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OHIO ENVIRONMENTAL PROTECTION AGENCY

DECISION DOCUMENT  
FOR THE

SHIELDALLOY METALLURGICAL CORPORATION SITE  
CAMBRIDGE, OHIO

April 1, 1997

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## 1.0 INTRODUCTION

The Shieldalloy Metallurgical Corporation facility is located near Cambridge, Ohio on State Route 209, Guernsey County, Ohio ("the Site"). The Shieldalloy facility has produced vanadium and other metal alloys since the 1950s. The facility has disposed much of its wastes, including radioactive slags and vanadium-contaminated soils, at the Site. The Site includes two slag piles, known as the East Slag Pile and the West Slag Pile, that span 11 acres. The Site also has contamination in soils, wetlands, and Chapman Run.

Ohio EPA prepared a Preferred Plan to describe its proposed strategy to abate pollution at, and prevent migration of wastes from, the Site. On or about December 13, 1996, Ohio EPA publicly announced the availability of the Preferred Plan and requested comments from interested members of the public. The Byesville Public Library held for public review copies of the Preferred Plan and other documents relevant to remediation of the site. On January 6, 1997, Ohio EPA held a public information session on the Preferred Plan at the Guernsey County Public Library. On January 22, 1997, Ohio EPA held a public hearing on the Preferred Plan at the Pritchard Laughlin Center, Cambridge. Ohio EPA extended the public comment period to February 28, 1997 as a result of a request from an interested member of the public.

Ohio EPA has considered the public comments. Attached to this document is Ohio EPA's Responsiveness Summary, which describes the comments Ohio EPA received and Ohio EPA's responses to them.

This Decision Document describes the remedial action selected by Ohio EPA for the Shieldalloy Site. This Decision Document has three parts. First, it describes the history of the Site, including facility operations, waste generation and disposal, and state and federal oversight. Second, this Decision document summarizes the remedial investigation and feasibility study report for the Site. The remedial investigation is a study of the type and extent of the contamination at the Site. The feasibility study is a description of options for addressing the contamination.

Ohio EPA oversaw the development of the remedial investigation and feasibility (RI/FS) study by Shieldalloy Metallurgical Corporation and Cyprus Foote Mineral Company (former Site owner). These companies prepared the RI/FS report under the requirements of an agreed court order. On July 11, 1995, the Guernsey County Court of Common Pleas issued the order (Consent Order for Preliminary Injunction) in the case of *State of Ohio, ex rel Montgomery v. Shieldalloy Metallurgical Company and Cyprus Foote Mineral Company*, Case No. 95CV242.

The third part of this Decision Document is a description of the remedy selected by Ohio EPA for abating pollution at, and preventing migration of wastes from, the Site. Ohio EPA's selected remedy for the Shieldalloy Site includes:

1. Excavate and remove contaminated sediments and soils from the Site;

2. Place excavated sediments and soils on top of the West Slag Pile;
3. Cap the West Slag Pile in accordance with state solid waste rules under Ohio Administrative Code Chapter 3745-27;
4. Ensure long term care of the West Slag Pile and;
5. For the East Slag Pile:
  - a. if feasible, sell and legally remove East Slag Pile materials, expeditiously; and/or
  - b. if the foregoing is not feasible, then cap the East Slag Pile in accordance with state solid waste rules under Ohio Administrative Code Chapter 3745-27 and ensure long term care.

The remedy selected by Ohio EPA is substantially the same as the remedy proposed by Ohio EPA in the Preferred Plan. The remedy meets applicable, relevant and appropriate requirements. Treatment of the radioactivity in the slag is not practicable. According to the RI/FS report, the projected cost of this remedy is \$10.3 million. For a more complete description of Ohio EPA's selected remedy, see section 5.0 of the Decision Document. Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the remedy selected in this Decision Document, may endanger public health, welfare or the environment. This Decision Document does not preclude Ohio EPA from seeking other remediation at the Site in the future in a manner not inconsistent with the U.S. Environmental Protection Agency's National Contingency Plan (NCP) at Title 40 of the Code of Federal Regulations, Part 300. Procedures under the NCP call for periodic review to ensure that the remedy will protect human health and the environment. This Decision Document does not address remediation of Cambridge area locations away from the Site where radioactive slag from the facility was used as fill material.

## 2.0 SITE HISTORY

### 2.1 Site Location

This Decision Document concerns property that is located on Route 209 about 1.5 miles south of Interstate 70 near Cambridge, Ohio in Guernsey County ("the Site"). The Site features are shown in Figure 1. A detailed topographic map is presented in Figure 2. The Site is located approximately 1 mile southwest of the municipal limits of Cambridge, Ohio. The Site is roughly triangular and covers approximately 130 acres. To the north, between the facility and Cambridge, lies open land, several residences and an interstate interchange (Interstates 70 and 77), with several hotels and other businesses north of Interstate 70. The closest residence is approximately one quarter of a mile northeast of the facility. Route 209, an industrial park, and a country club lie to the southwest. To the immediate north and south are former strip mines and open land. Chapman Run, a tributary to Wills Creek, lies to the west of the facility. A school is located to the south of the facility. To the east are a few residences, open fields, and Interstate 77. The town of Byesville is approximately 1 mile southeast of the facility.

### 2.2 Facility Ownership and Operation

Prior to 1952, the Site had been the location of a racetrack and farmland. Vanadium Corporation of America constructed the facility in 1952, and began production operations in 1953. Over the next 15 years, Vanadium Corporation of America operated the facility, which included a 2.5-megawatt arc furnace for separating vanadium and other valuable metals from ores and other raw materials. In 1956, the company added chemical manufacturing operations and a chemical laboratory, including a Pilot Plant to support research and development.

In 1967, Foote Mineral Corporation, a subsidiary of Newmont Mining Company, merged with Vanadium Corporation of America. Foote Mineral added a 7.5 megawatt arc furnace and a baghouse in 1970, and a second baghouse in 1976.

Shieldalloy Metallurgical Corporation ("Shieldalloy") acquired the facility from Foote Mineral Corporation in May 1987. Shieldalloy is a subsidiary of Metallurg, Inc. In 1991, Shieldalloy added to the facility a roaster and a new pole barn for ore storage. For a more detailed history of the Site, see *Onsite Slag Characterization and Distribution at the Shieldalloy Metallurgical Corporation Site in Cambridge, Ohio* (PTI 1995b). This document is available at the Byesville Public Library, along with other documents relevant to remediation of the Site.

### 2.3 Metal Alloy Production

Alloy production began at the Site in 1953, and the facility is still in operation today. The primary products manufactured at the facility are vanadium alloys (ferrovanadium and Ferrovan®), which account for approximately 80 percent of the total production. In addition, the facility has

1 manufactured lesser quantities of Grainal®, Solvan®, ferrotitanium, ferroboron, and  
2 ferrocolumbium. The Pilot Plant has produced small quantities of vanadium chemical compounds.  
3 The facility used ores or other raw materials containing naturally occurring radioactivity in the  
4 production of some alloys (e.g., ferrocolumbium, ferrovanadium and Grainal®).  
5

## 6 **2.4 License for Ferrocolumbium Slag under the Atomic Energy Act**

7

8 In 1953, Vanadium Corporation of America obtained an operating license from the Atomic Energy  
9 Commission (AEC) to possess a raw material known as niobium ore (formally known as columbium  
10 ore) which contained uranium and thorium (Atomic Energy Commission license SMB-00850).  
11 From 1953 to 1973, Vanadium Corporation of America and Foote Mineral produced  
12 ferrocolumbium alloy under the license. In 1975, the operating license expired and was not renewed.  
13

14  
15 In 1987, when it purchased the facility from Foote Mineral, Shieldalloy applied for and received a  
16 license from the AEC's successor, the Nuclear Regulatory Agency (NRC), on May 29, 1987 (license  
17 SMB-1507). The license is for the possession of the radioactive slag and not for production.  
18 Shieldalloy has not manufactured ferrocolumbian during its ownership of the site.  
19

## 20 **2.5 Slag and Other Wastes**

21

22 For every metal alloy produced, the facility generated a corresponding waste slag. The facility  
23 generated three types of radioactive slag (ferrocolumbium, ferrovanadium, and Grainal® slags) and  
24 about five types of nonradioactive slags. The facility also generated baghouse dust and other wastes.  
25

26 Since it began operation, and continuing until the late 1980s, the facility disposed of most of its  
27 waste slags and other wastes in various areas across the Site. The facility disposed of waste slag in  
28 the West Slag Pile, the East Slag Pile and the Grainal® Slag Pile. The West Slag Pile contains most  
29 types of radioactive and nonradioactive slag. The East Slag Pile contains all types of radioactive  
30 slags and some nonradioactive slags.  
31

32 The Grainal Slag Pile contained both radioactive and nonradioactive slag. Grainal slag produced  
33 prior to 1987 is radioactive because the zircon sand used to manufacture the Grainal contains  
34 naturally occurring uranium and thorium. Grainal Slag produced after 1987 does not contain  
35 radioactive material. Starting in 1987, Grainal was manufactured using a non-radioactive feed  
36 material (zircalloy). This resulted in a slag which was non-radioactive. This non-radioactive slag was  
37 placed on the Grainal Slag Pile from 1987 to 1989 when the slag pile was consolidated with East  
38 Slag Pile.  
39

40 In 1987, when Shieldalloy purchased the facility, the facility had waste stored at various locations  
41 on the Site, including the East and West Slag Piles, the Grainal® Slag Pile and the Baghouse Dust  
42 area (Figure 3). The Site also had soils contaminated with radioactive wastes and nonradioactive



hazardous wastes, as a result of operations such as the handling of raw material and slags.

## 2.6 NRC Oversight

NRC is overseeing certain decontamination/decommissioning work at the Site under the Atomic Energy Act and the National Environmental Policy Act.

### 2.6.1 Partial Decommissioning Under the Atomic Energy Act

In 1988, Shieldalloy submitted a decommissioning plan to NRC to decommission (remediate) ferrocolumbium slag at the Site. In 1989, Shieldalloy excavated approximately 140,000 tons of soil and slag, contaminated with chemical and radiological wastes, from sixteen operational areas around the Site (Figure 3), and placed them on top of the West Slag Pile. The soil from the operational areas was excavated on the basis of radiological characteristics only. Shieldalloy then reshaped the West Slag Pile for erosion control, and protected the exposed base from seasonal flooding.

After the placing the soil/slag material on the West Slag Pile, Shieldalloy also placed treated and untreated baghouse dust on this pile. In particular, Shieldalloy placed on the pile Ferrovan baghouse dust (treated through the Chemfix treatment process) and 1600 tons of untreated baghouse dust. The baghouse dust had high concentrations of hexavalent chromium, total chromium, and lead. The baghouse dust was treated with ferrous sulfate to reduce the hexavalent chromium to trivalent chromium. This was followed by treatment in the Chemfix solidification process. The resulting slurry was pumped to containment cells constructed in a circular arrangement on the West Slag Pile.

Following the placement of the treated (Chemfix) and untreated baghouse dusts, Shieldalloy covered this material with a geotextile and twelve inches of sand. These decommissioning activities brought the volume of the West Slag Pile to 548,000 tons of material with a surface area of 8.2 acres.

In 1989, Shieldalloy moved the 14,000 ton Grainal® Slag Pile to the top of the East Slag Pile. This consolidation increased the volume of the East Slag Pile to approximately 58,000 tons. Following the placement of the treated (Chemfix) and untreated baghouse dusts, Shieldalloy covered this material with a geotextile and twelve inches of sand.

In 1990, while performing decommissioning activities, Shieldalloy learned from NRC that the level of radioactivity in the waste slags, soils, and sediments at the Site was higher than what NRC had expected, and that NRC would impose additional requirements. Shieldalloy then stopped the decommissioning activities, leaving the West Slag Pile partially capped and the East Slag Pile uncapped.

In 1992, Shieldalloy installed a fence around the East Slag Pile consistent with NRC requirements. A purpose of the fence is to secure licensed material from unauthorized removal.

## **2.6.2 Environmental Impact Statement under NEPA**

In March 1990, NRC listed the Site in its Site Decommissioning Management Plan (SDMP). On November 26, 1993, NRC published a Notice of Intent to prepare an Environmental Impact Statement (EIS) for the Site in accordance with the National Environmental Policy Act (NEPA) of 1969. In May 1994, NRC issued a report summarizing NRC's EIS scoping process. On July 26, 1996, NRC announced the availability of its Draft EIS for the Site for public review. 58 *Federal Register* 62384. NRC's Draft EIS presents five options for addressing certain radioactive contamination at the Site: onsite stabilization and containment; offsite disposal; onsite separation processing with offsite disposal; onsite dilution processing and disposal; and no action.

