Jacobsville Neighborhood Soil Contamination Site

Evansville, Indiana
Vanderburgh County

Record of Decision

United States
Environmental Protection Agency

Region 5

February 2008

TABLES

FIGURES

APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

µg/dL	Micrograms per deciliter
ARAR	Applicable or relevant and appropriate requirements
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below ground surface
BLL	Blood lead level
CDI	Chronic Daily Intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
CIP	Community Involvement Plan
COC	Chemical of concern
COPC	Chemical of potential concern
COPEC	Chemical of potential ecological concern
CSM	Conceptual Site Model
CTE	Central tendency exposure
DCL	Default closure level
DQO	Data quality objectives
ELCR	Excess lifetime cancer risk
EPC	Exposure point concentration
EPW	Evansville Plating Works
ERA	Ecological risk assessment
ESD	Explanation of Significant Difference
FS	Feasibility study
GPS	Global Positioning System
HHRA	Human health risk assessment
HI	Hazard Index
HQ	Hazard quotient
HRS	Hazard Ranking System
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
IEBUK	Integrated Exposure Uptake Biokinetic Model
IWQS	Indiana Water Quality Standards
JNSC	Jacobsville Neighborhood Soil Contamination Site
LOAEL	Lowest observed adverse effect level
MCL	Maximum contaminant levels
mg/kg	Milligrams per kilogram
NCP	National Contingency Plan
NOAEL	No observed adverse effect level
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable unit
OU1	Operable Unit 1
OU2	Operable Unit 2

ppm	Parts per million
PRG	Preliminary remediation goals
PRP	Potentially Responsible Party
RAGS	Risk Assessment Guidance for Superfund
RAO	Remedial action objective
RBSL	Risk based screening level
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI	Remedial investigation
RI/FS	Remedial investigation/feasibility study
RME	Reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SF	Slope Factor
SPLP	Synthetic precipitation leaching procedure
TAL	Target analyte list
TBC	To be considered
TCLP	Toxicity characteristic leaching procedure
U.S. EPA	United States Environmental Protection Agency
U.S. FWS	United States Fish and Wildlife Service
UCL	Upper confidence limit
UTL	Upper tolerance limit
XRF	x-ray fluorescence

This Record of Decision (ROD) documents the remedy selected for the Jacobsville Neighborhood Soil Contamination Site in Evansville, Vanderburgh County, Indiana. The ROD is organized in two sections: Part I contains the *Declaration* for the ROD and Part II contains the *Decision Summary*. The *Responsiveness Summary* is included as Appendix A.

PART I: DECLARATION

This section summarizes the information presented in the ROD and includes the authorizing signature of the United States Environmental Protection Agency (U.S. EPA) Region 5 Superfund Division Director.

Site Name and Location

The Jacobsville Neighborhood Soil Contamination Site (CERCLIS # INN000508142) is located in Evansville, Vanderburgh County Indiana. The Site is divided into two operable units. The first operable unit (OU1) is roughly bounded by the Lloyd Expressway (State Highway 62) to the south, Mary Street to the west, Iowa Street to the north, and Elliot Street to the east, and is addressed in this ROD. The second operable unit (OU2) extends outward from OU1 consistent with the wind patterns for the City of Evansville, and covers approximately 4.5 square miles. The Jacobsville Neighborhood Soil Contamination Site OU1 encompasses 141 acres including 508 residential properties in the Jacobsville Neighborhood of Evansville (See Figure 1).

Statement of Basis and Purpose.

This decision document presents the selected remedy for the Jacobsville Neighborhood Soil Contamination Site OU1. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). Information used to select the remedy is contained in the Administrative Record file for the Site. The Administrative Record file is available for review at the U.S. EPA Region 5 Records Center, 77 West Jackson Boulevard, Chicago, Illinois, and at the Evansville Vanderburgh Public Library – Central Branch, 200 S.E. Martin Luther King Jr. Boulevard, Evansville, Indiana.

Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of pollutants or contaminants from this Site which may present an imminent and substantial endangerment to public health or welfare.

Description of the Selected Remedy

The Jacobsville Neighborhood Soil Contamination Site is being addressed as two operable units under the framework set forth in CERCLA. The selected remedy specified in this ROD will serve as the final action for Operable Unit 1 (OU1) at the Site. The selected remedy specifies response actions through removal of contaminated soil, backfill with clean soil, and restoration of the site. U.S. EPA believes the response actions outlined in this ROD, if properly implemented, will protect human health and the environment.

The selected remedy consists of excavating soil material from the residential properties that have concentrations in the soil that exceed the site-specific clean up levels for arsenic and/or lead. The depth of excavation will be determined at each residential property by determining the depth of contamination at each property and also physical barriers limiting soil excavation. The clean up levels for OU1 are 400 parts per million (ppm) for lead and 30 ppm for arsenic. Although lead and arsenic levels above the clean up levels thus far has not been found below one foot in depth, soils will be excavated down to a maximum of two feet, if necessary. Clean soils will be backfilled into the property and the property will be restored to as near the original condition as possible. Since sampling at depths greater than one foot have not encountered arsenic or lead above the clean up levels, it is assumed that no contamination will remain at the properties and therefore institutional controls and five-year reviews will not be needed after the site is remediated. There are no principal threat wastes at the Site. Since no viable responsible parties have been identified to date for this site, the U.S. EPA, in partnership with the Indiana Department of Environmental Management (IDEM), expect to be responsible for implementing the remedy.

The major components of the selected remedy are:

- Residential soils containing concentrations greater than the arsenic and/or lead clean up levels will have the soils excavated to the depth that the elevated concentrations were found, up to two feet. If physical barriers exist, such as large trees, soil will be excavated around the barrier to the extent possible. Engineering controls will be implemented in order to prevent exposure to lead and arsenic from dust created by the excavation of the soils. Building foundations, permanent walkways and fixtures will not be affected by the soil excavation.

- Once excavation is complete and verified by confirmation sampling, clean fill will be placed in the excavated areas and the lawns will be returned to as close to their original condition as possible.

- Excavated soils will be transported to a RCRA Subtitle D landfill. This remedy assumes that the excavated soil will not be characterized as hazardous waste.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to this remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies (or resource recovery) to the maximum extent practicable. This remedy does not satisfy the preference for treatment as a principal element of the remedy for the following reasons: (1) the in-situ treatment technology that exists for arsenic and lead in soils has not been studied enough to prove its long term permanence and effectiveness, (2) in-situ treatment technologies are less cost-effective than this remedy, (3) the chosen remedy is a permanent remedy which physically removes all soils having concentrations greater than the cleanup levels and is widely accepted by the community, and (4) no source materials consisting of principal threat wastes will be addressed within the scope of this action; therefore, treatment of wastes prior to disposal was not evaluated. Because this remedy will not result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a five-year review will not be required for this remedial action.

Data Certification Checklist

The following information is included in the Decision Summary section (Part II) of this ROD. Additional information can be found in the Administrative Record file for this Site.

- Contaminants of concern and their respective concentrations (Section 5);
- Baseline risk represented by the contaminants of concern (Section 7);
- Cleanup levels established for contaminants of concern and the basis for these levels (Section 8);
- How source materials are not considered a principal threat (Section 11);
- Current and reasonably anticipated future land use assumptions used in the baseline risk assessment and ROD (Sections 6 and 7);
- Potential land use that will be available at the Site as a result of the selected remedy (Section 12);
- Estimated total present worth costs and the number of years over which the remedy cost estimates are projected (Sections 9 an 12); and
- Key factors that led to selecting the remedy (Sections 10 and 12).

Support Agency Acceptance

The State of Indiana concurs with the selection of Alternative 2 for the Jacobsville Neighborhood Soil Contamination Site. The State of Indiana's concurrence letter is provided in Appendix B.

Authorizing Signature

Richard C. Karl, Director
Superfund Division
United States Environmental Protection Agency, Region 5

2-14-08
Date

PART II: DECISION SUMMARY

1.0 Site Name, Location, and Brief Description

The Jacobsville Neighborhood Soil Contamination Site is located in Evansville, Vanderburgh County Indiana. The site consists of residential soils contaminated by lead and arsenic. The site was named the Jacobsville Neighborhood Soil Contamination Site because the contamination was initially found in the Jacobsville Neighborhood of Evansville; however, after further investigations, the U.S. EPA has found contamination extends to other areas of Evansville. The site is divided into two operable units. The first operable unit (OU1) is roughly bounded by the Lloyd Expressway (State Highway 62) to the south, Mary Street to the west, Iowa Street to the north, and Elliot Street to the east, and is addressed in this ROD. OU1 encompasses 141 acres of residential properties in the Jacobsville Neighborhood of Evansville, and is shown in Figure 1. The second operable unit (OU2) extends outward from OU1 consistent with the wind patterns for the City of Evansville, and covers approximately 4.5 square miles. This ROD addresses the remediation of OU1, which will be the first OU addressed at the site. The U.S. EPA, in agreement with the Indiana Department of Environmental Management (IDEM), believes the remedy is necessary to protect human health and the environment due to actual and potential exposure to lead and arsenic in residential soils. U.S. EPA is the lead agency for this site, and IDEM is the support agency. The EPA CERCLIS Number is INN000508142. Site remediation is expected to be financed by U.S. EPA with a 10% share financed by the State of Indiana.

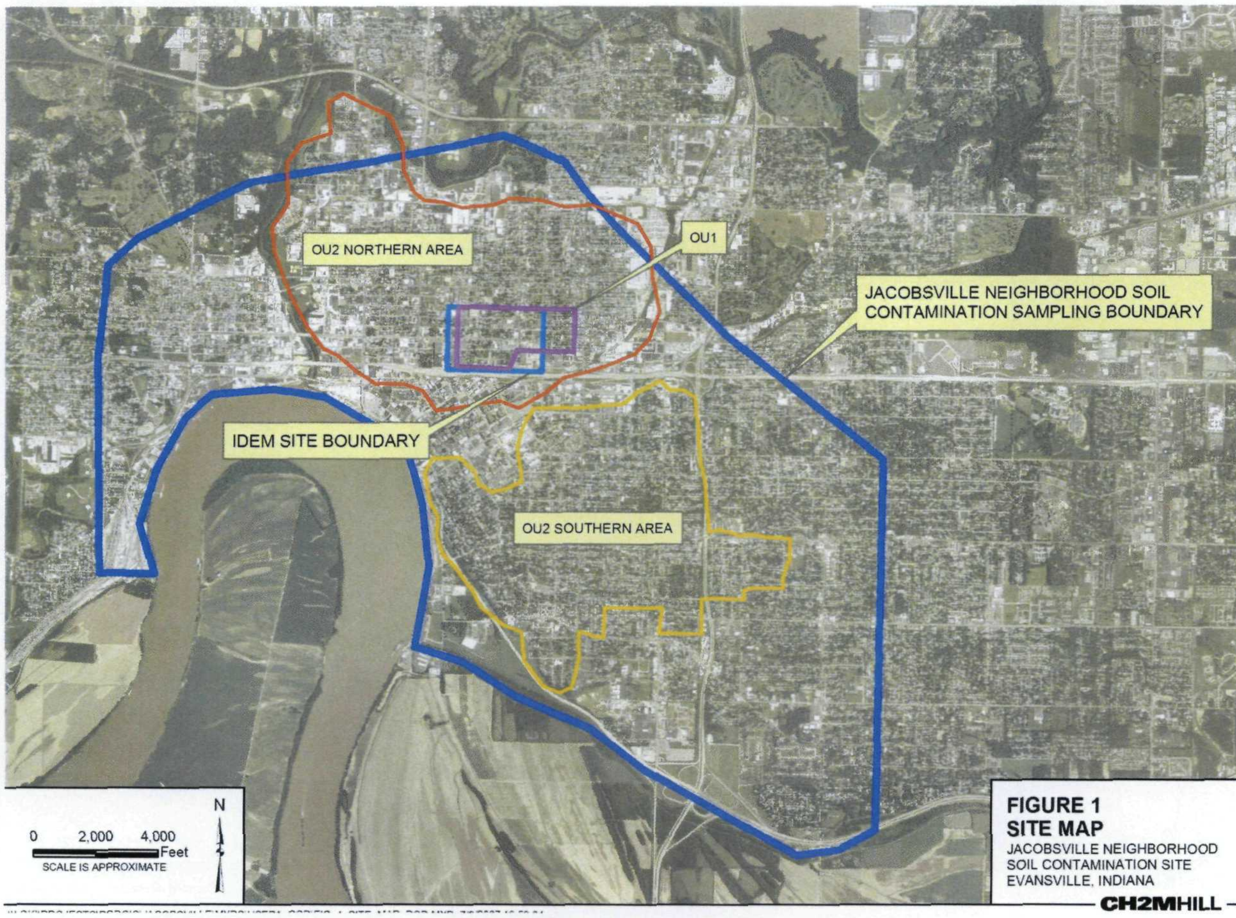

Figure 1. Map of Jacobsville Neighborhood Soil Contamination Site

2.0 Site History and Enforcement Activities

2.1 Source of Contamination

IDEM identified four former facilities that likely contributed to the contamination at the site: Blount Plow Works, (operated from the 1880s to about the 1940s), Advance Stove Works (operated from approximately the 1900s to the 1950s), Newton-Kelsay (operated from approximately the 1900s to the 1950s), and Sharpes Shot Works (operated from 1878 to an unknown date) (Figure 2). The facilities were located within the boundaries of OU1. Current conditions at these facilities are as follows:

- The Blount Plow Works building has been demolished. A supermarket, Buehler's IGA, and an asphalt parking lot are now present at the site.
- A one-story brick storage building with a gravel parking lot occupies part of the former Newton-Kelsay property. A McDonald's restaurant occupies the eastern part of the property.
- The former Sharpes Shot Works and the original Advance Stove Works facilities are now gravel parking lots. A chain-link fence encompasses the two sites.

In addition to the four facilities described above, Evansville Plating Works (EPW) also may have contributed to the contamination. The company, which began operations in 1897, plated zinc, brass, nickel, copper, iron black (iron oxide), cadmium, and chromium for individuals and industry. Evansville Plating Works is located at 100 West Indiana Street, just south of the Jacobsville Neighborhood (Figure 2). The 1-acre site formerly was occupied by a large, dilapidated, one-story building. The building was demolished, and the lot is now empty. The site also contains a parking lot and a small grassy field. Land use surrounding the site is predominantly residential with small and light industrial businesses nearby.

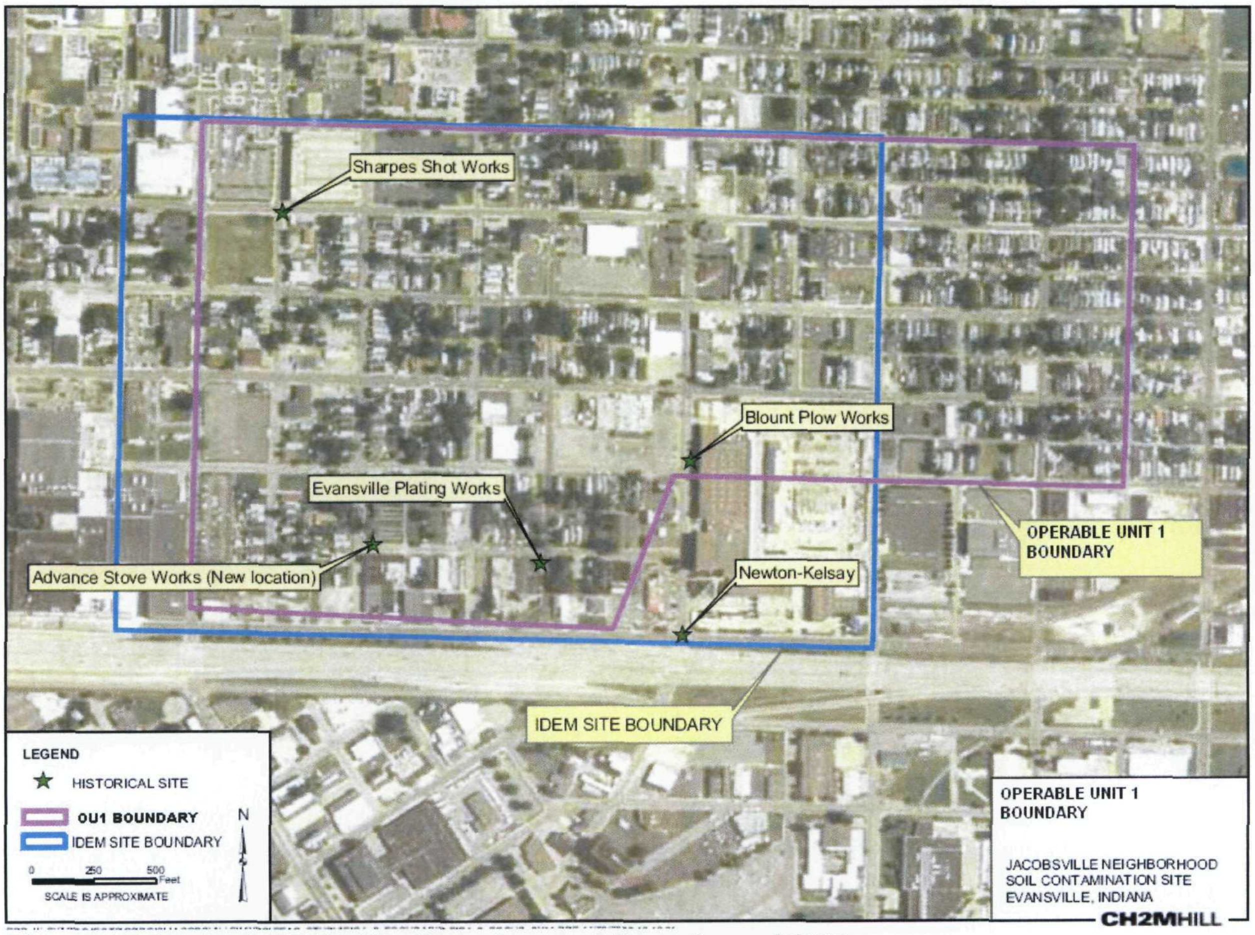

Figure 2. Original IDEM Site Boundary and Boundary of OU1

2.2 Previous Investigations

2.2.1 1990—Evansville Plating Works Site Investigation

In June 1990, U.S. EPA inspected EPW, sampled various spills and precipitates throughout the facility, and conducted air monitoring. Uncovered plating vats, drums, and precipitates were observed on the outside of the drums. Based on the site inspection and analytical results, U.S. EPA recommended a removal action. Following the removal action, U.S. EPA assigned a No Further Remedial Action Planned status to the EPW site.

2.2.2 2002—Integrated Assessment Report for JNSC Site

In the summer and fall of 2000, IDEM conducted a reassessment of the EPW site because off-site samples were not collected as part of the site screening inspection. The reassessment included residential soil sampling. Analysis of the soil samples collected in 2000 revealed elevated levels of lead in residential soils near the EPW property. The observations from the site inspection included that the area is urban and primarily residential. The area investigated includes empty lots, city parks, commercial properties, an elementary school, and a hospital.

In June 2001, IDEM collected 189 soil samples around the Jacobsville neighborhood and analyzed them for lead using portable x-ray fluorescence (XRF) to complete the Hazard Ranking System (HRS) scoring report. Samples were collected from a depth of 0 to 6 inches. Fifty-seven samples were sent to a laboratory for analysis. IDEM determined that the migration pathways include groundwater, surface water, soil, and air, but the soil exposure pathway is the only pathway of concern.

Lead concentrations exceeding U.S. EPA action levels were detected in most of the residential soils. Two samples were collected as background samples. Lead concentrations in these background samples were determined to be 86 parts per million (ppm). The highest lead concentration observed in soil was 7,700 ppm.

A storm drain system controls surface runoff from the site and conveys the collected storm water to the Evansville Wastewater Treatment Plant. The treated water is discharged to the Ohio River. No air samples were collected. IDEM stated that there was no potential risk to nearby residents by the air pathway, provided that contaminated sediments or soils do not become airborne.

2.2.3 2002—Hazard Ranking System

The Hazard Ranking System (HRS) is the principal mechanism U.S. EPA uses to place uncontrolled waste sites on the National Priorities List. The HRS for the Jacobsville Neighborhood Soil Contamination Site integrated information from the previous investigations to return a score of the site's relative potential as a risk to human health and the environment.

Four release pathways are assessed as part of the HRS: groundwater migration, surface water migration, soil exposure, and airborne migration. The risk factor categories evaluated were likelihood of release into the environment, waste characteristics, and targets affected by a release. The U.S. EPA has established a cutoff of 28.50 for listing on the National Priorities List.

IDEM staff completed the HRS Record in September 2002 for the JNSC site. The site received a score of 71.04 for soil exposure. The other pathways were not evaluated because of insufficient data. Overall, the JNSC site received a score of 35.52. On the basis of that score, IDEM recommended that the Site be included on the National Priorities List.

2.2.4 2003—Site Assessment Report for Evansville Plating Works

In January 2003, U.S. EPA conducted a site assessment of EPW. XRF was used to screen 49 soil samples and also dust within the building. One sample outside the building contained mercury at a concentration of 780 ppm. At 13 locations, lead was detected at concentrations exceeding 2,000 ppm, and at 6 locations chromium exceeded 2,000 ppm. No contamination was discovered within subsurface samples from the 10 locations screened with XRF.

Seven investigative samples, including soil and building materials, were collected and analyzed for total metals. The seven samples contained concentrations exceeding selected criteria for arsenic, cadmium, and chromium. Contaminant concentrations in six of the samples exceeded the IDEM residential default closure levels (DCLs) for copper, lead, and nickel. Iron exceeded U.S. EPA Region 3's risk-based criterion and Region 9 Preliminary Remediation Goals (PRGs) for residential soils in five of the samples. Four samples exceeded the IDEM residential DCLs for selenium and zinc, and three exceeded the criterion for mercury. Antimony, barium, and thallium results exceeded the IDEM residential DCLs in two of the samples, and silver exceeded this criterion in one sample. As a result, an additional removal action was performed at the Site by the U.S. EPA.

2.2.5 2004—Site Characterization 1

In November and December 2004, U.S. EPA performed soil sampling for the JNSC Site using a portable XRF and laboratory verification samples based on a random grid sample design. The sampling plan was designed to determine the areal extent of contamination and spatial distribution of surficial contamination, and extended beyond the IDEM defined site boundary. Forty-nine locations were sampled using two XRF units to screen soil for lead and other metals (see Figure 3). Of the samples collected, 20 percent were sent to the laboratory for metals analysis (beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, silver, sodium, vanadium, and zinc). The highest lead reading observed was outside the IDEM defined Site boundary, but was not located at a residential property. The second highest lead concentration was within the IDEM boundary. Laboratory results were used to "calibrate" the XRF results. U.S. EPA determined that the XRF results were biased low. Locations with elevated concentrations were somewhat sporadic because of air deposition and grading activities.

2.2.6 2005—Site Characterization 2

Sampling was conducted in April 2005 because the November and December 2004 sampling event was inconclusive in determining the areal extent of contamination within the soils. A second sampling design was created to extend the sampling grid beyond the November and December 2004 sampling design. Two grids were created: one that surrounded the previous sampling event (inner grid) and one that extended beyond the inner grid that could be used as needed (outer grid) (see Figure 3). During sampling, if two samples in a row (outward from the JNSC site) had XRF readings that did not exceed 200 ppm, sampling was not continued in that direction. Fifty-six locations were sampled and analyzed using XRF. The lab analyzed 15 of the soil samples for metals (beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, silver, sodium, vanadium, and zinc). The extent was delineated with results from outward samples of less than 400 ppm. Samples with adjusted concentrations greater than 400 ppm were within the Evansville city limits. The locations where lead was observed at a concentration greater than 400 ppm are somewhat sporadic because of air deposition and grading activities, but are generally within a 2-mile radius of the site. U.S. EPA recommended additional sampling to determine a site specific screening value for lead based on potential exposure and risk specific to Evansville.

