives considered are available in the Statement of Basis (Attachment 1) issued by EPA in June 2014. Prior to issuing this FD, EPA presented the Statement of Basis to the public and stakeholders for review and comment from June 24, 2014- July 25, 2014. No comments were received by EPA during the public comment period.

SELECTED REMEDIES

EPA is selecting the following remedy to address contaminated soils and groundwater at the Site:

- Interim action soil cleanup has been determined to have effectively remediated on-site contamination at concentrations posing an unacceptable level of risk;
- Installation of an engineered barrier for the containment of residual contamination in soils remaining after previously performed Interim Measures;
- Establish institutional controls to prohibit the installation of groundwater supply wells at the Site, and protect construction workers from exposure to contaminated subsurface soils and groundwater at the Site;
- Monitored natural attenuation of groundwater contamination to assess the effectiveness of removing the sources of the groundwater contamination, and to monitor the long-term stability and natural attenuation of the contaminants in the groundwater; and
- Continuation of the Letter of Credit established to ensure that LSF will have adequate funds to complete the construction as well as operation and maintenance of the selected remedy.

SITE BACKGROUND

Location and History

The Site is located at 653 Market Street in Waukegan, Lake County, Illinois 60085. See attached Figure 1. The dimensions of the property are approximately 270 feet north-south and 135 feet east-west. The 0.77 acre LSF property contained a single corrugated metal building, which was demolished in August 2010. The Site is located on the western shoreline of Lake Michigan. The Elgin, Joliet, and Eastern (EJ&E) railroad borders the Site on the west and north side. Lake Michigan borders the Site on the east side and the City of Waukegan owns the property to the south of the Site as road right of way.

Foundry operations at the property date back to approximately the 1920s. Sanborn Maps show a small foundry operation on the property in 1924. LSF started its operations on the property in 1924. Products previously produced by LSF included brass, bronze, aluminum sand, and permanent mold castings. The Facility previously manufactured prototype, short-run and high production non-ferrous alloys such as red brass and tin bronze. These products may have contained up to 30% lead, the main contaminant of concern found at the Site.

As a result of loan defaults, foreclosure proceedings were completed. NorStates Bank received the abandoned facility by default foreclosure on May 18, 2009. LSF continued to occupy the building and operate as a tenant until approximately June 2010, when they were evicted by NorStates Bank for non-payment of rent. The Facility ceased operations in June 2010. The building was demolished in August 2010. The property is currently vacant.

Hydrogeological Setting

The Site has a slight topographic mound, with the former LSF production building at the highest elevation. Topography decreases slightly in all directions, and decreases sharply along the east perimeter toward Lake Michigan. According to the USGS Waukegan Quadrangle Map (dated 1988), the study area topography averages around 595 feet above mean sea level (MSL). Based on review of the U.S. Wetland Inventory Map (dated 1981) and the Lake County Wetland Inventory (Lake County Geographic Information System Map Printed on 3/12/2008), there are no designated wetlands present at the property. According to the Flood Insurance Rate Map (dated 1987) and Mapped FEMA floodplains in Lake County (Lake County Geographic Information System, Map Printed on 3/12/2008), the study area is located within Zone X, which is classified as being outside the 100 and 500-year flood limits. According to the Surficial Geology of the Chicago Region Map (Illinois State Geological Survey, 1970), the Property is situated in an area having entirely Pleistocene Series, Wisconsinan Stage, and Woodfordian Substage deposits. The naturally occurring alluvial silty sands across the property are associated with the Carmi Member of the Equality Formation. These silty sands are largely quiet water lake sediments, well bedded and occurring along beaches. The silty clay deposits are associated with

the Wadsworth Member of the Wedron Formation, and specifically the Lake Border Morainic System. The till at the property appears to be associated with the Highland Park moraine.

Fill material is found across the entire property, ranging from at least 2.5 to 6.5 feet below ground surface (bgs). The concrete rubble fill was placed over the years to minimize ongoing soil erosion from Lake Michigan wave action. Alluvial, stratified silty sand with variable amounts of gravel is found across the entire property and directly below the fill material. Sand deposits typically become more graded and coarse with depth. Saturated conditions are only directly observed within naturally occurring soils between 8 and 10.5 feet below grade. Groundwater flow direction across the site was determined to be toward the east in the direction of Lake Michigan. At the site, rain water and snow melt percolates through the contaminated soil, through the fill material, into the groundwater. This contaminated groundwater then leaves the Site and discharges into Lake Michigan.

Ecological Setting

The site is relatively small, at about three-quarters of an acre, and had been used for industrial operations since the early 1920s. The ground surface at the Site consists of a rubble fill and is so disturbed and of such poor quality that vegetation growing on-site consists primarily of invasive and opportunistic herbaceous and woody plants. In general, the limited on-site habitats have been heavily influenced by historical land use. Although there are no permanent aquatic habitats on-site, Lake Michigan borders the Site to the east.

Interim Measures Taken

In order to address an unacceptable risk discovered at the site, LSF elected to take immediate action. In December 2007 to January 2008, an interim measures removal was completed in accordance with an EPA-approved Work Plan. This removal work consisted of the excavation, treatment, and off-site disposal of 527.94 tons of lead contaminated soil. On July 21 and August 5, 2008, additional soil excavation, treatment, and off-site disposal of 91.11 tons of soil at one remaining location of the property was completed although this was not done as part of the interim measure with EPA approval. Prior to the removal of the property structures in August 2010, a hazardous substance and asbestos survey was conducted throughout the building. Interior foundry sand and residual dusts were treated and confirmed to be rendered nonhazardous, removed from the building, and transported to a special waste landfill. Approximately 108 tons of treated foundry sand and spent sand cores were removed from the building as a further corrective measure prior to its demolition. In addition, unused or spent petroleum and chemicals were removed and manifested to offsite licensed Treatment, Storage, and Disposal Facilities (TSDFs) for recycling and disposal. The concrete floor slabs and asphalt paved surface areas were not removed during the demolition so they could remain as engineered surface barriers at the Site. Floor pits were backfilled with crushed stone and a perimeter gate was installed at the Site.

SUMMARY OF SITE RISKS

Investigation Results

During the site investigations, soil, groundwater, and any other affected media are sampled, and the results are compared against human health and/or ecological screening criteria. If certain chemicals are above the screening criteria, then those chemicals are assessed further in the human health and ecological risk assessments. At LSF, Illinois EPA's Tiered Approach to Corrective Action Objectives (TACO) rules (35 IAC 742) were utilized, as well as other EPA-approved risk methodologies. TACO is the Illinois EPA's health risk-based method for developing remediation objectives for contaminated soil and groundwater. Risks associated with human health were assessed along with risks to off-site ecological receptors. The absence of any significant habitat at the site obviated the need to assess on site ecological risks. This section describes how soil, groundwater, and sediment samples taken at the Site compare with the TACO standards.

Soil

Previous sampling was conducted by EPA in February 2003 and in September 2004 [Booz Allen Hamilton (BAH), *Trip Report for Soil Sampling Activities, Lake Shore Foundry*, 24 November 2004]. In February 2003, the EPA and the Illinois Environmental Protection Agency (IEPA) conducted a Compliance Sampling Inspection (CSI) to determine if any site contamination had occurred which would indicate the release of lead that would render soils or other residues as characteristic hazardous waste under 40 CFR 261.24. During the CSI, six surface soil samples were collected from areas outside the facility building/structure. Samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) metals and several samples were found to exceed the TCLP lead regulatory limit of 5 mg/L lead set forth in 40 CFR 261.24.

In September 2004, EPA, IEPA, and EPA's contractors performed additional sampling on LSF property to determine whether more areas of the soil was a characteristic hazardous waste based on TCLP metals. The results indicated ten of the twelve soil samples were above the regulatory limit for lead (BAH, 2004).