NRC prepared its Draft EIS based, in part, on information provided in drafts of the Remedial Investigation/Feasibility Study report for the Site. Shieldalloy and Cyprus Foote prepared the Remedial Investigation/ Feasibility Study report in response to an agreed court order in a court case filed by the State of Ohio.

## **2.7 Ohio EPA Oversight**

The Ohio EPA is overseeing remediation/cleanup of all contaminants at the Site (including radioactive wastes, nonradioactive hazardous wastes and other wastes) consistent with Federal and state law as discussed below.

### **2.7.1 Remediation/Cleanup Process under CERCLA**

Federal law establishes a six step process for remediating/cleaning up contaminated sites. The federal law that establishes these steps is known as the Comprehensive Environmental Response, Compensation and Liabilities Act (CERCLA), 42 U.S.C. 9601, *et seq.* The six major steps are<sup>1</sup>:

- 1) Remedial Investigation (RI);
- 2) Feasibility Study (FS);
- 3) Remedy Selection;
- 4) Remedial Design (RD);
- 5) Remedial Action (RA); and
- 6) Operation and Maintenance (O&M).

Ohio EPA typically carries out these six steps in the following manner. Persons or companies that contributed to the contamination carry out the first two steps under Ohio EPA oversight. The Remedial Investigation (RI) identifies the type of contaminants present at or near the Site, assesses the degree of contamination, and characterizes the actual and potential risks to the community and

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<sup>1</sup>For more information, see United States Environmental Protection Agency's National Contingency Plan, 40 CFR 300.

1 environment. The Feasibility Study (FS) then evaluates several alternative remedies to address  
2 contaminants at the Site.

3  
4 Upon completion of the Remedial Investigation/Feasibility Study (RI/FS) report, Ohio EPA prepares  
5 a Preferred Plan that summarizes the Remedial Investigation/Feasibility report and describes Ohio  
6 EPA's proposed remedy for the Site. Ohio EPA then holds a public comment period of at least 30  
7 days. This period allows the public an opportunity to learn about the remedy proposed for the Site  
8 and offer input.

9  
10 After considering public comments, Ohio EPA prepares a Decision Document that selects a long-  
11 term remediation/cleanup action ("remedy") to protect human health and the environment. Ohio  
12 EPA also prepares a Responsiveness Summary that addresses pertinent questions and concerns  
13 submitted by the public.

14  
15 Then, the persons or companies that contributed to the contamination develop detailed plans to carry  
16 out the selected remedy. This is called the Remedial Design (RD) stage. When the design is  
17 complete and approved, the responsible persons or companies carry out the selected remedy. This  
18 step is called the remedial action (RA) stage. The RA stage implements of the Remedial Design.  
19 The RA stage may involve construction activity.

20  
21 When the Remedial Action (RA) is complete, Operation and Maintenance (O&M) may be required  
22 if waste materials are left at the Site. O&M may include ongoing monitoring and maintenance of  
23 permanent structures.

### 24 25 2.7.2 Remedial Investigation / Feasibility Study

26  
27 On July 11, 1995, the State of Ohio filed a Complaint concerning the Site in the Guernsey County  
28 Court of Common Pleas. The Complaint asks the Court to order Shieldalloy and Cyprus Foote to  
29 remediate all contamination at the Site (including radioactive wastes, nonradioactive hazardous  
30 wastes and other wastes), to reimburse the State of Ohio for its costs in overseeing the remediation,  
31 and to take other actions. The case is docketed as *State of Ohio, ex rel Montgomery v. Shieldalloy*  
32 *Metallurgical Company and Cyprus Foote Mineral Company*, Case No. 95CV242.

33  
34 On July 11, 1995, the Guernsey County Court of Common Pleas issued in the case a Consent Order  
35 for Preliminary Injunction (COPI). The COPI is an agreed order that requires Shieldalloy and  
36 Cyprus Foote to conduct a remedial investigation/feasibility study for the Site under Ohio EPA  
37 oversight.

38  
39 The companies performed an Remedial Investigation/Feasibility (RI/FS) for the Site under Ohio  
40 EPA oversight. On January 17, 1997, Ohio EPA conditionally approved the RI/FS report.



### 2.7.3 Preferred Plan

On December 13, 1996, Ohio EPA issued for public comment its Preferred Plan for the Site. The Preferred Plan set forth Ohio EPA's proposed plan for remediation of the site. Ohio EPA's proposed plan included excavating and removing contaminated sediments and soils and capping the West Slag Pile. The proposed plan also included selling and legally removing the East Slag Pile, if feasible. If this is not feasible, the proposed plan was to cap the East Slag Pile.

### 2.7.4 Public Participation

Ohio EPA afforded interested members of the public the following opportunities to learn more about or comment on Ohio EPA's Preferred Plan for the Site:

1. Document Review - The Byesville Public Library held for public review copies of the Preferred Plan and other documents relevant to the Site. Ohio EPA files were open for public review at the agency's Southeast District Office in Logan, Ohio.
2. Discussion with Ohio EPA officials - On January 6, 1997, Ohio EPA officials held a public information session at the Guernsey County Public Library. On January 22, 1997, Ohio EPA officials held a second information session. Also, Ohio EPA officials were available at their offices to discuss the Site with interested members of the public.
3. Opportunities to Comment - On January 22, 1997, Ohio EPA officials held a public hearing to receive comments. Ohio EPA also received written comments. Ohio EPA extended the period for submitting written comments to February 28, 1997, as a result of a request from an interested member of the public.
4. Public Notice - Ohio EPA provided public notice of these events and opportunities through press releases and newspaper announcements.

### 2.7.5 Decision Document

This Decision Document is the document in which Ohio EPA selects a remedy for the Shieldalloy Site. This Decision Document describes the history of the site, summarizes the RI/FS report, and selects a remedy. The remedy that Ohio EPA selects for the Site includes:

1. Excavate and remove contaminated sediments and soils from the Site;
2. Place excavated sediments and soils on top of the West Slag Pile;
3. Cap the West Slag Pile in accordance with state solid waste rules under Ohio Administrative Code Chapter 3745-27;

1 4. Ensure long term care of the West Slag Pile and;

2  
3 5. For the East Slag Pile:

4  
5 a. if feasible, sell and legally remove East Slag Pile materials, expeditiously; and/or

6  
7 b. if the foregoing is not feasible, then cap the East Slag Pile in accordance with state  
8 solid waste rules under Ohio Administrative Code Chapter 3745-27 and ensure long  
9 term care.

10  
11 The remedy selected by Ohio EPA is substantially the same as the remedy proposed by Ohio EPA  
12 in the Preferred Plan. The remedy meets applicable, relevant and appropriate requirements.  
13 Treatment of the radioactivity in the slag is not practicable. According to the RI/FS report, the  
14 projected cost of this remedy is \$10.3 million. For a more complete description of Ohio EPA's  
15 selected remedy, see section 5.0 of the Decision Document. Actual or threatened releases of  
16 hazardous substances from the Site, if not addressed by implementing the remedy selected in this  
17 Decision Document, may endanger public health, welfare or the environment. This Decision  
18 Document does not preclude Ohio EPA from seeking other remediation at the Site in the future in  
19 a manner not inconsistent with the U.S. Environmental Protection Agency's National Contingency  
20 Plan (NCP) at Title 40 of the Code of Federal Regulations, Part 300. Procedures under the NCP call  
21 for periodic review to ensure that the remedy will protect human health and the environment. This  
22 Decision Document does not address remediation of Cambridge area locations away from the Site  
23 where radioactive slag from the facility was used as fill material.

24  
25 Attached to this Decision Document is Ohio EPA's Responsiveness Summary. The Responsiveness  
26 Summary summarizes the public comments Ohio EPA received on the Preferred Plan and Ohio  
27 EPA's responses to them.

### 3.0 NATURE AND EXTENT OF CONTAMINATION

In 1995 and 1996, Shieldalloy and Cyprus Foote conducted a remedial investigation under an agreed court order in a case brought by the State of Ohio in the Guernsey County Court of Common Pleas. Ohio EPA reviewed and commented on drafts of the remedial investigation report. The remedial investigation has the following objectives:

- Identify any chemicals (contaminants) that have been released to the environment
- Determine the extent of contaminants that have been released to the environment
- Determine the location of contaminants
- Determine potential migration pathways of contaminants
- Identify the environmental impacts, risks to human health and risks to ecological receptors potentially associated with any exposure to contaminants
- Develop the information necessary to support the feasibility study and subsequent remedial design.

#### 3.1 Hydrogeology and Groundwater

Several phases of environmental investigation have been conducted at the Shieldalloy facility since the early 1980's. These investigations typically entailed the installation and sampling of monitoring wells to monitor the groundwater at the Site. During the remedial investigation eleven monitoring wells and four piezometers were installed at the Site. Piezometers are groundwater wells used to provide groundwater elevation data but not water quality data. Four additional monitoring wells were installed on the southeastern portion of the Site for purposes of monitoring the recent baghouse dust storage area. Currently, thirty-four wells are present at the Site for groundwater monitoring purposes (Figure 4). Information from these monitoring wells were used to characterize the geology, groundwater and the extent of contamination.

The geology below the Site consists of two distinct geological formations. The first geological formation is a bedrock formation, consisting of alternating sandstones, shales, coal and limestone, and is present at depths ranging between 25 and 60 feet beneath the Site. The private well survey conducted during this investigation found that practically all private wells in the area surrounding the Site were installed into the bedrock.

The second geological formation at the Site is a formation of unconsolidated deposits consisting of sand, silts and clays. The unconsolidated deposits lie above, or on top of, the bedrock geology and range in thickness of 25 to 60 feet. The unconsolidated deposits can be classified into three

1 general groups: the lower unit consisting of 15 to 20 feet of silty clay; an intermediate zone of 15  
2 to 20 feet of silty sand; and, an upper zone consisting of brown, silty clay with a thickness of 15 feet.  
3 The intermediate silty sand was the primary geological unit that was investigated and monitored  
4 during the remedial investigation.

5  
6 The direction of groundwater flow is generally from east to west, toward Chapman Run. The rate  
7 of groundwater flow was estimated to be 0.0968 feet per day or 35 feet per year. The time of travel  
8 from the West Slag Pile to Chapman Run is estimated as ten years.

9  
10 The water level data was also used to evaluate vertical flow directions of groundwater. The water  
11 level data indicated that there was a small upward flow of groundwater in the silty sand unit. This  
12 is important in determining that the groundwater system is connected to Chapman Run, the  
13 wetlands, and other surface water bodies. An upward groundwater flow inhibits the downward  
14 migration of contaminants. This upward flow of groundwater reduces the likelihood of groundwater  
15 contamination at the Site.

### 16 17 **Groundwater Quality**

18  
19 Groundwater sampling conducted during the remedial investigation indicated that groundwater is  
20 not currently contaminated at the Site (other than the maintenance shop area). In April and May of  
21 1995, two rounds of groundwater sampling were conducted. In the first round, twenty-four wells  
22 were sampled for metals, while selected wells were sampled for radionuclides and organic  
23 compounds. In the second round, seven wells were sampled for metals and radionuclides.

24  
25 Of the contaminants analyzed, none exceeded background concentrations except zinc (in the bedrock  
26 monitoring well). Manganese and iron were detected at elevated levels in several wells. The  
27 distribution of manganese and iron in groundwater at the Site indicates that the elevated  
28 concentrations of these metals are due to regional influences, such as acid mine drainage, and not  
29 attributable to the Site. In addition, magnesium and sodium were detected at elevated concentrations  
30 in one well downgradient of the East Slag Pile; however, groundwater from other wells  
31 downgradient of both the East and West Slag piles did not contain elevated levels of magnesium or  
32 sodium.

33  
34 Radionuclide analyses of groundwater confirmed the findings of previous investigations that  
35 radionuclides are not found in groundwater above background levels.

36  
37 No volatile organic compounds were detected in groundwater with the exception of organics found  
38 in the vicinity of the maintenance shop area. Samples from this process area show that trace  
39 amounts of the solvents tetrachloroethylene (PCE) and trichloroethylene (TCE) exist in groundwater.  
40 It is believed that the source of the solvent was removed from the area during the decommissioning  
41 of 1988/1989. The remaining solvents detected are believed to be residual amounts from the source.

1 From the results of groundwater sampling conducted during the remedial investigation, groundwater  
2 is not currently contaminated at the Site (excluding the maintenance shop area).

### 3 4 **3.2 Onsite Soils**

5  
6 Soil samples were collected and analyzed to determine migration of the contaminants. Vanadium  
7 and chromium were the metal contaminants most often detected in onsite soils at concentrations  
8 exceeding background levels.