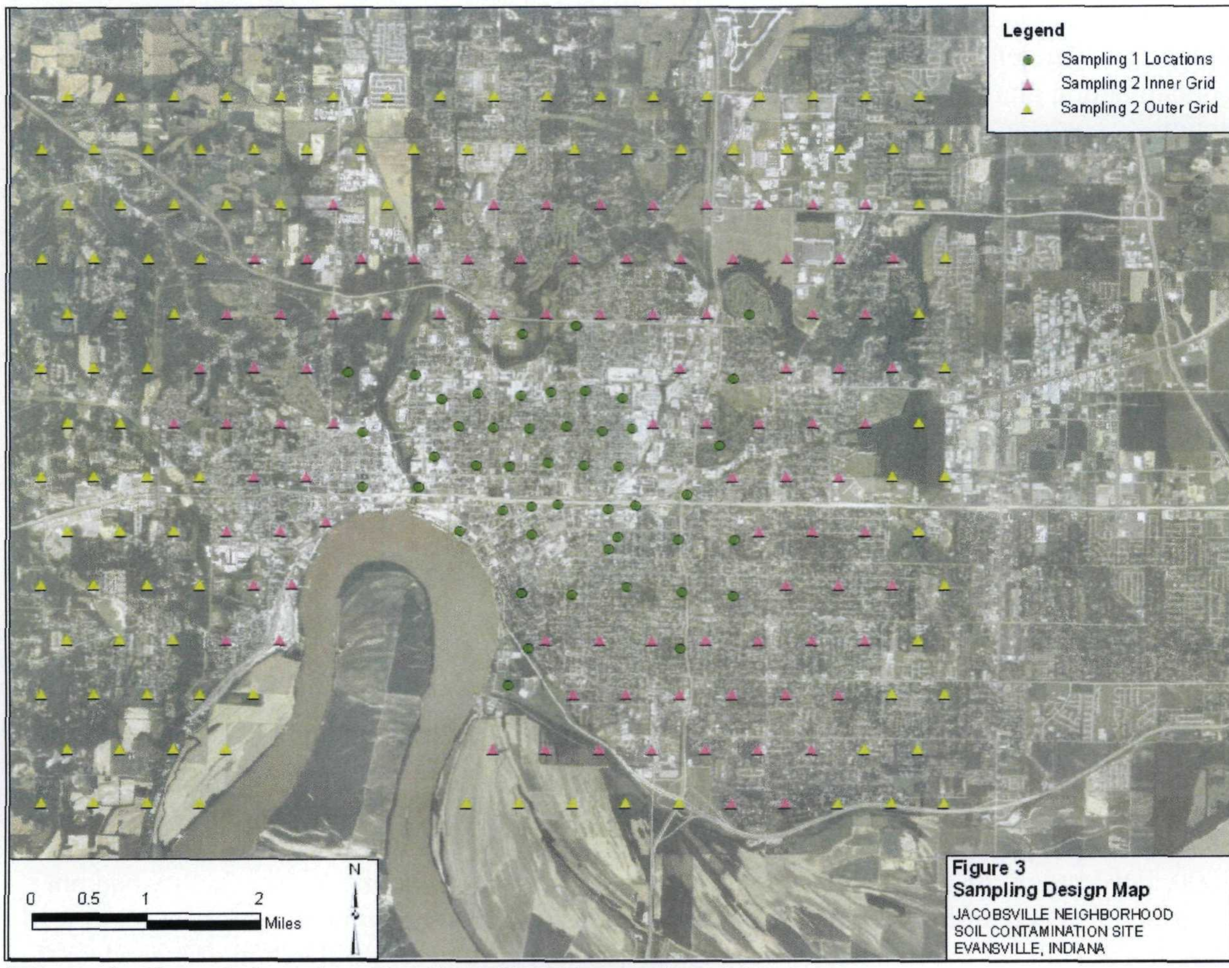

Figure 3. Sample locations for Sampling Events 1 and 2

2.2.7 2005—Site Characterization 3

The third sampling round by U.S. EPA was conducted on October 17 through 24, 2005. The sample network was designed to obtain data from areas where previous samples had high concentrations of lead. Specifically, the object was to characterize "hotspots" within the affected area. The sample locations were laid out on a grid.

One hundred sixty-two sample locations were analyzed using a portable XRF unit, and 29 soil samples were submitted to a laboratory for XRF data verification. Five-point composite soil samples were collected with samples taken at four corners of the yard and one taken in the center. A four-point composite drip zone sample (one sample from the midpoint of each side of the house) was collected at some of the residential sample locations to determine if lead paint may be contributing to the high levels of lead in yard soils. Sampling verified that previous samples with high lead concentrations were confirmed in areas with high lead contamination. Samples were collected along boundaries determined during Site Characterization 2, and elevated (greater than 400 ppm) lead concentrations were not observed outside the boundaries. Samples with elevated lead concentrations were within the Evansville city limits. In addition, several pockets within the contamination boundaries had very high lead concentrations, some outside the IDEM Site boundaries. Elevated lead concentrations are within a 2 mile radius of the IDEM Site boundaries. It was also noticed during this field investigation that many properties had been re-graded, and low concentration properties were adjacent to high concentration properties. Therefore, it is expected that some residences within the final delineated contamination plume will not have elevated lead concentrations and will not need remedial action.

2.2.8 2006—Remedial Investigation/Risk Assessment Sampling

Groundwater, surface water, sediment and soil samples were collected to acquire data to be used in human health and ecological risk assessments. Soil samples were also taken at depth intervals up to 18 inches. Background samples were taken for all media, which found that several analytes had background levels above screening levels. Sampling determined that lead and arsenic in residential and "other" (playgrounds, schools, and parks) properties were the contaminants of concern (COCs) for the Site. Contamination above cleanup levels was not found at soil depths of greater than one foot.

2.3 Previous Response Actions

2.3.1 U.S. EPA Evansville Plating Works Removal Action

The U.S. EPA initiated a removal action at the Evansville Plating Works facility on July 2, 1990. During the removal action, liquid and solid waste streams were characterized and transported off site for treatment and/or disposal. About 18,245 gallons of hazardous liquid waste streams were transported off site for treatment and disposal and 22,391 cubic yards of hazardous debris was shipped off-site to a disposal facility. The removal action was completed on January 12, 1993. On-site sampling was done to verify that all hazardous materials had been removed. In July of 2000, IDEM took off-site samples to verify that the Evansville Plating Works facility had not contributed to contamination outside of the property. It was at this time that high levels of lead were found at the site and in nearby residential soils. A second removal action was conducted in September and October of 2003 that addressed the demolition of the building and removal of contamination and debris from the site.

2.3.2 U.S. EPA Jacobsville Neighborhood Soil Contamination Removal Action

On September 17, 2007, the U.S. EPA initiated a removal action at residential properties at the JNSC Site where lead concentrations in the soils exceeded 1200 ppm. During the removal action, properties in areas where previous sampling had found lead levels of 1200 ppm or greater were sampled for lead. Approximately 75 homes will be addressed in this removal action, and work is scheduled to be complete in early 2008. The properties addressed in this removal action will not need to be addressed by this ROD.

2.4 Enforcement Activities

A search for Potentially Responsible Parties (PRPs) was conducted by U.S. EPA. To date, no viable PRPs have been identified, therefore no enforcement actions have been pursued.

3.0 Community Participation

The Proposed Plan for the Jacobsville Neighborhood Soil Contamination Site OU1 was made available to the public for comment near the end of January 2007. Copies of the Proposed Plan and the final Remedial Investigation (RI) and Feasibility Study (FS) reports (as well as other supporting documents) were placed in the local Information Repository located at the Evansville Vanderburgh Public Library—Central Branch—Public Comment Shelf. Documents are also available at the U.S. EPA Region 5 Records Center in Chicago, Illinois. Copies of the Proposed Plan as well as an announcement for the three public meetings to discuss the Proposed Plan were mailed to approximately 3,600 interested persons on U.S. EPA's community involvement mailing list for the Site. Copies of all documents supporting the remedy outlined in the Proposed Plan are located in the Administrative Record file for the Site, located at the U.S. EPA Region 5 Records Center, 77 West Jackson Boulevard, Chicago, Illinois, and the Vanderburgh Public Library—Central Branch in Evansville, Indiana.

The public comment period ran from January 12 through February 28, 2007. U.S. EPA held three public meetings to present the Proposed Plan. The first meeting was on January 23, 2007, in the evening, and was held at the C.K. Newsome Community Center in Evansville, Indiana. The second and third meetings were on February 8, 2007, in the afternoon and evening, and were held at the Central United Methodist Church, within the boundaries of OU1, in Evansville, Indiana. Roughly 70 people overall attended the meetings. The notice announcing the public meetings and the availability of the Proposed Plan was published in the Evansville Courier Press on January 11 and February 5, 2007 and in the Our Times newspaper on January 12, 2007, to alert media and the public about issuance of the Proposed Plan and the deadline for the public comment period. Representatives of U.S. EPA and IDEM were present at the public meetings to present the Proposed Plan and answer questions regarding the proposed remedy. Representatives from the City of Evansville (including the Evansville Environmental Protection Agency), Vanderburgh County Health Department, the Agency for Toxic Substances and Disease Registry (ATSDR), the Jacobsville Area Community Corp., and the Jacobsville Neighborhood Association were also present at the meetings. Responses to comments received during the public comment period (including comments received at the public meetings) are included in the Responsiveness Summary which is Appendix A of this ROD. These comments were considered prior to selection of the final remedy for the Jacobsville Neighborhood Soil Contamination Site OU1.

In addition to the Proposed Plan mailings and public meetings, the U.S. EPA held an availability session on April 12, 2005 to explain the threats at the site and the sampling that was taking place to characterize the site. U.S. EPA also spoke with many local residents in and around the boundaries of the Site during the community interviews and when the sampling was performed at the residential properties. U.S EPA developed a Community Involvement Plan (CIP) when RI/FS activities began at the Site in 2004. The CIP, Proposed Plan, and news releases were also posted to the U.S. EPA Region 5 website at http://www.epa.gov/region5/sites/jacobsville.

4.0 Scope and Role of Response Action and Operable Units

The U.S. EPA has organized the work to be performed at the Jacobsville Neighborhood Soil Contamination Site into two operable units (OUs):

Operable Unit 1: The first operable unit, which is the subject of this ROD, consists of contaminated residential soils within the boundaries of Lloyd Expressway

(State Highway 62) to the south, Mary Street to the west, Iowa Street to the north, and Elliot Street to the east (See Figures 1 and 2). OU1 encompasses 141 acres and 508 residential properties. The soils in this area were found to have the highest levels of lead and arsenic at the Site. This area also contained all four facilities that are likely responsible for the soil contamination (see Fig. 1). OU1 will be the first operable unit addressed at the Site, and remediation activities at OU1 will be financed by U.S. EPA, with a 10% share financed by the State of Indiana.

Operable Unit 2: The second operable unit consists of contaminated residential soils outside the boundaries of OU1, and encompassing approximately 4.5 square miles consistent with the wind patterns for Evansville, Indiana. The soils in this area were found to have levels of lead and arsenic moderately above the clean up levels and are likely to have contamination to a lesser depth. Remediation of OU2 will begin after a ROD for OU2 is prepared and signed, and will be the final response action for the site. Remediation activities at OU2 will be financed by U.S. EPA, with a 10% share financed by the State of Indiana.

U.S. EPA addressed the Site in its entirety in the RI Report dated September 2006. However, the FS, dated January 2007, and this ROD focus exclusively on OU1 at the Site. The site was divided into operable units for two reasons: to address the soils with the highest levels of lead and arsenic in a timely manner and to address the need for two separate strategies for the OUs. The different strategies are necessary because of the large difference in sizes of the two operable units, which will affect the logistics, including time and money, of implementing the remedy at each OU. A ROD for OU2 is schedule to be completed in 2009, and will be the final response action for this Site. The implementation of a remedy at OU2 will take a considerable amount of time and resources as compared to OU1.

5.0 Site Characteristics

5.1 Conceptual Site Model for Jacobsville Neighborhood Soil Contamination Site

The conceptual site model (CSM) provides an understanding of the site based on the sources of contaminants of concern, potential transport pathways, and environmental receptors. Figure 4 pictorially depicts the CSM for the Jacobsville Neighborhood Soil Contamination Site, which the risk assessment sampling and risk assessment analysis was based on. Based on the nature and extent of contamination and the fate and transport mechanisms described in the RI and FS reports, the refined CSM includes the following components:

- For the site-wide human health and ecological risk assessments, all possible exposure routes, including recreational activities outside of the site boundaries, were considered. There are no excess risks associated with contaminants in the groundwater, surface water, and sediments at the Site.

- Site-wide, arsenic and lead in surface soils were identified as chemicals of concern for human health exposures. Ingestion, dermal contact, and inhalation of the lead and arsenic from soils are complete exposure pathway to residents and industrial workers at the Site.

- No chemicals of concern were identified for ecological receptors at the Site.

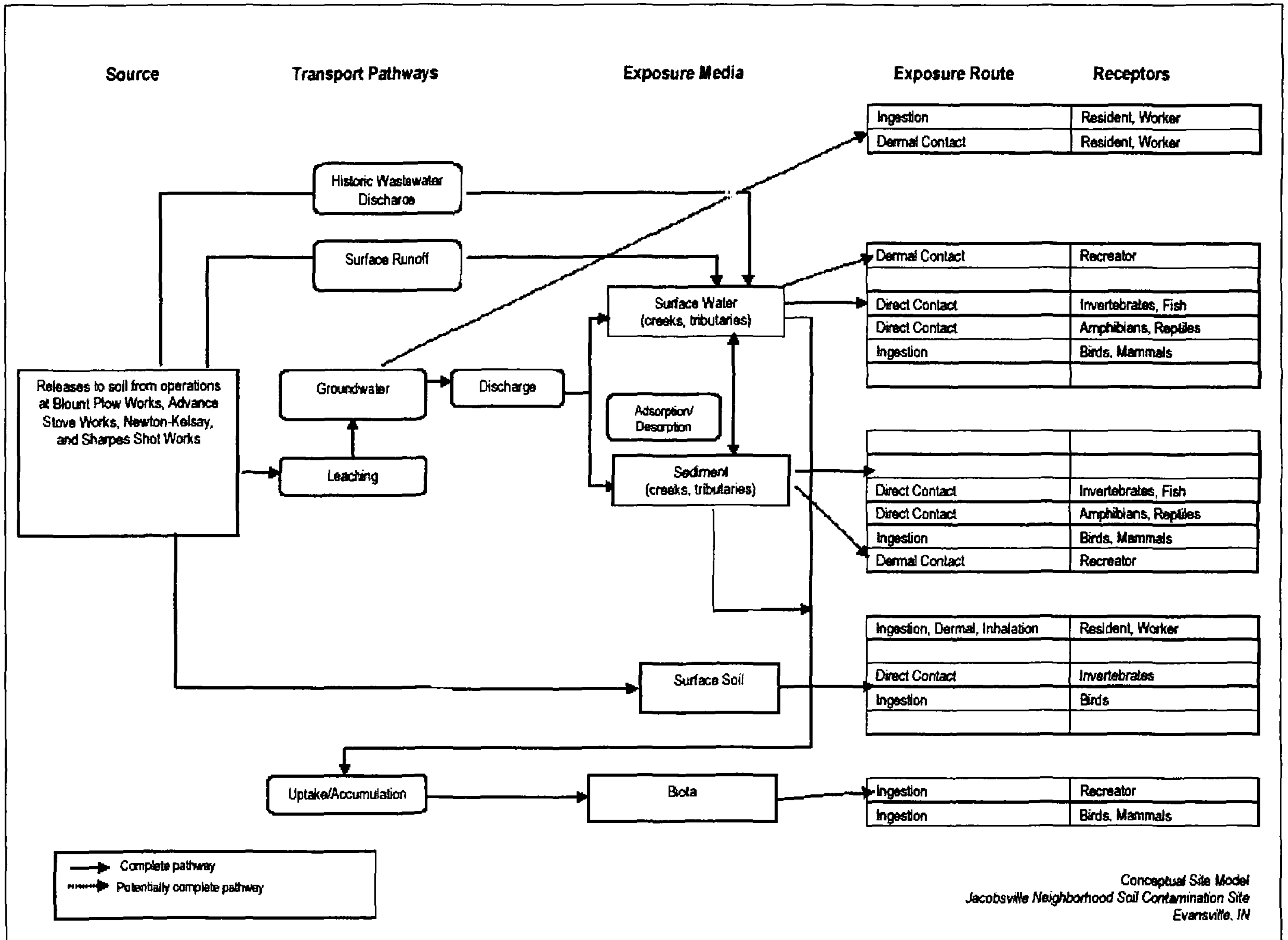

Figure 4. Conceptual Site Model for the Jacobsville Neighborhood Soil Contamination Site

5.2 Site Overview

The Jacobsville Neighborhood Soil Contamination Site is located in Evansville, Indiana and encompasses approximately 5 square miles containing residential properties that have soils with concentrations above the clean up levels of 400 ppm for lead and 30 ppm for arsenic. The Site is roughly bounded by Pigeon Creek to the west, Diamond Avenue Expressway to the north, U.S. Highway 41 to the east, and Veterans Memorial Highway to the south. OU1, the area addressed in this ROD, is bounded by the Lloyd Expressway (State Highway 62) to the south, Mary Street to the west, Iowa Street to the north, and Elliot Street to the east. OU1 soils contain the highest levels of lead and arsenic in soils found at the Site, and the four former facilities thought to be responsible for the contamination are within the boundaries of OU1. OU1 has a mixture of residential, commercial, and industrial properties. OU1 encompasses 141 acres and 508 residential properties. Surficial soils contaminated with lead and arsenic present an exposure risk to children and adults at residential and recreational properties within the Site boundaries. Sampling thus far has found lead and arsenic concentrations above cleanup levels at depths of one foot or less. There are two surface water bodies near the Site, Pigeon Creek, which is the westerly boundary and is approximately one half mile from OU1, and the Ohio River, which is one quarter mile from the Site, and approximately 1 mile southeast of OU1. The Site does not lie within a floodplain.

The Site is located in the Ohio River basin. Unconsolidated sand and gravels, along with Pennsylvanian sandstones and limestones, make up the aquifers in the region. There are four main aquifers in Vanderburgh County: the Linton, Dugger, and Patoka formations, which are bedrock aquifers, and the Ohio River Valley aquifer, consisting of terrace and floodplain deposits. Typically, the lower two-thirds or more of the alluvial deposits consist of coarse sand and gravel that directly overlie bedrock and form the principal unconsolidated aquifers. A surficial aquifer system is present only along the Ohio River Valley and a few of its tributaries. The shallow, surficial aquifer consists of sand and gravel layers with some clay layers that extend 14 to 82 feet below ground.

Except for a few private water supply wells, groundwater use at the site and the surrounding areas is minimal and limited to use for industrial purposes. The City of Evansville obtains its drinking water from the Ohio River. The Evansville Water Department pumps water from the Ohio River to the Evansville Water Filtration Plant, where 32 million gallons of treated water per day is distributed to 150,000 customers. Water quality conditions of the Ohio River are monitored continuously by the Ohio River Valley Water Sanitation Commission.

The Site and surrounding area are located in the Wabash Lowland physiographic province. The Wabash Lowlands are characterized by broad terraced valleys and low till-covered hills with an average elevation of about 500 feet above seal level.

The overall climate of southwestern Indiana is similar to that of the Gulf Coast because of the prevailing southerly winds that push moist, warm air from the Gulf of Mexico. Average temperatures range from 32°F in January to 86°F in July. The average annual rainfall is 42 inches, and the average annual snowfall is 13 inches.

The population of Evansville, Indiana is roughly 121,000 (U.S. Census 2000). The Jacobsville Neighborhood Soil Contamination Site consists of a primarily centralized urban area bordered by agricultural land to the south along the Ohio River.

5.3 Sampling Strategy

Three tiers of sampling were performed during the RI to characterize the Jacobsville Neighborhood Soil Contamination Site. IDEM conducted the first tier of sampling in 2001 to determine if the Site should be listed on the National Priorities List (NPL). Sampling was limited to the top six inches of soil at residential properties in close proximity to the Evansville Plating Works Site. The sampling resulted in the Jacobsville Neighborhood Soil Contamination Site being listed on the NPL. IDEM defined the Site boundary as bounded to the west by Edgar Street, to the south by the Lloyd Expressway, to the east by Heidelbach Street, and to the north by Iowa Street (IDEM boundary) (See Figure 2).

U.S. EPA performed three rounds of sampling to define the areal extent of contamination at the Site. To accomplish this, a 500 meter grid sampling design was centered on the IDEM site boundaries and extended out three to four miles from the boundaries. Once the areal extent of contamination had been captured, a 250 meter grid sampling design was used in areas that had shown to have lead concentrations above 400 ppm to better define the spatial distribution of contamination. This sampling was performed during three separate field events during December 2004, April 2005, and October 2005.

The third tier of sampling was performed in order to define depth of contamination, risk assessment sampling, and contaminant fate and transport.

Field investigations as part of the RI included the following:

- Site reconnaissance activities, including coordinating access with property owners and identifying sampling locations not identified during office reconnaissance.

- Soil sampling from residential areas, including focused sampling after the areal extent of contamination had been defined. Also soil sampling from high-access (such as day care centers, playgrounds, and schools) and background locations.

- Data collection on soil properties that were used to evaluate contaminant fate and transport and remedial alternatives.

- Sediment and surface water sampling from tributaries within the affected areas and reaches of the same tributaries upstream of assumed impacted areas.

- Groundwater sampling from wells that were potential drinking water sources within the defined area.

- Ecological assessment

- Documentation of sample locations using Global Positioning System (GPS) equipment

- Definition of the nature and extent of contamination in soil, sediment, surface water, and groundwater to support the assessment of potential risk to human health and the environment and to assist in the evaluation of potential remedial alternatives.

5.4 Source of Contamination

As discussed in Section 2.1 of this ROD, the lead and arsenic found at the Jacobsville Neighborhood Soil Contamination Site most likely originated from four former facilities that operated foundries on-site: Blount Plow Works (operated from the 1880s to about the 1940s), Advance Stove Works (operated from the turn of the century to about the 1950s), Newton-Kelsay (operated from the turn of the century to about the 1950s), and Sharpes Shot Works (operated from 1878 to an unknown date) (Figure 2). The facilities were located within the OU1 boundaries. Current conditions at these facilities are as follows:

- The Blount Plow Works building has been demolished. A supermarket, Buehler's IGA, and an asphalt parking lot are now present at the site.

- A one-story brick storage building with a gravel parking lot occupies part of the former Newton-Kelsay property. A McDonald's restaurant occupies the eastern part of the property.

- The former Sharpes Shot Works and the original Advance Stove Works facilities are now gravel parking lots. A chain-link fence encompasses the two sites.

In addition to the four facilities described above, Evansville Plating Works also may have contributed to the contamination. The company, which began operations in 1897, plated zinc, brass, nickel, copper, iron black (iron oxide), cadmium, and chromium for individuals and industry. Evansville Plating Works is located at 100 West Indiana Street, just south of the Jacobsville Neighborhood. The 1-acre site formerly was occupied by a large, dilapidated, one-story building. The building was demolished, and the lot is now empty. The site also contains a parking lot and a small grassy field. Land use surrounding the site is predominantly residential with small and light industrial businesses nearby.