In 2006, LSF and EPA entered into an Administrative Order on Consent (Order) to address contamination found at the facility. The Order required LSF to perform the interim measures required to control lead in soil. In July 2007, discrete soil samples were collected at every sample location in the 0- to 6-inch interval and at every two feet in depth, beginning at 6 inches below ground surface (bgs) and continuing to the interface of the groundwater/vadose zone. **Table 1** shows the evaluation of the levels of total lead measured in soil by comparing the average surface (0–6 inch) soil lead concentration to both the EPA Region 9 preliminary remediation goal (PRG) of 800 mg/kg for a commercial/industrial exposure scenario and to the TCLP lead regulatory limit set forth in 40 CFR 261.24 of 5 mg/L.

Table 1: Summary of Pre-Interim Measure Soil Sample Results for Total Lead and TCLP – Surface Soil - Concentrations above the PRG or TCLP limit are in bold.

Sample Location	Total Lead Highest Level Detected (mg/kg)	TCLP Highest Level Detected (mg/L)
SP-01	260	0.24
SP-02	**2100**	0.65
SP-03	570	0.46
SP-04	**1800**	**55**
SP-05	230	0.1
SP-06	**12000**	**16**
SP-07	640	0.56
SP-08	750	**19**
SP-09	35	0.0075
SP-10	540	0.92
SP-11	**3300**	**5.3**
SP-12	610	0.26
SP-13	280	0.0075
SP-14	24	0.0077
SP-15	180	0.0075
SP-16	170	0.0075
SP-17	36	0.038
SP-18	290	0.041
SP-19	79	0.0075
SP-20	76	0.013
SP-21	No total lead given	0.011
SP-22	No total lead given	0.0064
SP-23	No data	No data
SP-24	No total lead given	0.0098
SP-25	No total lead given	0.026
SP-26	No total lead given	0.29

In the initial 20 sampling locations, the arithmetic average of the total lead levels was 1,199 mg/kg, which was above the PRG of 800 mg/kg. Of those samples, five (SP-04, 06, 08, 10 (at depth), 11) were proposed to be removed due to TCLP lead exceedances. Therefore, the average was calculated over the remaining 15 sample locations. The arithmetic average of lead concentrations was found to be 372 mg/kg, which is below the EPA Region 9 industrial PRG.

Interim measures included excavating lead contaminated soil and treating the excavated soil to

render lead levels to below TCLP characteristic thresholds in order to dispose of it in a special wastes landfill. Proprietary product (Mactite) was spray applied in liquid form to the impacted soils, then mixed and homogenized on the ground using traditional excavating equipment. Immediately following the appropriate mixing and cure times, soil samples were collected and sent for rapid turnaround TCLP lead analysis to confirm that lead levels met the threshold for disposal as non-hazardous special waste. One sample per 100 cubic yards (CY) of treated soil was analyzed for TCLP lead to confirm treatment to less than 5 mg/L. Treated soil was stockpiled on-site under secure tarps while lab analysis was performed. Once acceptable treatment was confirmed via lab data, the soil was loaded onto licensed special waste transporter trucks, manifest documents were completed, and the treated soil was transported to the landfill in Zion, Illinois for final disposal. Over 527 tons of contaminated soil was removed during this interim measure. The area was backfilled with 2 feet of clean soil.

Excavated soil areas were subject to TCLP and total metals analysis to confirm removal of all TCLP hazardous level soils and to document remaining levels of total metals for purposes of further risk-based assessment of site conditions, prior to being backfilled. **Table 2** shows the excavation sidewall and bottom confirmation sampling results that were collected following the removal of impacted soils.

Table 2: Summary of Confirmation Sampling Results for Total Lead – Sub-Surface Soil - Concentrations above the PRG are in bold.

Sample Location	Concentration (mg/kg)
LSF-1	510
LSF-2	310
LSF-3	740
LSF3R	760
LSF-4	34
LSF-5	770
LSF-6	110
LSF-7	**1500**
LSF-8	**1700**
LSF-9	**880**
LSF-10	530
LSF12	**900**
LSF-13	**1800**
LSF-14	**1900**
LSF-15	**1200**

While discrete samples exceeded the EPA Region 9 industrial PRG of 800 mg/kg, the arithmetic average concentration of lead in surface soil, defined as 0-2 ft. bgs (641 mg/kg) did not exceed

the PRG. The dataset used in the averaging included the 15 original investigative sample locations not impacted by the removal and the 15 post-excavation locations sampled upon completion of the soil removal.

The 15 post-excavation locations were sampled for the presence of the EPA Part 264 Appendix IX list of metals and inorganics. These results were compared to IEPA's 35 IAC Part 742 TACO Tier 1 risk based soil remediation objectives for direct contact (ingestion and inhalation) and migration to groundwater exposure routes. Volatile organic contaminants (VOCs) and semi-volatile organic contaminants (SVOCs) were shown not to be an issue at the site. The analysis of these compounds in soil did indicate that copper exceeded IEPA TACO Tier 1 residential ingestion soil remediation objectives at several discrete sample locations. However, the copper concentrations do not exceed Tier 1 industrial/commercial soil remediation objectives. The Order specified the use of risk-based cleanup objectives for an Industrial/Commercial property. The copper concentration did exceed the Tier 1 construction worker ingestion soil remediation objective at LSF-8 (but not in the re-sample LSF-8R), LSF-12 and LSF-13. The average copper concentration in duplicate samples at LSF-11 did not exceed the construction worker objective. As Tier 1 industrial/commercial soil objectives have not been exceeded, there is no unacceptable current human exposure to soil through the direct contact pathway.

Groundwater

To address the source of lead, the main site contaminant of concern, LSF excavated lead-contaminated soils as an interim measure. In addition, seven rounds of groundwater sampling were conducted. There are five groundwater monitoring wells on site. Groundwater was encountered at around 10 feet below ground surface (bgs). **Table 3** (below) lists the maximum concentration of each contaminant found in groundwater from June 2008 through January 2012.

Table 3: 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.

The data shows that no Class I & II groundwater standards are exceeded at the four (4) perimeter on-site monitoring wells (MW-01, MW-03, MW-04 and MW-05). Monitoring well MW-02, which is located near former building contaminant source areas, has only a negligible exceedance of Class I groundwater standard for total cadmium (0.0053 vs. 0.005 mg/L). However, the dissolved concentration of cadmium at MW-02 does not exceed the Class I groundwater standard.
Table 4 shows the dissolved metals data, which are compared to the U.S. EPA Maximum Contaminant Levels (MCLs) for drinking water.

Table 4: 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.

Seven (7) groundwater sampling events were performed at the property from June 2008 through January 18, 2012. The results of the groundwater sampling indicated that the migration of contaminated groundwater above acceptable levels has stabilized at the property.
The City of Waukegan has also enacted a groundwater use restriction ordinance that prohibits groundwater use within the South Lakefront Development area, which includes the entire LSF property. The potable water at the property and surrounding properties is supplied by the City of Waukegan. This limited-area groundwater ordinance will eliminate the potential exposure to the impacted groundwater at the property and surrounding properties. In addition, the engineered barrier will limit the potential for leaching of residual contaminants to groundwater. Because there is no complete pathway between contamination in groundwater and human receptors, the risk related to this exposure pathway is considered acceptable.

Human Health Risks

After contaminant levels were identified, a human health risk assessment was performed to determine whether health problems could result if the contamination was not cleaned up. Human health risks are identified when there is a pathway for humans to be exposed to harmful contaminants. These risks can be controlled by preventing humans from being exposed to unacceptable concentrations of the contaminants. The screening criteria used in this determination were the following: 1) surface soil-EPA Region 9 PRGs for industrial soil and Illinois Tiered Approach C Objectives (TACO) for industrial use; 2) subsurface soil-Illinois TACO for industrial worker and Redevelopment worker; 3) groundwater MCL 4) surface water-Illinois Water Quality Standards; 5) sediment-EPA Region 9 PRGs for industrial use as a surrogate for the recreational user; 6) outdoor air-EPA Region 9 for particulates. Below is a discussion of how the site sampling results compared to each of the screening criteria. The risk assessment was done for industrial workers occupying the Site, construction and redevelopment workers accessing the Site, and recreational users visiting the Site.