9  
10 The former Grainal® Slag Pile and baghouse dust areas had metal contaminants at or above  
11 background levels. Elevated metal concentrations were also observed in the empty drum  
12 accumulation area and the field southeast of the Roaster Building. Vanadium and chromium were  
13 detected in soil from these areas at concentrations of up to 2,050 and 521 mg/kg, respectively. Fill  
14 from the empty drum accumulation area was identified as a mixture of ferrovanadium and Grainal®  
15 slags. Fill from the field southeast of the Roaster Building is elevated in metal contaminants, the  
16 origin of this fill was not determined. Soil samples collected near the Pilot Plant had elevated  
17 concentrations of copper, lead, zinc, and vanadium.

18  
19 Soil samples from the perimeter of the slag piles did not have elevated concentrations of metal  
20 contaminants, with the exception of soil from the 0 to 5 foot depth collected next to the Slag Piles.  
21 Samples collected during the installation of MW-20 had elevated concentrations of metals possibly  
22 due to slag or coal fragments observed in the upper 18 inches of soil .

23  
24 Samples collected from beneath the West Slag Pile contained calcium and magnesium at elevated  
25 levels. The high levels of calcium and magnesium are probably the result of historical runoff from  
26 fresh slag when the piles were originally being amassed.

27  
28 Soils from the perimeter of the West Slag Pile were analyzed for PCBs to help determine if these  
29 compounds were present in the soil layer of the pile. PCBs were not detected in the perimeter soil  
30 samples.

31  
32 The remedial investigation detected above background levels of the radionuclides thorium-230,  
33 actinium-227, and radium-228 in samples from the sedimentation delta of the south side of the West  
34 Slag Pile and in the area southeast of the Roaster Building where fill had been found.

### 35 36 **3.3 Surface Water**

37  
38 Sampling of surface waters in onsite wetlands and ditches and Chapman Run showed elevated levels  
39 of contaminants at various locations. Existing surface water data was supplemented by the collection  
40 of additional samples. Eighteen additional areas were sampled during the remedial investigation.  
41 Eight areas were located in onsite ditches and tributaries. Metal contaminants detected above  
42 background concentrations included arsenic, chromium, copper, lead, selenium, vanadium, and zinc.



1 Vanadium was the only contaminant to consistently exceed background levels. Samples from the  
2 west Mill Building ditch, which lies downstream of the active slag pile, yielded the highest  
3 concentrations of arsenic, copper, selenium, and vanadium.  
4

5 Surface water samples were also collected from the wetland areas north of the East Slag Pile.  
6 Vanadium was detected at concentrations exceeding three times background in the wetland water  
7 samples. One sample collected from Chapman Run exceeded background levels for most  
8 contaminants. Vanadium concentrations in offsite surface water (Chapman Run) were highest in the  
9 samples collected from the northern property boundary.  
10

11 Radionuclides were not elevated in either onsite or offsite surface water with the exception of  
12 thorium-230. Thorium-230 was slightly elevated downstream of the West Slag Pile when compared  
13 to concentrations at areas upstream of the pile, but not when compared to background concentrations  
14 in Wills Creek.  
15

### 16 **3.4 Sediments and Wetland Soil**

17

18 Sampling of sediments in drainage ditches and wetlands showed elevated levels of metals and other  
19 contaminants at various locations. Sediment sampling was conducted during the remedial  
20 investigation to supplement data from previous investigations. Six onsite and three downstream  
21 offsite sediment samples collected during the remedial investigation were analyzed for metal  
22 contaminants. Selected samples were analyzed for radionuclides. In addition, soil samples were  
23 collected from wetland areas located north and west of the East Slag Pile to supplement wetland soil  
24 data collected by Ohio EPA.  
25

26 The elements most frequently observed exceeding background levels in onsite sediments were  
27 arsenic, beryllium, cobalt, manganese, nickel, vanadium, and zinc. The highest metals  
28 concentrations in sediment were in drainage downstream of the active slag pile and the East and  
29 West Slag Piles. Elevated concentrations of metals downgradient of the active slag pile suggests  
30 the contamination is the result of both current runoff from the active pile and historical runoff from  
31 the East and West Slag piles. Concentrations of contaminants, in particular vanadium, exceeded  
32 background levels in sediment samples from Chapman Run that were collected immediately  
33 downstream of outlets of drainage from the Site. However, concentrations of contaminants were  
34 lower in samples collected a short distance downstream of these outlets. Concentrations of arsenic,  
35 beryllium, chromium, manganese, nickel, thallium, vanadium, and zinc consistently exceeded  
36 background levels in wetland soils.  
37

### 38 **3.5 Transport and Fate of Contaminants**

39

40 Past and present contaminant sources were evaluated to determine potential present and future  
41 contamination of soils, surface water, sediments, and groundwater. This evaluation included soil  
42 erosion, sediment resuspension and sedimentation, weathering, dissolved phase transport, and

1 infiltration to groundwater.

### 2 3 **3.5.1 Surface Water Transport**

4  
5 Redistribution of particles by over-bank, high-water events is probably the most significant process  
6 in contaminant transport at the Site. Elevated concentrations of contaminants in soils and sediments  
7 at the Site indicate redistribution from source areas by soil erosion and sediment transport.  
8 Migration of contamination is influenced by surface water pH. Surface water pH ranges from  
9 approximately three, where acid mine drainage enters the Site, to approximately twelve in a ditch  
10 that drains the Active Slag Pile. Concentrations and loading rates of contaminants in water from  
11 onsite indicate that the Site is a source of vanadium to Chapman Run, but is a negligible source of  
12 arsenic, barium, beryllium, copper, lead, selenium, and zinc to Chapman Run. Vanadium is  
13 relatively mobile and is transported in surface water primarily in the dissolved phase, even at neutral  
14 pH and high suspended solids concentrations.

### 15 16 **3.5.2 Vadose Zone and Groundwater Transport**

17  
18 The remedial investigation concludes that, based on the groundwater model, the contaminants are  
19 not expected to contribute to groundwater contamination. Groundwater sampling and analysis  
20 conducted during the remedial investigation found that groundwater had not been significantly  
21 impacted by the source areas, other than the maintenance shop area. Given the results of the  
22 remedial investigation and some of the limitations of the groundwater model, future groundwater  
23 monitoring will be necessary to ensure no future impact to groundwater.

### 24 25 **3.5.3 Atmospheric Transport**

26  
27 Ambient concentrations were determined for fugitive emissions by modeling onsite areas. Onsite  
28 areas that contributed to fugitive emissions were limited to areas with vehicular traffic. The  
29 conservative modeling, which included emissions and dispersion calculations, demonstrates that air  
30 quality at the Site does not pose unacceptable risk.

## 31 32 **3.6 Risk Assessments**

### 33 34 **3.6.1 Human Health Risk Assessment**

35  
36 The Remedial Investigation contains a human health risk assessment that evaluates the potential for  
37 adverse human health effects from exposures to Site-related radiological and chemical contaminants  
38 under current and potential future Site conditions, if no remedial action is taken. Several potential  
39 scenarios of human exposure were evaluated, including an onsite occupational (industrial) scenario,  
40 an offsite recreational scenario, and a hypothetical future onsite residential scenario. Environmental  
41 media that were examined include soil, sediments, groundwater, and surface water. Exposures to  
42 direct radiation from slag are also considered.

1 The incremental (above background) lifetime cancer risk as calculated by Shieldalloy and Cyprus  
2 Foote for the Site is  $2 \times 10^{-5}$  for the current onsite occupational scenario, including workers who hunt  
3 and trap at the Site. The primary contributor to potential exposures is external radiation emanating  
4 from the East Slag Pile. The primary contributor to cancer risks estimated by Shieldalloy and  
5 Cyprus Foote for the hypothetical future onsite residential scenario (i.e.,  $3 \times 10^{-5}$  (if bioavailability  
6 adjustment factors are included in the calculations, or  $7 \times 10^{-5}$  if they are omitted)) is exposure to  
7 contaminants (i.e., arsenic, beryllium, and thorium-230) in soil. Risk estimated for the offsite  
8 recreational scenario is approximately one order of magnitude less (i.e.,  $3 \times 10^{-6}$ ).  
9

10 Site wide risk from radionuclides were also evaluated by Ohio EPA using standard USEPA  
11 Superfund methods based on concentrations reported by Shieldalloy and Cyprus Foote on October  
12 16, 1996 and using assumptions about the presence of actinium-227 and its daughter products.  
13 Incremental carcinogenic risk was  $1.7 \times 10^{-4}$  for a hypothetical residential scenario, and  $3.84 \times 10^{-5}$  for  
14 an industrial scenario. See Appendix R of the remedial investigation for discussion on these  
15 calculations. USEPA's accumulative risk range (from all contaminants and all media) is  $10^{-4}$  to  $10^{-6}$ ,  
16 with a goal of  $1 \times 10^{-6}$ .  
17

18 The primary contributor to hazards other than cancer is vanadium in the soil. In assessing the  
19 potential non-cancer health effects at the Site, the hazard index calculated for the offsite recreational  
20 exposure scenario (0.5) is less than USEPA's safe target level of 1. For the occupational scenario,  
21 a hazard index of 2 is estimated regardless of whether bioavailability adjustment factors are included  
22 in the calculations and whether additional exposures associated with hunting and trapping activities  
23 at the Site are included in the analyses. Thus, the hazard index for the onsite occupational scenario  
24 exceeds USEPA's target level. The hazard index calculated for the hypothetical onsite residential  
25 scenario is 9 (or 20, if the bioavailability adjustment factors are omitted from the calculations). A  
26 hazard index of 20 is also associated with dermal contact with certain vanadium concentrations  
27 found in onsite surface water in several localized areas.

28 For an overview of the human health risk assessment, please refer to *Remedial Investigation/  
29 Feasibility Study at the Shieldalloy Metallurgical Corporation Site in Cambridge, Volume I, Section  
30 6 and appendix R (September 1996)*.  
31

### 32 **3.6.2 Phase I Ecological Assessment**

34 Data from several sampling events was used in the Phase I Ecological Risk Assessment. Fish tissue,  
35 fish community, and benthic macroinvertebrate community data from existing documents as well  
36 as more recent sampling data was used in the Phase I Ecological Risk Assessment. Onsite surface  
37 soil, wetland soil, sediment, and surface water and offsite sediment and surface water were analyzed  
38 for selected metals and radionuclides.  
39

40 Several ecological receptor species and aquatic and terrestrial exposure pathways were evaluated in  
41 this assessment. In accordance with Ohio EPA's generic statement of work for a remedial  
42 investigation / feasibility study, the Phase I ecological assessment included the four components  
43 outlined below:



- Site Characterization: Physical characteristics of the Site and associated ecological habitats and vegetation community types were described, Contaminants were selected, and ecological receptors likely to come into contact with contaminants were identified.
- Initial Toxicity Assessment: A literature-based toxicity assessment and benchmark screening analysis were used to evaluate the effects of contaminants on wildlife and terrestrial plants; Site-specific toxicity tests using *Chironomus tentans* and *Hyaella azteca* were used to evaluate the toxicity of Site sediments to aquatic invertebrates; and surveys of the fish community and comparison of measured concentrations of contaminants in water to water quality criteria were used to assess the toxicity of surface waters.
- Preliminary Ecological Assessment: Results of the initial toxicity assessment were used to evaluate the probability of adverse effects on ecological receptors.
- Evaluation of Uncertainties and Limitations: The degree of confidence in the risk estimates was determined; the most important limitations and sources of uncertainty were described.

Using conservative assumptions, the results of the wildlife toxicological benchmark screening analysis show that arsenic, barium, chromium, copper, selenium, vanadium, and zinc could potentially cause environmental impacts to several receptors and should be further evaluated. A bioconcentration factor for estimating the concentration of lead in invertebrates is not available. Exposures of belted kingfishers and red-winged blackbirds were estimated in the Phase II Ecological Risk Assessment using measured concentrations of lead in invertebrates.

Concentrations of contaminants in soils from the former Grainal® Slag Pile area, the former baghouse dust area, the empty drum accumulation area, and the field southeast of the Roaster Building were compared to concentrations in soils that caused reduced growth expressed as relatively low root, shoot, or leaf weight in agricultural plants. These areas were found to contain metal concentrations in soils which exceed USEPA benchmark values for plant toxicity.

The lack of vegetation on the sedimentation delta located on the north side of the West Slag Pile is due to the chemical and physical characteristics of the deposited sediment.

Survival and growth of *Chironomus tentans* exposed in the laboratory to sediments from the Site were not reduced relative to survival and growth of this species exposed to sediments from reference areas. Results of the amphipod survival bioassay showed significant sediment toxicity at station SB-04, which was also impacted by untreated industrial sewage overflow from the Cambridge sewer

1 lift station. Survival of amphipods exposed to the onsite beaver pond sediments (station SB-03) was  
2 66 percent.