Lead and arsenic are commonly found near foundry operations. Historic photos of the area indicate that the foundries operated outdoors, allowing dust from the operations to be released into the air in large quantities. The foundry dust, containing lead and arsenic, contaminated residential soils by wind dispersion. This is supported by the fact that the extent of contamination is consistent with the wind patterns in Evansville.

5.5 Types of Contaminants and Affected Media

At the Jacobsville Neighborhood Soil Contamination Site, surface water, groundwater, sediment, and soil were analyzed for Target Analyte List (TAL) inorganics. The results were carefully evaluated in the Human Health and Ecological Risk Assessments to determine the Contaminants of Potential Concern (COPCs), which revealed which of these chemicals and affected media were most important in driving potential risk at the Site. These findings are summarized in Section 7 of this ROD, but extensive evaluation is found in the RI Report. Human health and ecological risk assessments were evaluated using the site data, and the Contaminants of Concern (COCs) at the site were determined to be lead and arsenic in residential soils.

5.6 Extent of Contamination

5.6.1 Soil Investigation and Results

A total of 189 five-point composite soil samples were collected by IDEM in 2001 as part of the Site Investigation for Jacobsville Neighborhood Soil Contamination Site. All samples were analyzed on-site using a portable x-ray fluorescence (XRF) unit, and 57 samples were sent to a laboratory for verification of XRF results.

Two hundred and fifty-four soil samples were collected during the three U.S. EPA sampling events in 2004 and 2005. The samples were five-point composite samples taken from either the front or back lawns of residential properties, parks, or recreational areas. An XRF unit was used for in-field analysis of the samples, and twenty percent of the samples were also sent to a lab for verification of the XRF results. The detection of arsenic by the XRF was limited, because lead masks arsenic when using XRF if the lead levels are greater than ten times the arsenic levels. However, all arsenic was found to be co-located with lead in all samples when it was detected, so the areal extent of contamination for lead encompasses the entire areal extent of contamination for arsenic. The areal extent encompassed approximately 5 square miles, centered near the four facilities thought to be responsible for the lead and arsenic contamination and consistent with the historical wind patterns of Evansville.

During January 2006 RI sampling event, after the areal extent of contamination was defined, 213 soil samples were collected from within the Site boundaries to use in the risk assessments and twelve samples were collected outside of the site limits to serve as background locations.

5.6.2 Background Levels

Twelve samples were collected as background samples from a depth interval of 0 to 2 inches below ground surface (bgs). Four of the samples were analyzed for arsenic, lead, and iron, and the remaining eight samples were analyzed for TAL inorganics. The background threshold statistic for this study is the 95 percent/95 percent background upper tolerance limit (UTL), that is, an upper bound (with 95 percent confidence) of the background 95th percentile. The calculation of the UTLs and other summary statistics are based on the complete background data set without excluding any detected concentrations. Outlier tests were performed on the background data set, in accordance with U.S. EPA guidance, and it was determined that no data would be excluded as outliers. Three metals were found to have background concentrations above typical background concentrations: lead, arsenic, and iron. The site specific background concentrations for these metals are 277 ppm, 16.9 ppm, and 30,400 ppm, respectively.

5.6.3 High Access Properties

Seventy-five samples were collected from potentially high access properties (parks, playgrounds, schools, and day care facilities). The soil samples were collected at an interval of 0 to 2 inches below ground and analyzed for lead, arsenic, and iron. Samples were taken at every high access property found within the OU1 boundaries. No high access properties within OU1 were found to have elevated levels of lead, arsenic, or iron.

5.6.4 Residential Properties

Samples were collected from the yards of 28 residential properties within OU1 at four discrete intervals: 0 to 2, 0 to 6, 6 to 12, and 12 to 18 inches below ground surface (bgs). Drip zone samples were collected from 0 to 2 inches bgs at 26 of the residential properties. Iron was not found above the background level of 30,400 ppm at any residential properties within OU1. Arsenic was found at four properties within OU1 at concentrations above the clean up level of 30 ppm:

- 0 to 2 inch interval—1 of 28 properties, with detected concentrations ranging from 3.9 to 31.2 ppm.
- 0 to 6 inch interval—1 of 28 properties, with detected concentrations ranging from 2.5 to 31.8 ppm.
- 6 to 12 inch interval—2 of 28 properties, with detected concentrations ranging from 7.0 to 37 ppm.

Lead was found at concentrations greater than 400 ppm at the following intervals and frequencies:

- 0 to 2 inch interval—20 of 28 properties, with detected concentrations ranging from 136 to 1,900 ppm.
- 0 to 6 inch interval—19 of 28 properties, with detected concentrations ranging from 88 to 1,070 ppm.
- 6 to 12 inch interval—8 of 28 properties, with detected concentrations ranging from 49.8 to 2,040 ppm.
- Drip zone samples—25 of 26 properties, with detected concentrations ranging from 20 to 8,210 ppm.

5.6.5 Groundwater Results

Eleven drinking wells were sampled. Two of the wells were within the sampling boundaries; the other nine wells were sampled to establish background concentrations. Groundwater samples were analyzed for arsenic, lead, and iron, with four of the samples analyzed for TAL inorganics. Manganese exceeded the screening level of 88 micrograms per liter (μg/L) at one location within the sampling boundaries, with a concentration of 283 μg/L. Therefore, manganese was further evaluated in the human health risk assessment due to additive effects of exposures to heavy metals. No other TAL inorganics exceeded screening levels in the groundwater samples.

5.6.6 Surface Water Results

Ten surface water locations were sampled from various locations in Pigeon Creek. Two samples were taken upgradient of the site to establish background levels. Surface water samples were analyzed for total (unfiltered) and dissolved (field filtered) inorganics. Hardness as calcium carbonate ($CaCO_3$) was analyzed in six of the surface water samples. Aluminum, barium, cadmium, dissolved cadmium, copper, iron, and manganese were detected in surface water at concentrations exceeding their respective screening levels. All seven of these analytes were also detected at similar concentrations at the background locations, so their presence is probably not site related. Nevertheless, all seven analytes were further evaluated in the risk assessments.

5.6.7 Sediment Results

Ten sediment samples were taken at the same locations as the surface water samples. Sediment samples were analyzed for TAL inorganics (excluding cyanide). Total organic carbon, pH, and grain size were analyzed in seven of the sediment samples, which were collected to determine physical characteristics of site-specific sediment for use in the ecological risk assessment. Antimony, cadmium, copper, lead, iron, manganese, nickel, silver, and zinc were detected in sediments at concentrations slightly exceeding their respective screening levels. All nine analytes were further evaluated in the risk assessments.

6.0 Current and Potential Future Land and Resource Uses

For purposes of the human health and ecological risk assessments for this Site, current and reasonably anticipated future land uses and current and potential beneficial groundwater uses were identified.

Residential properties within the Jacobsville Neighborhood Soil Contamination Site boundaries will be remediated as explained in this ROD. There is no indication that the residential properties in OU1 will be re-zoned. Therefore it assumed that the future land use at the properties addressed in this ROD will be residential use.

To determine the current groundwater use at the Site, a search for groundwater wells within the Jacobsville Neighborhood Soil Contamination Site was performed. No drinking water wells were found within the Site boundaries. The entire City of Evansville receives its water from the Evansville Water Filtration Plant, where 32 million gallons of treated water per day is distributed to 150,000 customers. Water quality conditions of the Ohio River are monitored continuously by the Ohio River Valley Water Sanitation Commission. Therefore groundwater is not currently used and is not anticipated to be used as a potable water source at the Site.

7.0 Summary of Site Risks

A baseline human health risk assessment (HHRA) and an ecological risk assessment (ERA) were prepared for the Jacobsville Neighborhood Soil Contamination Site, in order to evaluate potential risks to human health and the environment if no action is taken. To evaluate potential risks to human health from lead, the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Children was used in the HHRA. This process characterizes current and future threats or risks to human health and the environment posed by lead contaminated soils at the Site. To evaluate potential risks to human health from arsenic, a human health risk assessment was performed, consistent with U.S. EPA's Risk Assessment Guidance for Superfund (RAGS) (1989). The reasonable maximum exposure (RME) and central tendency exposure (CTE) were evaluated. This process characterizes current and future threats or risks to human health and the environment posed by arsenic contaminated soils at the Site. The risk assessments provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline HHRA and ERA for the Site. The HHRA and ERA determined that the COCs for the Site are lead and arsenic for residential and "other" soils, and that cleanup levels of 400 ppm and 30 ppm, respectively, will be protective of human health and the environment at the site for current and future residential use.

In accordance with U.S. EPA guidance on preparing RODs, the information presented here focuses on the information that is driving the need for the response action at the Jacobsville Neighborhood Soil Contamination Site and does not necessarily summarize the entire HHRA or ERA. Further information is contained in the risk assessments within the RI report, included in the Administrative Record for this Site.

7.1 Summary of Human Health Risk Assessment

The baseline HHRA estimates what risks to human health the site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline HHRA. More detailed information can be found in the RI.

The approach used in the HHRA relies on Tier I screening-level evaluations to identify media and exposure pathways that may pose unacceptable risks and more detailed (Tier II) baseline risk assessments that are considered if the Tier I screening-levels evaluations identify potentially significant risks. The HHRA evaluated the potential risks that could result to people from exposure to the contaminants at the Site. The HHRA conducted at this Site is consistent with U.S. EPA's Risk Assessment Guidance for Superfund (RAGS) and other supplemental guidance to evaluate human health risks. The HHRA identified possible receptors and potentially complete pathways of exposure. The information used in the HHRA helped define site-specific risk-based screening levels (RBSLs).

7.2 Identification of Contaminants of Concern

TAL inorganics were sampled in soil, groundwater, surface water, and sediment in and around the Site. The chemicals of potential concern (COPCs) were identified for soil, groundwater, and surface water using human health RBSLs. The following were identified as COPCs for the Jacobsville Neighborhood Soil Contamination Site:

- Surface Soil, Residential (yard) – arsenic, iron, and lead
- Surface Soil, Day care center – arsenic and iron
- Surface Soil, Other – arsenic, iron, and lead
- Groundwater, Private drinking water well – none

- Groundwater, Backup water well – manganese
- Surface Water, Pigeon Creek – cobalt, iron, lead, manganese, and mercury
- Sediment, Pigeon Creek – none

The maximum detected concentrations of the COPCs at each of the three soil exposure settings (general data groupings: residential, day care centers, and "other" properties) were used as exposure point concentrations (EPCs) for residents. This approach is appropriate since soil samples were collected from individual properties and a resident at the maximally affected property in each soil grouping could contact soil with those COPC concentrations rather than concentrations averaged over multiple properties.

The detected concentration of manganese in the one groundwater sample collected from the backup water well was used as the EPC for groundwater at the industrial property.

The 95 percent upper confidence limit (UCL) on the mean concentration of each surface water COPC was used as the EPC in surface water unless it exceeded the maximum detected concentration. The 95 percent UCLs were calculated using the most recent version of ProUCL (Version 3.00.02).

The EPCs in fish were modeled based on the calculated surface water EPCs and bioaccumulation factors available in U.S. EPA's Estimation Program Interface (EPI) software.

A chemical was identified as a COPC even if detected concentrations were within background levels. Potential Excess Lifetime Cancer Risks (ELCRs) and Hazard Indexes (HIs) were calculated using the COPCs. Contaminants above the recommended ELCRs and HIs that were also above background levels were retained as contaminants of concern (COCs). Lead and arsenic in residential and "other" soils were identified as COCs for the Jacobsville Neighborhood Soil Contamination Site.

During the risk assessment sampling, arsenic was detected in residential soils at 25 of 25 locations, at concentrations ranging from 4.8 to 31.2 ppm. Lead was detected in residential soils at 25 of 25 locations, at concentrations ranging from 20 to 8,210 ppm. Arsenic was detected in day care center soils at 7 of 7 locations, at concentrations ranging from 9.6 to 13.4 ppm. Lead was detected in day care center soils at 7 of 7 locations, at concentrations ranging from 23.4 to 145 ppm. Arsenic was detected in "other" soils (including playground, ballfield, park, library, gravel lot, and other) at 70 of 70 locations, at concentrations ranging from 4.1 to 18.2 ppm. Lead was detected in "other" soils at 70 of 70 locations, at concentrations ranging from 9.3 to 1,520 ppm.

Data quality objectives were met for the risk assessment sampling, as described in the RI report. Analytical data were available from soil, groundwater, surface water, and sediment samples collected during the RI field investigation. Soil analytical data from previous sampling events were not used in the risk assessments because soil samples were not sieved per U.S. EPA guidance. Risk assessment soil samples were taken from the 0 to 2 inch interval at residential, day care centers, and other properties. The samples (including those collected from drip zone areas) were used in the HHRA because they represent the soil most likely to contain higher inorganic concentrations. The sieved part of the sample is the part most likely to be retained on a person's skin, which may lead to absorption and accidental ingestions. Background soil samples available from 12 locations outside the U.S. EPA Sampling Boundary were used to characterize background soil quality nearby. Upper tolerance limits were calculated for arsenic, iron, and lead concentrations in background soil, as discussed in Section 5.6.2. Groundwater, surface water, and sediment sample data, including background sample data, were all within the data quality objectives for the project.

A summary of the COC data is presented in Table 1.

Table 1. Summary of Chemicals of Concern for the Jacobsville Neighborhood Soil Contamination Site.

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Soil

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Min	Max					
Residential Soil On-Site Contact	Arsenic	4.8	31.2	ppm	25/25	31.2	ppm	MAX
	Lead (IEUBK model)	20	8210	ppm	25/25	8210	ppm	MAX
Day care Soil On-Site Contact	Arsenic	9.6	13.4	ppm	7/7	13.4	ppm	MAX
	Lead (IEUBK model)	23.4	145	ppm	7/7	145	ppm	MAX
"Other" Soil On-Site Contact	Arsenic	4.1	18.2	ppm	70/70	18.2	ppm	MAX
	Lead (IEUBK model)	9.3	1520	ppm	70/70	1520	ppm	MAX

Key
ppm: parts pei million (mg/kg)
MAX: Maximum Concentration
Other: Other high access properties including playground, ballfield, park, library, gravel lot, and "other"

The table presents the chemicals of concern (COCs) and exposure point concentration for each of the COCs detected in soil at residential, day care centers, and "other" properties (i.e., the concentration that will be used to estimate the exposure and risk for each COC in the soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site for the HHRA), the exposure point concentration (EPC), and how the EPC was derived. The table indicates that arsenic and lead were detected at the same frequency at the Site, however, lead was detected at levels of concern at a much higher frequency than arsenic at the Site. The maximum detected concentration was used as the exposure point concentration. This approach is appropriate since soil samples were collected from individual properties and a resident at the maximally affected property in each soil grouping could contact soil with those COC concentrations rather than concentrations averaged over multiple properties.

7.2.1 Exposure Assessment

Various potential exposure pathways were quantitatively evaluated in the HHRA. These pathways are represented in the Conceptual Site Model (CSM) found in Figure 4 in Section 5 of this ROD. All potential exposure pathways represented in the CSM were evaluated to determine if they were complete pathways at this Site. Exposure point concentrations (EPCs) were calculated for the COPCs in each data grouping and used in estimating potential intakes and risks for the following receptors:

- Current/Future Residential Adult and Child (Residential Setting) – Ingestion, dermal contact, and inhalation of surface soil.

- Current/Future Residential Adult and Child (Day Care Center Setting) – Ingestion, dermal contact, and inhalation of surface soil.

- Current/Future Residential Adult and Child ("Other" Setting) – Ingestion, dermal contact, and inhalation of surface soil.

- Current/Future Industrial Worker – Ingestion of groundwater at the backup water well. Dermal contact exposures were not quantified because tap water likely would be used only occasional, brief hand washing or showering at work, and the COPC (manganese) would not be a significant concern for these types of exposures.

- Current/Future Adolescent Recreator – Dermal contact with surface water in Pigeon Creek.

- Current/Future Adult Angler – Ingestion of fish caught in Pigeon Creek.

Although both adult and child scenarios were calculated for the residential scenarios, the IEUBK Model for Children was used, therefore addressing the higher sensitivity of children to lead exposure.

Default exposure values from U.S. EPA human health risk assessment guidance documents were used in the risk calculations for this Site.

To identify a site-specific soil exposure frequency, the climate conditions related to exposure to bare soil within the sampling boundary were evaluated. Several sources of meteorological data were consulted. The data indicate that snow cover is not extensive in Evansville. Therefore, the mean number of days with snowfall or precipitation was evaluated.

The mean number of days in a year with snowfall of 1 inch or more for Evansville is 13.7, with the maximum in a month being January with 4.4 days. The average month of the first 1-inch snowfall is December, and the average month of the last 1-inch snow fall is March. Similarly, the average high temperature is above freezing each month. Therefore, it was assumed that there is no continuous snow cover or frozen ground in the area and that the number of days of snowfall is included in the number of rainy days.

There are, on average, 115 days with rainfall for the year. Thus, there are 250 days where there would be expected to be no snow cover and no precipitation, and therefore exposure to bare soils by residents. The 250 days per year of exposure was used in both the IEUBK model and arsenic risk assessment calculation.

7.2.2 *Toxicity Assessment*

The residential and industrial scenarios are most likely long term exposures, so chronic and subchronic exposure values were used in these risk scenarios. A conservative approach was used with the recreator and angler scenarios, and chronic and subchronic exposure values were used in these risk scenarios as well. A summary of the Toxicity Assessment is presented in Tables 2 and 3.

The following hierarchy of sources was used to obtain toxicity data for COPCs in soil, groundwater, and surface water within the sampling boundary:

- Integrated Risk Information System (U.S. EPA 2006)
- Provisional Peer-Reviewed Toxicity Values (USEPA Region 9, 2004)
- Health Effects Assessment Summary Tables (U.S. EPA 1997)

The available toxicity data indicate that the following COPCs have non-carcinogenic effects on primary target organs, and were therefore evaluated as such:

- Arsenic, Oral/Dermal – Skin (chronic and subchronic)
- Mercury, Oral/Dermal – Immune system (chronic and subchronic)
- Manganese, Inhalation – Neurological (chronic)

A chemical was identified as a COPC, even if detected concentrations were within background levels. Potential Excess Lifetime Cancer Risks (ELCRs) and Hazard Indexes (HIs) were calculated using the COPCs. ELCRs were calculated for the adult/child carcinogenic exposure scenario using the default exposure duration of 70 years. The HI for the adult non-carcinogenic exposure scenario was calculated using the default exposure duration of 24 years. The HI for the child non-carcinogenic exposure scenario was calculated using the default exposure duration of 6 years. Contaminants above the recommended ELCRs and HIs that were also above background were retained as contaminants of concern (COCs). Lead and arsenic in residential and "other" soils were identified as COCs for the Jacobsville Neighborhood Soil Contamination Site.

Table 2. Cancer Toxicity Data Summary for the Jacobsville Neighborhood Soil Contamination Site

Cancer Toxicity Data Summary						
Pathway: Ingestion, Dermal						
Chemical of Concern	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/Cancer Guideline Description	Source	Date
Arsenic	1.5	1.5	$(mg/kg\text{-}day)^{-1}$	A	IRIS	05/01/2006
Lead	NA	NA	NA	B2	IRIS	05/01/2006

Pathway: Inhalation							
Chemical of Concern	Unit Risk	Units	Inhalation Cancer Slope Factor	Units	Weight of Evidence/Cancer Guideline Description	Source	Date
Arsenic	0.0043	$(\mu g/m^3)^{-1}$	15	$(mg/kg\text{-}day)^{-1}$	A	IRIS	05/01/2006
Lead	NA	NA	NA	NA	B2	IRIS	05/01/2006

Key

EPA Group:

NA: Not available

IRIS: Integrated Risk Information System, U.S. EPA

- A- Known Human Carcinogen
- B1- Probable human carcinogen—indicates that limited human data are available
- B2- Probable human carcinogen—indicates sufficient evidence in animals and inadequate or no evidence in humans
- C- Possible human carcinogen
- D- Not classifiable as a human carcinogen
- E- Evidence of Noncarcinogenicity

This table provides carcinogenic risk information which is relevant to the contaminants of concern in soil. At this time, slope factors are not available for lead for oral, dermal, or inhalation routes of exposures. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed vial the oral route. An adjustment factor of 95% was used for arsenic. Therefore, a slightly lower value than is presented above was used as the dermal carcinogenic slope factor for arsenic.

Table 3. Non-Cancer Toxicity Data Summary for the Jacobsville Neighborhood Soil Contamination Site

Non-Cancer Toxicity Data Summary									
Pathway: Ingestion, Dermal									
Chemical of Concern	Chronic/ Subchronic	Oral Rfd Value	Oral RfD Units	Dermal RfD Value	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ
Arsenic	Chronic	3.0E-04	mg/kg-day	3.0E-04	mg/kg-day	Skin	3/1	IRIS	05/01/2006
Arsenic	Subchronic	3.0E-04	mg/kg-day	3.0E-04	mg/kg-day	Skin	3	HEAST	07/31/1997
Lead	Chronic/ Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Pathway: Inhalation									
Chemical of Concern	Chronic/ Subchronic	Inhalation RfC Value	Inhalation Rfc Units	Inhalation RfD Value	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfC:RfD: Target Organ	Dates of RfD: Target Organ
Arsenic	Chronic/ Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Lead	Chronic/ Subchronic	NA	NA	NA	NA	NA	NA	NA	NA

Key
EPA Group:
NA: Not available
IRIS: Integrated Risk Information System, U.S. EPA
HEAST: Health Effects Assessment Summary Tables, U.S. EPA

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in soil. At this time, RfD are not available for lead for oral, dermal, or inhalation routes of exposures and arsenic for the inhalation route of exposure. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed vial the oral route. An adjustment factor of 95% was used for arsenic. Therefore, a slightly lower value than was presented above is used as the dermal carcinogenic slope factor for arsenic.

7.2.3 Risk Characterization

For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

Risk = CDI x SF

Where: risk = a unitless probability (e.g., 2×10^{-5}) of an individuals developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as $(\text{mg/kg-day})^{-1}$

These risks are probabilities that usually are expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime risk of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure (RME) estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as "excess lifetime cancer risk" (ELCR) because it would be in addition to the risks of cancer individuals faces from other causes such as smoking or exposure to sunlight. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. U.S. EPA's generally acceptable risk range for site-related exposures is 10^{-4} to 10^{-6}.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ<1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI<1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. An HI>1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

Non-cancer HQ = CDI/RfD

Where: CDI = Chronic Daily Intake
RfD = Reference Dose

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

The U.S. EPA has developed the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children to predict blood lead levels (BLLs) in children exposed to lead. Because lead does not have a nationally approved reference does (RfD), slope factor, or other accepted toxicological factor which can be used to assess risk, standard risk assessment methods cannot be used to evaluate the health risks associated with lead contamination. The IEUBK model calculates the probability that a child will have a BLL greater than 10 micrograms of lead per deciliter of blood (µg/dL). BLLs above 10 µg/dL have been directly related to adverse health effects in adults and children. The U.S. EPA expects that the IEUBK model is used to develop lead cleanup levels at Superfund sites.

The IEUBK Model for Lead in Children was used to evaluate the risks posed to young children as a result of the lead contamination at this Site. The IEUBK Model was run using site specific data to predict a lead soil level that will be protective of children and other residents. Site-specific soil concentrations for lead, found in Appendix D, were used in place of model default values. Drip zone samples were included in the IEUBK model calculations.