Lead is the main contaminant of concern at the site, so a 95% upper confidence level (UCL) for lead in the post remedial surface soil was calculated and is estimated to be 527 mg/kg which is

below the TACO level for industrial land use of 800 mg/kg. Therefore, the mean residual lead concentration in the surface soil is not considered significant. Arsenic was found in the surface soil above the screening criteria for industrial land use. The maximum concentration of arsenic in soil was 22 mg/kg. A 95% UCL was calculated and found to be 11 mg/kg, which is below the screening value of 16 mg/kg.

There are several subsurface soil sample results that had lead concentrations above the TACO level of 700 mg/kg for the typical on-site construction worker. The 95% UCL of the mean concentration of lead in the subsurface was calculated to be 1,181 mg/kg in the remedial area. Using the adult lead model (ALM), PRGs were calculated for a construction worker and a redevelopment worker exposure. The PRG for a Midwestern population is calculated to be 2,625 ppm for a construction worker for a 45 day exposure and 1,312 ppm for a redevelopment worker for an exposure period of 90 days. The residual level of lead left in the subsurface soil as a result of the interim remedy, is protective to the workers during subsurface intrusion.

A site specific PRG was calculated for the recreational user scenario using the adult lead model. For an estimated exposure duration of 104 days in a year, the PRG is calculated to be 2,271 ppm. The average concentration of lead in the surface soil is estimated to be 527 ppm which is much less than the receptor specific PRG of 2,271 ppm. Therefore, the residual contamination is not expected to pose significant risk to recreational receptors.

Ecological Risks

Ecological risks occur when a plant or animal can come in contact with a contaminant long enough and at a high enough concentration that the contaminant can cause an adverse effect.

The ground surface at the LSF site is so disturbed and of such poor quality that vegetation growing on-site consists primarily of invasive and opportunistic herbaceous and woody plants. There is no high-quality ecological habitat on the LSF property that could be adversely affected by the soil contaminants. In addition, there are no permanent aquatic habitats on-site.

An assessment was conducted of the effect that the contaminated groundwater from the Site might have on the surface water and sediments of Lake Michigan. During the most recent January 2012 groundwater sampling event, the dissolved metals concentrations for cadmium, copper, and zinc exceeded the IL Lake Michigan Basin Chronic Standards. However, there has been a downward trend in the dissolved contaminant concentrations over time, particularly after the interim measure removed the source of the soil contamination.

Sediment samples were collected from the shoreline area immediately north and south of the facility to evaluate the potential for adverse effects to ecological receptors. The lead concentration in sediment did not exceed U.S. EPA ecological screening levels (ESLs) for sediment while copper and zinc concentrations in the south sediments exceeded

ESLs. However, the maximum concentrations of copper (130 mg/kg) and zinc (360 mg/kg) do not exceed probable effects concentrations (PECs), which are 150 mg/kg and 460 mg/kg respectively, developed for sediment. The PECs are an upper effect level at which toxicity to benthic dwelling organisms are predicted to be probable. Thus, the sediment data shows no "unacceptable" ecological exposures to "contamination" (i.e., contaminants in concentrations in excess of risk-based levels) in sediment and no further cleanup of sediments is required.

SUMMARY OF ALTERNATIVES CONSIDERED

The remediation alternatives that EPA evaluated include no further action, complete excavation and off-site disposal of contaminated soil along with a groundwater use restriction, and source area excavation, engineered barriers, and a groundwater use restriction. These alternatives were presented in the Statement of Basis and the public was provided an opportunity to comment. A description of each corrective measure alternative considered follows. The actual corrective measures that were selected are presented in the next section.

Alternative 1: No Further Action
The "no further action" remediation option would be proposed if no remedial treatment is necessary. This alternative does not meet the threshold criteria. It is not appropriate because under current conditions, there are areas of the Site that do not meet the media cleanup standards for this project, based on industrial land use. This alternative would not meet the cleanup goals for this project and is not considered for further evaluation.

Alternative 2: Complete Excavation and Off-site Disposal of Contaminated Soil – GW Use Restriction
In this alternative scenario, all of the contaminated soils exceeding the unrestricted residential cleanup level of 400 mg/kg would be excavated and transported to a permitted landfill facility for proper disposal. Prior to off-site disposal, the contaminated soil exceeding the hazardous levels would be treated on-site or the untreated soils would need to go to a hazardous waste landfill. In addition, the limited-area groundwater ordinance would also be utilized as part of this alternative. Implementation of this alternative will result in the removal of contaminated soil exceeding the unrestricted land use cleanup objectives. Therefore, no restrictions would be necessary for future development and land use under this alternative, except for the limited-area groundwater ordinance. Semi-annual groundwater monitoring of MW-01, 02, 03, 04, and 05 would also occur to assess whether the proposed remedy was meeting cleanup standards.

Alternative 3: Source Area Excavation, Engineered Barriers, and GW Use Restriction
The source area soil exceeding the toxicity characteristic hazardous levels was treated on-site and transported to a permitted landfill facility for proper disposal under the interim measure. The residual contaminated soil remaining at the property would be addressed utilizing engineered barriers that eliminate exposure pathways for industrial/commercial or recreational

land uses (the existing concrete foundation and placement of three-feet of clean soil fill material or alternatively, six-inches of compacted asphalt in remaining areas). In addition, the limited area groundwater use restriction ordinance would remain in effect and semi-annual groundwater monitoring of MW-01, 02, 03 ,04, and 05 would also occur to assess whether the proposed remedy was meeting cleanup standards.

SELECTED REMEDY

EPA is proposing that LSF should implement the following remedy to address contaminated soils and groundwater at the Site:

The interim measure implemented at the LSF site effectively removed source area soil exceeding the toxicity characteristic hazardous levels.

The excavation, treatment, and off-site disposal of 527.94 tons of lead contaminated soil, and the subsequent excavation, treatment, and off-site disposal of 91.1 tons of contaminated soil adequately remediated the highest concentrations of contaminants at the site.

Installation of an engineered barrier for the containment of residual contamination in soils remaining after previously performed Interim Measures

The remedial technologies for containment of the residual contamination in soils would consist of engineered barriers (concrete pavement and 3-feet of clean fill material or 6 inches of compacted asphalt). Based on the area currently not covered with an engineered barrier, approximately 2,500 tons of clean fill material is planned to be installed in those areas.

Establish institutional controls to prohibit the installation of groundwater supply wells at the Site, and protect construction workers from exposure to contaminated subsurface soils and groundwater at the Site

Areas identified with COCs exceeding the applicable Cleanup Objectives for the construction worker scenario will be addressed by utilizing a precaution construction worker notice attached to the deed. The City of Waukegan obtains its groundwater from Lake Michigan and recently passed the limited-area groundwater ordinance, which is unlikely to be rescinded in the near future. Additional restrictions need to be placed on the property deed indicating that engineered barriers are required in specific areas in case of future redevelopment at the property, and that should the limited-area groundwater ordinance be rescinded, groundwater use restrictions would need to be placed on the Site.

Monitored natural attenuation of groundwater contamination to assess the effectiveness of removing the sources of the groundwater contamination, and to monitor the long-term stability and natural attenuation of the contaminants in the groundwater

Groundwater will continue to be monitored to assess the long-term stability and natural attenuation of the contaminants in the groundwater. Monitoring wells to be sampled are MW-01, 02, 03, 04, and 05. 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 analysis in order to compare the data to the IL Lake Michigan Basin Chronic Standards. Once the groundwater data show that there are no longer exceedances of the standards, monitoring may cease upon written agreement between EPA and LSF.

Continuation of Financial Assurance established to ensure that LSF will have adequate funds to complete the construction as well as operation and maintenance of the selected remedy

EPA is selecting financial assurance as a component of the final remedy. LSF must demonstrate that adequate funds will be available to complete the construction as well as the operation and maintenance of all selected remedies. LSF will develop a detailed, updated cost estimate, incorporating contractor bids of the EPA approved scope of work contained in the CMI work plan for all selected remedies. LSF must provide this financial assurance after EPA issues the Final Decision document, in accordance with the schedule provided below. LSF may use any of the following financial mechanisms to make this demonstration: financial trust, surety bonds, letters of credit, insurance, or qualification as a self-insurer by means of a financial test. After successfully completing the construction, LSF may request that EPA reduce the amount of the financial assurance to the amount necessary to cover the remaining costs. LSF may make similar requests from time to time as the operation and maintenance phase of the remedies proceeds.