3  
4 The macroinvertebrate communities in Chapman Run were in the fair to poor range. All Sites  
5 sampled were in the fair range except at river mile 0.9, downstream from the Shieldalloy Site, which  
6 fell in the poor range. Marginal habitat conditions existed at all locations with worst conditions  
7 being downstream from the Shieldalloy Site, due largely to the pervasive silt load originating from  
8 Shieldalloy property. The poor macroinvertebrate community performance at river mile 0.9 is below  
9 what would be expected given the habitat conditions, based on a comparison of the data results with  
10 other data with similar habitat conditions.

11  
12 The results of the wildlife toxicological benchmark screening analysis and the sediment toxicity tests  
13 indicated that a focused Phase II Ecological Risk Assessment was needed. During the Phase II  
14 Ecological Risk Assessment, Site-specific data were collected to address data gaps and uncertainties  
15 identified in the Phase I Ecological Risk Assessment.

### 16 **3.6.3 Phase II Ecological Risk Assessment**

17  
18  
19 The Phase II Ecological Risk Assessment assesses the impact of specific contaminants associated  
20 with activities at the Site on selected ecological receptor species. The Phase II Ecological Risk  
21 Assessment was designed to meet three specific objectives:

- 22 ■ Identify contaminants from the initial analyte list
- 23 ■ Characterize risk to selected ecological receptors
- 24 ■ Identify areas of concern to be addressed in the feasibility study.

25  
26  
27 The analyses conducted to achieve these objectives included additional sediment toxicity bioassays,  
28 an assessment of surface water quality relative to water quality criteria for the protection of aquatic  
29 life, a survey of amphibian communities onsite, and an assessment of contaminants risk to birds and  
30 mammals based on food web exposure modeling. The following contaminants from Phase I  
31 Ecological Risk Assessment were considered in the Phase II Ecological Risk Assessment: arsenic,  
32 barium, chromium, copper, lead, selenium, silver, vanadium, and zinc.

33  
34  
35 The Phase I Ecological Risk Assessment shows that terrestrial receptors are at risk due to exposure  
36 to arsenic and vanadium. The remaining contaminants do not demonstrate risk to terrestrial  
37 receptors and therefore, these contaminants were evaluated for aquatic pathways only. Exposure of  
38 receptors to arsenic and vanadium was evaluated for both aquatic and terrestrial pathways. In  
39 addition, nine metals detected during surface water sampling were sampled in the Phase II  
40 Ecological Risk Assessment. These metals were aluminum, antimony, cadmium, cobalt,  
41 magnesium, manganese, mercury, nickel, and thallium. Exposure of receptors to these nine  
42 additional contaminants through both aquatic and terrestrial pathways was evaluated in the Phase II  
43 Ecological Risk Assessment.

1 The same ecological receptors considered in the Phase I Ecological Risk Assessment were  
2 considered in the Phase II Ecological Risk Assessment. Exposure of receptors to contamination  
3 onsite was estimated from contaminant concentrations in surface water, sediment, and soils reported  
4 in the Phase I Ecological Risk Assessment. In addition, as part of the Phase II Ecological Risk  
5 Assessment, sediment samples were collected and tested for toxicity to amphipods, and sediment  
6 and biological tissue samples were collected and analyzed for contaminants. Concentrations of  
7 chemicals in fish from Chapman Run as reported by Ohio EPA were also used in the exposure  
8 assessment.

9  
10 In Site-specific tests, sediment toxicity to amphipods correlated with vanadium concentrations in  
11 sediment. The survival of amphipods did not significantly decrease relative to survival of  
12 amphipods exposed to sediments from reference areas until vanadium concentrations in sediment  
13 reached 1,280 mg/kg (dry weight). This concentration of vanadium in sediments is considered the  
14 apparent effects threshold for aquatic macroinvertebrates.

15  
16 In the surface water assessment, vanadium was the only contaminant with concentrations in  
17 Chapman Run that exceeded Ohio chemical water quality criteria. Exceedances of the vanadium  
18 criterion occurred at all stations, except for Chapman Run stations CHRN-02 and CHRN-03 and  
19 station UTEF-01 in the south ditch. One water sample collected in the north ditch exceeded the  
20 chemical water quality criterion for mercury.

21  
22 Vanadium concentrations in Chapman Run exceed Ohio's Water Quality Criteria. The analysis of  
23 fish tissue conducted by Ohio EPA provides additional evidence that Chapman Run fish are exposed  
24 to vanadium as well as other chemicals from upstream sources. Lead and mercury were detected in  
25 fish tissue sampled in Chapman Run upstream of the Site and in Wills Creek. Other factors  
26 potentially influencing Chapman Run fish communities include non-point source pollution upstream  
27 of the Site, degradation of habitat quality resulting from development of the watershed, and  
28 influences of a malfunctioning sewer lift station. Impacts on the fish community per the fish  
29 community studies of Ohio EPA reflect the cumulative effects of multiple stressors throughout  
30 Chapman Run.

31  
32 Results of the exposure modeling indicate that the exposure of mink and muskrat to vanadium  
33 accounts for potentially significant risk related to Site contaminants identified in the Phase II  
34 Ecological Risk Assessment. Qualitative evaluation of cumulative impacts from exposures to  
35 aluminum and vanadium in the context of trapping, habitat loss, and chemicals offsite suggest that  
36 the rate of population increase of mink and muskrats that use the Site could decline. Results of the  
37 food web model indicate that there is a low risk to terrestrial mammals (as represented by white-  
38 tailed deer) from exposure to vanadium. Uncertainties affecting the interpretation of the risk  
39 characterization include the extent to which wildlife use the Site, the quality of habitat throughout  
40 the year, the specific toxicity of each chemical to each receptor, and the precise distribution of  
41 chemicals in relation to the foraging and breeding habitats of receptors.

42  
43 Under the no-action alternative, the use of onsite aquatic habitats by fish and wildlife is likely to vary

1 as a result of physical modifications of habitat unrelated to contamination. Wetlands onsite are  
2 maintained by beaver; if beaver remain absent or are removed through trapping, there will be a  
3 reduction in available aquatic habitat and a loss of wildlife associated with beaver ponds. Return  
4 of beaver from offsite areas will result in reestablishment of beaver dams and open water. Loading  
5 of vanadium to Chapman Run via sediment transport would be expected to continue. Under the no-  
6 action alternative, the wetland soils and the area in Chapman Run at the confluence with the north  
7 ditch will continue to contain sediments that are toxic to amphipods.

#### 4.0 DESCRIPTION OF REMEDIATION ALTERNATIVES

Shieldalloy and Cyprus Foote developed a feasibility study under an agreed court order. Ohio EPA reviewed and commented on drafts of the feasibility study report. The feasibility study identifies and screens technologies and alternatives for all areas requiring remedial action. The feasibility study evaluates methods to meet the remedial action objectives, which are to:

- Develop remedial action objectives and preliminary remediation goals for media of concern developed in the investigation
- Identify and screen remedial technologies applicable to the Site based on the remedial action objectives and preliminary remediation goals
- Develop remedial action alternatives from the remedial technologies retained after screening
- Conduct a detailed analysis of the alternatives, including cost estimates for implementation of the alternatives and relative rankings of the alternatives.

The remedial investigation for the Site identified the following chemicals (including radiological isotopes) of potential concern:

arsenic, barium, beryllium, chromium, copper, lead, selenium, silver, thorium-232 and progeny, uranium-235 and progeny, uranium-238 and progeny, vanadium, and zinc.

The remedial investigation for this Site identified the following areas of potential concern:

- East and West Flag Piles
- Offsite slag (included for the purpose of evaluating onsite remedial alternatives; offsite slag is not otherwise evaluated in the feasibility study)
- Wetland soil
- Onsite sediment (drainage ditches)
- Offsite sediment (Chapman Run)
- Surface water

The feasibility study for this Site evaluated the following alternatives for remediating the areas of potential concern:

■	<u>West Slag Pile</u>	■	<u>East Slag Pile</u>
	no action		no action
	capping in place (without offsite slag)		capping in place
	capping in place (with offsite slag)		removal and offsite disposal
	removal and offsite disposal		removal and sale of the slag
■	<u>Onsite Sediment</u>	■	<u>Offsite Sediment</u>
	no action		no action
	capping		natural recovery
	removal and onsite containment		rechannalization
	removal and offsite disposal		removal and onsite containment
			removal and offsite disposal
■	<u>Wetland Soil</u>		
	no action		
	wetlands mitigation		
	capping		
	removal and onsite containment		
	removal and offsite disposal		

This section describes the remedial alternatives for the West and East Slag Piles, onsite/offsite sediment and wetland soil that were selected for detailed analysis. This section also includes cost estimates for the remediation alternatives provided. Cost estimates for this section are taken from Appendix C and E of the Feasibility Study and are used for comparison purposed only. This section proceeds in the following order: West Slag Pile, East Slag Pile, onsite sediment, offsite sediment, and wetland soil. For a more detailed analysis of all the alternatives, please refer to the Feasibility Study.

## 4.1 West Slag Pile

The West Slag Pile covers approximately 8.2 acres as shown in Figure 1. It includes most types of radioactive and nonradioactive slag that have been generated at the SMC Cambridge facility. The West Slag Pile has an estimated weight of 532,150 tons, and an estimated volume of 220,663 yd<sup>3</sup>.

### 4.1.1 No Action

The no-action alternative is the baseline to which all other alternatives must be compared. No-action consists of the current conditions at the Site. It assumes that no future remedial actions will be conducted at the Site.

Some decontamination/decommissioning activities that have already occurred on the West Slag Pile include placing stabilized baghouse dust on the pile, resloping the edges of the piles, installing silt fencing around the pile, and restricting access. The 1989 partial "decommissioning cap" was



constructed using the stabilized baghouse dust (Chemfix material). The Chemfix material was pumped into cells constructed of clay and allowed to harden. Then, the pile was covered with a geotextile cloth and twelve inches of sand. The geotextile cloth was intended to function as a barrier layer for plants. The growth of plants into the Chemfix would break the material apart, creating fractures that would allow migration of water through this unit. Migration of water through this unit would increase the leachate generated and the potential for surface water contamination or groundwater contamination.

The only active component of this alternative is the incomplete "decommissioning cap" that provides a partial barrier for the decommissioning soils that were disposed of in the pile during the decontamination/decommissioning activities of 1989/1990. However, the incomplete decommissioning cap does not adequately protect human health and the environment.

#### **Cost Estimates**

The cost of work needed to implement this alternative would be zero dollars. This alternative assumes that no additional work will be conducted and no monies spent.

#### **4.1.2 Capping in Place**

This alternative would contain the slag in the existing West Slag Pile by constructing one of the following caps:

- Completing the cap that Shieldalloy began to construct in 1989 and 1990 (Decommissioning Cap)
- Constructing a solid waste cap over the entire slag pile in accordance with solid waste rules under Ohio Administrative Code Chapter 3745-27 (solid waste cap)
- Constructing a cap over the entire slag pile in accordance with hazardous waste rules under Ohio Administrative Code Rule 3745-57-10 and the guidelines presented in U.S. EPA's Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (U.S. EPA 1989).

Measures to protect wetlands during remediation and restoration efforts would be implemented. Institutional controls, including deed restrictions, survey markers, monitoring, and financial assurance, would also be implemented.

#### **Decommissioning Cap**

Completing the decommissioning cap would first require placing clay around the perimeter of the West Slag Pile. The new clay layer would have a thickness of 3 feet with a permeability  $10^{-6}$  to  $10^{-8}$  cm/sec and would extend from the edge of the Chemfix/baghouse dust layer down to ground

1 surface, followed with 12 inches of silty sand and geotextile fabric. Upon the completion of the  
2 capping of the perimeter, 9 inches of top soil would be placed over the entire West Slag Pile. (See  
3 Figure 8) Erosion control measures would be included in completing construction of this cap. A  
4 portion of the West Slag Pile is in the 100 year floodplain. Therefore, in addition to the vegetative  
5 growth, these measures would include approximately seven rip rap drainage channels placed along  
6 the side slopes of the pile and rip rap placed at the base of the pile.

### 7 8 **Solid Waste Cap**

9  
10 The development of the solid waste cap is based on the Ohio Administrative Code, Rule 3745-27-  
11 11. This alternative would contain the slag in the West Slag Pile by constructing a new cap over the  
12 entire pile. The cap would consist of a 2 foot thick recompacted soil barrier (e.g. clay with a  
13 permeability of  $1 \times 10^{-7}$  cm/s) placed on top of the entire slag pile, followed by a 1 foot thick  
14 granular drainage layer, a geotextile fabric, and a 9 inch topsoil layer that is seeded to provide  
15 vegetation. The topsoil would be seeded with a grass compatible with the local climate and  
16 conducive to long-term growth and minimum maintenance. Erosion control measures and  
17 institutional controls, including monitoring, would be similar to the preceding alternative. All  
18 materials for the cap would be imported from offsite sources. The conceptual design of this cap is  
19 shown in Figure 8. The solid waste cap would further reduce the leaching of contaminants.