A bioavailability study was also performed to determine a more specific evaluation of the lead present at the site. Bioavailability is the fraction of lead in the soil matrix that can be absorbed into the bloodstream by a specific exposure pathway. Nineteen samples were collected from residential soils at the site for bioavailability analysis. The results were evaluated for relative and absolute bioavailability. The bioavailability study results are discussed in the next paragraph and the report is included in the Administrative Record.

A blood lead level study was not conducted at this Site because the areas that contained the highest levels of lead have a high percentage of rental properties that experience frequent tenant turnover. However, some lead data was available from the Vanderburgh County Health Department that indicated that there have been BLLs in children within OU1 that were above 10 μg/dL. To protect current and future residents in OU1, the IEUBK model was also run using the bioavailability results from the site-specific bioavailability study. This evaluation was used to calculate a range of lead concentrations in the soil that correspond to the U.S. EPA target level of 95 percent of the population with a BLL below 10μg/dL. The range of cleanup levels calculated from the study was from 306 to 467 ppm. Therefore, the default cleanup level for lead in residential soils of 400 ppm is considered protective of human health and will be used for OU1.

After evaluating all COPCs for the appropriate exposure scenarios, only lead and arsenic were retained as contaminants of concern (COCs) due to the current/future residential adult and child (residential setting) and current/future residential adult and child (other setting) scenarios. Non-carcinogenic effects attributable to COPCs other than lead at the Site were found to be negligible for all exposure scenarios. Table 4 summarizes the carcinogenic risk summary attributable to the Site. The evaluation of the risk scenarios is summarized below.

Residential Setting

Potential ingestion, dermal contact, and inhalation exposures to surface soil COPCs (arsenic, iron, and lead) were quantified for adult and child residents in a residential setting. For the RME to arsenic scenario, an ELCR of 6×10^{-5} and HIs of 0.1 and 1 were calculated for residential setting adult/child, adult, and child receptors, respectively. For the CTE to arsenic scenario, an ELCR of 2×10^{-5} and HIs of 0.05 and 0.5 were calculated for residential setting adult/child, adult, and child receptors, respectively.

Based on the IEUBK Model, the predicted BLL concentrations exceeded the target criterion (<5 percent of the child population with a BLL greater than 10 μg/dL) at 25 individual residential properties. When averaging all predicted results from the residential yards, the probability of the "neighborhood average" child population having a BLL exceeding 10 μg/dL was 55.6 percent.

Although the ELCR for arsenic did not exceed 1×10^{-4}, it posed an ELCR greater than 1×10^{-6}. No COPCs exceeded an HI of 1. The percentage of the "neighborhood average" child population with a BLL greater than 10 μg/dL exceeded the target of 5 percent. The maximum detected concentrations of arsenic and lead at residential properties exceeded background UTLs for these chemicals. Therefore, arsenic and lead were identified as COCs for adult and child residents at residential properties.

"Other" Properties

Potential ingestion, dermal contact, and inhalation exposures to surface soil COPCs (arsenic, iron, and lead) were quantified for adult and child residents on properties used for "other" purposes (including playground, ballfield, park, library, gravel lot, and others). For the RMF scenario, an ELCR of 3×10^{-5} and HIs of 0.07 and 0.6 were calculated for residential setting adult/child, adult, and child receptors, respectively. For the CTE scenario, an ELCR of 1 x 10^{-5} and HIs of 0.03 and 0.3 were calculated for residential setting adult/child, adult, and child receptors, respectively.

Predicted BLL concentrations based on the IEUBK Model exceeded the target criterion on one property. When averaging all predicted results from the "other" properties, IEUBK predicted that the probability of the "neighborhood average" child population having a BLL exceeding 10 µg/dL was 0.553 percent.

Although the ELCR for arsenic did not exceed 1 x 10^{-4}, it posed an ELCR greater than 1x 10^{-6}. No COPCs exceeded an HI of 1. The percentage of the "neighborhood average" child population with a BLL greater than 10 µg/dL was less than the target of 5 percent. The maximum detected concentrations of arsenic and lead at residential properties exceeded background UTLs for these chemicals. Therefore, arsenic and lead were identified as COCs for adult and child residents at "other" properties.

The calculated ELCRs and HIs for RME scenarios used to identify COCs are estimates of potential upper-bound risks that are useful in regulatory decision-making. All assumptions, such as lifetime of exposure and number of days per year of exposure, are also conservative estimates that have an additive effect of overestimating the risk. This is done to ensure the cleanup level selected is protective of human health. Also, drip zone samples were included in the risk assessment calculations. Drip zone samples typically contain higher levels of lead, due to lead-based paint on houses or airborne deposition on roofs and subsequent washing into soils in yards. However, when the drip zone samples were removed from the risk analysis, only four fewer residential properties were predicted to exceed the target BLL criterion.

Table 4. Summary of Carcinogenic Risk Characterization for Arsenic at the Site

Risk Characterization Summary—Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk: Ingestion	Carcinogenic Risk: Inhalation	Carcinogenic Risk: Dermal	Carcinogenic Risk: Exposure Routes Total
Surface Soil	Residential (Yard)	Soil On-Site Adult/Child RME	Arsenic	5.2E-05	NA	5.0E-06	5.7E-05
	Day Care	Soil On-Site Adult/Child RME	Arsenic	2.2E-05	NA	2.1E-06	2.5E-05
	"Other" Properties	Soil On-Site Adult/Child RME	Arsenic	3.1E-05	NA	2.9E-06	3.3E-05
						Total Risk	1.2E-04

Key

NA: Route of exposure is not applicable to this medium

Table 4 provides risk estimates for the significant routes of exposure. These risk estimates are based on a Reasonable Maximum Exposure (RME) scenario and were developed taking into account various assumptions about the frequency and duration of an adult's and/or child's exposure to soil in residential areas, as well as the toxicity of arsenic. The total risk from direct exposure to contaminated soil at this site to a current resident is estimated to be 1.2E-04. The COC contributing most to this risk level is arsenic. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 12 in 100,000 of developing cancer as a result of Site related exposure to COCs.

Table 5. Summary of Non-Carcinogenic Risk Characterization for Arsenic at the Site

Risk Characterization Summary—Non-Carcinogens								
Scenario Timeframe: Current/Future **Receptor Population:** Resident **Receptor Age:** Child								
Medium	**Exposure Medium**	**Exposure Point**	**Chemical of Concern**	**Primary Target Organ**	**Non-Carcinogenic Hazard Quotient**			
					Ingestion	**Inhalation**	**Dermal**	**Exposure Routes Total**
Surface Soil	Residential (Yard)	Soil On-Site Child RME	Arsenic	skin	9.5E-01	NA	8.0E-02	1.0E-01
		Ambient Air (Dust)	Arsenic	NA	NA	NA	NA	NA
							Soil Hazard Index Total	1.0E-01
							Receptor Hazard Index	1.0E-01
							Skin Hazard Index	1.0E-01
Key NA: Route of Exposure is not applicable to this medium								
Note: There are non-carcinogenic risks posed by lead at the Site, however the risks were quantified using the IEUBK model and are not comparable to HQs, therefore they were not included in this table.								

Table 5 provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all complete routes of exposure based on a RME scenario. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index greater than 1 indicates the potential for adverse noncancer effects. The estimated HI of 1 indicates that there is a slight potential for adverse noncancer effects could occur from exposure to contaminated soil containing arsenic. In addition, since the risk from lead is calculated using the IEUBK model, the additive effects can not be evaluated, so there is a higher potential for noncancer effects than indicated by the HI of 1.

7.3 Summary of Ecological Risk Assessment

The baseline ERA estimates what, if any, risks the Site poses to the ecological receptors at the Site if no action were taken. It can provide a basis for taking action and identifies contaminants and ecological receptors that may need to be addressed by the remedial action.

The approach used in the ERA relies on screening level evaluations as described in U.S. EPA ERA guidance. The ERA considers those chemicals that were detected in surface soils, surface water, and sediment. The assessment incorporates both measured and modeled estimates of exposure, the available guidance and published information on the environmental fate and toxicities of the chemicals evaluated, and the expected/known habitats and likely species in the area. As recommended by U.S. EPA guidance, after the screening-level ERA, a baseline ERA was performed on the set of contaminants of potential ecological concern (COPECS) from the screening level ERA, with more realistic exposure assumptions. The ERA was performed for the entire site, not specifically for OU1. Therefore, not all information will pertain to OU1. More detailed information is presented in the RI report.

7.3.1 Identification of Contaminants of Potential Ecological Concern

Most samples taken at the Site had a majority of TAL metals above ecological screening levels and were evaluated in the screening ERA. The contaminants identified as COPECS and retained for the baseline ERA were arsenic, iron, and lead. The sources used for screening toxicity values used in the baseline ERA are as follows: *Ecological Soil Screening Value for Arsenic*, U.S. EPA Office of Solid Waste and Emergency Response, March 2005 was referenced for flora exposure to arsenic; *Ecological Soil Screening Value for Lead*, U.S. EPA Office of Solid Waste and Emergency Response, March 2005 was referenced for flora and fauna exposure to lead; *Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment*, U.S. EPA Region 4, Website updated November 2001 was referenced for flora exposure to iron; and Efroymson et al. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants*, 1997 Revision was referenced for fauna exposure to arsenic and iron.

After calculating the ecological Hazard Quotients (HQs) for each COPEC in soil, iron and lead were retained as COPECS for both flora and fauna exposure to soils, and arsenic was retained as a COPEC for flora exposure to soils. The HQs for the evaluated COPEC were: 1.73 for flora exposure to arsenic, 151 for flora exposed to iron, 71.4 for flora exposed to lead, 0.52 for fauna exposed to arsenic, 151 for fauna exposed to iron, and 4.83 for fauna exposed to lead. The range of concentrations detected for the COPECs are 4.14 to 31.2 ppm for arsenic, 9,060 to 30,200 ppm for iron, and 9.3 to 8,210 ppm for lead. Background concentrations for arsenic, iron, and lead were found to be 16.9 ppm, 30,400 ppm, and 277 ppm, respectively. The mean concentrations for arsenic, iron, and lead were found to be 10.7 ppm, 19,000 ppm, and 750 ppm, respectively. The frequency of detection of the COPECs was 103 detected out of 103 samples for arsenic, 103 detected out of 103 samples for iron, and 129 detected out of 129 samples for lead. All data obtained in the January 2006 risk assessment sampling met data quality objectives for the project and was deemed suitable for use. This data is summarized in Table 6.

Table 6. Summary of Chemicals of Potential Ecological Concern for the Jacobsville Neighborhood Soil Contamination Site

Occurrence, Distribution, and Selection of Chemicals of Potential Ecological Concern (COPECs)									
Exposure Medium: Soil									
Chemical of Potential Concern	Minimum Conc.[1] (ppm)	Maximum Conc.[1] (ppm)	Mean Conc.[2] (ppm)	Standard Deviation	Background Conc. (ppm)	Screening Toxicity Value (ppm)	Screening Toxicity Value Source[3]	HQ Value[4]	COPEC flag
Soil Flora Arsenic	4.1	31.2	10.7	4.27	16.9	18.0	EPA1	1.73	Y
Soil Flora Iron	9060	30200	19000	4580	30400	200	EPA2	151	Y
Soil Flora Lead	9.3	8210	750	1470	277	115	EPA3	71.4	Y
Soil Fauna Arsenic	4.1	31.2	10.7	4.27	16.9	60.0	Efroymson	0.52	N
Soil Fauna Iron	9060	30200	19000	4580	30400	200	Efroymson	151	Y
Soil Fauna Lead	9.3	8210	750	1470	277	1700	EPA3	4.83	Y

Key
Conc. = Concentration

Notes
[1]Minimum/maximum detected concentration above the sample quantitation limit (SQL)
[2]Value calculated using ½ reporting limit for nondetects
[3]EPA1 = *Ecological Soil Screening Value for Arsenic*, U.S. EPA Office of Solid Waste and Emergency Response, March 2005
EPA2 = *Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment*, U.S. EPA Region 4, Website updated November 2001
EPA3 = *Ecological Soil Screening Value for Lead*, U.S. EPA Office of Solid Waste and Emergency Response, March 2005
Efroymson = Efroymson et al. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants*, 1997 Revision
[4]Hazard Quotient (HQ) is defined as Maximum Concentration/Screening Toxicity Value

7.3.2 Exposure Assessment

The environmental setting of the assessment area encompassing the Jacobsville Neighborhood Soil Contamination Site consists primarily of residential properties, commercial/industrial properties, and municipal facilities. The Ohio River is the dominant aquatic feature in the region. Evansville is situated in the southwestern part of the state on the north bank of the Ohio River, 792 river miles below Pittsburgh. A levee system protects the City of Evansville during periods of high water.

Pigeon Creek is a perennial stream that enters the sampling boundary from the north and discharges into the Ohio River about 2 miles downstream, at the southern boundary of the sampling limits. Pigeon Creek originates in Princeton, Indiana, 41 river miles upstream from its discharge point, and drains a watershed of 235,000 acres. Within the sampling boundary, the creek is 15 to 75 feet wide and 5 to more than 20 feet deep. When sampling occurred, in January 2006, the water generally was turbid with moderate to slow stream flow. The creek banks are eroded and terraced, and sediment is highly compacted, indicating widely fluctuating flows. Most parts of the creek within the sampling boundary are affected by human activities. Pigeon Creek is a critical component of the levee system protecting the City of Evansville. Riprap along the banks is common where bridges cross the creek. Refuse also litters the banks. There is little to no riparian buffer along most of the creek, with turf grass encroachment up to the banks. In some areas, a forested riparian buffer, composed of willow, silver maple, black gum, American sycamore, green ash, and oak is present, and waterfowl, fish, invertebrates, frogs, and a beaver were observed.

The ecological terrestrial habitat is limited to maintained/mowed grassy areas and trees interspersed along roadways and in playgrounds/parks. Since the Site is almost exclusively in an urban residential area, many of the species local to the area (Southwest Indiana) may not occur in the assessment area or are rare visitors. Nonetheless, the ERA identified 110 species of trees shrubs and ferns, 36 amphibians and reptiles, 101 species of birds, and 30 species of mammals, that may be found in Southwestern Indiana. Two special status species were identified by U.S. Fish and Wildlife Service (U.S. FWS) and 6 species of special status were identified by Indiana Department of Natural Resources (IDNR) that may be found in Southwestern Indiana. More detailed information about these species can be found in the RI. The most commonly observed birds in the area were the common grackle, European starling, red-winged blackbird, ring-billed gull, mourning dove, Canada goose, and mallard. Mammalian species common in urban settings, such as squirrels, deer, raccoons, skunks, opossums, beaver, mice, rats, and bats are expected to occur in the Site. The two species identified by the U.S. FWS are the Federally endangered Indiana bat and the Federally threatened bald eagle, and are in decline in most of Southwestern Indiana. The 6 special status species identified by IDNR are Ohio Pigtoe, Hellbender, Great Egret, Peregrine Falcon, Bald Eagle, Indiana Bat, and American Badger, and are also in decline in most of Southwestern Indiana. More detailed information is presented in the RI report.

Arsenic, iron, and lead were identified as Chemicals of Potential Ecological Concern (COPECs) in surface soil as a result of historical activities. Complete exposure pathways exist for terrestrial ecological receptors within the Site boundary. Terrestrial animals may be exposed to chemicals in soil by direct contact with the soil, incidental ingestion of soil, and ingestion of contaminated food items for chemicals that have entered food webs. Terrestrial vegetation may be exposed to chemicals by direct contact of roots to soils. Exposure to chemicals present in the surface soil by dermal contact may occur but is unlikely to represent a major exposure pathway for bird and mammal receptors because fur or feathers minimize transfer of chemicals across dermal tissue. Direct contact is a potential exposure route for soil invertebrates. The chemical contribution from the inhalation pathway generally is insignificant for bird and mammal ecological receptors relative to ingestion pathways, and so the air pathway was not considered for ecological receptors. See Figure 5 for a diagram of the Ecological Conceptual Site Model, and Table 7 for exposure pathways of concern.

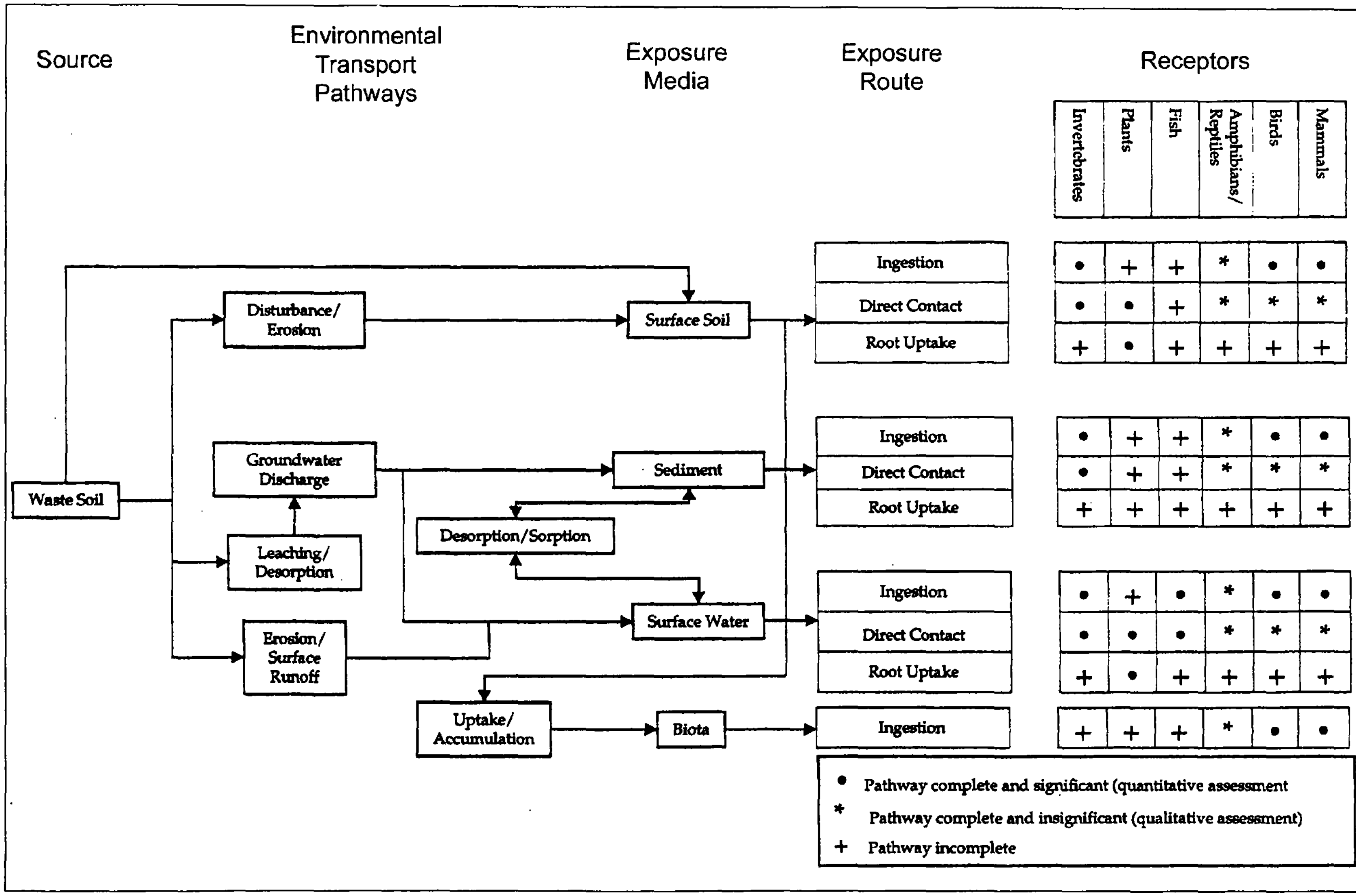

Figure 5. Ecological Conceptual Site Model for the Jacobsville Neighborhood Soil Contamination Site.

Table 7. Summary of Ecological Exposure Pathways of Concern at the Jacobsville Neighborhood Soil Contamination Site

Ecological Exposure Pathways of Concern						
Exposure Medium	Sensitive Environment Flag (Y or N)	Receptor	Endangered/ Threatened Species Flag (Y or N)	Exposure Routes	Assessment Endpoints	Measurement Endpoints
Soil	N	Invertebrates	N	Ingestion, Direct Contact	Survival, growth, and reproduction	Toxicity reference values for soil invertebrates
	N	Plants	N	Direct Contact	Survival, growth, and reproduction	Toxicity reference values for plants
	N	Birds	N	Ingestion	Survival, growth, and reproduction	Literature-derived chronic NOAEL values for survival, growth, and or reproductive effects with modeled dietary exposure doses for American robin, Red-tailed hawk, and Mourning dove
	N	Mammals	N	Ingestion	Survival, growth, and reproduction	Literature-derived chronic NOAEL values for survival, growth, and or reproductive effects with modeled dietary exposure doses for Short-tailed shrew, Meadow vole, and Red fox
Biota (soil)	N	Birds	N	Ingestion	Survival, growth, and reproduction	Literature-derived chronic NOAEL values for survival, growth, and or reproductive effects with modeled dietary exposure doses for American robin, Red-tailed hawk, and Mourning dove
	N	Mammals	N	Ingestion	Survival, growth, and reproduction	Literature-derived chronic NOAEL values for survival, growth, and or reproductive effects with modeled dietary exposure doses for Short-tailed shrew, Meadow vole, and Red fox

Risk estimates in the baseline ERA were based on average (arithmetic mean) chemical concentrations. Central tendency estimates for exposure parameters and for body weight and ingestion rate were used to represent realistic exposure estimates to flora and fauna evaluated in the ERA. Concentrations of chemicals below background levels were not considered in the baseline ERA since they are unlikely to have an impact on the assessment endpoints evaluated in the ERA. The frequency of detection, spatial distribution of exceedances of screening levels, and association of exceedances with habitat quality were also considered in the baseline ERA. Chemicals that had no or few exceedances in suitable habitat or that were spatially isolated were not considered to have population-level effects.

7.3.3 Ecological Effects Assessment

Because average concentrations of arsenic in surface soil (soil flora) and lead in surface soil (soil fauna) were below conservative screening values, risks associated with these chemicals are considered negligible to the community-level assessment endpoints evaluated in the baseline

ERA, and no further investigation was warranted. Iron and lead in surface soil were further evaluated by a comparison to background levels. Sample concentrations of iron in surface soil were below site-specific background levels and therefore were not considered to be site-related. Therefore, no further investigation was warranted. Concentrations of lead in surface soil exceeded the soil flora screening level (115 mg/kg) at 71 of 129 locations, with 52 of the samples occurring within the OU1 boundary. All samples collected within the OU1 boundary exceeded the soil flora screening level. An evaluation of sample locations that exceeded the soil flora screening level found no natural vegetative features, as all terrestrial plants consist of maintained grassy/treed areas in urban/residential properties. Concentrations above 115 mg/kg can inhibit the growth of plants. Injury to terrestrial plants on properties within the sampling boundary has not been observed, although investigations specific to this purpose were not conducted.

Although concentrations of lead in surface soil exceed soil flora screening levels, impacts to terrestrial plants are not expected because the terrestrial communities in areas with the highest concentration are essentially manmade and are routinely disturbed or artificially maintained. Since the sample concentrations are largely reflective of conditions within disturbed areas, the exposed plant populations would be controlled by human activity, and further evaluation of the risks to plants from lead was not considered warranted.

7.3.4 Ecological Risk Characterization

Arsenic, iron, and lead in surface soil had maximum concentrations or exposure doses that exceeded screening values and were retained as COPECS for further evaluation. However, based on COPEC evaluation using more realistic assumptions, potential risks to terrestrial receptors in the Jacobsville Neighborhood Soil Contamination Site is considered negligible.