Respondent must submit all original executed and/or otherwise finalized instruments to EPA's Regional Comptroller (MF-10J), 77 W. Jackson Blvd., Chicago, IL 60604-3590, within 30 days after date of execution or finalization as required to make the documents legally binding. A transmittal letter stating the name and RCRA ID number of the facility, Respondent's name and address, and the EPA docket number of the Order must accompany the instruments. Respondent must also provide copies to the EPA Project Manager.

Five-Year Remedy Reviews

LSF shall conduct five-year remedy reviews until such time a "corrective action complete determination" is achieved. Reviews are intended to ensure the selected remedies continue to protect potential receptors and achieve performance standards. They are also designed to reduce overall long-term costs by identifying problems early. LSF's groundwater monitoring program will be evaluated during these reviews to confirm the long-term effectiveness of the remedy, update the conceptual site model as needed, or demonstrate the appropriateness of reduced

efforts over time. The engineered barrier and institutional controls shall be evaluated to ensure and document that they are being adequately maintained.

PUBLIC PARTICIPATION ACTIVITIES

EPA held a public comment period from June 24 – July 25, 2014 to receive comments on the proposed remedies presented in the Statement of Basis. The Statement of Basis was available in the local repository and on EPA's website. The public was notified of this comment period through a newspaper advertisement. EPA did not receive any comments or requests for a public meeting during the comment period.

CORRECTIVE ACTION COMPLETE DETERMINATION

Once LSF believes it has met its corrective action obligations, it may submit a request with supporting information to EPA Region 5 for a corrective action complete determination (CACD). Once EPA receives this request, we may issue a CACD based on the content and completeness of information provided by LSF. At a minimum, the facility's CACD request must: I) demonstrate that construction activities are complete, 2) demonstrate that all required institutional controls have been implemented, 3) demonstrate that the cleanup goals and objectives have been achieved.

ADMINISTRATIVE RECORD

The administrative record can be found at the local repository located within the Waukegan Public Library and at EPA's Chicago office, addresses below. Information on the LSF facility can also be found at EPA's website,

http://www.epa.gov/region5/cleanup/rcra/lakeshore/

Waukegan Public Library
128 North County Street
Waukegan, Illinois 60085
(708) 862-6220

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Land and Chemicals Division Records Center
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DECLARATION

Based on the information in this Final Decision and the Administrative Record compiled for this corrective action site, the EPA has determined that the selected remedies at the Lakeshore Foundry Co., Inc. Site are appropriate and will be protective of human health and the environment.

Date: 9/25/2014

Margaret M. Guerriero, Director
Land and Chemicals Division
United States Environmental Protection Agency,
Region 5

ATTACHMENT 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

STATEMENT OF BASIS

For

Proposed Soil and Groundwater Cleanup

At

LAKESHORE FOUNDRY Co., Inc.
653 S. Market Street Waukegan, Illinois 60085
ILR 000 111 591

U.S. ENVIRONMENTAL PROTECTION AGENCY
STATEMENT OF BASIS
for Proposed Cleanup at
LAKESHORE FOUNDRY Co., Inc.
653 S. Market Street
Waukegan, Illinois
ILD 000 111 591

INTRODUCTION

This *Statement of Basis*, issued by the U.S. Environmental Protection Agency, explains the proposed remedy for cleaning up hazardous contaminants at the Lakeshore Foundry Co., Inc. (LSF) Site in Waukegan, Illinois (the Site), as required under Section 3008(h) of the Resource Conservation and Recovery Act (RCRA). This *Statement of Basis* also summarizes the other alternative remedies that were analyzed for this Site. EPA will select a final remedy for the Site only after the public comment period has ended and EPA has reviewed and considered the information provided by the public during this period.

EPA is issuing this *Statement of Basis* as part of its public participation responsibilities under RCRA. The public comment period for the *Statement of Basis* begins June 24, 2014 and ends on July 25, 2014. Information describing how interested persons may comment on this document can be found on pages 18 and 19. This document summarizes detailed information from the *Description of Current Conditions Report* (DOCC), the *Corrective Measures Study*, and other pertinent documents contained in the Administrative Record for the LSF Site. EPA encourages the public to review these documents to gain a more comprehensive understanding of the Site and the RCRA investigation and cleanup activities that have already been conducted at LSF.

Following the public comment period, EPA will respond to all of the comments, and select a specific remedy in a document called the *Final Decision and Response to Comments (FD/RC).* EPA may modify the proposed remedy or select another remedy based on new information or a re-evaluation of existing information or public comments. Therefore, the public is encouraged to review and comment on all alternatives.

After EPA issues the FD/RC, LSF will prepare and submit a document for EPA approval titled *Corrective Measures Implementation Plan* that describes in detail how the corrective measures will be constructed and implemented. LSF will implement the plan upon approval by EPA. The plan will include a schedule for completing each of the required tasks, including submitting an *Operation, Maintenance and Monitoring Plan* for EPA approval.

PROPOSED REMEDY

EPA is proposing that LSF should implement the following remedy to address contaminated soils and groundwater at the Site:

- Installation of an engineered barrier for the containment of residual contamination in soils remaining after previously performed Interim Measures;
- Establish institutional controls to prohibit the installation of groundwater supply wells at the Site, and protect construction workers from exposure to contaminated subsurface soils and groundwater at the Site;
- Monitored natural attenuation of groundwater contamination to assess the effectiveness of removing the sources of the groundwater contamination, and to monitor the long-term stability and natural attenuation of the contaminants in the groundwater; and
- Continuation of the Letter of Credit established to ensure that LSF will have adequate funds to complete the construction as well as operation and maintenance of the selected remedy.

SITE BACKGROUND

Location and History

The Site is located at 653 Market Street in Waukegan, Lake County, Illinois 60085. See attached Figure 1. The dimensions of the property are approximately 270 feet north-south and 135 feet east-west. The 0.77 acre LSF property contained a single corrugated metal building, which was demolished in August 2010. The Site is located on the western shoreline of Lake Michigan. The Elgin, Joliet, and Eastern (EJ&E) railroad borders the Site on the west and north side. Lake Michigan borders the Site on the east side and the City of Waukegan owns the property to the south of the Site as road right of way.

Foundry operations at the property date back to approximately the 1920s. Sanborn Maps show a small foundry operation on the property in 1924. LSF started its operations on the property in 1924. Products previously produced by LSF included brass, bronze, aluminum sand, and permanent mold castings. The Facility previously manufactured prototype, short-run and high production non-ferrous alloys such as red brass and tin bronze. These products may have contained up to 30% lead, the main contaminant of concern found at the Site.

As a result of loan defaults, foreclosure proceedings were completed. NorStates Bank received the abandoned facility by default foreclosure on May 18, 2009. LSF continued to occupy the building and operate as a tenant until approximately June 2010, when they were evicted by NorStates Bank for non-payment of rent. The Facility ceased operations in June 2010. The building was demolished in August 2010. The property is currently vacant.

Hydrogeological Setting

The Site has a slight topographic mound, with the former LSF production building at the highest elevation. Topography decreases slightly in all directions, and decreases sharply along the east perimeter toward Lake Michigan. According to the USGS Waukegan Quadrangle Map (dated 1988), the study area topography averages around 595 feet above mean sea level (MSL). Based on review of the U.S. Wetland Inventory Map (dated 1981) and the Lake County Wetland Inventory (Lake County Geographic Information System Map Printed on 3/12/2008), there are no designated wetlands present at the property. According to the Flood Insurance Rate Map (dated 1987) and Mapped FEMA floodplains in Lake County (Lake County Geographic Information System, Map Printed on 3/12/2008), the study area is located within Zone X, which is classified as being outside the 100 and 500-year flood limits. According to the Surficial Geology of the Chicago Region Map (Illinois State Geological Survey, 1970), the Property is situated in an area having entirely Pleistocene Series, Wisconsinan Stage, and Woodfordian Substage deposits. The naturally occurring alluvial silty sands across the property are associated with the Carmi Member of the Equality Formation. These silty sands are largely quiet water lake sediments, well bedded and occurring along beaches. The silty clay deposits are associated with the Wadsworth Member of the Wedron Formation, and specifically the Lake Border Morainic System. The till at the property appears to be associated with the Highland Park moraine.