### 20 21 **Hazardous Waste Cap**

22  
23 The development of the hazardous waste cap is based on the requirements presented in state  
24 hazardous waste rules, including Ohio Administrative Code Rule 3745-57-10 and the guidelines  
25 presented in U.S. EPA's Technical Guidance Document: Final Covers on Hazardous Waste  
26 Landfills and Surface Impoundments (U.S. EPA 1989). This alternative includes many of the  
27 elements that are part of the decommissioning cap.

28  
29 This alternative would contain the slag in the West Slag Pile by constructing a new cap over the  
30 entire pile. The cap would consist of 2 foot thick layer of clay (compacted to a permeability equal  
31 to  $1 \times 10^{-7}$  cm/s), a flexible membrane liner (with a thickness of 40 mil), a 1 foot thick drainage layer  
32 (permeability equal to  $1 \times 10^{-2}$  cm/s or greater) placed on top of the entire Slag Pile, followed by  
33 geotextile fabric, and a 2 foot thick topsoil layer that is seeded to provide vegetation. All materials  
34 for the cap would be imported from offsite sources. The conceptual design of this cap is shown in  
35 Figure 8. The topsoil would be seeded with a grass compatible with the local climate and conducive  
36 to long-term growth and minimum maintenance. Erosion control measures and institutional  
37 controls, including monitoring, would be the same as the decommissioning cap alternative. The  
38 Hazardous Waste Cap would further reduce any leaching of contaminants.



## Cost Estimates for Capping

### Recommissioning Cap:

Capital Costs	\$1,636,300
Operation and Maintenance (O&M)	\$ 629,138
Total Present Worth	\$2,265,000

### Solid Waste Cap:

Capital Costs	\$3,216,600
Operation and Maintenance (O&M)	\$ 629,138
Total Present Worth	\$3,846,000

### Hazardous Waste Cap

Capital Costs	\$4,020,800
Operation and Maintenance (O&M)	\$ 629,138
Total Present Worth	\$4,650,000

## 4.1.3 Capping in Place (with soils, sediments and offsite slag)

The Site has contaminated soils and sediments at various locations. The RI/FS report evaluated the possibility of excavating these soils and sediments and containing them under a cap for the West Slag Pile. For more information on this alternative, see discussions under this section 4.0 for onsite sediments, offsite sediments and soils.

### Offsite Slag

For this alternative, slag located offsite displaying radiological and metallurgical characteristics similar to slag produced by the Cambridge facility would be excavated and returned to the Site. An estimated 10,000 yd<sup>3</sup> of slag and soil has been used to analyze this alternative. This alternative is similar to the capping alternative discussed above, but also includes hauling the offsite slag back onsite, placing it directly on top of the West Slag Pile to the extent feasible (or to the extent this is not feasible, then placing it adjacent to the pile), and capping it. Only slag that is substantially similar to the slag in the West Slag Pile, and that originated on the Site, would be brought back onsite. The offsite slag would be placed on the West Slag Pile instead of the East Slag Pile for the following reasons:

- The West Slag Pile already contains slag and a soil/slag mixture that is more likely to be representative of the offsite slag,
- The West Slag Pile offers better access,

- 1 ■ The slag in the East Slag Pile is more likely to be used in the future, therefore, adding offsite  
2 slag and excavated soils would only make future excavation and use of the slag more  
3 difficult.  
4

5 As with the previous alternative, this alternative would contain the slag by constructing one of the  
6 following caps:  
7

- 8 ■ Completing the existing decommissioning cap, including capping the offsite slag  
9 consolidated with the Pile,  
10  
11 ■ Constructing a solid waste cap over the entire Slag Pile, including the offsite slag  
12 consolidated with the Pile,  
13  
14 ■ Constructing a hazardous waste cap over the entire Slag Pile, including the offsite slag  
15 consolidated the Pile.  
16

#### 17 Cost Estimates for Capping with Offsite Slag

18

##### 19 **Decommissioning Cap:**

20

21 Capital Costs	\$2,318,400
22 Operation and Maintenance (O&M)	<u>\$ 657,650</u>
23 Total Present Worth	\$2,976,000

24

##### 25 **Solid Waste Cap:**

26

27 Capital Costs	\$3,319,700
28 Operation and Maintenance (O&M)	<u>\$ 657,650</u>
29 Total Present Worth	\$3,977,000

30

##### 31 **Hazardous Waste Cap**

32

33 Capital Costs	\$5,717,600
34 Operation and Maintenance (O&M)	<u>\$ 657,650</u>
35 Total Present Worth	\$6,375,000

36

#### 37 4.1.4 Removal and Offsite Disposal

38

39 This alternative involves removing all of the material in the West Slag Pile and disposing of it in an  
40 offsite licensed disposal facility. For the purpose of this report, it is assumed that the slag would be  
41 loaded into rail cars and transported to the Envirocare facility in Clive, Utah for disposal. The  
42 estimated volume of material (including slag, soil, and Chemfix®) in the West Slag Pile (including

1 the Chemfix®) is 220,663 yd<sup>3</sup>. The estimated weight of the material is 532,150 tons. The pile covers  
2 8.2 acres.  
3

4 Prior to loading the rail cars, a staging area would be established in the vicinity of the East Slag Pile  
5 to serve as a temporary stockpile and loading area for the slag. If both the East Slag Pile and the  
6 West Slag Pile were to be removed, the slag in the East Slag Pile would be removed first and then  
7 the footprint of that pile would serve as the staging area for stockpiling and loading the slag from  
8 the West Slag Pile. Construction of an additional railroad spur may also be needed to accommodate  
9 temporary storage and loading of the cars and is included. Additional Site preparation activities  
10 would include adding onto the existing facility road network, as needed, to accommodate the truck  
11 traffic between the West Slag Pile and the staging area. It is assumed that the existing roads could  
12 accommodate trucks for most of the distance, but that another 500 linear feet of gravel road would  
13 be constructed to modify the existing system to reduce the impact on plant traffic.  
14

15 Removal of the material from the West Slag Pile would include five main phases that to some degree  
16 would be conducted concurrently. The five phases are:  
17

- 18 ■ Removing the decommissioning cap (i.e. cover) material (approximately  
19 45,500 yd<sup>3</sup>) and transporting it to a licensed solid waste landfill for disposal  
20
- 21 ■ Moving the slag and soil (approximately 175,300 yd<sup>3</sup>) from the West Slag  
22 Pile to the staging area located near the East Slag Pile  
23
- 24 ■ Crushing the slag to meet the size requirements of the offsite facility  
25
- 26 ■ Loading the slag and soil from the staging area into the rail cars  
27
- 28 ■ Transporting the slag and soil to the offsite facility and disposing of it.  
29

30 A front-end loader would be used to load the slag into trucks at the West Slag Pile. A wheel-  
31 mounted 5 yd<sup>3</sup> capacity loader or comparable equipment would be used. The estimated production  
32 rate is 185 yd<sup>3</sup> per hour. The slag would be hauled to the staging area in 20 yd<sup>3</sup> dump trucks.  
33 Approximately three trucks would be used. A bulldozer would be used on the West Slag Pile to  
34 loosen the material and move it toward the loader. A grader and water truck would be used for the  
35 haul road and as otherwise needed. Slightly larger front-end loader and haul trucks could be used  
36 if available to increase productivity.  
37

38 The stockpiled slag would be crushed to meet sizing requirements and then loaded into rail cars  
39 using a front-end loader similar to that used at the West Slag Pile. Instead of having two loaders,  
40 another option would be to operate in two shifts and load the rail cars at night as well. A small  
41 locomotive would be required to shift the rail cars around as they are loaded. The railcar capacity  
42 is 90 tons of slag. Using this capacity, a total of 4,865 rail cars would be needed assuming that all  
43 of the rail cars are loaded to capacity. Exclusive-use closed transport rail cars would be used.

The same type of measures to protect wetlands during remediation and wetlands restoration efforts that were included in the capping alternatives would also be implemented as part of this alternative. After the slag is removed from the West Slag Pile, the area would be graded. Topsoil would then be placed onto the area, if needed, and seeded to provide vegetation. It is assumed that 1 foot of topsoil would be placed over the entire area. This results in an estimated quantity of topsoil of 13,300 yd<sup>3</sup>.

The estimated time to complete the actions for this alternative is approximately 4 years from the date that a contractor is retained and given authorization to proceed based on the facility being able to receive 15 rail cars per day and a construction season of 5 months each year. This assumes that a sufficient number of rail cars will be available.

#### **Cost Estimates for Removal and Disposal**

Capital Costs	\$147,090,100
Operation and Maintenance (O&M)	\$ NA
Total Present Worth	\$147,090,100

## **4.2 East Slag Pile**

The East Slag Pile covers approximately 3 acres as shown in figure 1. The estimated volume of the pile is 37,000 yd<sup>3</sup>. The estimated weight of the pile is 58,405 tons.

### **4.2.1 No Action**

The no-action alternative is the baseline to which all other alternatives must be compared. No action consists of the current conditions at the Pile. It assumes that no future remedial actions will be conducted on the Pile.

The current conditions of the Pile include the following decontamination/decommissioning actions:

- Resloping the edges of the pile: The pile was extensively graded during the decontamination project carried out by Shieldalloy in 1989. The north, south, and east sides of the pile have steep cuts; the west side is curved with a shallow slope.
- Excavating and placing all of the slag from the Grainal® Slag Pile onto the East Slag Pile: Approximately 9,600 yd<sup>3</sup> of slag or soil was excavated from the Grainal® Slag Pile and added to the top of the East Slag Pile during the 1989/1990 decontamination project.

- Constructing a chain link fence with controlled access around the perimeter of the pile: The pile has a chain link fence around the perimeter of the pile. Access is controlled through a locked gate.
- Posting signs that state there is a radioactive hazard: The pile is currently posted with radiation hazard signs and the property boundaries are posted with *No Trespassing* signs.

#### Cost Estimates

The cost of implementing of this alternative would be zero dollars. Because this alternative assumes that no additional work will be conducted, no monies would be spent.

#### 4.2.2 Capping in Place

This alternative would contain the slag in the existing East Slag Pile by capping the entire pile. Prior to placement of the cap, grading would be conducted. Conventional heavy construction equipment would be used for constructing the cap. A water truck would be used, as needed, to minimize dust emissions.

An evaluation of different capping alternatives is presented in Appendix E of the feasibility study. A soil cap would address only the radioactive materials in the pile. Small quantities of spent carbon anodes, scrap steel and crushed drums have also been placed in the pile, however.

Installation of a cap over radioactive materials typically serves four purposes:

1. Containment of the material from environmental pathways, such as rain water intrusion and wind erosion
2. Erection of a barrier to potential intruders (plant, animal, and human) that might be exposed to the waste matrix
3. Reduction in the flux of radon from the radioactivity in the matrix.
4. Shielding potentially exposed persons from the direct radiation being given off by the material.

For the shielding criterion, a 2 foot thick layer of soil will reduce the exposure rate from the East Slag Pile by a factor of 200. This reduction is expected to bring exposure rates around the East Slag Pile to levels below background. This soil layer will also act as an effective intruder barrier, so long as the soil is not lost through interstitial spaces between the pieces of slag or eroded away by wind and water. The loss of soil through the slag will be addressed by grading and reworking the slag on the pile prior to capping to minimize the interstitial spaces between the pieces of slag, and by

1 providing additional soil to serve as a transition layer between the slag and the cap. The  
2 supplemental soil will be spread onto the slag and compacted in lifts in order to work the soil into  
3 the interstitial spaces. A vegetative cover will be placed on top of the final cap to prevent the loss  
4 of soil to erosion.

## 6 **Decommissioning Cap**

8 The decommissioning cap for the East Slag Pile would be made up of the following:

- 10 ■ Twelve inches of soil that will serve as a transition layer to separate the slag  
11 and overlying soil
- 13 ■ Eighteen inches of soil to cover the pile
- 14 ■ Six inches of topsoil.

16 The top layer will be provided with a vegetative cover to ensure long-term stability. All materials  
17 for the cap would be imported from offsite sources. The conceptual design of the proposed cap is  
18 shown in Figure 9.

20 The soil portion of the cap would be keyed into the ground surface. The key would be constructed  
21 around the perimeter of the pile and would have an estimated width of 3 feet and depth of 5 feet.  
22 The quantity of soil for the cap, including the transition layer and key, but excluding the topsoil, is  
23 an estimated 12,300 yd<sup>3</sup>. The soil layer would be constructed and compacted in lifts to achieve  
24 uniform compaction. The topsoil would be seeded with a grass compatible with the local climate  
25 and conducive to long-term growth and minimum maintenance.