Risk to special-status birds and mammals (also representative of special-status amphibians and reptiles) are also considered negligible. Screening-level exceedances for birds and mammals were based primarily on high concentrations near the immediate source area. Habitat for terrestrial receptors near the immediate source area is considered low quality, and is expected to significantly limit exposure to these areas. Therefore, the cleanup goals developed in the HHRA are protective of the ecological community at this Site.

7.4 Risk Assessment Conclusions

The risk to human health from lead and arsenic in residential soils is driving the need for remedial action for the Jacobsville Neighborhood Soil Contamination Site. The response action selected in this ROD is necessary to protect public health or welfare or the environment from actual or threatened releases of pollutants or contaminants from this site which may present an imminent and substantial endangerment to public health or welfare.

8.0 Remedial Action Objectives and ARARS

8.1 Remedial Action Objectives (RAOs)

Remedial Action Objectives (RAOs) are goals specific to media or operable units for protecting human health and the environment. Risk can be associated with current or potential future exposures to residential soils. A single RAO was developed for OU1 based in part on the contaminant levels and exposure pathways found to present potentially unacceptable risk to human health as determined in the RI. The RAO, remediation goals, and remediation strategies developed address constituents posing unacceptable risk to residents.

The RAO for the Site is to control concentrations of arsenic and lead in residential soil that present a human health risk by minimizing the potential for dermal contact, ingestion, and inhalation exposures.

The RAO will be achieved by addressing all residential soils above the risk-based cleanup levels based on site-specific background levels and the HHRA for the Site. The cleanup level at the Site for lead is 400 parts per million (ppm), based on the IEUBK modeling of Site data. The cleanup level for lead corresponds to less than 5 percent probability of the child population at the Site having BLLs above 10 µg/dL, which is the recommended target per U.S. EPA guidance. The cleanup level for arsenic at the Site is 30 ppm, based on risk assessments and Site background concentrations of arsenic. The cleanup level for arsenic corresponds to a ELCR of 1×10^{-4} ELCR, which is within the range required by the National Contingency Plan (NCP).

8.2 Applicable or Relevant and Appropriate Requirements (ARARs)

CERCLA, as amended by SARA, specifies that Superfund remedial actions must comply with the substantive requirements of federal and state environmental laws. Such requirements may be applicable or relevant and appropriate requirements (ARARs). In addition to ARARs, federal and state advisories and guidance documents exist that, although not binding regulations, contain information "to be considered" (TBC). ARARs and TBCs are important in developing remedial objectives that comply with regulatory requirements or guidance (as appropriate). The identification of site-specific ARARs is based on specific constituents at a site, the various response actions proposed, and the general site characteristics. As such, ARARs are classified into three general categories:

Chemical-specific ARARs – specific to the type(s) of constituents, pollutants, or hazardous substances at a site; include state and federal requirements that regulate contaminant levels in various media;

Action-specific ARARs – specific to the cleanup activities being considered; usually technology- or activity-based; regulatory requirements that define acceptable excavation, treatment, and disposal procedures; and

Location-specific ARARs – specific to actions at the geographic location; requirements for contaminant concentrations or remedial activities resulting from a site's physical location (e.g., wetlands or floodplains).

Potentially applicable federal, state and local ARARs and TBCs are summarized in Appendix C.

9.0 Description of Alternatives

Following development of the RAOs, a screening and evaluation of potential remedial alternatives was conducted in accordance with CERCLA and the NCP in the Feasibility Study (FS) Report. Remedial technologies screened for this Site can be found in Appendix E.

The technologies that remained following screening were assembled into remedial alternatives that meet RAOs and satisfy ARARs. The specific details of the remedial components discussed for each alternative are intended to serve as representative examples.

The preliminary remedial alternatives identified for soil are: Alternative 1, No Action; Alternative 2, Soil Excavation, Backfill, and Site Restoration; and Alternative 3, In Situ Treatment and Site Restoration.

For the purpose of this ROD and the remedial action, a residential lot includes properties that contain single- and multi-family dwellings, apartment complexes, schools, day care centers, playgrounds, parks, greenways, and vacant lots zoned residential that are near other residential lots, per U.S. EPA guidance. Therefore, this ROD covers residential and high access property designations as presented in the RI Report. There are 508 residential lots within OU1, and approximately 75 properties are being addressed by the Jacobsville Neighborhood Soil Contamination Removal Action discussed in Section 2.3.2. Only residential lots with soil concentrations exceeding 400 ppm lead or 30 ppm arsenic will be addressed by the selected remedy , and the FS report estimated that 90 percent of the residential lots in OU1 will have concentrations above the cleanup levels and require remediation.

9.1 Description of Remedy Components

Each of the alternatives is briefly described below. More detailed information about each of the alternatives can be found in the FS report, which is included in the Administrative Record for the Site.

<u>Alternative 1 – No Action</u>

Alternative 1 consists of taking no action. The NCP requires that a no-action alternative be retained throughout the FS process as a baseline for comparison to the other approaches. The no-action alternative would leave affected soil in place at the site. There are no capital or operations and maintenance (O&M) costs associated with Alternative 1. However, the NCP requires 5-year site reviews as long as hazardous substances remain at the site at concentrations that do not allow unlimited use and unrestricted exposure.

Alternative 2—Soil Excavation, Backfill and Site Restoration

Alternative 2 consists of excavating soil with arsenic and lead levels exceeding the Site cleanup levels from residential lots, offsite disposal at a permitted Subtitle D landfill, backfilling with clean soil, and site restoration. Soil is to be excavated to a maximum depth of two feet, and if verification sampling finds that lead remains at levels above the cleanup goal below a depth of two feet, institutional controls (ICs) such as restrictive covenants will be implemented. This alternative assumes that the excavated soil will not be characterized as hazardous waste. Treatment of the Subtitle D soils is not required prior to disposal and therefore was not evaluated. The excavation will be backfilled with clean fill and top soil and restored to original property condition.

The main components of Alternative 2 include the following:

- Gaining access to residential properties;
- Sampling residential yards that were not sampled during previous sampling events to determine the need for remedial actions at the property or part of the property;
- Collecting soil samples from residential lots to verify that the soil is not characteristically hazardous for disposal purposes;
- Completing residential property checklists, taking inventory of current vegetation, and collecting photographic documentation of current property conditions outside and potentially inside structures on the property;
- Clearing and soil removal of individual residential lots;
- Excavating contaminated soils to a predetermined depth based on initial sampling;
- Transporting and disposing of soil at an approved Subtitle D landfill;
- Verification sampling of soils below the excavation depth;
- Backfilling excavation with clean general fill and topsoil;
- Restoring the property to as close to original conditions as possible;
- Implementation of ICs such as restrictive covenants at properties where lead levels greater than the cleanup goal remain at depths greater than two feet. Since lead and arsenic above cleanup levels have not been found at depths greater than one foot at the Site, U.S. EPA believes that ICs will not be necessary at this Site; and
- Properties needing remediation but not granting access for sampling and cleanup will have restrictive covenants placed on properties consistent with local and state government authority.

Alternative 3—In Situ Treatment and Site Restoration

Alternative 3 consists of implementing in situ treatment of the contaminated soil followed by placement of 6 inches of topsoil to establish vegetative growth as part of site restoration. A bench-scale test may be required to determine the proper chemistry of the mixing reagent. Soil mixing technology will be used to distribute the reagent. Soil confirmation samples in the form of toxicity characteristic leaching procedure (TCLP) or synthetic precipitation leaching procedure (SPLP) will be required to determine if treatment is successful. Minimal grading operations may be required during installation of top soil to ensure proper drainage during site restoration. Properties requiring treatment that are located between properties not requiring treatment may require disposal of excess treated soil to maintain property surface drainage.

Five-year reviews will be required to assess the long-term effectiveness of soil treatment. This will require a site reconnaissance visit and periodic sampling of treated properties.

Alternative 3 has the following main components:

- Gaining access to residential properties;
- Sampling of individual residential properties that were not sampled during previous sampling rounds to determine the need for remedial actions at the property;
- Completing residential property checklists, taking inventory of current vegetation, and collecting photographic documentation of current property conditions outside and potentially inside structures on the property;
- Clearing and soil disturbance to expose soil;
- Performing in situ soil mixing using Enviroblend® or a similar reagent;
- Removing excess soil for offsite disposal as required to maintain drainage or match existing grades;
- Analyzing post-treated soil to verify treatment effectiveness;
- Placement of 6 inches of topsoil on treated areas;
- Restoring the properties as close to original conditions as possible;
- Performing monitoring and five year reviews for OU1; and
- Properties needing remediation but not granting access for sampling and cleanup will have restrictive covenants placed on properties consistent with local and state government authority.

9.2 Common Elements and Distinguishing Features of Each Alternative

Alternatives 2 and 3 have many common elements. These include access having to be gained for residential properties, sampling needing to be done at residential properties that have not been sampled previously to determine if the soils need remediation, clearing grass and plants having before remediation could begin, some disruption to residents while soils were being remediated, and landscaping needed to restore lawns to their original condition. Alternatives 2 and 3 would also need to consider the City of Evansville dust control regulations during excavation and/or mixing of soils.

Both Alternatives 2 and 3 would need to transport excavated soils off-site to be managed in a RCRA Subtitle D landfill, although Alternative 3 would require much less soil to be transported off-site. Alternative 2 would take slightly less time than Alternative 3, and the cost for Alternative 3 is slightly greater than the cost for Alternative 2.

The primary difference between Alternative 2 and Alternative 3 is that Alternative 2 is a proven permanent solution, in that it removes the soils with contamination above the cleanup levels from the Site, and Alternative 3 is expected to be permanent, but this technology has not had long-term performance testing to demonstrate that the effects of treatment are long lasting.

Alternatives 1 and 3 involve leaving the original soils in place and therefore five-year reviews will be necessary if these Alternatives were implemented. Five-year reviews are not anticipated to be required for Alternative 2. Alternative 3 would require bench-scale testing before the remedial action could be implemented, whereas Alternatives 1 and 2 would not require testing before implementation. Alternatives 1 and 2 would not require long-term operation and maintenance, but Alternative 3 will require long-term maintenance if monitoring determines the treatment is not permanent. Institutional controls will be required for Alternatives 1 and 3, but are not expected to be required for Alternative 2, except for properties that need remediation but are not remediated due to refusal of access by owners.

The only commonality between Alternative 1 and 2 is that they do not reduce the toxicity, mobility, or volume of contamination through treatment. However, Alternative 2 would eliminate the risk of exposure to soils above the cleanup levels whereas Alternative 1 would not. The total volume of waste is the same for Alternatives 1, 2 and 3.

The estimated time for completion of remedial action of Alternative 2 is two years, and the estimated time for completion of Alternative 3 is at least three years, depending on how long the bench-scale testing lasts and how difficult it is to perform in situ mixing at the Site. The implementation of Alternative 1 would not require any time. The estimated net present worth cost is $0 for Alternative 1, $21.1 million for Alternative 2, and $23.0 million for Alternative 3.

9.3 Expected Outcomes of Each Alternative

Since the site use is currently residential, it is reasonably assumed that the properties would continue to have residential use. If Alternative 1 is implemented, residents would continue to be exposed to levels of lead and arsenic that pose unacceptable risk to adults and children. If

Alternatives 2 or 3 are implemented, the residents at the properties will not be exposed to unacceptable levels of lead and arsenic which will allow for unlimited residential and recreation use of the properties.

There is no risk from exposure to groundwater regardless of the Alternative that is implemented.

If Alternative 1 is selected, the area in and around OU1 will likely not change in character and will continue to have the negative association of soil contamination. If Alternative 3 is implemented, there may also be a negative association attached to the area because the contamination will remain in the soils, although it will no longer pose a risk to human health or the environment. If Alternative 2 is implemented, the association of the neighborhood with lead and arsenic contamination will be removed and this may facilitate the area being redeveloped and revitalized. Currently, the City of Evansville and several neighborhood organizations are working towards neighborhood revitalization, with the remediation of OU1 being a step in that process.

9.4 Preferred Alternative

The preferred alternative described in the Proposed Plan for the Jacobsville Neighborhood Soil Contamination Site is Alternative 2. The estimated cost of the preferred alternative is $21.1 million.

10.0 Summary of Comparative Analysis of Alternatives

This section explains the U.S. EPA's rationale for selecting an alternative. The U.S. EPA has developed nine criteria to evaluate remedial alternatives to ensure that important considerations are factored into remedy selection decisions. These criteria are derived from the statutory requirements of Section 121 of CERCLA, the NCP, as well as other technical and policy considerations that have proven to be important when selecting remedial alternatives. When selecting a remedy for a site, U.S. EPA conducts a detailed analysis of the remedial alternatives consisting of an assessment of the individual alternatives against each of the nine evaluation criteria and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

The nine evaluation criteria are described in more detail below.

<u>**Threshold Criteria**</u>

Threshold criteria are standards that an alternative must meet to be eligible for selection as a remedial action. There is little flexibility in meeting the threshold criteria. If ARARs cannot be met, a waiver may be obtained where one or more site exceptions occur as defined in the NCP.

Overall Protection of Human Health and the Environment. Protectiveness is the main requirement that remedial actions must meet under CERCLA. It is an assessment of whether each alternative achieves and maintains adequate protection of human health and the environment. A remedy is protective if it eliminates, reduces, or controls all current and potential risks posed by the site through each exposure pathway. Adequate engineering controls, land use controls, or some combination of the two can be implemented to control exposure and thereby ensure reliable protection of human health and the environment over time. In addition, implementation of a remedy cannot result in unacceptable short-term risks or cross-media impacts on human health and the environment.

Compliance with ARARs. Compliance with ARARs is a statutory requirement of remedy selection. This criterion is used to determine whether the selected alternative would meet the federal, state, and local ARARs identified in Appendix C. A discussion of the compliance of each alternative with chemical-, location-, and action-specific ARARs is included.

<u>Primary Balancing Criteria</u>

Balancing criteria are used to weigh tradeoffs between alternatives. These represent the standards upon which the detailed evaluation and comparative analysis of alternatives are based. A high rating on one generally can compensate for a low rating on another.

Long-Term Reliability and Effectiveness. Long-term reliability and effectiveness reflects CERCLA's emphasis on implementing remedies that will protect human health and the environment in the long term. Under this criterion, results of a remedial alternative are evaluated in terms of the risk remaining at the site after response objectives are met. The primary focus of the evaluation is the extent and effectiveness of the actions or controls that may be required to manage the risk posed by treatment residuals or untreated wastes.

Factors to be considered and addressed are magnitude of residual risk, adequacy of controls, and reliability of controls. Magnitude of residual risk is the assessment of the risk remaining from untreated waste or treatment residuals after remediation. Adequacy and reliability of controls is the evaluation of the controls that can be used to manage treatment residuals or untreated wastes that remain onsite.

Reduction of Toxicity, Mobility, or Volume through Treatment. This criterion addresses the statutory preference for remedies that employ treatment to significantly reduce the toxicity, mobility, or volume of the hazardous substances. That preference is satisfied when treatment is used to reduce the principal threats at a site by destroying toxic chemicals or reducing the total mass or total volume of affected media. This criterion is specific to evaluating only how the treatment reduces toxicity, mobility, and volume. Specifically, the analysis will examine the magnitude, significance and irreversibility of reductions. It does not address containment actions, such as capping.

Short-Term Effectiveness. This criterion examines the short-term impacts associated with implementing the alternative. Implementation may affect workers, the neighboring community, or the surrounding environment. Short-term effectiveness also includes potential threats to human health and environment associated with excavation, treatment and transportation of hazardous substances; potential cross-media impacts of the remedy; and the time required to achieve protection of human health and the environment.

Implementability. Implementability considerations include technical and administrative feasibility of the alternatives, as well as the availability of goods and services (including treatment, storage or disposal capacity) associated with the alternative. Implementability considerations often affect the timing of remedial actions (for example, limitations on the season in which the remedy can be implemented, the number and complexity of material handling steps, and the need to secure technical services). Onsite activities must comply with the substantive parts of applicable permitting regulations.

Cost. The detailed cost analysis of alternatives includes capital and annual O&M costs incurred over a period of 50 years in accordance with U.S. EPA guidance *Guide to Developing and Documenting Cost Estimates During the Feasibility Study.* The focus during the detailed analysis is on the net present worth of these costs. Costs are used to select the most cost-effective alternative that will achieve the remedial action objectives.

The cost estimates are prepared to have accuracy in the range of –30 to +50 percent. The exact accuracy of each cost estimate depends upon the assumptions made and the availability of costing information. Present worth will be calculated assuming the current discount rate established by the Office of Management and Budget

Modifying Criteria

Modifying criteria are evaluated by addressing comments received after the regulatory agencies and the public have reviewed the FS and Proposed Plan. This evaluation is presented in the Responsiveness Summary, found in Appendix A.

State Acceptance. This criterion evaluates the technical and administrative issues and concerns the state may have regarding the alternatives. This was addressed upon receiving comments from IDEM on the RI and FS Reports and the Proposed Plan.

Community Acceptance. This criterion evaluates the issues and concerns the public may have regarding the alternatives. This was addressed upon receiving comments documented during the public comment period.

The full text of the detailed analysis of the three remedial alternatives against the nine evaluation criteria (including both the individual analysis and the comparative analysis) is contained in the FS Report for the Jacobsville Neighborhood Soil Contamination Site, which is part of the Administrative Record for the Site. Because the two Modifying Criteria cannot be fully evaluated until the public comment is closed, they were not evaluated in the FS. The

Responsiveness Summary of this ROD contains a more detailed discussion of public comments received.

This section of the ROD presents a comparative analysis of the remedial alternatives presented for the Site. The purpose of the comparative analysis is to identify the relative advantages and/or disadvantages of each remedial action alternative. The NCP is the basis for the detailed comparative analysis. Table 8 summarizes the comparative analysis.

Table 8. Comparative Analysis of Remedial Alternatives

Evaluation Criteria	Alternative 1: No Action	Alternative 2: Excavation, Backfill, and Site Restoration	Alternative 3: In Situ Treatment, Topsoil, and Site Restoration
Overall Protection to Human Health and the Environment			
Protection of human health and the environment	Not protective.	Protective.	Protective
Compliance with ARARs			
Location-specific ARARs	Not in compliance.	In compliance.	In compliance.
Action-specific ARARs	Not in compliance.	In compliance.	In compliance.
Chemical-specific ARARs	Not in compliance.	In compliance.	In compliance.
Long-Term Effectiveness and Permanence			
Magnitude of residual risk	Residual risk remains.	No residual risk.	Low residual risk.
Adequacy and reliability of controls	No controls.	Very reliable.	Limited performance measures.
Need for 5-year review	Required.	Not required.	Required.
Reduction of Toxicity, Mobility, or Volume Through Treatment			
Treatment processes used and materials treated	None.	None.	Treatment process utilized.
Amount of hazardous material destroyed or treated	None.	None.	100% treatment.
Expected reduction in toxicity, mobility, or volume of the waste	None.	None.	Toxicity and mobility reduced.
Irreversibility of treatment	Not applicable.	Not irreversible.	Not likely irreversible.
Type and quantity of residuals that will remain following treatment	Not applicable.	No residuals.	Some residuals.
Statutory preference for treatment	Does not satisfy.	Does not satisfy.	Does satisfy.
Short-Term Effectiveness			
Protection of workers during remedial action	Not applicable.	Moderate.	Moderate.
Protection of the community during remedial action	Not applicable.	Moderate.	Moderate.
Potential environmental impacts of remedial action	Not applicable.	Low.	Low.
Time until protection is achieved	Protection not achieved.	Immediate.	Immediate.
Implementability			
Technical feasibility	Not applicable.	Difficult.	Difficult.
Reliability of technology	Not applicable.	Very reliable.	Reliable.
Administrative feasibility	Not applicable.	Feasible.	Feasible.
Availability of services, equipment, and materials	Not applicable.	Readily available.	Readily available.
Cost			
Capital cost	$0	$21,094,993	$23,027,555
Present worth O&M	$0	$0	$276,830
Period of analysis (yrs)	0	NA	20
Capital and present worth O&M	$0	$21,094,993	$23,027,555
Note: Costs are estimated for 2007.			

10.1 Overall Protection of Human Health and the Environment

Alternative 1, No Action, does not reduce potential risk to human health. Alternatives 2 and 3 are protective of human health and the environment. Alternative 2, Soil Excavation, Backfill, and Restoration, eliminates the potential risk to human health by removing contaminated soils in excess of the cleanup levels from the Site. Alternative 3, In Situ

Treatment and Site Restoration, eliminates or reduces the potential risk to human health and the environment by reducing the bioavailability of the contaminant within the soil.

10.2 Compliance with ARARs

Alternative 1 is not compliant with ARARs. Alternatives 2 and 3 will require significant effort during implementation to comply with Indiana and federal ARARs related to waste characterization, transportation and disposal of contaminated material, stormwater/nuisance water, and fugitive particulate matter management during excavation activities.

10.3 Long-Term Effectiveness and Permanence

Alternative 1 does not achieve long-term effectiveness and permanence. Alternative 2 achieves long-term effectiveness and permanence by removing the contaminated soil and therefore permanently eliminates the exposure routes. The measurement of long-term effectiveness for Alternative 3 has not been determined because it is a relatively new technology. The technology is becoming more widely accepted, and treated sites have demonstrated success, however, it is too soon to have any evidence of long term permanence.

10.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Neither Alternatives 1 nor 2 will reduce toxicity, mobility, or volume of the contaminants through treatment. Alternative 3 will reduce the toxicity and mobility of the contaminant through treatment of the soil.

10.5 Short-Term Effectiveness

Alternative 1 has no short-term effectiveness since no action will be taken. Alternatives 2 and 3 will affect residents, neighboring communities, and construction workers. A large number of trucks will be required to haul excavated materials offsite and/or import clean fill. Alternatives 2 and 3 will pose potential risks to residents and construction workers through airborne particles. Additional short-term risks associated with Alternatives 2 and 3 involve occupational construction risks and the potential of runoff infiltrating the stormwater drainage system. Engineering controls and other reasonable measures will be used to minimize these potential impacts.

10.6 Implementability

Alternative 1 is the easiest to implement because no effort is associated with the alternative. Alternative 2, Soil Excavation, Backfill, and Restoration, will be difficult to implement based on the excavation and disposal volume, clean fill volume, and amount of time required to move the large quantity of material. Working in and around residential properties will require hand digging in areas where earthmoving equipment cannot reach, such as under decks and areas adjacent to structures. Implementation of

Alternative 3 also will be difficult. Soil mixing will be a slow process, requiring hand digging in and around residences and structures. Site restoration will require a property-by-property determination for removal and disposal of excess soil to ensure proper drainage.

Although Alternative 2 employs a proven method, Alternative 3 presents a relatively new technology in the treatment of contaminated soil. Enviroblend® treatment additives can be used to render metal-bearing wastes nonhazardous at remedial sites (RMT Inc. 2006). Enviroblend® can be mixed in place through excavators, discs, and specialized mixing equipment with metalbearing media. An in situ treatment approach avoids additional handling during treatment. The resulting material can be left onsite (Premier Chemicals 2006).

Enviroblend® effectively treats arsenic, lead, and several other inorganics such as antimony, barium, cadmium, chromium, copper, mercury, nickel, selenium, and zinc. RMT's products have been approved and successfully used in over 40 states; 16 of these have approved onsite reuse of the treated material. Since its development, this technology has effectively treated more than 2 million tons of hazardous waste from a wide range of industries (Premier Chemicals 2006).