Fill material is found across the entire property, ranging from at least 2.5 to 6.5 feet bgs. The concrete rubble fill was placed over the years to minimize ongoing soil erosion from Lake Michigan wave action. Alluvial, stratified silty sand with variable amounts of gravel is found across the entire property and directly below the fill material. Sand deposits typically become more graded and coarse with depth. Saturated conditions are only directly observed within naturally occurring soils between 8 and 10.5 feet below grade. Groundwater flow direction across the site was determined to be toward the east in the direction of Lake Michigan. At the site, rain water and snow melt percolates through the contaminated soil, through the fill material, into the groundwater. This contaminated groundwater then leaves the Site and discharges into Lake Michigan.

Ecological Setting

The site is relatively small, at about three-quarters of an acre, and had been used for industrial operations since the early 1920s. The ground surface at the Site consists of a rubble fill and is so disturbed and of such poor quality that vegetation growing on-site consists primarily of invasive and opportunistic herbaceous and woody plants. In general, the limited on-site habitats have been heavily influenced by historical land use. Although there are no permanent aquatic habitats on-site, Lake Michigan borders the Site to the east.

Corrective Action Process

EPA and LSF entered into an Administrative Order on Consent in 2006 to begin the corrective action process. LSF submitted an Interim Measures Work Plan, Quality Assurance Project Plan (QAPP) and Site Health and Safety Plan in April 2007. In March 2008, LSF submitted a Description of Current Conditions Report (DOCC) and Work Plan. Following several

Addendums detailing demolition work and groundwater sampling, LSF submitted the Corrective Measures Study/Corrective Measures Proposal (CMS) in December 2012 to propose final corrective measures for the past releases of hazardous contaminants.

Interim Measures Taken

In order to address an unacceptable risk discovered at the site, LSF elected to take immediate action. In December 2007 to January 2008, an interim measures removal was completed in accordance with an EPA-approved Work Plan. This removal work consisted of the excavation, treatment, and off-site disposal of 527.94 tons of lead contaminated soil. On July 21 and August 5, 2008, additional soil excavation, treatment, and off-site disposal of 91.11 tons of soil at one remaining location of the property was completed although this was not done as part of the interim measure with EPA approval. Prior to the removal of the property structures in August 2010, a hazardous substance and asbestos survey was conducted throughout the building. Interior foundry sand and residual dusts were treated and confirmed to be rendered nonhazardous, removed from the building, and transported to a special waste landfill. Approximately 108 tons of treated foundry sand and spent sand cores were removed from the building as a further corrective measure prior to its demolition. In addition, unused or spent petroleum and chemicals were removed and manifested to offsite licensed Treatment, Storage, and Disposal Facilities (TSDFs) for recycling and disposal. The concrete floor slabs and asphalt paved surface areas were not removed during the demolition so they could remain as engineered surface barriers at the Site. Floor pits were backfilled with crushed stone and a perimeter gate was installed at the Site.

SUMMARY OF SITE RISKS

Investigation Results

During the site investigations, soil, groundwater, and any other affected media are sampled, and the results are compared against human health and/or ecological screening criteria. If certain chemicals are above the screening criteria, then those chemicals are assessed further in the human health and ecological risk assessments. At LSF, Illinois EPA's Tiered Approach to Corrective Action Objectives (TACO) rules (35 IAC 742) were utilized, as well as other EPA-approved risk methodologies. TACO is the Illinois EPA's health risk-based method for developing remediation objectives for contaminated soil and groundwater. Risks associated with human health were assessed along with risks to off-site ecological receptors. The absence of any significant habitat at the site obviated the need to assess on site ecological risks. This section describes how soil, groundwater, and sediment samples taken at the Site compare with the TACO standards.

Soil

Previous sampling was conducted by EPA in February 2003 and in September 2004 [Booz Allen Hamilton (BAH), *Trip Report for Soil Sampling Activities, Lake Shore Foundry*, 24 November

2004]. In February 2003, the EPA and the Illinois Environmental Protection Agency (IEPA) conducted a Compliance Sampling Inspection (CSI) to determine if any site contamination had occurred which would indicate the release of lead that would render soils or other residues as characteristic hazardous waste under 40 CFR 261.24. During the CSI, six surface soil samples were collected from areas outside the facility building/structure. Samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) metals and several samples were found to exceed the TCLP lead regulatory limit of 5 mg/L lead set forth in 40 CFR 261.24.

In September 2004, EPA, IEPA, and EPA's contractors performed additional sampling on LSF property to determine whether more areas of the soil was a characteristic hazardous waste based on TCLP metals. The results indicated ten of the twelve soil samples were above the regulatory limit for lead (BAH, 2004).

In 2006, LSF and EPA entered into an Administrative Order on Consent (Order) to address contamination found at the facility. The Order required LSF to perform the interim measures required to control lead in soil. In July 2007, discrete soil samples were collected at every sample location in the 0- to 6-inch interval and at every two feet in depth, beginning at 6 inches below ground surface (bgs) and continuing to the interface of the groundwater/vadose zone. **Table 1** shows the evaluation of the levels of total lead measured in soil by comparing the average surface (0–6 inch) soil lead concentration to both the EPA Region 9 preliminary remediation goal (PRG) of 800 mg/kg for a commercial/industrial exposure scenario and to the TCLP lead regulatory limit set forth in 40 CFR 261.24 of 5 mg/L.

Table 1: Summary of Pre-Interim Measure Soil Sample Results for Total Lead and TCLP – Surface Soil - Concentrations above the PRG or TCLP limit are in bold.

Sample Location	Total Lead Highest Level Detected (mg/kg)	TCLP Highest Level Detected (mg/L)
SP-01	260	0.24
SP-02	**2100**	0.65
SP-03	570	0.46
SP-04	**1800**	**55**
SP-05	230	0.1
SP-06	**12000**	**16**
SP-07	640	0.56
SP-08	750	**19**
SP-09	35	0.0075
SP-10	540	0.92
SP-11	**3300**	**5.3**
SP-12	610	0.26
SP-13	280	0.0075
SP-14	24	0.0077

SP-15	180	0.0075
SP-16	170	0.0075
SP-17	36	0.038
SP-18	290	0.041
SP-19	79	0.0075
SP-20	76	0.013
SP-21	No total lead given	0.011
SP-22	No total lead given	0.0064
SP-23	No data	No data
SP-24	No total lead given	0.0098
SP-25	No total lead given	0.026
SP-26	No total lead given	0.29

In the initial 20 sampling locations, the arithmetic average of the total lead levels was 1,199 mg/kg, which was above the PRG of 800 mg/kg. Of those samples, five (SP-04, 06, 08, 10 (at depth), 11) were proposed to be removed due to TCLP lead exceedances. Therefore, the average was calculated over the remaining 15 sample locations. The arithmetic average of lead concentrations was found to be 372 mg/kg, which is below the EPA Region 9 industrial PRG.

Interim measures included excavating lead contaminated soil and treating the excavated soil to render lead levels to below TCLP characteristic thresholds in order to dispose of it in a special wastes landfill. A 5,000 gallon tanker truck of proprietary product (Mactite) was spray applied in liquid form to the impacted soils, then mixed and homogenized on the ground using traditional excavating equipment. Immediately following the appropriate mixing and cure times, soil samples were collected and sent for rapid turnaround TCLP lead analysis to confirm that lead levels met the threshold for disposal as non-hazardous special waste. One sample per 100 cubic yards (CY) of treated soil was analyzed for TCLP lead to confirm treatment to less than 5 mg/L. Treated soil was stockpiled on-site under secure tarps while lab analysis was performed. Once acceptable treatment was confirmed via lab data, the soil was loaded onto licensed special waste transporter trucks, manifest documents were completed, and the treated soil was transported to the landfill in Zion, Illinois for final disposal. Over 527 tons of contaminated soil was removed during this interim measure. The area was then backfilled with 2 feet of clean soil.