27 Erosion control measures would be included in construction of the cap. In addition to the vegetative  
28 growth, these measures would include approximately four rip rap drainage channels placed along  
29 the side slopes of the pile and rip rap placed at the base of the pile.

31 Institutional controls including Site access restrictions, monitoring, financial assurance, and deed  
32 restrictions would be implemented as part of this alternative. The East Slag Pile is currently  
33 completely enclosed by 1,540 linear feet of chain link fence with controlled access. Signs are posted  
34 stating that there is a radioactive hazard. The same type of deed restrictions, survey markers,  
35 financial assurance, and monitoring that were included in the capping alternative for the West Slag  
36 Pile would also be implemented as part of this alternative. In addition, the same type of wetlands  
37 restoration measures that were included in the capping alternative for the West Slag Pile would also  
38 be implemented as part of this alternative.

## 40 **Solid Waste Cap**

42 The development of the solid waste cap is based on the Ohio Administrative Code, Section 3745-  
43 27-11. This alternative would contain the slag in the East Slag Pile by constructing a new cap over



1 the entire pile. The cap would consist of a 2 foot thick recompacted soil barrier (e.g. clay with a  
2 permeability of  $1 \times 10^{-7}$  cm/s) placed on top of the entire slag pile, followed by a 1 foot thick  
3 granular drainage layer, a geotextile fabric, and a 9 inch topsoil layer that is seeded to provide  
4 vegetation (see Figure 8). The topsoil would be seeded with a grass compatible with the local  
5 climate and conducive to long-term growth and minimum maintenance. Erosion control measures  
6 and institutional controls, including monitoring, would be the same as the preceding alternative. All  
7 materials for the cap would be imported from offsite sources. The solid waste cap would reduce  
8 the leaching of all contaminants.

### 10 **Hazardous Waste Cap**

12 The development of the hazardous waste cap is based on the requirements presented in Ohio  
13 Administrative Code 3745-57-10 and the guidelines presented in U.S. EPA's Technical Guidance  
14 Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (U.S. EPA  
15 1989).

17 This alternative would contain the slag in the East Slag Pile by constructing a new cap over the entire  
18 pile. The cap would consist of 2 foot thick layer of clay (compacted to a permeability equal to  
19  $1 \times 10^{-7}$  cm/s), a flexible membrane liner (with a thickness of 40 mil), a 1 foot thick drainage layer  
20 (permeability equal to  $1 \times 10^{-2}$  cm/s or greater), geotextile fabric, and a 2 foot thick topsoil layer that  
21 is seeded to provide vegetation (see Figure 8). All materials for the cap would be imported from  
22 offsite sources. The topsoil would be seeded with a grass compatible with the local climate and  
23 conducive to long-term growth and minimum maintenance. Erosion control measures and  
24 institutional controls, including monitoring, would be the same as the decommissioning cap  
25 alternative. The Hazardous Waste Cap would further reduce the leaching of all contaminants.

27 All capping alternatives for the East Slag Pile would need to address, during the remedial design/  
28 remedial action phase, any and all setbacks from the railroad spur, underground utilities, and the  
29 access road to the plant.

### 31 Cost Estimates for Capping

#### 33 **Decommissioning Cap:**

35 Capital Costs	\$798,100
36 Operation and Maintenance (O&M)	<u>\$ 91,553</u>
37 Total Present Worth	\$890,000

#### 39 **Solid Waste Cap:**

41 Capital Costs	\$1,339,200
42 Operation and Maintenance (O&M)	<u>\$ 91,553</u>
43 Total Present Worth	\$1,431,000

## Hazardous Waste Cap:

Capital Costs	\$1,679,400
Operation and Maintenance (O&M)	\$ 91,553
Total Present Worth	\$1,771,000

### 4.2.3 Removal and Offsite Disposal

This alternative would involve removing all of the material in the East Slag Pile and disposing of it in an offsite licensed disposal facility. For the purpose of this report, it is assumed that the slag would be loaded into rail cars and transported to the Envirocare facility in Clive, Utah for disposal.

The estimated volume of material in the East Slag Pile is 37,000 yd<sup>3</sup>. The estimated weight of the material is 58,405 tons.

Removal of the material from the East Slag Pile would include three main phases that would be conducted concurrently. The three phases are:

- Crushing the slag to meet the size requirements of the offsite facility
- Loading the slag from the East Slag Pile into the rail cars
- Transporting of the slag to the offsite facility and disposing of it.

Crushing and loading of the slag into the rail cars would take place at the East Slag Pile. Construction of an additional railroad spur may be needed to accommodate temporary storage and loading of the cars and is included. A front-end loader would be used to load the slag into rail cars. A wheel-mounted 5 yd<sup>3</sup> capacity loader or comparable equipment would be used. The estimated production rate is 185 yd<sup>3</sup> per hour. A slightly larger front-end loader could be used if available to increase productivity. A bulldozer would be used on the pile to loosen the material. A water truck would be used to minimize dust emissions, as needed.

The railcar capacity is 90 tons of slag. Using this capacity, a total of 672 rail cars would be needed assuming that all of the rail cars are loaded to capacity. Exclusive-use closed transport rail cars would be used.

The same type of wetlands restoration measures that were included in the capping alternative for the West Slag Pile would also be implemented as part of this alternative. After the slag is removed from the East Slag Pile, the area would be graded. Topsoil would then be placed onto the area, if needed, and seeded to provide vegetation. It is assumed that 1 foot of topsoil would be placed over the entire area. This results in an estimated quantity of topsoil of 3,900 yd<sup>3</sup>.



## Cost Estimates for Removal and Disposal

Capital Costs	\$21,889,400
Operation and Maintenance (O&M)	\$ NA
Total Present Worth	\$21,889,400

### 4.2.4 Removal and Sale of Slag

This alternative would involve removing slag from the East Slag Pile, processing it to generate a consistent product, and selling it in batches to either steel companies or material distributors. For the purpose of this evaluation, it will be assumed that the slag product will be shipped in bulk form using tractor-trailer trucks.

A number of uncertainties concerning the sale of slag from the East Slag Pile are still being evaluated. Prior to the sale of this material, all regulatory and licensure requirements of the State of Ohio, NRC and other regulators must be satisfied for both the generator and the buyer of the material. Assuming that it is viable, the processing required to convert slag from the East Slag Pile to a product would require a series of steps. Conceptually, these steps could involve the following:

- A portion of the slag pile would be collected (e.g. using a front end loader) and moved to a staging area
- The slag would be spread out in the staging area and foreign matter would be removed
- The slag would be crushed to achieve a uniform size
- Different batches of crushed slag would be blended to ensure homogeneous consistency of the product
- The product material would be staged for shipment
- Periodically the product would be loaded onto trucks for shipment to customer companies.

It is assumed that the area to the north and east of the Roaster Building would be used for slag staging, sorting, crushing, and blending. Road improvements and some modifications to boundary fencing may be needed to allow movement of the East Slag Pile into the area and movement of product out of the plant.

Front-end loaders or a track-mounted backhoe would be used to load the slag into dump trucks. The trucks would move the slag to the staging area and deposit the load as flat as possible.

Once in the staging area, front-end loaders would be used to spread out any piled material. Sorting operations would be performed manually. A separate waste container would be utilized to collect

1 non-slag materials, if any, found in each load. Upon completion of the sorting operation, the slag  
2 would be loaded into a crusher, which reduces the slag to a predetermined maximum size.

3  
4 Upon completion of the crushing operation, the material would be sampled to determine its  
5 radioactivity content and metallurgical composition. Material meeting the required specifications  
6 for sale would be transferred to a stockpile area, from which the product would be drawn. Material  
7 not meeting specifications would be mixed with other slags being delivered from the East Pile and  
8 sent back through the crusher. This process would continue until the desired composition was  
9 achieved. (It may be also be possible to separate very large chunks of slag exhibiting elevated  
10 radioactivity for offsite disposal.)  
11

12 Crushing campaigns would be managed based on the demand for the product. If the entire inventory  
13 of the East Pile could be sold in a discrete time period the entire pile would be processed. If demand  
14 was not high enough to warrant processing the pile in one operation, processing would be done on  
15 a campaign basis. (Currently Shieldalloy is selling slag from the Newfield, New Jersey facility. The  
16 slag is not contaminated with radiological material and is used in steelmaking processes. The slag  
17 removes sulfur from the steel and minimizes sulfur air pollution.)  
18

19 Once removal of all of the East Pile Slag was accomplished, a survey of the pile area would be  
20 conducted. If the concentrations of contaminants in the soil met remedial action objectives and  
21 preliminary remediation goals, there would be a combination of direct radiation readings and  
22 samples collected for radiological and metals analysis. The data collected would be compiled into  
23 a report to be submitted for regulatory review.  
24

25 Upon regulatory concurrence that residual concentrations of contaminants met remedial action  
26 objectives and preliminary remediation goals, all fencing and signs would be removed from the area.  
27

### 28 Cost Estimates

29

30 The feasibility of selling the slag in the East Slag Pile has yet to be determined. Once evaluation  
31 of the sale of the slag has been completed, a cost estimate will be prepared.  
32

## 33 **4.3 Onsite Sediment**

34

35 Onsite sediments include sediments in drainage ditches.  
36

### 37 4.3.1 No Action

38

39 The no-action alternative is the baseline to which all other alternatives must be compared. No action  
40 consists of the current conditions at the Site. It assumes that no present or future remedial actions  
41 will be conducted at the Site. Note, however, that a stormwater permit is required to control  
42 rainwater discharges at the Site independent of the remedial investigation / feasibility study.

#### 4.3.2 Capping

This alternative would involve containing the sediment with elevated levels of contaminants in the onsite drainage ditches by capping them. The cap would consist of a 1-foot thick layer of coarse gravel. Minor grading and some clearing and removal of debris may be conducted prior to placing the cap. Conventional construction equipment would be used to construct the cap; however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able to work in wet, soft soils.

The estimated area of onsite sediment that may have elevated levels of contaminants is approximately 13,560 ft<sup>2</sup>. The quantity of coarse material needed for capping this area is an estimated 500 yd<sup>3</sup>.

This alternative also assumes that the drainage ditches would be stabilized with check dams and vegetation. It is estimated that 16 check dams would be installed throughout the onsite drainage ditch network. The check dams would be constructed of rock or comparable material, would be approximately 2 feet high, and would have a slope of 2:1 (horizontal to vertical). The estimated quantity of rock needed for all of the check dams is 19 yd<sup>3</sup>.

The same type of wetlands protective measures used during remediation that were included in the capping alternative for the West Slag Pile would also be implemented as part of this alternative. In addition, institutional controls including Site access restrictions, regular inspection of the grounds, monitoring, and deed restrictions would be implemented as part of this alternative. The Site has controlled vehicle access and signs that state no trespassing is allowed. The same type of deed restrictions, survey markers, financial assurance, and monitoring that were included in the capping alternative for the West Slag Pile would also be implemented as part of this alternative. Source control measures would be implemented in the operational portion of the Site to prevent the migration of material from that area.

The estimated time to complete the actions for this alternative, other than long-term monitoring and maintenance, is approximately 3 months from the date that a contractor is retained and given authorization to proceed.

#### Cost Estimates for Capping

Capital Costs	\$304,600
Operation and Maintenance (O&M)	\$ 50,000
Total Present Worth	\$355,000

#### 4.3.3 Removal and Onsite Containment (on the West Slag Pile)

This alternative would contain the onsite sediment by removing the onsite sediment with elevated contaminants, placing the sediment on the West Slag Pile, and capping it with a low-permeability

cap. Conventional heavy construction equipment would be used for excavating the sediment and capping it; however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able to work in wet, soft soils. The estimated area of onsite sediment that may have elevated levels of contaminants is approximately 13,560 ft<sup>2</sup>. The sediment would be temporarily stockpiled by the ditch and drained, as needed, prior to hauling and placing it on the West Slag Pile.

The location for placement of the excavated sediment on the West Slag Pile was assumed to be the same area that was previously designated for the offsite slag. Assuming an average depth of 5 feet for placement of the sediment, the resulting area is 1,900 ft<sup>2</sup>.

The sediment would be placed on top of the West Slag Pile and one of the three previously discussed cap options would then be implemented for the Pile. Institutional controls, including monitoring and financial assurance, would be implemented as discussed for capping the West Slag Pile. Constructing check dams, vegetating the drainage ditch banks, and implementing source control measures are also included in this alternative. It is assumed that replacement sediment would not be needed for the area where sediment is removed from the ditches.

During remediation, protective measures for wetlands would be implemented. The estimated time to complete the actions for this alternative, other than long-term monitoring and maintenance, is approximately 3 months from the date that a contractor is retained and given authorization to proceed.