10.7 Cost

In terms of net present worth, Alternative 1 has no cost. Alternative 2 has high costs associated with excavation, transportation, and disposal costs. Construction will require several years to complete, resulting in high costs for construction oversight and management. Costs associated with Alternative 3 are also high. The cost of the reagents used for treatment is estimated at only $10 per treated ton, but the cost of the soil mixing will be high. There are also moderate costs associated with the transportation and placement of top soil and possible excavation and disposal of material during site restoration. Alternative 3 will also require several years to complete and incur high costs for oversight and management. Alternative 3 is the only alternative with associated O&M costs. Table 8 shows a breakdown of costs for the three alternatives.

10.8 State Agency Acceptance

The State Agency, IDEM, has been involved with the Site prior to it being listed on the National Priorities List, and has continued to be involved in all steps of the RI/FS for the Site. The State of Indiana concurs with the selection of Alternative 2. A letter of concurrence from the State can be found in Appendix B.

10.9 Community Acceptance

During the public comment period on the Proposed Plan, the community expressed very few concerns with the proposed remedy for the Jacobsville Neighborhood Soil Contamination Site. As discussed in the Responsiveness Summary the local community is supportive of Alternative 2 and expressed that they want the remedy to be implemented as soon as possible. This ROD includes a responsiveness summary that summarizes the public comments and U.S. EPA's response to those comments. The responsiveness summary is included as Appendix A.

11.0 Principal Threat Wastes

The NCP establishes an expectation that U.S. EPA will use treatment to address the principal threat posed by a site wherever practicable. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. The lead and arsenic contamination found in the soils at the Jacobsville Neighborhood Soil Contamination Site are not considered to be highly toxic or highly mobile, and can be reliably contained. Therefore, the principal threat waste definition does not apply to the contamination at this Site.

12.0 Selected Remedy

This section describes the selected remedy and provides U.S. EPA's reasoning behind its selection. Alternatives can change or be modified if new information is made available to U.S. EPA through further investigation or research. An appropriate range of alternatives was developed, based upon initial screening of technologies, and potential for contaminants to impact the environment, and site-specific RAOs and goals.

12.1 Identification of the Selected Remedy and Summary of the Rationale for its Selection

Based on the analysis of the nine criteria as summarized in Section 10 of this ROD, the selected remedy for the Jacobsville Neighborhood Soil Contamination Site is Alternative 2. This alternative represents the best balance of overall protectiveness, compliance with ARARs, long-term effectiveness and permanence, cost, and other criteria. It is also the alternative favored by the State of Indiana and the community.

12.2 Description of the Selected Remedy

Alternative 2 consists of excavating soil with arsenic and lead levels exceeding Site cleanup levels from residential properties, offsite disposal at a permitted Subtitle D landfill, backfilling with clean soil, and site restoration. This alternative assumes that the excavated soil will not be characterized as hazardous waste. The excavation will be backfilled with clean fill and top soil and restored to original property condition.

The main components of Alternative 2 include the following:

- Through community outreach, property owners in OU1 will be contacted to gain access to their property to sample the soils (if necessary) and implement the remedy.

- Utilities within the proposed excavation areas will be marked and, if required, temporarily relocated.

- Residential soils within the OU1 boundaries will be sampled down to two feet to determine if they contain concentrations of arsenic and/or lead that are greater than the clean up levels for the site. The clean up levels for the Site are 400 ppm for lead and 30 ppm for arsenic.

- Residential soils containing concentrations greater than the arsenic and lead clean up levels will have the soils excavated to the depth that the elevated concentrations were found, to a maximum of two feet. If physical barriers exist, such as trees, soil excavation will be done around the barrier to the extent possible. Engineering controls will be implemented in order to prevent exposure to lead and arsenic from dust created by the excavation of the soils. Building foundations, permanent walkways and fixtures will not be affected by the soil excavation.

- Once excavation is complete and verified by confirmation sampling, clean fill will be placed in the excavated areas and the lawns will be returned to as close to their original condition as possible.

- Properties needing remediation but not granting access for sampling and cleanup will have restrictive covenants placed on properties consistent with local and state government authority.

Excavated soils will be transported to a RCRA Subtitle D landfill. This remedy assumes that the excavated soil will not be characterized as hazardous waste.

12.3 Summary of the Estimated Remedy Costs and Time Required for Implementation

The estimated cost of the selected remedy for the Jacobsville Neighborhood Soil Contamination Site is $21,094,993. The remedial design is expected to take three months to complete, and the remedial action is expected to take at least two years to complete. Appendix E contains the cost breakdown for Alternative 2.

The information in the cost estimate summary table is based on the best available information regarding the scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Difference (ESD), or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

12.4 Expected Outcomes of the Selected Remedy

The selected remedy for the Jacobsville Neighborhood Soil Contamination Site, Alternative 2, will achieve the RAO for the Site. The selected remedy will be protective of human health and the environment and will comply with all ARARs. The following are expected to occur by implementing Alternative 2 for OU1:

- Unrestricted residential and/or recreational site use at the remediated properties.
- All residential properties within OU1 will have lead and arsenic concentrations below the cleanup levels of 400 ppm and 30 ppm, respectively, which will reduce the potential human health risk at OU1 to acceptable levels as described in the NCP and U.S. EPA guidance.
- Blood lead levels of children in the area will decline due to decreased exposure to lead through the residential soils.
- Groundwater use at the site will not be affected, as there are no private groundwater wells within OU1 and all drinking water in OU1 is provided by the Evansville Water Department.
- There are anticipated beneficial socio-economic and community impacts resulting from the remediation of OU1. There are currently community organizations and not-for-profit developers interested in revitalization of the area. Many planned projects will not move forward until the properties in the area are remediated.

Table 9 summarizes the cleanup levels for the Jacobsville Neighborhood Soil Contamination Site that will achieve these expected outcomes.

Table 9. Summary of Cleanup Levels for the Jacobsville Neighborhood Soil Contamination Site

Cleanup Levels for Contaminants of Concern			
Media: Soil **Site Area:** OU1 **Available Use:** Residential **Controls to Ensure Restricted Use (if applicable):** N/A			
Chemical of Concern	Cleanup Level	Basis for Cleanup Level	Risk at Cleanup Level[1]
Lead	400 mg/kg (ppm)	Risk Assessment/IEUBK model	<5 percent of the child population with a BLL greater than 10 µg/dL
Arsenic	30 mg/kg (ppm)	Risk Assessment/ Background Concentrations	Cancer risk = 1×10^{-4}
Notes The exposure scenarios are for current/future residential for adults and children at residential and "other" high access properties.			

13.0 Statutory Determinations

Under CERCLA Section 121 and the NCP, remedies selected for Superfund sites are required to be protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a waiver is justified) and be cost effective. The following sections discuss how the selected remedy for the Jacobsville Neighborhood Soil Contamination Site meets these statutory requirements.

13.1 Protection of Human Health and the Environment

The current and potential future risks at the Jacobsville Neighborhood Soil Contamination Site are due to the presence of lead and arsenic in residential soils. Implementation of the selected remedy will be protective of human health and the environment, as described in the NCP, through the removal of residential soils with lead concentrations above 400 ppm and/or arsenic concentrations above 30 ppm. The site specific RAO was developed to protect current and future receptors that are potentially at risk from contaminants at the Site. The selected remedy will meet the RAO. OU1 will be available for unrestricted use and unlimited exposure at the completion of the remedial action and institutional controls are not expected to be required in order to ensure that the remedy remains protective.

13.2 Compliance with ARARs

Section 121(d) of CERCLA requires that Superfund remedial actions meet ARARs. Appendix C provides all ARARs identified for this Site which will be met under this ROD. In addition to ARARs, non-enforceable guidelines, criteria, and standards may be useful in designing the selected remedy. As described previously in Section 8.2 of this ROD, these guidelines, criteria, and standards are known as TBCs. The selected remedy will comply with the ARARs for the Site.

13.3 Cost Effectiveness

U.S. EPA has determined that the selected remedy for the Jacobsville Neighborhood Soil Contamination Site is cost effective and represents value for the money to be spent. A cost effective remedy in the Superfund program is one whose costs are proportional to its overall effectiveness. The overall effectiveness of the potential remedial alternatives for the Site was evaluated in the FS by considering the following three criteria: long-term effectiveness and permanence, reduction in toxicity, mobility and volume through treatment, and short-term effectiveness. The overall effectiveness was then compared to cost to determine whether an alternative is cost effective. Of the remedial alternatives evaluated for this Site, Alternative 2 provided the highest degree of cost effectiveness.

13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment are practicable at this Site. Although treatment technologies will not be utilized in this remedy, the selected remedy is the only remedy with proven long-term permanence, and is more cost-effective than treatment technologies available. The selected remedy also permanently removes the contamination from the Site, allowing for unlimited residential and recreational use, and avoids the statutory requirements of five-year reviews and monitoring that would be needed if the contamination was treated and left in place. This remedy is also more easily implemented because removal of soils is less labor intensive than in-situ mixing of soils at each property. The selected remedy is also favored by the state and local community. To the extent that the remedial alternatives are comparable with respect to short-term effectiveness and implementability, these criteria were not decisive factors in the selection process.

13.5 Preference for Treatment as a Principal Element

This remedy does not satisfy the preference for treatment as a principal element of the remedy for the following reasons(1) the in-situ treatment technology that exists for arsenic and lead in soils has not been studied enough to prove its long term permanence and effectiveness, (2) in-situ treatment technologies are less-cost effective than this remedy, (3) the chosen remedy is a permanent remedy which physically removes all soils having concentrations greater than the cleanup levels and is widely accepted by the community, and (4) no source materials consisting of principal threat wastes will be addressed within the scope of this action, therefore, treatment of wastes prior to disposal was not evaluated.

13.6 Five-Year Review Requirements

The NCP requires that the remedial action be reviewed no less often than every five years if the remedial action results in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure. Because this remedy is not expected to result in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure at the completion of the remedial action, no statutory reviews are anticipated after the completion of the remedial action. However, if any properties have concentrations above the cleanup levels at depths greater than the excavated two feet, five year reviews will be required.

14.0 Documentation of Significant Changes

The Proposed Plan for Jacobsville Neighborhood Soil Contamination Site was released for public comment on January 12, 2007 and the public comment period ran from January 12 through February 28, 2007. The Proposed Plan identified Alternative 2 (Soil Excavation, Backfill, and Site Restoration) as the preferred alternative for the Site. U.S. EPA reviewed all written and verbal comments submitted during the comment period and determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

APPENDIX A
Responsiveness Summary

RESPONSIVENESS SUMMARY
for the Jacobsville Neighborhood Soil Contamination Site

This Responsiveness Summary provides both a summary of the public comments U.S. EPA received regarding the Proposed Plan of the Jacobsville Neighborhood Soil Contamination Site and U.S. EPA's responses to those comments. The Proposed Plan was released to the public in mid-January, 2007, and the public comment period ran from January 12 through February 28, 2007. Indiana Department of Environmental Management provided support on the Proposed Plan. U.S. EPA held three public meetings regarding the Proposed Plan, one on January 23, 2007 at the C.K. Newsome Community Center in Evansville, Indiana, and two on February 8, 2007 at the Central United Methodist Church in Evansville, Indiana. Indiana Department of Environmental Management (IDEM) participated in the public meetings, assisted in responding to questions, and provided support at the meetings.

U.S. EPA received written comments (via regular and electronic mail) and verbal comments (at the public meetings) during the public comment period. In total, U.S. EPA received comments from approximately 15 different people. Copies of all the comments received during the public comment period (including the verbal comments which can be found in the transcript of the public meeting) are included in the Administrative Record for the Site. U.S. EPA carefully considered all comments prior to selecting the final Site remedy documented in the ROD.

Because the U.S. EPA did not receive a large number of comments, this Responsiveness Summary repeats verbatim each individual comment and a response to the comment, unless the comment conveyed general support for the proposed remedy.

U.S. EPA received a comment letter dated January 23, 2007, submitted on behalf of the City of Evansville Environmental Protection Agency, regarding recently enacted municipal code regulations limiting fugitive particulate matter. This letter was not included in the Responsiveness Summary, but rather in Appendix C – ARARS and TBCs, because it is the U.S. EPA's intent to comply with these regulations during the remedial action.

The remainder of this Responsiveness Summary contains the comments U.S. EPA received and U.S. EPA's responses to those comments.

- **Oral and written comment, January 23rd public meeting**
  Commenter: Monica Edwards, Kahn, Dees, Donovan & Kahn, LLP, Attorneys and Counselors at Law

"In the EPA's January 2007 clean up plan for the Jacobsville Neighborhood Soil Contamination Site, the EPA proposes to remove soil from residential properties containing lead concentrations of 400 ppm and/or arsenic concentrations of 30 ppm. However, this phase of the proposed plan fails to address how and when commercial properties with mixed-uses and/or sensitive populations such as churches, schools, medical facilities, playgrounds, and day care facilities will be addressed by the EPA for those commercial properties falling within the area encompassing the 250 acres originally defined by the EPA as the Jacobsville Superfund Site. We hereby request that the EPA provide such information, including but not limited to the clean-up plan and timing of commercial properties of the nature described above."

The U.S EPA's Proposed Remedy for the first phase, or Operable Unit 1, of the Jacobsville Neighborhood Soil Contamination Site in Evansville, Indiana addresses residential properties with soil concentrations of lead above 400 parts per million (ppm) and arsenic above 30 ppm. These cleanup levels are based on risk calculations for child and adult receptors in a residential setting, the most conservative exposure scenarios in a risk assessment because they assume a much higher frequency of exposure than recreational, industrial, and commercial settings. Risk calculations were also performed for "high access" properties, such as parks, playgrounds, schools, libraries, and day care facilities. As noted at the public meetings, U.S. EPA plans to address these properties with the residential properties, however no "high access" properties within the boundaries of Operable Unit 1 were found to have concentrations of lead or arsenic above the cleanup levels for the Site. U.S. EPA will not be addressing any industrial or commercial properties during the remedial action of Operable Unit 1 of this Site.

The Indiana Department of Environmental Management's (IDEM) has calculated an extremely conservative risk-based value of 1300 ppm lead for direct contact to soil at industrial and commercial properties. During U.S. EPA's sampling of the entire Site, only 28 samples were found to be above 1200 ppm, and most of these samples were located in drip zones (the six inches next to a building that is under the gutters and therefore expected to have higher lead concentrations due to rainfall runoff and lead paint runoff). Therefore, any commercial or industrial properties that have lead concentrations in soil above 1300 ppm are not considered to be site related and therefore will not be addressed in the remedial action for this Site.

Of the samples where arsenic was detected, only 4 of the samples had arsenic concentrations above 30 ppm, with the highest concentration being 37 ppm. These elevated concentrations were found in samples with very high lead concentrations. Again, the risk calculation used to determine the cleanup number was based on a residential exposure scenario, and industrial/commercial exposure scenarios would yield much higher cleanup levels. Therefore, any commercial or industrial properties that have arsenic concentrations in soil above an industrial/commercial cleanup level are not considered to be site related and therefore will not be addressed in the remedial action for this Site.

More detailed information about the risk calculations, "high access" properties, and soil sampling can be found in the Remedial Investigation Report, dated September 2006. This report has been submitted to the Administrative Record for the Site, and all documents in the Administrative Record can be found at the Evansville Vanderburgh Public Library—Central Branch—Public Comment Shelf.

- **Oral Comment, January 23rd and February 8th (4 p.m.) public meetings**
  Jim Morgan, Jacobsville Neighborhood Association

"My comment is...on thanking you for coming and trying to get the information you need so we know what to do. The one thing we would like more than anything else is to be notified as to when you're coming ahead of time so that we can assist, like in the trash and debris cleanup, and that we also can notify our people of that because I know that our people didn't get very good information on this meeting this evening. That's one of the reasons why we had made the comments earlier, and I think that's what also brought in the second meeting, not just this one but another meeting over at the Central Methodist Church...One of the things we've done is to try to get the information out, especially into the commercial area, as to what it takes to overcome this problem if you're not redoing your property...and we've also talked to homeowners that are doing things in their yards and so forth, as to the danger of working with this topsoil and how to properly do it, but the more we can work together and the more that we know when you're coming, and I hope it's soon, but the more that we know, I think the better that we can work together to get the whole job done in the community."

The U.S. EPA agrees that it is beneficial in the cleanup process to keep the public, especially those affected by the cleanup, as informed as possible. The U.S. EPA realizes that the first mailing announcing the proposed plan was not received by many affected residents and local officials, and therefore two more meetings were held and the proposed plan and meeting announcement was re-mailed to the correct mailing list.

- **Oral Comment, January 23rd public meeting**
  Dwayne Caldwell, Vanderburgh County Health Department

"Our department does have a lead program dating back to the early eighties to investigate children with elevated blood lead levels, so I'd like you to know that if anyone desires to have a lead test done, the only way to find out if you have exposure is to have your blood tested. We do do that at the health department free of cost. We have reams of information on lead poisoning, lead and soil remediation. Whatever you'd like to know about, we've got it and would be glad to provide it for you. We're in the phone book and we're over at 420 Mulberry. Drop in and we'll be happy to see you. One point that does need to be made is there's been a lot of talk about soil remediation, and that is a big factor. Soil is one of the big things with children because they play in it. People also track it into the house and it's deposited on things as dust, and the hand to mouth activity will poison a child. However, this is not going to eliminate the problem in that area. You know, housing stock in the area is way prior to 1978. That's when we put – stopped putting lead into paint, so if you have original paint on there, pre-'78 paint, it probably has some lead on there, too. So I'm urging everybody, and this is really from my heart for the kids in the area, once this is done, don't feel like they're perfectly safe. Keep every child, you know, below six tested yearly for lead because it can come from the paint on the window sliding up and down and creating dust. It can come from the trinket that grandma brought back from Mexico and the kid's sucking on it or something. There are lots of lead factors out there. So now that I've been Mr. doom and gloom, I'd just urge you that if you have any questions or if you want any help on getting tested or anything, give us a call at the department and we'd be glad to do it."

The U.S. EPA appreciates the efforts of the Vanderburgh County Health Department in preventing lead poisoning, and agrees that affected residents need to be aware that lead in the soils is not the only exposure pathway children in the area have to lead. The U.S. EPA *encourages the residents of Vanderburgh County to have their children tested for lead exposure, even after the remediation is complete, to protect the children from lead.*

Oral Comment, January 23rd meeting
Audience member

"I think one of the things we found early on when we were doing the initial sampling was that a lot of the addressees that we sent to were the misplaced owners that Wayne referred to that aren't there because there is a large transient community there --and I think that's a big percentage of who you're mailing to, and it might be better if the president of the neighborhood association knows who's actually there" [to send the mailings].

The U.S EPA obtained the mailing list from the Jacobsville neighborhood association and included all addresses in the mailing announcing the February 8th meetings. We will continue to use the most accurate source of addresses that we can identify.

Oral Comment, January 23rd meeting
Audience member

:...but there is no minimum percentage that you have to meet in order for this project to proceed forward? If one resident only says I want my yard changed, E.P.A. is going to do that, right? I mean, is there a -- there's not a cutoff level, is there?"

There is no minimum number of houses that must grant U.S. EPA access for cleanup in order for the cleanup to move forward. Because this cleanup is free of charge to property owners and is necessary to prevent current and future exposure to lead and arsenic to area residents, the U.S. EPA does not anticipate many owners denying U.S. EPA access for cleanup. In addition, property owners who do deny access may have a notice recorded on the property deed consistent with local and state government authority.

Oral Comment, February 8th meeting (afternoon session)
Steven Belcher, City Councilman for Jacobsville area

"...this has been going on since I got on the Council back in the early '90s, and that's why we're so impatient and not understanding sometimes why it takes so long. And we also lose breakdown of the communication what you
22 guys do in the looking at DMV. So what I want to make sure you do is keep the communications going this whole time, because I don't want other contractors knocking on people's doors trying to do something. I want to be able for us to be able to say when everything is going to happen and when you have these meetings, give us plenty of notice so we can get the word out and maybe get a crowd, because I think communication in our community here is a vital sign, and that's why it's important to us to be here. So with that, I just like you to make a fact that -- be sure to include DMV, City of Evansville and the Mayor, get down to us. You got my e-mail; I'd like to know every time you come througn, too, because we're the ones that are

going to be asked. Jacobsville, we're the people that are going to ask you, but I live in this area. You missed my house by one house, it looks like. So anyway, we need your help and if there's something we can do on our end, like if there's a resolution we can do or something from the Mayor down the road to get the Senator Bayh or Congressman Lugar got the environmental planning works together down for us, and that happened a few years ago. And that's how it got jump started. So we want to make sure we're getting this all done."

The U.S. EPA will be sure to stay in contact with the local government agencies and officials, in order to update them on the site status and to notify local residents of the cleanup timeline and details of individual property cleanups. The U.S. EPA also would like to note that all U.S. EPA or U.S. EPA contractors will have proper identification when working at the Site and at individual properties, and will contact property owners in advance of any sampling or cleanup work at the property.

3 Written Comments: Support for Preferred Remedy:

Three written comments expressed support for the proposed remedy for the Site (Alternative 2 – Soil Excavation, Backfill, and Site Restoration) and stated that it is the only option that should be considered because it is the only permanent option.

The U.S. EPA appreciates the support for the proposed remedy.

- **4 Written Comments: Willingness to Participate in the Cleanup**

Four written comments expressed their willingness to participate in the Site remediation.

The U.S. EPA appreciates the cooperation of the community and will contact property owners to gain signed access agreements for sampling and remediation once the Remedial Action begins.

- **2 Written Comments:**

"My home is a block outside the marked area. I received a letter stating they were going to check my yard and no one showed up. I believe my soil may need replace. Could someone check our block."

"It puzzles me to think the line stops on the other side of 1st Ave. and my homes are just a few feet away...We did receive some information the other day on the different avenues the EPA may consider, but nothing directed at us."

The U.S. EPA did not sample all residential properties within OU1 or the within the entire Site boundaries. Rather, sampling was conducted based on a grid sampling design, at approximately 1 sample per block. This was done to get a general idea of what areas have high lead and/or *arsenic levels in the soil. If a sample was taken on a block, the U.S. EPA did not sample other properties on the block.*

The U.S. EPA is addressing the Jacobsville Neighborhood Soil Contamination Site in two phases. The first phase addresses the area that had the highest levels of lead and arsenic and is in the area where the facilities thought to have caused the contamination were located. The second phase will address the much larger area of the Site that has levels of lead and/or arsenic above 400 ppm and 30 ppm , respectively, but not levels quite as high as the Phase 1 area. Therefore, if a residential property is on a block next to the Phase 1 area, this property will be part of the cleanup for the Site if sampling shows lead and arsenic above the cleanup levels in the soils.

The U.S. EPA will be developing a separate Record of Decision to address the areas outside of the Phase 1 area. This phased approach will facilitate the remediation of the highest levels first, which will eliminate the highest risks to humans and prevent recontamination of cleaned properties. A separate Record of Decision will also allow U.S. EPA to explore more cost and time effective options for the larger area to facilitate an expedited Site remediation. The U.S. EPA will hold another public meeting and present another proposed plan for the second Record of Decision.

- **Written Comment**

"This condition has been present for many years. What documentation is available to support the need to do this? How many cases of exposure to lead are being reported because of actual negative conclusions resulting? I understand that the danger is there, but what effect is it currently causing. Do you have to eat the soil to become ill?"

Various studies have been done on this Site to document the need for the cleanup. This Record of Decision summarizes the studies, but additional information can be found in the Administrative Record files, available for public viewing at the Evansville Vanderburgh Public Library – Central Branch, 200 S.E. Martin Luther King Jr. Boulevard, Evansville, Indiana.