Excavated soil areas were subject to TCLP and total metals analysis to confirm removal of all TCLP hazardous level soils and to document remaining levels of total metals for purposes of further risk-based assessment of site conditions, prior to being backfilled. **Table 2** shows the excavation sidewall and bottom confirmation sampling results that were collected following the removal of impacted soils.

Table 2: Summary of Confirmation Sampling Results for Total Lead – Sub-Surface Soil - Concentrations above the PRG are in bold.

Sample Location	Concentration (mg/kg)
LSF-1	510
LSF-2	310
LSF-3	740
LSF3R	760
LSF-4	34
LSF-5	770
LSF-6	110
LSF-7	**1500**
LSF-8	**1700**
LSF-9	**880**
LSF-10	530
LSF12	**900**
LSF-13	**1800**
LSF-14	**1900**
LSF-15	**1200**

While discrete samples exceeded the EPA Region 9 industrial PRG of 800 mg/kg, the arithmetic average concentration of lead in surface soil, defined as 0-2 ft bgs (641 mg/kg) did not exceed the PRG. The dataset used in the averaging included the 15 original investigative sample locations not impacted by the removal and the 15 post-excavation locations sampled upon completion of the soil removal.

The EPA Part 264 Appendix IX list of metals and inorganics was also analyzed at the 15 confirmation sample locations. These results were compared to IEPA's 35 IAC Part 742 TACO Tier 1 risk based soil remediation objectives for direct contact (ingestion and inhalation) and migration to groundwater exposure routes. Volatile organic contaminants (VOCs) and semi-volatile organic contaminants (SVOCs) were shown not to be an issue at the site. The analysis of these compounds in soil did indicate that copper exceeded IEPA TACO Tier 1 residential ingestion soil remediation objectives at several discrete sample locations. However, the copper concentrations do not exceed Tier 1 industrial/commercial soil remediation objectives. The Order specified the use of risk-based cleanup objectives for an Industrial/Commercial property. The copper concentration did exceed the Tier 1 construction worker ingestion soil remediation objective at LSF-8 (but not in the re-sample LSF-8R), LSF-12 and LSF-13. The average copper concentration in duplicate samples at LSF-11 did not exceed the construction worker objective. As Tier 1 industrial/commercial soil objectives have not been exceeded, there is no unacceptable current human exposure to soil through the direct contact pathway.

Groundwater

To address the source of lead, the main site contaminant, LSF implemented Interim Measures as required by the Order to excavate lead-contaminated soils. In addition, seven rounds of groundwater sampling were conducted. There are five groundwater monitoring wells on site.

Groundwater was encountered at around 10 feet below ground surface (bgs). **Table 3** (below) lists the maximum concentration of each contaminant found in groundwater from June 2008 through January 2012.

Table 3: 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.

The data shows that no Class I & II groundwater standards are exceeded at the four (4) perimeter on-site monitoring wells (MW-01, MW-03, MW-04 and MW-05). Monitoring well MW-02, which is located near former building contaminant source areas, has only a negligible exceedance of Class I groundwater standard for total cadmium (0.0053 vs. 0.005 mg/L). However, the dissolved concentration of cadmium at MW-02 does not exceed the Class I groundwater standard.

Table 4 shows the dissolved metals data, which are compared to the U.S. EPA Maximum Contaminant Levels (MCLs) for drinking water.

Table 4: 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.

Seven (7) groundwater sampling events have been performed at the property from June 2008 through January 18, 2012. The results of the groundwater sampling have indicated that the migration of contaminated groundwater above acceptable levels has stabilized at the property. The City of Waukegan has also enacted a groundwater use restriction ordinance that prohibits groundwater use within the South Lakefront Development area, which includes the entire LSF property. The potable water at the property and surrounding properties is supplied by the City of Waukegan. This limited-area groundwater ordinance will eliminate the potential exposure to the impacted groundwater at the property and surrounding properties. In addition, the engineered barrier will limit the potential for leaching of residual contaminants to groundwater. Because there is no complete pathway between contamination in groundwater and human receptors, the risk related to this exposure pathway is considered acceptable.

Human Health Risks

After contaminant levels were identified, a human health risk assessment was performed to determine whether health problems could result if the contamination was not cleaned up. Human health risks are identified when there is a pathway for humans to be exposed to harmful contaminants. These risks can be controlled by preventing humans from being exposed to

unacceptable concentrations of the contaminants. The screening criteria used in this determination were the following: 1) surface soil-EPA Region 9 PRGs for industrial soil and Illinois Tiered Approach C Objectives (TACO) for industrial use; 2) subsurface soil-Illinois TACO for industrial worker and Redevelopment worker; 3) groundwater MCL 4) surface water-Illinois Water Quality Standards; 5) sediment-EPA Region 9 PRGs for industrial use as a surrogate for the recreational user; 6) outdoor air-EPA Region 9 for particulates. Below is a discussion of how the site sampling results compared to each of the screening criteria. The risk assessment was done for industrial workers occupying the Site, construction and redevelopment workers accessing the Site, and recreational users visiting the Site.

As lead is the main contaminant of concern at the site, a 95% upper confidence level (UCL) for the lead in the post remedial surface soil was calculated and is estimated to be 527 mg/kg which is below the TACO level for industrial land use of 800 mg/kg. Therefore, despite the one surface soil sample that had a concentration of lead at 2,100 mg/kg, it is unlikely that an industrial worker will spend his/her entire work day at the location with the maximum concentration of lead. Therefore, the mean residual lead concentration in the surface soil is not considered significant. Arsenic was found in the surface soil above the screening criteria for industrial land use. The maximum concentration of arsenic in soil was 22 mg/kg. A 95% UCL was calculated and found to be 11 mg/kg, which is below the screening value of 16 mg/kg.

There are several subsurface soil sample results that had lead concentrations above the TACO level of 700 mg/kg for construction worker. The 95% UCL of the mean concentration of lead in the subsurface was calculated to be 1,181 mg/kg in the remedial area. Using the adult lead model (ALM), PRGs were calculated for construction worker and redevelopment worker exposure. The PRG for a Midwestern population is calculated to be 2,625 ppm for a construction worker for a 45 day exposure and 1,312 ppm for a redevelopment worker for an exposure period of 90 days. The residual level of lead in the subsurface soil with the interim remedy is protective to the workers during subsurface intrusion.

A site specific PRG was calculated for the recreational user scenario using the adult lead model. For an estimated exposure duration of 104 days in a year, the PRG is calculated to be 2,271 ppm. The average concentration of lead in the surface soil is estimated to be 527 ppm which is much less than the receptor specific PRG of 2,271 ppm. Therefore, the residual contamination is not expected to pose significant risk to recreational receptors.

Ecological Risks

Ecological risks occur when a plant or animal can come in contact with a contaminant long enough and at a high enough concentration that the contaminant can cause an adverse effect.

The ground surface at the LSF site is so disturbed and of such poor quality that vegetation growing on-site consists primarily of invasive and opportunistic herbaceous and woody plants. There is no high-quality ecological habitat on the LSF property that could be adversely affected by the soil contaminants. In addition, there are no permanent aquatic habitats on-site.

An assessment was conducted of the effect that the contaminated groundwater from the Site might have on the surface water and sediments of Lake Michigan. During the most recent January 2012 groundwater sampling event, the dissolved metals concentrations for cadmium, copper, and zinc exceeded the IL Lake Michigan Basin Chronic Standards. However, there has been a downward trend in the dissolved contaminant concentrations over time, particularly after the interim measure removed the source of the soil contamination.