#### **Cost Estimates for Removal and Onsite Containment (on the West Slag Pile)**

Capital Costs	\$256,300
Operation and Maintenance (O&M)	\$ 50,000
Total Present Worth	\$306,000

#### **4.3.4 Removal and Offsite Disposal**

This alternative would involve removing the onsite sediment with elevated levels of contaminants and disposing of it in a regulated offsite landfill. The area and volume of sediment that would be removed are approximately 13,560 ft<sup>2</sup> and 350 yd<sup>3</sup>. The sediment would be temporarily stockpiled by the ditch and drained, as needed, prior to loading it into trucks for disposal. It would then be loaded into 20 yd<sup>3</sup> watertight dump trucks and hauled to a appropriate permitted facility.

Mitigation measures to protect wetlands during remediation, as previously discussed, would be implemented. After the sediment is removed, check dams would be constructed, drainage ditch banks would be vegetated, and source control measures would be implemented. The estimated time to complete the actions for this alternative is approximately 3 months from the date that a contractor is retained and given authorization to proceed.

## Cost Estimates for Removal and Offsite Disposal

Capital Costs	\$269,000
Operation and Maintenance (O&M)	<u>\$ 50,000</u>
Total Present Worth	\$319,000

### **4.4 Offsite Sediment**

Offsite sediments constitute sediments located in Chapman Run adjacent to and downstream of the Site.

#### 4.4.1 No Action

The no-action alternative is the baseline to which all other alternatives must be compared. No action consists of the current conditions at the Site. It assumes that no present or future remedial actions will be conducted at the Site.

#### 4.4.2 Natural Recovery

This alternative would allow natural sedimentation processes to contain (i.e., bury) the sediment with elevated levels of contaminants. Natural recovery may be enhanced by introducing additional sediment material such as sand into the stream and allowing it to settle out. The surface area of the sediments in Chapman Run is estimated to be 231,320 ft<sup>2</sup>. Allowing for 3 inches of sand for this area, the quantity of sand needed would be 2,100 yd<sup>3</sup>. The sand would consist of varied-density grains to allow for differential settling. It would be sprayed into the stream at various locations along the 1.3-mile-length stream segment. Sampling of the sediment would be conducted annually for ten years to determine whether the remedial action objectives are met. Five samples would be collected each year and analyzed for vanadium and gross alpha and beta. The estimated time to complete the actions for this alternative, other than long-term monitoring, is approximately three months from the date that a contractor is retained and given authorization to proceed. An analysis to estimate the time for natural recovery to meet the remedial action objectives has not been conducted. For the purpose of this report it is assumed that remedial action objectives would be met in ten years.

#### Cost Estimates for Natural Recovery

Capital Costs	\$250,300
Operation and Maintenance (O&M)	<u>\$ 50,000</u>
Total Present Worth	\$300,000

#### 4.4.3 Rechannelization

This alternative would involve creating a new stream channel and using the excavated soil to fill the



existing channel of Chapman Run. Conventional construction equipment would be used to construct the new channel; however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able to work in wet, soft soils.

The newly constructed channel would be similar in size to the existing channel. It would have a width that ranges from approximately 26 feet upstream to 54 feet downstream. The channel length would be 1.3 miles including meanders. The average channel depth is assumed to be 10 feet. These dimensions would result in a volume of excavated soil of 85,700 yd<sup>3</sup> that would be placed in the existing channel.

The new channel would be constructed first. The soil would be scraped off and temporarily stockpiled separately during construction of the channel. After construction of the new channel the water would be diverted to it and the existing channel would be blocked. The existing channel would then be filled and the stockpiled topsoil would be placed as the final layer. The filled existing channel would then be seeded to establish vegetation.

The banks of the new channel and areas that were disturbed during construction would be seeded to stabilize them. Habitat enhancement measures such as the addition of wood debris to create a favorable environment for aquatic life would also be implemented.

Protective measures to protect wetlands, including Chapman Run, during remediation would be implemented as previously discussed. Institutional controls that include deed restrictions would be included as part of this alternative. The estimated time to complete the actions for this alternative, other than long-term monitoring, is approximately six months from the date that a contractor is retained and given authorization to proceed. This assumes that the acquisition of the property or property easements needed to implement this alternative has already been completed prior to procurement of a remedial contractor.

#### Cost Estimates for Rechannelization

Capital Costs	\$2,299,000
Operation and Maintenance (O&M)	\$ N/A
Total Present Worth	\$2,299,000

#### 4.4.4 Removal and Onsite Containment (on the West Slag Pile)

This alternative would contain the offsite sediment by removing the offsite sediments with elevated contaminants, placing the sediment on the West Slag Pile, and capping it with a low-permeability cap. Conventional heavy construction equipment would be used for removing the sediment and capping it; however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able to work in wet, soft soils. The estimated area of offsite sediment that may have elevated levels of contaminants is approximately 231,320 ft<sup>2</sup>. Assuming a removal depth of 0.75 feet to 1 foot, the estimated volume of sediment that would be removed is 7,400 yd<sup>3</sup>. Removal of the

1 sediment would be conducted during low stream flow, and silt curtains or comparable measures  
2 would be used to limit turbidity during removal. The sediment would be placed in temporary lined  
3 basins to allow for drainage prior to hauling and placing it on the West Slag Pile.

4  
5 The location for placement of the excavated sediment on the West Slag Pile was assumed to be the  
6 same area that was previously designated for the offsite slag. Assuming an average depth of five feet  
7 for placement of the sediment, the resulting area is 46,300 ft<sup>2</sup>.

8  
9 The sediment will be placed on top of the West Slag Pile and one of the three previously discussed  
10 cap options would then be implemented for the Pile. Institutional controls, including monitoring and  
11 financial assurance, would be implemented as discussed for capping the West Slag Pile. It is  
12 assumed that replacement sediment would not be needed for the area where sediment is removed  
13 from the stream.

14  
15 The quantity of clay for capping the onsite sediment portion of the West Slag Pile, including the key,  
16 is an estimated 5,500 yd<sup>3</sup>. The estimated quantities for the geotextile and silty sand are 5,100 yd<sup>2</sup>  
17 and 1,700 yd<sup>3</sup>, respectively. The estimated quantity of topsoil is 1,300 yd<sup>3</sup>. The estimated quantity  
18 of rip rap is 400 yd<sup>3</sup>.

19  
20 Protective measures for wetlands during remediation, as previously discussed, would be  
21 implemented. The estimated time to complete the actions for this alternative, other than long-term  
22 monitoring and maintenance, is approximately six months from the date that a contractor is retained  
23 and given authorization to proceed.

#### 24 25 Cost Estimates for Removal and Onsite Containment (on the West Slag Pile)

26	
27	Capital Costs \$1,283,300
28	Operation and Maintenance (O&M) \$ 50,000
29	Total Present Worth \$1,333,000

#### 30 31 4.4.5 Removal and Offsite Disposal

32  
33 This alternative would involve removing the offsite sediment with elevated levels of contaminants  
34 and disposing of it in a regulated offsite landfill in accordance with applicable regulations. The area  
35 and volume of sediment that would be removed are approximately 231,320 ft<sup>2</sup> and 7,400 yd<sup>3</sup>,  
36 respectively, assuming a 0.75 ft to 1 ft removal depth. Removal of the sediment would be conducted  
37 during low stream flow, and silt curtains or comparable measures would be used to limit turbidity  
38 during removal. The sediment would be placed in temporary basins to allow for drainage prior to  
39 loading it into trucks for disposal. It would then be loaded into 20 yd<sup>3</sup> watertight dump trucks and  
40 hauled to an appropriate permitted facility. Using this capacity for the dump trucks, a total of 370  
41 trips would be needed assuming that all of the trucks are loaded to capacity.

Protective measures as previously discussed to protect wetlands during remediation would be implemented. The estimated time to complete the actions for this alternative is approximately six months from the date that a contractor is retained and given authorization to proceed.

#### **Cost Estimates for Removal and Offsite Disposal**

Capital Costs	\$2,934,200
Operation and Maintenance (O&M)	\$ <u>N/A</u>
Total Present Worth	\$2,934,200

### **4.5 Wetland Soil**

#### **4.5.1 No Action**

The no-action alternative is the baseline to which all other alternatives must be compared. No action consists of the current conditions at the Site. It assumes that no present or future remedial actions will be conducted at the Site.

#### **4.5.2 Wetland Mitigation**

This alternative includes wetland mitigation for onsite wetland areas that may have been affected by siltation (i.e., the two deltas adjacent to the West Slag Pile). The estimated area of the deltas is 85,300 ft<sup>2</sup>.

Wetland mitigation would consist of restoration or enhancement of degraded wetlands in the Cambridge area. The function and value of the onsite wetland that will be mitigated are assumed to be equivalent to the new wetland. It is estimated that it would take approximately 6 months to acquire and enhance the new mitigated wetland acreage.

#### **4.5.3 Capping**

This alternative would involve containing wetland soil with elevated levels of contaminants by capping them. The cap would consist of a 1-ft thick layer of topsoil that is seeded to provide vegetation. Minor grading and some clearing and removal of large objects may be conducted prior to placing the cap. Conventional construction equipment would be used to construct the cap; however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able to work in wet, soft soils.

The estimated area of wetland that may have elevated levels of contaminants is approximately 465,900 ft<sup>2</sup>. The quantity of topsoil for capping this area is an estimated 19,000 yd<sup>3</sup>. This quantity allows for some overlap and sloping onto adjacent soils. It is assumed that drainage ditches would be installed around a portion of the delta areas to divert runoff and thereby prevent it from eroding the cap on the deltas. It is estimated that 1,200 linear feet of drainage ditches may be needed. Rip

1 rap, coarse gravel material, and/or vegetation would be used to stabilize the drainage ditches. If rip  
2 rap or coarse material is used, it is estimated that approximately 1,800 yd<sup>3</sup> would be needed.

3  
4 If this alternative is implemented, wetland mitigation must also be included and may consist of the  
5 measures described in the preceding alternative except the total area potentially requiring mitigation  
6 may be about 10.7 acres. In addition, the same type of wetlands protective measures during  
7 remediation that were included in the capping alternative for the West Slag Pile would also be  
8 implemented as part of this alternative.

9  
10 Institutional controls including Site access restrictions, regular inspection tours, monitoring, and  
11 deed restrictions would be implemented as part of this alternative. The Site has controlled access  
12 and signs that state no trespassing is allowed. The same type of deed restrictions, survey markers,  
13 financial assurance, and monitoring that were included in the capping alternative for the West Slag  
14 Pile would also be implemented as part of this alternative.

15  
16 The estimated time to complete the actions for this alternative, other than long-term monitoring and  
17 maintenance, is approximately six months from the date that a contractor is retained and given  
18 authorization to proceed.

#### 19 Cost Estimates for Capping

20	Capital Costs	\$ 1,857,600
21	Operation and Maintenance (O&M)	\$ 73,844
22	Total Present Worth	\$ 1,931,000

#### 23 4.5.4 Removal and Onsite Containment (on the West Slag Pile)

24  
25 This alternative would contain the wetland soil by removing wetland soil with elevated  
26 contaminants, placing the soil on the West Slag Pile, and capping it with a low-permeability cap.  
27 The West Slag Pile instead of the East Slag Pile would be used for consolidation of the soil for the  
28 reasons that were presented for the capping alternatives (with offsite slag) for the West Slag Pile.  
29 Conventional heavy construction equipment would be used for excavating the soil and capping it;  
30 however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able  
31 to work in wet, soft soils. The estimated area of wetland that may have elevated levels of  
32 contaminants is approximately 465,900 ft<sup>2</sup>. Assuming a removal depth of 1.5 feet, the estimated  
33 volume of wetland soil that would be removed would be 25,900 yd<sup>3</sup>.

34  
35 The location for placement of the excavated sediment on the West Slag Pile was assumed to be the  
36 same area that was previously designated for the offsite slag. Assuming an average depth of 5 ft for  
37 placement of the wetland soil, the resulting area is 139,800 ft<sup>2</sup>.

38  
39 The excavated wetland soils would be placed on top of the West Slag Pile and one of the three  
40 previously discussed cap options would be implemented for the pile. Institutional controls, including  
41  
42  
43

1 monitoring and financial assurance, would be implemented as discussed for capping the West Slag  
2 Pile.

3  
4 The quantity of clay for capping the wetland soil portion of the West Slag Pile only, including the  
5 key, is an estimated 16,100 yd<sup>3</sup>. The estimated quantities for the geotextile and silty sand are 15,500  
6 yd<sup>2</sup> and 5,200 yd<sup>3</sup>, respectively. The estimated quantity of topsoil is 3,900 yd<sup>3</sup>. The estimated  
7 quantity of rip rap is 630 yd<sup>3</sup>. (Note: only the quantities of material related directly to the portion  
8 of the cap that includes the wetland soil are included here in order to provide an equivalent basis for  
9 comparing costs among the wetland soil alternatives).