According to the Center for Disease Control (CDC), blood lead levels at or above 10 micrograms per deciliter (µg/dL) can have permanent deleterious effects on children, especially for children ranging from infants to age 7. Therefore, the U.S. EPA has developed the Integrated Exposure Uptake Biokinetic (IEUBK) Model to predict children's blood lead levels based on exposure parameters that are input into the computer model. When the site-specific values from the Jacobsville Neighborhood Soil Contamination Site, particularly within the OU1 boundaries, were entered into the model, the lead concentration in soils was recommended to be 400 ppm or less to prevent blood lead levels greater than 10 µg/dL.

Blood lead level testing done by the Vanderburgh County Health Department indicates that there have been results levels greater than 10 µg/dL in children from the Jacobsville Neighborhood.

The CDC notes the following effects due to exposure to high levels of lead:

- *Lead can produce adverse effects on virtually every system in the body; it can damage the kidneys, the nervous system, the reproductive system, and cause high blood pressure. It is especially harmful to the developing brains of fetuses and young children.*

- *There may be no lower threshold for some of the adverse effects of lead in children. In addition, the harm that lead causes to children increases as their blood lead levels increase.*

- *Blood lead levels as low as 10 µg/dL are associated with harmful effects on children's learning and behavior. We should try to prevent the occurrence of blood lead levels of 10 µg/dL and above in children.*

- *Very high blood lead levels cause devastating health consequences including seizures, coma, and death.*

- *Children with venous blood lead levels of 20 µg/dL or above or with venous blood lead levels in the range of 15-19 µg/dL over a period of at least 3 months need a doctor's care.*

- *Elevated blood lead levels in children are a major preventable health problem that affects children's mental and physical health. The higher a child's BLL and the longer it persists, the greater the chance that the child will be affected. Elevated blood lead levels can result in:*
    - *learning disabilities.*
    - *behavioral problems.*
    - *mental retardation.*
    - *at extremely high levels (70 µg/dL or higher), seizures, coma, and even death.*

Exposure to lead from the soils is most likely to occur from accidental ingestion of the soil or dust from soils. For example, if soil gets on the hand and face during recreational activities, and then it touches something that is eaten, exposure will occur. This is why it is recommended that children playing outside be encouraged to wash their hands afterwards.

APPENDIX B
Concurrence Letter from State of Indiana

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We make Indiana a cleaner, healthier place to live.

Mitchell E. Daniels, Jr.
Governor

Thomas W. Easterly
Commissioner

100 North Senate Avenue
Indianapolis, Indiana 46204
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(800) 451-6027
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February 5, 2008

Ms. Mary A. Gade
Regional Administrator
U.S. EPA, Region 5
77 West Jackson Blvd.
MC: R-19J
Chicago, IL 60604

Dear Ms. Gade:

Re: Record of Decision (ROD),
Jacobsville Neighborhood Soil
Contamination Superfund Site,
Evansville, IN

The Indiana Department of Environmental Management (IDEM) has reviewed the U.S. Environmental Protection Agency's (U.S. EPA's) ROD for the Jacobsville Neighborhood Soil Contamination (JNSC) Superfund site. IDEM is in full concurrence with the major components of the selected remedy outlined in the document, which include:

- Gaining access to residential properties.
- Sampling residential yards that were not sampled during previous sampling events to determine the need for remedial actions at the property or part of the property.
- Collecting soil samples from residential lots to verify that the soil is not characteristically hazardous for disposal purposes.
- Completing residential property checklists, inventory current vegetation, and collecting photographic documentation of current property conditions outside and potentially inside structures on the property.
- If physical barriers exist, such as large trees, soil will be excavated around the barrier to the extent possible.
- Engineering controls will be implemented in order to prevent exposure to lead and arsenic from dust created by the excavation of the soils.
- Building foundations, permanent walkways and fixtures will not be affected by the soil excavation.
- Residential soils containing concentrations greater than the arsenic and/or lead remediation goals will have the soils excavated to the depth that the elevated concentrations were found, up to two feet.
- Excavated soils will be transported to a RCRA Subtitle D landfill. This remedy assumes that the excavated soil will not be characterized as hazardous waste.

- Verification soil samples will be collected below the excavation depth and analyzed.
- Backfilling excavation with clean general fill and topsoil.
- Restoring the property to as close to original conditions as possible.
- Implementation of ICs at properties where lead levels greater than the remediation goal remain at depths greater than two feet. Since lead and arsenic above remediation goals have not been found at depths greater than one foot at the Site, the selected remedy assumes that ICs will not be necessary at this Site.

IDEM staff agree that the selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. IDEM staff have been working closely with Region V staff in the selection of an appropriate remedy and is satisfied with the selected alternative.

Please be assured that IDEM is committed to accomplish remediation at all Indiana sites on the National Priorities List and intends to fulfill all obligations required by law to achieve that goal. We look forward to beginning work on this project.

Sincerely,

Bruce H Palin

Bruce H Palin
Assistant Commissioner
Office of Land Quality

BP:KH:bl

cc: Rex Osborn, IDEM
Kevin Herron, IDEM
Bruce Oertel, IDEM
Dave Holder, IDEM

APPENDIX C
ARARs and TBCs

Requirement	Requirement Synopsis
Location-Specific ARARs	
Federal	
Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.)	The Act provides protection and consultation with the U.S. Fish and Wildlife Service and state counterpart for actions that would affect streams, wetlands, other water bodies, or protected habitats. Action taken should protect fish or wildlife, and measures should be developed to prevent, mitigate, or compensate for project-related losses to fish and wildlife. This Act is considered an ARAR for site contaminants and any future remediation construction activities that may affect surface waters and streams.
Action-Specific ARARs	
Federal	
Hazardous Materials Transportation Act (49 U.S.C. 1801 et seq.)	The Act provides regulations governing the transportation of hazardous materials and hazardous waste. The regulations include recordkeeping and reporting requirements; labeling and packaging requirements; and detailed handling requirements for each mode of transport (rail, air, waterway, or road). Remedial alternatives involving transport of hazardous materials are not anticipated. Contaminated soils or wastes that are excavated for offsite disposal would, however, be tested for hazardous waste characteristics, and if soil or waste is found to be hazardous waste, the requirements of this act would be followed. Soils are required to be managed as a hazardous waste if they contain listed hazardous waste or have the characteristics of a hazardous waste.
Resource Conservation and Recovery Act (42 U.S.C. 321 et seq.)	RCRA was passed in 1976. It amended the Solid Waste Disposal Act by including provisions for hazardous waste management. The goals of RCRA are to promote conservation of natural resources while protecting human health and the environment. The statute sets out to control the management of hazardous waste from inception to ultimate disposal. RCRA is also linked closely with CERCLA, and the CERCLA list of hazardous substances includes RCRA hazardous wastes. The Act applies to remedies that generate hazardous waste. Soils are required to be managed as hazardous waste if they contain listed hazardous waste or have the characteristics of hazardous waste. The Act may apply and will be adhered to if future remedies generate waste that can be classified as hazardous.
Occupational Safety and Health Act (29 U.S.C. 61 et seq.)	The Act was passed in 1970 to ensure worker safety on the job. The U.S. Department of Labor oversees it. Worker safety at hazardous waste sites is addressed under 29 CFR 1910. 120: Hazardous Waste Operations and Emergency Response. General worker safety is covered elsewhere within the law. The Act is considered an ARAR for construction activities performed during the implementation of remedies.

Clean Air Act (42 U.S.C. 7401 et seq.)	The Act is intended to protect the quality of air and promote public health. Title I of the Act directed the USEPA to publish national ambient air quality standards for "criteria pollutants." In addition, USEPA has provided national emission standards for hazardous air pollutants under Title III of the Act. Hazardous air pollutants are also designated hazardous substances under CERCLA. The Clean Air Act amendments of 1990 greatly expanded the role of National Emission Standards for Hazardous Air Pollutants by designating 179 new hazardous air pollutants and directed USEPA to attain maximum achievable control technology standards for emission sources. Such emission standards are potential ARARs if selected remedial technologies produce air emissions of regulated hazardous air pollutants. The Act is considered an ARAR for remedies that involve creation of air emissions, such as excavation activities that might create dust.
State	
Indiana Solid Waste Rules (IAC Title 329)	This law applies to remedies that involve offsite disposal of materials typically involved with excavations. Contaminated soils or wastes that are excavated for offsite disposal would be tested for hazardous waste characteristics and, if soil or waste is found to be hazardous waste, the requirements of the Rules would be followed.
Indiana Air Pollution Control Regulations (IAC Title 326)	The law is considered an ARAR for remedies that involve creation of air emissions, such as excavation activities that have the potential to create dust.
Chemical-Specific ARARs	
Federal	
Clean Water Act (33 U.S.C. 1251 et seq.)	The Act was passed in 1977. It is a major amendment of the original 1972 Federal Water Pollution Control Act. Its chief purpose is to restore and maintain surface water quality by controlling discharges of chemicals (priority toxic pollutants) to surface water. The act is closely linked to CERCLA: all 126 priority toxic pollutants under the act are CERCLA hazardous substances. Direct and indirect discharges of priority pollutants to surface water are regulated through NPDES. The NPDES program also includes ambient water quality standards and antidegradation policy standards. The Act is considered an ARAR for remedies involving construction activities that have the potential to affect surface water, such as excavation or that involve discharge of groundwater to surface water.
State (To be Considered)	
Voluntary Remediation of Hazardous Substances and Petroleum (IC 13-25-5)	IC 13-25-5 established the Voluntary Remediation Program in 1993 and gave the IDEM the authority to establish guidelines for voluntary site closure. Under this authority IDEM developed a nonrule policy document, the Risk Integrated System of Closure to guide site closures within the authority of IDEM's remediation programs. This guidance document does not have the effect of law.
Contained-in Policy Guidance for RCRA	Guidance document on management of remediation waste. This guidance document does not have the effect of law.

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
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January 25, 2007

Ms. Jena Sleboda
Remedial Project Manager
U.S. EPA Region 5, Superfund Division
Mail Code: SR-6J
77 West Jackson Blvd.
Chicago, Illinois 60604

Dear Ms. Sleboda:

Re: Applicable or Relevant and Appropriate Requirements for Jacobsville Neighborhood Soil Contamination Superfund Site, Evansville, Vanderburgh County, Indiana

Indiana Department of Environmental Management staff have performed an evaluation to determinate the Applicable or Relevant and Appropriate Requirements (ARARs) for the Jacobsville Neighborhood Soil Contamination (JNSC) Superfund Site in Evansville, Vanderburgh County, Indiana. The ARARs determination was evaluated for the three proposed remedial alternatives, which include Alternative 1 - No Action, Alternative 2 – Soil Excavation, Backfill and Site Restoration, and Alternative 3 – In Situ Treatment and Site Restoration. The proposed remedial alternatives are subject to the Indiana Administrative Code (IAC) and Indiana Code (IC) as follows:

1. Chemical-Specific Requirements:

   a. 326 IAC 2 regulates any source which has the potential to emit air pollutants. Since the JNSC site is a National Priorities List (NPL) site, registration and a permit may not be required. The facility will, however, need to comply with the substantive requirements of registration and a permit.

   b. 329 IAC 3.1 establishes a hazardous waste management program consistent with the requirements of the Resource Conservation and Recovery Act (RCRA). All wastes generated by remediation activities must undergo a waste determination. All wastes determined to be hazardous must be disposed in an approved RCRA permitted facility in accordance with 40 CFR 260-280.

   c. 329 IAC 10 regulates the management of solid wastes. All waste determined to be nonhazardous must be disposed in a facility permitted to accept such waste.

2. Action-Specific Requirements:

    a. Hazardous Air Pollutants (HAPs) are defined at 326 IAC 1-2-33.5 as any air pollutant listed pursuant to Section 112(b) of the Clean Air Act. HAPs are regulated because of their toxic effects. HAPs are regulated by 326 IAC 2. This site is contaminated with lead and possibly arsenic. Compounds of arsenic and lead emitted into the air are HAPs.

        - 326 IAC 2-5.1-2(a)(1)(A) requires a source that has the potential to emit five (5) tons per year of particulate matter (PM) to apply for a registration. A source with lower emissions is exempt.
        - 326 IAC 2-5.1-2(a)(1)(F) requires a source that has the potential to emit two-tenths (0.2) ton per year of lead to apply for a registration. A source with lower emissions is exempt.

    The report evaluating the three remedial alternatives gives no measurement or estimate of the amount of contaminates that may be emitted to the air as a result of the remedial actions. Therefore, the potential air pollution emissions resulting from the remedial actions cannot be calculated.

    b. Fugitive dust, defined as dust that crosses onto a property line, is defined and regulated by 326 IAC 6-4-1. This includes the generation of particulate matter to the extent that some portion of the material escapes beyond the property line or boundaries of the property, right of way, or easement on which the source is located. Fugitive dust and particulate matter releases may occur when soil is disturbed during remediation, including excavation of contaminated soils, transportation of soil, and backfilling. Particulate matter is defined at 326 IAC 1-2-52 and regulated by 326 IAC 2 and 326 IAC 6.

    c. 326 IAC 6-4-4 requires that any vehicle driven on any public right of way must not allow its contents to escape and form fugitive dust. This rule applies to any soil movement or removal actions.

    d. 329 IAC 3.1 (http://www.in.gov/legislative/iac/T03290/A00031.PDF) establishes a hazardous waste management program consistent with the requirements of RCRA.

    e. Requirements for solid waste land disposal facilities can be found in 329 IAC 10.

    f. The possibility of impact on surface water would be minimal because there is no proven surface water migration pathway (www.epa.gov/supefund/sites/docrec/pdoc1711.pdf). However, if a discharge to surface water is anticipated, 327 IAC 2-1-1.5 and 2-1-6, should be followed.

    g. Additional information needs to be provided to the Indiana Department of Natural Resources (IDNR) Division of Historical Preservation in order for them to conduct a complete analysis of the proposed remedies. IDEM staff provided the IDNR Division of Historic Preservation staff a hard copy of the draft FS Report. A copy of their January 4, 2007, letter is enclosed. The IDNR, Divisions of Water or Fish and Wildlife, has no ARARs for the JNSC Superfund Site.

3. There are no Location-Specific Requirements at this time.

4. To Be Considered (TBC)

    a. The IDEM Non-Rule Policy Document entitled "Contained-in Policy Guidance for RCRA" (NPD ID number WASTE-0052, 2002), which in turn references the federal guidance <u>Management of Remediation Waste Under RCRA</u>, EPA Publication Number 530-F-98-026, is a TBC. This nonrule policy document is intended solely as guidance and does not have the effect of a law or represent formal IDEM decisions or final actions. It is applicable to soil and groundwater which is generated and subsequently managed, and does not replace or alter requirements for closure or cleanups found in various regulatory authorities. This nonrule policy is available at http://www.in.gov/idem/rules/policies.

If you have questions concerning this correspondence, please feel free to contact me by email at kherron@ide.IN.gov or by phone at 317-234-0354.

Sincerely,

for

Kevin D. Herron, Project Manager
Federal Programs Section
Office of Land Quality
Indiana Department of Environmental Management

KDH:bl
Enclosure
cc: Rex Osborn

Mitchell E. Daniels, Jr., Governor
Robert E. Carter, Jr., Director

DNR Indiana Department of Natural Resources

Division of Historic Preservation & Archaeology•402 W. Washington Street, W274 · Indianapolis, IN 46204-2739
Phone 317-232-1646•Fax 317-232-0693 · dhpa@dnr.IN.gov

HISTORIC PRESERVATION AND ARCHAEOLOGY

January 4, 2007

JAN 9 2006 2007

Kevin Herron
Indiana Department of Environmental Management
100 North Senate Avenue
Mail Code 50-01
Indianapolis, Indiana 46204

Agency: Indiana Department of Environmental Management ("IDEM")

Re: Information regarding applicable or relevant and appropriate requirements pertinent to the Jacobsville Neighborhood Soil Contamination Superfund Site (DNR #12494; DHPA #1325)

Dear Mr. Herron:

Pursuant to Section 106 of the National Historic Preservation Act (16 U.S.C. § 470f) and 36 C.F.R. Part 800, the staff of the Indiana State Historic Preservation Officer ("Indiana SHPO") has conducted an analysis of the materials dated November 29, 2006 and received on December 7, 2006 for the above indicated project in Evansville, Vanderburgh County, Indiana.

The Indiana SHPO is unable to determine by the information provided if any state funding will be involved for this project. If there will be an undertaking with the potential to effect historic resources, the following information will need to be submitted to our office for a review:

1) Detail any construction, demolition, and earthmoving activities.

2) Define the area of potential effects[1] and provide a map or a good quality photocopy of a map containing the following:

   - The boundaries of the area of potential effects and the precise location of the project area within those boundaries clearly outlined in dark ink on a copy of the relevant portion of a town, city, county, or U.S. Geological Survey quadrangle map.

   - The names of nearby landmarks clearly labeled (e.g., major streets, roads, highways, railroads, rivers, lakes).

3) Give the precise location of any buildings, structures, and objects *within the area of potential effects* (e.g., addresses and a site map with properties keyed to it).

4) Give the known or approximate date of construction for buildings, structures, objects, and districts *within the area of potential effects*.

5) Submit historical documentation for buildings, structures, objects, and districts *within the area of potential effects*.

6) List all sources checked for your historical research of the *area of potential effects*. The Indiana SHPO recommends consulting the 1993 Vanderburgh County Interim Report for this information.

[1] Area of potential effects means the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (see 36 C F R § 800. 16[d]).

7) Provide recent, clear photographs or good quality computer-generated images (not photocopies or aerial photographs), keyed to a site plan, showing the exterior of any buildings, structures, objects, or land *that could be affected in any way by the project.*

8) Describe the current and past land uses within the project area; in particular, state whether or not the ground is known to have been disturbed by construction, excavation, grading, or filling, and, if so, indicate the part or parts of the project area that have been disturbed and the nature of the disturbance; agricultural tilling generally does not have a serious enough impact on archaeological sites to constitute a disturbance of the ground for this purpose.

Once the indicated information is received, the Indiana SHPO will resume identification and evaluation procedures for this project. Please keep in mind that additional information may be requested in the future.

A copy of the revised 36 C.F.R. Part 800 that went into effect on August 5, 2004, may be found on the Internet at www.achp.gov for your reference. If you have questions, please contact Miriam Widenhofer of our office at (317) 232-1646.

In all future correspondence please refer to DHPA # 1325

Very truly yours,

Miriam L. Widenhofer
Structures Review Assistant

MLW:mlw

cc: Christie Stanifer, Indiana Department of Natural Resources, Division of Water

City of Evansville
Environmental Protection Agency
Suite 100 – C.K. Newsome Community Center
100 East Walnut Street
Evansville, IN 47713
Phone (812) 435-6145 * Fax (812) 435-6155

Jonathan Weinzapfel, Mayor

January 23, 2007

U.S. Environmental Protection Agency – Region 5
Ms. Yolanda Bouchee, Community Involvement Coordinator
Ms. Jena Sleboda, Remedial Project Manager
77 W. Jackson Blvd.
Chicago, IL 60604

RE: Jacobsville Neighborhood Soil Contamination Site Clean Up

Dear Ms. Bouchee and Ms. Sleboda:

First, let me welcome you back to Evansville and express my gratitude for U.S. EPA's clean up of these contaminated properties! These yards and homes will be safer for our children because of this project and we sincerely appreciate your efforts!

For decades, to try to protect and improve our air quality, Evansville has enforced air quality ordinances more stringent than state or federal regulations, including rules intended to minimize dust from earthmoving activities. On January 8, 2007, the City adopted even more stringent rules. Because these new rules are very recent and because it is especially important to contain the lead / arsenic contaminated dust to prevent additional contamination, I wanted to make a special effort to provide you with this information so you could forward it to contractors interested in bidding on this project. The applicable portions of the Municipal Code are attached to this letter, but to summarize our requirements in plain English, contractors must:

- Keep the mud and dirt off streets and thoroughfares.
- Keep the dirt out of the air and prevent it from visibly crossing property lines.
- Cover the load on dump trucks or keep the load below the cab or cargo box.
- Prevent materials from leaking from the truck cargo area.

As major projects are announced for this region, Evansville Mayor Weinzapfel has made a special point of contacting the project planners and encouraging them to implement voluntary measures to conserve energy and reduce their impacts on the environment. For the Jacobsville project, we suggest that U.S. EPA include the following contractor requirements:

- Use dust suppressant measures as needed to minimize dust from earth-moving activities;
- Design and follow adequate Erosion Control Plans;
- Utilize Storm Water Best Management Practices;
- Require that all on and off-road equipment (bulldozers, backhoes, etc.) used in this project are equipped with particulate filters or Diesel Oxidation Catalysts (DOCs).
- Use a blend of 5% soy biodiesel and 95% Ultra-Low Sulfur Diesel for all diesel fueled equipment;
- Institute and enforce on-site "No-Idling" policies for all mobile equipment (semi-trucks, autos, construction equipment and delivery vehicles).

More than likely, U.S. EPA has already instituted these and additional measures for such projects and the suggestions provided above are already in place. Still, good ideas deserve repeating and we appreciate your consideration.

Again, thank you for your efforts and attention. Please contact the Evansville EPA if we can be of any assistance with this project.

Respectfully,

Dona J. Bergman
Director

Pc: Mayor Jonathan Weinzapfel
Ms. Rose Young, Chief of Staff
Evansville EPA Board

To view the Evansville Environmental Protection Agency's portion of the Municipal Code, go to "www.evansvillegov.org/epa" - on the left hand side of the home page, click on "Municipal Code of Evansville".

Section 3.30.212 Fugitive Particulate Matter.

(A) **APPLICABILTIY OF RULE:** This section shall apply to all sources of fugitive particulate matter.

(B) **DEFINITIONS:** Definitions of terms as set forth in this Section.

(1) "AS NEEDED BASIS." Means the frequency of application necessary to maintain compliance with the requirements of this Section.

(2) "CONSTRUCTION SITE ACCESS." Means a stabilized stone surface at all points of ingress or egress to a construction site for the purpose of capturing or detaining sediment carried by tires of vehicles or other equipment entering or exiting the project site.

(3) "FUGITIVE PARTICULATE MATTER." Means the generation of particulate matter to the extent that some portion of the material escapes beyond the property line or boundaries of the property, right-of-way, or easement on which the source is located or the activity causing the fugitive particulate matter emissions is taking place.

(4) "GROUND LEVEL." Means from zero (0) inches to thirty (30) feet above the ground.

(5) "MANUFACTURING PROCESS." Means any single or series of actions, operations, or treatments in which a mechanical, physical, or chemical transformation of materials occurs that emits or has the potential to emit, particulate in the production of the product. The term includes transference, conveyance, or repair of a product.

(6) "NOTICE OF INTENT LETTER." Means a written notification indicating a person's intention to comply with the terms of a specified general permit rule in lieu of applying for a specific NPDES permit and includes information as required in 327 IAC 15-3 and the general permit rule.

(7) "OVERSPRAY." Means the particulate matter resulting from surface coating activities not deposited on the part or surface for which it was intended.

(8) "PARTICULATE MATTER." Any finely divided solid or liquid material, excluding uncombined water.

(9) "PAVED PARKING LOT." Means any asphalt or concrete surfaced parcel of land located on the property of, or owned by, an individual or company upon which automobiles or other motorized vehicles are parked.

(10) "PAVED ROAD." Means any asphalt or concrete surfaced thoroughfare or right-of-way designed or used for vehicular traffic and located on the property of, or owned by, an individual or company.

(11) "UNPAVED PARKING LOT." Means any parcel of land located on the property of, or owned by, an individual or company lacking asphalt or concrete surfacing materials upon which automobiles or other motorized vehicles are parked.