Sediment samples were collected from the shoreline area immediately north and south of the facility to evaluate the potential for adverse effects to ecological receptors. The lead concentration in sediment did not exceed U.S. EPA ecological screening levels (ESLs) for sediment while copper and zinc concentrations in the south sediments exceeded ESLs. However, the maximum concentrations of copper (130 mg/kg) and zinc (360 mg/kg) do not exceed probable effects concentrations (PECs, 150 mg/kg and 460 mg/kg, respectively) developed for sediment. The PECs are an upper effect level at which toxicity to benthic dwelling organisms are predicted to be probable. Thus, the sediment data shows no "unacceptable" ecological exposures to "contamination" (i.e., contaminants in concentrations in excess of risk-based levels) in sediment and no further cleanup of sediments is needed.

SCOPE OF CORRECTIVE ACTION

EPA's short-term goals for this site are:

a. All current human exposures to contamination at or from the Site must be under control. That is, significant or unacceptable exposures do not exist for all media known or reasonably suspected to be contaminated with hazardous wastes or hazardous constituents above risk-based levels, for which there are complete pathways between contamination and human receptors.
b. Migration of contaminated groundwater at or from the Site must be stabilized. That is, the migration of all groundwater known or reasonably suspected to be contaminated with hazardous wastes or hazardous constituents above acceptable levels is stabilized to remain within any existing areas of contamination as defined by monitoring locations designated at the time of the demonstration. In addition, any discharge of groundwater to surface water is either insignificant or currently acceptable according to an appropriate interim assessment.

Our short-term goals have already been achieved. On December 23, 2008, EPA determined that (a) had been achieved, and on December 11, 2012, that (b) had been achieved.

EPA's long-term goals for the remedy being proposed are:

- Protecting human health and the environment;
- Attaining the applicable media cleanup standards;
- Controlling the sources of the releases to the extent practicable; and

- Managing all remediation waste in compliance with the applicable standards.

Returning usable groundwaters to their maximum beneficial uses wherever practical is a factor leading to the goal of protecting human health and the environment. At this Site, any remedy selected will include monitoring of the groundwater contamination on Site to assure that the contaminant levels do not increase, or cause any unacceptable risk to the nearby surface waters of Lake Michigan. **Table 5** shows a comparison between the short-term and long-term cleanup standards.

Table 5: Groundwater to Surface Water Cleanup Standards

Contaminant of Concern	Highest Level Detected (a) (mg/kg)	Short-term Cleanup Standard (mg/kg)	Long-term Cleanup Standard (mg/kg)	Basis of Standard
Cadmium	0.0053	0.005	0.003	Short-term: IEPA Class I Groundwater Standard for total metals
Copper	0.51	0.65	0.012	Long-term: IEPA Lake Michigan Basin Chronic Water Quality Standards
Zinc	1.5	5.0	0.153	

(a) Data are from January 18, 2012 Groundwater sampling event; only those COCs which had exceedances in the January 2012 sampling event are shown.

SUMMARY OF ALTERNATIVES

EPA uses four threshold criteria and five balancing criteria in the evaluation of remedial alternatives. Any alternative that fails to meet the four threshold criteria is screened out from further consideration. The five balancing criteria are used to identify the remedy that provides the best relative combination of attributes. The four threshold criteria are:

1. Protection of Human Health and the Environment
2. Attainment of Media Cleanup Standards
3. Controlling the Sources of Releases
4. Compliance with Waste Management Standards

The five balancing criteria are:

5. Long-term Reliability and Effectiveness
6. Reduction of Toxicity, Mobility or Volume of Wastes
7. Short-term Effectiveness
8. Implementability
9. Cost

Alternative 1: No Further Action

The "no further action" remediation option would be proposed if no remedial treatment is necessary. This alternative does not meet the threshold criteria. It is not appropriate because under current conditions, there are areas of the Site that do not meet the media cleanup standards for this project, based on industrial land use. This alternative would not meet the cleanup goals for this project and is not considered for further evaluation.

Alternative 2: Complete Excavation and Off-site Disposal of Contaminated Soil – GW Use Restriction
In this alternative scenario, all of the contaminated soils exceeding the unrestricted residential cleanup level of 400 mg/kg would be excavated and transported to a permitted landfill facility for proper disposal. Prior to off-site disposal, the contaminated soil exceeding the hazardous levels would be treated on-site or the untreated soils would need to go to a hazardous waste landfill. In addition, the limited-area groundwater ordinance would also be utilized as part of this alternative. Implementation of this alternative will result in the removal of contaminated soil exceeding the unrestricted land use cleanup objectives. Therefore, no restrictions would be necessary for future development and land use under this alternative, except for the limited-area groundwater ordinance. Semi-annual groundwater monitoring of MW-01, 02, 03, 04, and 05 would also occur to assess whether the proposed remedy was meeting cleanup standards.

Alternative 3: Source Area Excavation, Engineered Barriers, and GW Use Restriction
The source area soil exceeding the toxicity characteristic hazardous levels was treated on-site and transported to a permitted landfill facility for proper disposal under the interim measure. The residual contaminated soil remaining at the property would be addressed utilizing engineered barriers that eliminate exposure pathways for industrial/commercial or recreational land uses (the existing concrete foundation and placement of three-feet of clean soil fill material or alternatively, six-inches of compacted asphalt in remaining areas). In addition, the limited area groundwater use restriction ordinance would remain in effect and semi-annual groundwater monitoring of MW-01, 02, 03 ,04, and 05 would also occur to assess whether the proposed remedy was meeting cleanup standards.

EVALUATION OF THE PROPOSED REMEDY AND ALERNATIVES

EPA is proposing that LSF should implement Alternative 3 to address contaminated soils and groundwater at the Site. EPA's proposed remedy includes the following components:

- Utilization of engineered barriers that eliminate exposure pathways for industrial/commercial or recreational land uses (maintain the existing concrete foundation and placement of a total of three-feet of clean soil fill material or alternatively, six-inches of compacted asphalt in remaining areas) from residual contamination in soils remaining after Interim Measures;
- Establish institutional controls to prohibit the installation of groundwater supply wells at the Site, and protect construction workers from exposure to contaminated subsurface soils and groundwater at the Site;

- Monitored natural attenuation of groundwater contamination to assess the effectiveness of removing the sources of the groundwater contamination, and to monitor the long-term stability and natural attenuation of the contaminants in the groundwater; and
- Continuation of the Letter Of Credit established to ensure that LSF will have adequate funds to complete the construction as well as operation and maintenance of the selected remedy.

The remedial technologies for containment of the residual contamination in soils would consist of engineered barriers (concrete pavement and 3-feet of clean fill material or 6 inches of compacted asphalt) and institutional controls (limited-area groundwater ordinance). Based on the area currently not covered with an engineered barrier, approximately 2,500 tons of clean fill material is planned to be installed in those areas. Areas identified with COCs exceeding the applicable Cleanup Objectives for the construction worker scenario will be addressed by utilizing a precaution construction worker notice attached to the deed. Through the utilization of the engineered barriers, the construction worker notifications and the limited-area groundwater ordinance, significant or unacceptable exposure to the contaminated media do not exist and the proposed corrective measures will be protective of human health and the environment from all current and future risks associated with the previous releases of hazardous waste or hazardous constituents from the former Facility.

Groundwater will continue to be monitored to assess the long-term stability and natural attenuation of the contaminants in the groundwater. Monitoring wells to be sampled are MW-01, 02, 03, 04, and 05. 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 analysis in order to compare the data to the IL Lake Michigan Basin Chronic Standards. Once the groundwater data show that there are no longer exceedances of the standards, monitoring may cease upon written agreement between EPA and LSF.

The following section profiles the attributes of EPA's proposed remedy against the nine remedy selection criteria, noting how it compares to the other options under consideration.

Protection of Human Health and the Environment

Alternative 2:
Implementation of this alternative will result in the removal of all contaminated soil exceeding the unrestricted land use cleanup objectives. Therefore, it would be protective of human health and the environment.

Alternative 3:
With the utilization of the engineered barriers, the construction worker precaution notifications and the limited-area groundwater ordinance, significant or unacceptable exposures to the contaminated media are not expected and the proposed corrective measures will be protective of human health and the environment from all current and future risks associated with the previous releases of hazardous waste or hazardous constituents from the former Facility. Long-term

protectiveness requires compliance with the effective engineered barriers and institutional control and maintenance of all remedy components. An O&M Plan would be developed and include regular inspection of the engineered barrier at the site and annual certification to the EPA that the institutional controls (limited-area groundwater ordinance) are in place and effective.