(12) "UNPAVED ROADS." Means any surfaced thoroughfare or right-of-way, other than a paved road as defined above, which is designed or used for vehicular traffic located on the property of, or owned by an individual or company.

(13) "SURFACE COATING." Means the application of powder coating or a solvent or water-based coating to a surface that imparts protective, functional, or decorative films in which the application emits, or has the potential to emit, particulate matter. Surface coating does not include galvanizing.

(14) "USED OIL." Means:

(a) Any oil that has been refined from crude oil that has been used and as a result of such use is contaminated by physical or chemical impurities; or

(b) Any synthetic oil that has been used and as a result of such use is contaminated by physical or chemical impurities.

(c) Any used oil will be presumed to be contaminated by physical or chemical impurities. It shall be the burden of the owner or operator to refute this presumption by providing acceptable scientific data to the Director.

(C) **EXEMPTIONS.** The following may be exempted from the requirements of this Section:

(1) Release of steam not in combination with any other gaseous or particulate pollutants unless the steam creates a nuisance or hazard.

(2) Fugitive particulate matter resulting from demolition where every reasonable precaution has been taken in minimizing fugitive particulate matter emissions.

(3) Fugitive particulate matter caused by adverse meteorological conditions.

(4) Fugitive particulate matter from parking areas and access drives on properties zoned R-1, R-2, or Agricultural so long as the actual usage of the property is in conformance with the zoning.

(D) **USED OIL.** Application of used oil.
No person shall apply or allow the application of used oil to any ground surface.

(E) **VIOLATIONS.**

(1) The owner or operator of a source will be considered in violation of this section if evidence is obtained to verify the subject fugitive particulate matter originated from that source.

(2) A source or sources generating fugitive particulate matter shall be in violation of this Section if:

(a) A qualified representative of the Director observes fugitive particulate matter visibly crossing the site boundary or property line at ground level.

(b) A qualified representative of the Director observes mud or soil tracked from the site boundaries onto a public street, thoroughfare, road, or public or private right-of-way.

(c) A sworn law enforcement official observes fugitive particulate matter visibly crossing the site boundary or property line at ground level.

(3) Photographs or video evidence may be utilized to determine a violation of this Section.

(F) **CONSTRUCTION OR DEMOLITION ACTIVITIES.** Fugitive particulate matter resulting from construction or demolition activities shall be controlled.

(1) Construction Activities disturbing over one (1) acre:

(a) For activities subject to 327 IAC 15-5, a stable construction site access shall be provided at all points of construction traffic ingress and egress to the project site.

(b) The Site Operator, as designated on the Notice of Intent letter issued pursuant to 327 IAC 15-5-2 (d) (1), shall be considered in violation of this Section if a qualified representative of the Director visually verifies mud or soil tracked from the construction site onto a public street, road, alley, highway, public or private right-of-way or other thoroughfare.

(i) In addition to the Site Operator, the Director may also determine other companies or individuals are in violation of this Section.

(ii) Failure to obtain a Notice of Intent letter or to provide a Notice of Intent letter upon request by the Director shall be a violation of this Section.

(G) **MOTOR VEHICLE SOURCES.** Fugitive particulate matter resulting from transportation or hauling of loose material such as, but not limited to, soil, sand, gravel, coal, grain, and other similar materials shall be controlled.

(1) No vehicle shall be driven or moved on any public street, road, alley, highway, or other thoroughfare, unless such vehicle is so constructed as to prevent its contents from dripping, sifting, leaking, or otherwise escaping therefrom so as to create result an emission of particulate matter.

(2) Soil, sand, gravel, coal, grain and other similar materials may be hauled in open trucks as long as the material is not allowed to fall on a public or private way and the requirements of 3.30.212 (G) (3) hereof are complied with.

(3) Vehicles hauling soil, sand, gravel, coal, grain and other similar materials on a public or private way without a cover shall be loaded in the following manner:

(a) The peak, or highest point, of the load shall not be higher than the top of the vehicle cab or cargo box, whichever is lower.

(b) All vehicles must have a leak proof gate. Pick-up trucks and other vehicles with a low-hinged tailgate must have a liner to prevent leakage.

(c) All areas of the vehicle not within the confines of the cargo box shall be free of loose materials.

(d) The vehicle cargo area, including but not limited to the bottom, tailgate hinges, latches and sideboards, must be in a substantial state of repair to prevent shifting or leakage of the cargo.

****

Section 3.30.251 Penalties

(A) In accordance with Section 3.30.201, unless specifically provided for in this Section, monetary penalties for violations of this Subchapter occurring within a thirty-six (36) month period shall not be less than those provided by the following.

(1) First Violation: $ 50.00

(a) The Director may issue a Letter of Violation without a monetary penalty for the first violation.

(b) If the Director issues only a Letter of Violation, if a second violation is determined within a thirty-six (36) month period from the date of the first violation, the minimum monetary penalty shall begin at fifty dollars ($50.00) for the second violation.

(2) Second Violation: $ 150.00
(3) Third Violation: $ 500.00
(4) Fourth Violation: $1,500.00
(5) Fifth and subsequent Violations: $1,500.00 to $7,500.00.

(B) Violations prior to the effective date of this ordinance shall be included in the calculation of the number of offenses. The maximum monetary penalty shall be $7,500.00 per day, per violation.

(C) After the Director has determined that four (4) or more violations of this Subchapter have occurred at the same location or by the same person or company within a six-month period, the Director may, subject to appeal to the Environmental Protection Agency Board, upon determining a fifth violation, stop work on the project or at the facility and cause the immediate cessation of work on all or part of the project or at the facility until the conditions causing the violation(s) have been corrected.

(D) The Director, subject to appeal to the Environmental Protection Agency Board, may suspend, cancel or refuse to issue or renew any applicable permit provided in this Subchapter (3.30.195--3.30.251) relating to the violation committed.

(E) If the Director's action pursuant to subsections (C) and/or (D) are appealed, the Board shall fix a place and time not less than forty-eight (48) hours or more than seventy-two (72) hours (excluding Saturdays, Sundays and legal holidays) thereafter for a hearing to be held before the Board. Not more than twenty-four (24) hours after the commencement of such a hearing, the Board shall affirm, modify or set aside the order of the Director.

APPENDIX D
Screened Remedial Technologies

Soil Technology and Process Option Screening
Jacobsville Neighborhood Soil Contamination Site

Remedial Technology	Process Options	Descriptions	Treated Compounds	Limitations	Effectiveness[a]	Implementability[b]	Relative Cost[c] Range	Screening Comment
No Action								
None	None	No further action to address affected soils.	None.	Does not achieve RAOs.	Not effective.	Easily implemented.	Low.	Required by CERCLA for comparison.
Institutional Controls								
Access and Use Restrictions	Deed Restrictions	Deed restrictions issued for property within potentially affected areas to restrict property use.	None.	May be used in conjunction with other GRAs.	Good for preventing change in land use and to define resident restrictions (such as planting depths). Institutional controls do not prevent contaminant migration or reduce contaminant concentrations.	Easily implemented. May have legal implications.	Low. May incur legal fees.	Retained for further evaluation.
	Fences	Security fences installed around potentially affected areas to limit access.	None.	May need to be used in conjunction with other GRAs.	Effective.	Not Implementable because the affected areas consist of residential yards where access is required.	Low.	Not retained because of infeasibility.
	Permits	Regulations promulgated to require a permit for excavation/removal activities.	None.	May need to be used in conjunction with other GRAs.	Required only if soil with arsenic or lead concentrations in excess of the PRG are left in-place. Would require action by the City government to implement.	Implementable. May have legal implications.	Low. May incur legal fees.	Retained for further evaluation
Removal								
Excavation	Excavation	Excavation of soils exceeding PRGs can use ordinary construction equipment (backhoes, bulldozers, front-end loaders).	Excavation is applicable to the full range of contaminants.	Fugitive emissions such as dust and particulates are often a problem during operations. Communities often oppose the transportation of excavated material through populated areas.	Highly effective because all contaminants are removed and soil can be easily sampled during excavation to verify that arsenic and lead PRGs are met.	Implementable and well-proven process, however, will be difficult in and around residences.	High.	Retained for further evaluation.
Disposal								
Landfill	RCRA Subtitle C Hazardous Waste Landfill	Solid hazardous wastes are permanently disposed of in a RCRA-permitted landfill.	Disposal in a RCRA-permitted landfill is applicable to hazardous and nonhazardous wastes.	Will be used in conjunction with other GRAs. Disposal facilities are limited and must be approved.	Effective. Permitted landfills are rigorously designed and operated to contain hazardous waste.	Implementable. RCRA permitted landfills are available.	Cost estimates for disposal per ton range from moderate to high, depending on waste classification, quantity, and distance to nearest landfill.	Retained for further evaluation.
	RCRA Subtitle D Solid Waste Landfill	Solid nonhazardous wastes are permanently disposed of in a solid waste landfill.	Disposal in a permitted RCRA Subtitle D solid waste landfill is applicable only to nonhazardous wastes.	Will be used in conjunction with other GRAs.	Effective.	Implementable. Nearby landfills are available.	Costs for disposal per ton are moderate but will depend on quantity and distance to nearest landfill.	Retained for further evaluation.
In Situ Treatment								
Biological	Phyto-remediation	Phytoremediation is a set of processes that uses plants to remove inorganics from the shallow soil and transfer them to the biomass. It is preferred that metal-accumulating plants accumulate the metals in the shoots (aboveground biomass) rather than the roots for ease in harvesting and repeated removal of accumulated metals.	Applicable for remediation of metals, particularly lead. Success of phytoremediation for arsenic is limited, but recent studies have shown that arsenic bioaccumulates in some ferns.	Climatic or seasonal conditions may interfere or inhibit plant growth, slow remediation efforts, or increase the length of the treatment period. Phytoremediation for extraction is limited to relatively shallow depths of root penetration.	Because of the plant types required, it is not suitable for use within residential properties.	Easily implementable but unsuited to site use.	Low to moderate.	Not retained because of site use.

Soil Technology and Process Option Screening
Jacobsville Neighborhood Soil Contamination Site

Remedial Technology	Process Options	Descriptions	Treated Compounds	Limitations	Effectiveness[a]	Implementability[b]	Relative Cost[c] Range	Screening Comment
Physical/ Chemical	Stabilization	Stabilization is accomplished by reducing the contaminant toxicity through the application of chemical reagents. Reduction of toxicity is achieved and maintained by reducing the bioavailability of the contaminant. In-situ application can be accomplished with standard soil mixing practices. In situ stabilization avoids additional handling during treatment and typically allows resultant materials to be left in place.	The leaching characteristic of inorganics is treated rendering the bioavailability of the inorganic below toxicity levels. Treatment is determined by post mixing TCLP tests. Total metals remain in soil onsite.	Environmental conditions may affect long-term toxicity. The process will result in a slight increase in volume (10%), therefore, provisions may be made for final grading plans. Bench scale testing is generally required. Limited long-term effectiveness has been demonstrated.	Effective in treating inorganics such as lead and arsenic.	Implementable. Utilizes standard soil mixing practices but, however, will be difficult in and around residences.	High.	Retained for further evaluation.
Ex Situ Treatment								
	Soil Washing	Soil washing is a water-based process for scrubbing soil ex situ to remove contaminants. The process removes contaminants from soil in one of two ways: (1) by dissolving or suspending contaminants in a wash solution (can be sustained by chemical manipulation of pH) or (2) by concentrating contaminants into a smaller volume of soil through particle size separation, gravity separation, and attrition.	Effective in treating soils containing heavy metals, radionuclides and organic contaminants.	Soil washing is considered a media transfer technology. Therefore, contaminated water generated from soil washing will require treatment with a technology suitable for the contaminants.	Does not destroy wastes, but is a means of separating hazardous contaminants from soils, thereby reducing the volume of the hazardous waste that must be treated.	Difficult.	High.	More effective technologies exist for treatment of metals in soil.
	Chemical Extraction	Hydrochloric acid is used to extract heavy metals from soil in an acid extraction process. The soil and acid are mixed in a closed extraction unit, dissolving the inorganic contaminants into the acid. When extraction is complete (10 to 40 minutes) the soil is rinsed with water to remove the entrained acid and metals. The clean soil is then dewatered and mixed with lime and fertilizer to neutralize any residual acid.	Effective in treating soil containing inorganic contaminants.	Organically bound metals can be extracted along with target pollutants, thereby creating residuals with special handling requirements. After acid extraction, any residual acid in treated soil needs to be neutralized.	Does not destroy wastes but is a means of separating hazardous contaminants from soils, thereby reducing the volume of the hazardous waste to be treated. Some soil types and moisture content levels will affect process performance adversely. Soil with higher clay content may reduce extraction efficiency and require longer contact times.	Implementable.	High.	Effectiveness may not be optimal because of the silt and clay content of affected soil at JNSC.

Note: Highlighted technologies are screened from further consideration in the assembly of stabilization measure alternatives.
[a]Effectiveness is the ability to perform as part of an overall alternative that can meet the objective under conditions and limitations that exist onsite.
[b]Implementability is the likelihood that the process could be implemented as part of the remedial action plan under the physical, regulatory, technical, and schedule constraints.
[c]Relative cost is for comparative purposes only and it is judged relative to the other processes and technologies that perform similar functions.

APPENDIX E
Detailed Cost Analysis of Remedy

Alternative 2—Excavation, Backfill, and Site Restoration

Jacobsville Neighborhood Soil Contamination Remedial Alternatives Analysis Report

Description: Excavation of soils within residential parcels, transportation and disposal, and site restoration which includes backfill, topsoil, and seeding.

CALCULATIONS

Excavation Voumes and Quantities

1. Residential Lot Excavation Area

Lot size excludes footprint of building

Area of Average Lot (GIS)	3,000	ft^2
	0.07	acres
Total # of Parcels	508	

2. Residential Excavation per Parcel

Volume per parcel	3,000	ft^3
	111	yd^3
Disposal (correction factor 1.42)	158	tons
# of Parcels (90% of total)	457	parcels

3. Residential Ecxavation Totals

Total Volume of Excavations	50,800	yd^3
Total Disposal Quantity	72,136	tons

4. Site Restoration

Volume of general fill per parcel	55.6	yd^3
Total volume of general fill	25,420	yd^3
Volume of top soil per parcel	55.6	yd^3
Total volume of top soil	25420.3	yd^3

ASSUMPTIONS

1. Property Assumptions

Average parcel size is 4000 f^2.

Impervious surfaces assumed to cover 1000 ft^2. Average area requiring excavation per lot is 3000 ft^2.

2. Quantity Assumptions

Based on initial sampling results:

90% of parcels will be excavated to 12"

3. Sampling Requirements

Initial sampling for all parcels not previously sampled includes up to 3 composite samples at 3 depths (0–6, 6–12, and 12–18 in).

Up to 9 samples per lot.

Waste characterization sampling for disposal includes 1 TCLP sample per parcel.

Confirmation sampling not required.

Sampling frequency for clean backfill, 1 TCLP sample per 1,000 yd^3.

4. Excavation and Disposal

Soil excavation may require hand excavation and double handling of material.

Assume up to 1 tree per lot (avg 14" diameter).

5. Site Restoration

Backfill includes 6 in of clean fill and a 6 in of top soil.

Seeding will be representative of local native grasses.

Trees and shrubs will be replaced in lots only where they previously existed. Inventory taken before clearing and grubbing.

Single Property Excavation Cost - 12" Depth

Description	Qty	Unit	Unit Cost	Total Cost	Notes
Laboratory Analysis					
Initial Sampling-SW 846 - 6010B/6020	9	each	$ 100	$ 900	Engineers Estimate
TCLP (Waste Characterization)	1	each	$ 1,100	$ 1,100	Engineers Estimate
Property Requirements					
Access Agreement	8	hr	$ 100.00	$ 800	Engineers Estimate
Sampling	20	hr	$ 100.00	$ 2,000	Engineers Estimate
Property Checklists/Inventory/Photo	8	hr	$ 100.00	$ 800	Engineers Estimate
Excavation and Disposal					
Clearing/Grubbing	0.07	AC	$ 4,650	$ 326	Ryans Excavating
Tree/Stump Removal & Disposal	1	each	$ 650	$ 650	RS Means
Vegetation T&D (30 yd^3 Roll-Off)	1	each	$ 720	$ 720	Ryans Excavating
Soil Excavation	111	yd^3	$ 28	$ 3,111	NADC
Soil Waste T&D (multiply by 1.42)	158	ton	$ 65	$ 10,255	Ryans Excavating
Restoration					
General Fill (Compacted)	56	yd^3	$ 13	$ 723	NADC
Top Soil (Loose)	56	yd^3	$ 20	$ 1,112	NADC
Seeding/Fertilizer (seed and straw)	3,000	ft^2	$ 0.08	$ 240	Engineers Estimate
Vegetation Maintenance (30 days)	1	LS	$ 1,500.00	$ 1,500	Engineers Estimate
Tree/Shrub Restoration	1	LS	$ 850	$ 850	Engineers Estimate

Survey Support							
Pre/Post Residential Lot Survey	2	LS	$	1,000	$	2,000	Engineers Estimate
Subtotal							**$27,086**
Remedial Design					6%		$1,625
Contingency					20%		$5,417
Subtotal of Single Property Excavation							**$34,128**
Total Cost of Properties							
	422	each	$	34,128			**$14,401,971**
Assuming 90% - 35 completed							
Additional Costs of Alternative 2 (not on a per property basis)							
Parcels Not Requiring Excavation							
Initial Sampling-SW 846 - 6010B/6020	23	each	$	900	$	20,700	Engineers Estimate
Access Agreement/Sampling	23	each	$	2,800	$	64,400	Engineers Estimate
Parcels Requiring Excavation							
Backfill Material Analysis-per 1,000 yd^3	51	each	$	1,200	$	61,200	Up to 51,000 yd^3
Subtotal							**$146,300**
Total Cost of Properties with Additional Costs							**$14,548,271**
Associated Planning and Construction Costs							
Mobilization/Demobilization					15%		$2,182,241
Construction Oversight/Project Management					20%		$2,909,654
Reporting					10%		$1,454,827
Subtotal							**$6,546,722**
TOTAL CAPITAL COSTS AND PRESENT WORTH (2007)							**$21,094,993**

Note:

1) The estimate above is considered budgetary-level cost estimating, suitable for use in project evaluation and planning. Actual construction costs are expected to vary from these estimates due to market conditions, actual costs of purchased materials, quantity variations, regualtory requirements, and other factors existing at the time of construction.

2) Costs were based on RS Means (2005 edition using a 4% annual increase to 2007), Premier Chemicals, Middleburg Heights, OH phone quote, North American Dismantling Corporation (NADC), Ryan's Excavating (IN), and Engineer's Estimates.

3) *Mobilization/Demobilization* costs will include site setup, facilities, utility location, erosion and sediment controls, signage, security, decon cell, residential access during construction, dust supression, site teardown/restoration, and demobilization.

4) *Construction Oversight/Project Management* costs include daily oversight, health and safety requirements, project management requirements, subcontractor procurements, and any day to day requirements deemed necessary.

5) *Reporting* costs include development of the work plan and other required planning documents including but not limited to quality control, health and safety, environmental protection, and completion reporting (as-built drawings).

APPENDIX F
Administrative Record Index

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
JACOBSVILLE NEIGHBORHOOD SOIL CONTAMINATION SITE
EVANSVILLE, VANDERBURGH COUNTY, INDIANA

ORIGINAL
APRIL 28, 2005

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	01/13/05	Sleboda, J., U.S. EPA	U.S. EPA	Technical Memorandum #1: Field Sampling Report for Sampling Event (November 29-December 3, 2004)	28
2	04/04/05	Sleboda, J., U.S. EPA	U.S. EPA	Technical Memorandum #2: Preliminary Site Characterization Summary for Sampling Event (November 29-December 3, 2004)	31

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
JACOBSVILLE NEIGHBORHOOD SOIL CONTAMINATION SITE
EVANSVILLE, VANDERBURGH COUNTY, INDIANA

UPDATE #1
DECEMBER 21, 2006

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	12/07/04	Sleboda, J., U.S. EPA	U.S. EPA	Quality Assurance Project Plan for the Jacobsville Neighborhood Soil Contamination Site Revision 1	150
2	07/11/05	Sleboda, J., U.S. EPA	U.S. EPA	Technical Memorandum #4: Preliminary Site Characterization Summary for Dates: April 11-15, 2005 Revision 0	68
3	08/18/05	Sleboda, J., U.S. EPA	U.S. EPA	Technical Memorandum #3: Field Summary Report for Sampling Event Dates: April 11-15, 2005 for the Jacobsville Neighborhood Soil Contamination Site - Revision 1	31
4	12/28/05	Sleboda, J., U.S. EPA	U.S. EPA	Technical Memorandum #5: Field Summary Report for Sampling Event Dates: October 17-26, 2005 Revision 0	67
5	01/23/06	CH2M HILL	U.S. EPA	Signature Page for the Final Quality Assurance Project Plan for the Jacobsville Neighborhood Soil Contamination Site	1
6	01/23/06	Sleboda, J., U.S. EPA	U.S. EPA	Technical Memorandum #6: Preliminary Site Characterization Summary for Dates: October 17-27, 2005 Revision 0	56
7	01/23/06	Chapman, T., CH2M HILL	Sleboda, J., U.S. EPA	Site Specific Plans for the Jacobsville Neighborhood Soil Contamination Site w/Cover Letter	477
8	09/00/06	CH2M HILL	U.S. EPA	Final Remedial Investigation Report for the Jacobsville Neighborhood Soil Contamination Site	627

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMOVAL ACTION

ADMINISTRATIVE RECORD
FOR
JACOBSVILLE NEIGHBORHOOD SOIL CONTAMINATION SITE
EVANSVILLE, VANDERBURGH COUNTY, INDIANA

UPDATE #3
AUGUST 22, 2007

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	01/00/07	U.S. EPA	Public	Proposed Plan for the Jacobsville Neighborhood Soil Contamination Site	8
2	08/22/07	Turner, K., U.S. EPA	Karl, R., U.S. EPA	Action Memorandum: Request for a Time Critical Removal Action at the Jacobsville Neighborhood Soil Contamination Site (PORTIONS OF THIS DOCUMENT HAVE BEEN REDACTED)	17

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
JACOBSVILLE NEIGHBORHOOD SOIL CONTAMINATION SITE
EVANSVILLE, VANDERBURGH COUNTY, INDIANA

UPDATE #4
JANUARY 29, 2008

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	01/23/07	Lenn, S., Tri-State Reporting, Inc.	U.S. EPA/ Public	Public Hearing Transcript: Proposed Plan for the Jacobsville Neighborhood Soil Contamination Site	67
2	02/08/07	Strijek, C., Kentuckiana Reporters	U.S. EPA/ Public	Public Meeting Transcript: Proposed Plan for Soil Cleanup at the Jacobsville Neighborhood Soil Contamination Site - Afternoon Session	27
3	02/08/07	Strijek, C., Kentuckiana Reporters	U.S. EPA/ Public	Public Meeting Transcript: Proposed Plan for Soil Cleanup at the Jacobsville Neighborhood Soil Contamination Site - Evening Session	60
4	12/13/07	CH2M HILL	U.S. EPA	Technical Memorandum: Revised Remediation Cost Estimate, Jacobsville Neighborhood Soil Contamination Site	4
5	01/00/08	CH2M HILL	U.S. EPA	Bioavailability Study Report for the Jacobsville Neighborhood Soil Contamination Site	73
6	00/00/00	U.S. EPA	U.S. EPA/ Public	Record of Decision for the Jacobsville Neighborhood Soil Contamination Site **(PENDING)**	