Attainment of Media Cleanup Standards

Alternative 2:
With the excavation of all contaminated soils above the unrestricted land use cleanup objectives, cleanup standards would be immediately met in soils. Monitoring of the GW would need to occur to ensure attainment of GW standards.

Alternative 3:
The excavation, on-site treatment, and off-site disposal of the identified lead contaminated soils exceeding the hazardous levels has already been implemented, soil samples have confirmed that the identified lead exceeding the hazardous levels have been removed and confirmation samples demonstrate the media cleanup standard of 5.0 mg/L for hazardous levels of lead has been achieved. The concrete pavement already exists over a portion of the site and the installation of the three-feet of clean fill material or six-inches of compacted asphalt as part of the engineered barrier on the remaining contaminated soil will limit the potential for leaching of residual contaminants to groundwater. Monitoring of the GW would need to occur to ensure attainment of GW standards.

Controlling the Sources of Releases

Alternative 2:
Previously identified contaminated soil exceeding the hazardous levels was excavated, treated on-site and transported for disposal to a permitted landfill facility. All remaining soil exceeding the unrestricted land use cleanup objectives will be removed, effectively removing all potential sources of releases.

Alternative 3:
Previously identified contaminated soil exceeding the hazardous levels was excavated, treated on-site and transported for disposal to a permitted landfill facility. Therefore, the source of the release and any future releases from facility operations has been eliminated. The engineered barriers will be utilized as exposure pathway elimination measures for the remaining residual contamination. The engineered barriers will consist of concrete pavement (existing) and the placement of three-feet of clean fill material or six-inches of compacted asphalt. If redevelopment of the property occurs (removal of the engineered barriers), either a new concrete slab foundation, asphalt pavement, or three feet of clean fill material will need to be placed in the areas exceeding media cleanup standards for the ingestion of soil. Alternatively, as part of the proposed redevelopment activities, the residual contaminated soil may be managed by excavating and transporting offsite to a licensed landfill facility for proper disposal.

Compliance with Waste Management Standards

Alternative 2: The excavated soil exceeding the hazardous levels for lead was treated on-site and transported under waste manifests to a permitted landfill facility for disposal. Copies of the signed waste manifests were provided to the EPA in previously submitted documents. All remaining contaminated soil removed from the property will be properly characterized and handled and disposed of in accordance with all applicable federal, state and local regulations.

Alternative 3:
The excavated soil exceeding the hazardous levels for lead was treated on-site and transported under waste manifests to a permitted landfill facility for disposal. Copies of the signed waste manifests were provided to the EPA in previously submitted documents.

Long-term Reliability and Effectiveness

Alternative 2:
This Alternative would effectively and permanently remove all risks from previous Site releases.

Alternative 3:
The useful life of the concrete foundation slab engineered barriers should typically be effective for 10 -15 years before signs of deterioration and cracks no longer make the concrete foundation slab an impermeable barrier. Concrete has been proven to be reliable engineered barriers for capping contaminated soils and limiting exposure to those soils. The three-feet of clean soil fill material will be constructed of common natural geologic construction materials that exhibit long-term durability within the natural environment of the property. Alternatively, six-inch compacted asphalt may be utilized. Routine inspections and long-term maintenance would be performed to ensure the engineered barriers remain intact. An environmental covenant with the current property owner will be established ensuring that the engineered barriers are inspected and maintained.

The limitations of the proposed technology are that the engineered barrier may be removed as part of redevelopment activities and the limited-area groundwater ordinance may be rescinded by the City of Waukegan in the future. However, given the fact that the City of Waukegan obtains its groundwater from Lake Michigan and it just recently passed the limited-area groundwater ordinance, it is unlikely to be rescinded in the near future. Restrictions would need to be placed on the property deed indicating that engineered barriers are required in specific areas in case of future redevelopment at the property and that construction worker precaution notifications would be required during any subsurface work activities at the property.

Reduction of Toxicity, Mobility or Volume of Wastes

Alternative 2:
The removal of all remaining contaminated soil would effectively eliminate any potential for COCs to impact the environment.

Alternative 3:
The excavation of the lead-contaminated soils exceeding the hazardous levels has reduced the overall volume of COCs. In addition, the proposed engineered barriers will substantially reduce the mobility of the COCs thereby reducing their potential to impact the environment.

Short-term Effectiveness

Alternative 2:
The removal of all remaining contaminated soil would immediately eliminate any potential for COCs to impact the environment.

Alternative 3:
The removal of contaminated soils provided immediate reduction of contaminants to groundwater and the nearby Lake Michigan. The proposed engineered barriers will eliminate the exposure of the residual contaminated soils to human and ecological receptors. Monitoring of the GW would need to occur to ensure attainment of GW standards.

Implementability

Alternative 2:
The administrative activities necessary for the complete removal of all remaining contaminated soil would be extensive as compared to Alternative 3.

Alternative 3:
The interim measure consisting of the excavation of hazardous levels of lead in soil was implemented without any delays from the State or local agencies. The City of Waukegan has already passed the limited-area groundwater use restriction ordinance and it has already been approved by IEPA. It is technically feasible to add the three-feet of clean soil fill material or six inches of asphalt. The clean fill material is readily available in the Chicago area and obtaining clean fill material should not delay the project.
The administrative activities needed to implement the corrective measures would be the approval of the railroad company to cross over the existing railroad tracks to gain access to the property by the dump trucks and construction equipment and vehicles. No other permits or administrative activities are necessary at this time

Cost

Alternative 2: It is estimated that the costs for Alternative 2 would exceed $1 million.

Alternative 3: It is estimated that Alternative 3 would cost approximately $300,000. The cost estimate for Alternative 3 includes the long-term operation and maintenance costs that could be incurred.

In summary, excavation of localized hot spots and implementation of institutional controls provide the best balance of tradeoffs among the alternatives with respect to the evaluation criteria. The preferred alternative protects human health and the environment and will effectively control the residual source of contaminants into the groundwater so as to reduce or eliminate further contamination. All applicable standards regarding groundwater protection and off-site waste management would be addressed under this proposal and complied with during the corrective measures implementation process.

12.0 PUBLIC PARTICIPATION

EPA solicits input from the community on the cleanup methods proposed in this document. The public is also invited to provide comments on alternatives not addressed in this *Statement of Basis*. EPA has set a public comment period from June 24, 2014 to July 25, 2014 to encourage public participation in the selection process. During the public comment period, EPA will accept written comments on the proposed action. Members of the public may contact EPA and request a public meeting be held in the affected community during the public comment period.

The public may submit written comments, questions and requests for a public meeting to the following address:

Jennifer Dodds
U.S. Environmental Protection Agency
77 West Jackson Boulevard, LU- 9J
Chicago, Illinois 60604

The Administrative Record for the LSF Site is available at the following locations:

Waukegan Public Library
128 North County Street
Waukegan, Illinois 60085
(708) 862-6220

Hours: Monday-Wednesday	Thursday - Friday	Saturday - Sunday
10:00 a.m. - 8:00 p.m.	10:00 a.m. - 6:00 p.m.	1:00 p.m. - 5:00 p.m.

U.S. EPA, Region 5
Land and Chemicals Division Records Center
77 West Jackson Boulevard, 7th Floor
Chicago, Illinois 60604
(312) 353-5821
Hours: Mon-Fri, 8:30 a.m. - 5:00 p.m.

EPA will summarize and address all comments received during the public comment period in a *Final Decision and Response to Comments* document. The preferred remedy in the *Statement of Basis* is a preliminary determination. Should another option be selected as the remedy based upon public comment, new information, or a re-evaluation of existing information, any significant differences from the *Statement of Basis* will be explained in the *Response to Comments*. The *Response to Comments* will be incorporated into the Administrative Record and made available to the public in the information repositories.

FIGURE 1

Deigan & Associates, LLC
Environmental Consultants

Figure 1
Site Location Map
Lake Shore Foundry, Inc.
653 Market St., Waukegan, Lake County, IL. 60085