10  
11 The same type of wetlands protective measures used during remediation that were included in the  
12 capping alternative for the West Slag Pile would also be implemented as part of this alternative. In  
13 addition, it is estimated that replacement soil would be needed for approximately one-half of the area  
14 where wetland soil is removed. This results in an estimated quantity of replacement soil of 12,900  
15 yd<sup>3</sup>. The replaced soil and the remaining area would be seeded or otherwise restored to pre-existing  
16 conditions.

17  
18 The estimated time to complete the actions for this alternative, other than long-term monitoring and  
19 maintenance, is approximately three to six months from the date that a contractor is retained and  
20 given authorization to proceed.

#### 21 Cost Estimates for Removal and Onsite Containment (on the West Slag Pile)

##### 22 **Solid Waste Cap**

23  
24  
25  
26 Capital Costs \$ 3,256,900  
27 Operation and Maintenance (O&M) \$ 73,844  
28 Total Present Worth \$ 3,331,000  
29

##### 30 **Hazardous Waste Cap**

31  
32 Capital Costs \$ 3,777,200  
33 Operation and Maintenance (O&M) \$ 73,844  
34 Total Present Worth \$ 3,851,000  
35

#### 36 4.5.5 Removal and Offsite Disposal

37  
38 This alternative would involve removing the wetland soil with elevated levels of contaminants and  
39 disposing of it in a regulated offsite landfill. The area and volume of wetland soil that would be  
40 removed are approximately 465,900 ft<sup>2</sup> and 25,900 yd<sup>3</sup>, respectively, assuming a 1.5 foot removal  
41 depth. The soil would be loaded into 20 yd<sup>3</sup> dump trucks and hauled to an appropriate permitted  
42 facility. Using this capacity for the dump trucks, a total of 1,296 trips would be needed assuming  
43 that all of the trucks are loaded to capacity.



1 Protective measures for wetlands during remediation, as previously discussed, would be  
2 implemented. After the soil is removed, the area would be restored as discussed for the preceding  
3 alternative. The estimated time to complete the actions for this alternative is approximately 3  
4 months from the date that a contractor is retained and given authorization to proceed.  
5

6 **Cost Estimates for Removal and Offsite Disposal**  
7

8	Capital Costs	\$ 6,241,100
9	Operation and Maintenance (O&M)	<u>\$ N/A</u>
10	Total Present Worth	\$6,241,100

## 5.0 OHIO EPA'S SELECTED REMEDY

This chapter sets out Ohio EPA's selected remedy and includes performance standards for remediation of the Shieldalloy Site.

### 5.1 Selection Criteria

In selecting a remedy for a contaminated site, Ohio EPA considers the following eight criteria as outlined under USEPA's National Contingency Plan (NCP) promulgated under CERCLA (40 CFR 300):

1. Overall protection of human health and the environment - addresses whether or not a remedy provides adequate protection, and describes how risks are eliminated, reduced or controlled through treatment, engineering controls, and/or institutional controls;
2. Compliance with all State, Federal and Local laws and regulations - addresses whether or not a remedy will attain applicable, relevant and appropriate requirements under federal, state, and local environmental laws;
3. Long-term effectiveness and permanence - refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once pollution has been abated and clean-up goals have been met;
4. Reduction of toxicity, mobility, or volume through treatment - is the anticipated performance of the treatment technologies to yield a permanent solution. This includes the ability of the selected alternative to reduce the toxic characteristics of the chemicals of concern or remove the quantities of those chemicals to an acceptable risk concentration or regulatory limit and/or decrease the ability of the contaminants to migrate through the environment;
5. Short-term effectiveness - involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until pollution has been abated and clean-up goals are achieved;
6. Implementability - is the technical and administrative feasibility of a remedy, including the availability of goods and services needed to implement the chosen solution;
7. Cost - includes capital and operation and maintenance costs;

- 1 8. Community acceptance - will be assessed in the Decision Document following review of the  
2 public comments received on the Remedial Investigation and Feasibility Study (RI/FS)  
3 report and the Preferred Plan.  
4

## 5 **5.2 Summary**

6  
7 The major components of Ohio EPA's selected remedy for the Shieldalloy Site include:  
8

- 9 1. Excavate and remove contaminated sediments and soils from the Site;  
10  
11 2. Place excavated sediments and soils on top of the West Slag Pile;  
12  
13 3. Cap the West Slag Pile in accordance with state solid waste rules under Ohio  
14 Administrative Code Chapter 3745-27;  
15  
16 4. Ensure long term care of the West Slag Pile and;  
17  
18 5. For the East Slag Pile:  
19  
20 a. if feasible, sell and remove East Slag Pile materials, expeditiously; and  
21  
22 b. if the foregoing is not feasible, then cap the East Slag Pile in accordance with state  
23 solid waste rules under Ohio Administrative Code Chapter 3745-27 and ensure long  
24 term care.  
25

26 Ohio EPA would periodically review the remedy at the Site to ensure that the remedy will protect  
27 human health and the environment.  
28

## 29 **5.3 Contaminated Sediments and Soils at the Site**

### 30 **5.3.1 Excavate to meet Performance Standards**

31  
32  
33 The selected remedy includes excavating and removing contaminated sediments and soils from  
34 onsite drainage channels, sedimentation deltas, wetland soils, and Chapman Run. The sedimentation  
35 deltas lay to the north and south of the West Slag Pile. Removal of contaminated soils and  
36 sediments from these impacted areas would reduce the contaminants found in this media to levels  
37 that are protective of the residents, plants and animals. Removal of the sedimentation deltas would  
38 remedy the physical effects caused by erosion and sedimentation from the process areas and slag  
39 piles. The precise areas and volumes for the wetland soils and sediments will be determined during  
40 the remedial design phase.

### 5.3.2 Performance Standards for Cleanup of Soils and Sediments

This section discusses performance standards for excavation of contaminated soils and sediments. The results of the human health risk assessment prepared by Shieldalloy and Cyprus Foote indicate that remedial action is not required to address human health concerns for wetland soil, onsite sediment, or offsite sediment. At this time, the remedial action needed for those areas is based on protection of the environment. However, further radiological sampling of the wetland soils will be required in order to confirm that no remedial action is required in this area for protection of human health. In any event, the selected remedy must remain protective of human health and the environment.

For purposes of this report, area and volume estimates for wetland soil removal are based on a conservative vanadium concentration of 700 mg/kg (USEPA's screening value for human ingestion of vanadium pentoxide for a residential soil ingestion scenario). The area and volume estimates for onsite sediment and offsite sediment are based on a vanadium concentration of 1280 mg/kg per the Phase II Ecological Risk Assessment. Further sampling will be required in the remedial design phase in conjunction with the use of medium-specific remediation goals and consideration of other factors (e.g., short-term environmental effects) to refine cleanup concentrations and volumes for wetland soil. Specific volumes and areas were not calculated for surface water because the combination of source control (i.e., implementation of the storm water pollution prevention plan) and sediment remediation is expected to meet the preliminary remediation goal for surface water (87 ug/L for vanadium). For areas of concern for wetland soil, onsite sediment, and offsite sediment see Figures 5, 6, and 7. Please refer to table this section which outlines the clean up levels for each environmental media at the Site. The risk assessment performed by Shieldalloy and Cyprus Foote indicates that upland (process area) soils did not pose a risk to workers or modeled fauna.

The goal of the excavation and removal of contaminated soils and sediments is to protect human health and the environment. Cleanup levels for vanadium (the most common heavy metal contaminant found at the Site) are listed below. The cleanup level for wetland soils will be refined during the remedial design phase. Final cleanup levels for vanadium in wetland soils must be protective of ecological receptors expected to occur at the site, including birds, mammals, amphibians, and benthic communities (risk assessment to benthic communities will include amphipod bioassay techniques).

Consistent with USEPA's National Contingency Plan, an acceptable cleanup goal for radionuclides in soils, sediment, groundwater, and surface water achieves a risk range of  $1 \times 10^{-6}$  -  $1 \times 10^{-4}$  excess lifetime cancer risk, with  $1 \times 10^{-6}$  as the point of departure (i.e. goal). During the remedial investigation, the major radionuclide detected in most media above background was Th-230. In order to ensure accuracy during the remedial investigation, the State of Ohio retained an independent consultant to evaluate and validate radiological data collected at the Site. The results of the data validation indicated that the radionuclides Pa-231m and Ac-227 are present in soils at levels at least slightly above background. Thus, the State intends that future analysis for soils during the remedial design/remedial action phase be analyzed for Pa-231m and Ac-227.

MEDIA	VANADIUM CLEAN-UP LEVEL
<b>SOILS</b>	
Wetland Soils *	700 mg/kg
<b>SEDIMENTS</b>	
Onsite	1280 mg/kg
Offsite	1280 mg/kg
<b>SURFACE WATER</b>	
Onsite	87 ug/l
Offsite	87 ug/l

\* During the remedial design, additional studies will be conducted to further derive an exact clean-up number for wetland soil. For the purposes of the decision document, the clean-up level is shown above.

### **5.3.3 Place Excavated Sediments and Soils on the West Slag Pile**

Ohio EPA's selected remedy is to place the excavated sediments and soils on top of the West Slag Pile prior to capping of this pile. This pile already received excavated sediments and soils in the partial decommissioning of 1989-1990.

## **5.4 West Slag Pile**

### **5.4.1 Capping of the West Slag Pile**

Ohio EPA's selected remedy for the West Slag Pile consists of a cap system designed in accordance with Ohio's solid waste regulations under Ohio Administrative Code Chapter 3745-27. The objective of a cap is to contain the waste and minimize infiltration of water into the waste. Ohio EPA considers the solid waste cap alternative to be the most suitable alternative for remediating the West Slag Pile. This alternative best meets the eight selection criteria described above.

The cap is a recompacted low permeability cap. The cap, commonly referred to as a solid waste cap, is currently used to cap landfills in the State of Ohio. The cap would cover not only the West Slag Pile, but also contaminated soils from the wetland soils, and onsite/offsite sediment. The remedy also controls stormwater discharges to levels that are protective of human health and the environment.



1 The cap system would apply to contaminated sediments, sediment/soil from sedimentation deltas,  
2 wetland soils and Chapman Run sediments that would be placed on the West Slag Pile prior to  
3 capping (refer to Figures 5, 6, 7 for onsite/offsite sediments and wetland soil areas of concern). The  
4 material would be placed on top of the West Slag Pile so as to minimize the footprint of the pile  
5 wherever feasible. Should it be impractical to place all such material on the West Slag Pile, the  
6 remaining material would be placed against the side of the West Slag Pile prior to capping.  
7 The cap system would guard against any additional surface water contamination from the Site in  
8 the future. Capping the slag piles guards against chemical and radiological releases from the piles.

9  
10 An important consideration during evaluation of remediation alternatives is identification of  
11 "Applicable or Relevant and Appropriate Requirements" ("ARAR"s). Disposal of the solid and/or  
12 chemical waste materials currently found in the West Slag Pile would require disposal in either solid  
13 waste landfills or hazardous waste facilities. A permitted landfill operated today would be required  
14 to install a cap per solid or hazardous waste regulations. (These and other ARARs are set forth in  
15 the Complaint filed by the State of Ohio in *State of Ohio, ex rel Montgomery v. Shieldalloy*  
16 *Metallurgical Company and Cyprus Foote Mineral Company*, Case No. 95CV242, Guernsey County  
17 Court of Common Pleas.)

#### 18 19 **5.4.2 Performance Standards for the Cap**

20  
21 The goal of the cap system is to protect human health and the environment. The performance  
22 standards for the cap should meet the standards described in this Decision Document, including  
23 applicable requirements for solid waste caps under Ohio Administrative Code Chapter 3745-27.  
24 Further, the cap should provide sufficient shielding such that any external radiation exposure from  
25 the pile does not exceed background levels.

#### 26 27 **5.4.3 Long Term Care**

28  
29 There is a need for long term care of any radioactive material left at the Site. The design of the cap  
30 for the West Slag Pile would include long term care and an Operation and Maintenance (O&M)  
31 program of 1000 years. To better ensure that a cap would meet performance standards for this time  
32 period, Shieldalloy and Cyprus Foote would need to evaluate and present a mechanism for long term  
33 care of the Site (referred to as operation and maintenance).

34  
35 Conceptually, Shieldalloy and Cyprus Foote would need to provide financial instruments that would  
36 pay out funds over time to pay for the long term operation and maintenance of the Site. There would  
37 need to be sufficient funds to address any failure of the cap system. Moneys would need to be  
38 available for cap repairs and other operation and maintenance for a period of 1000 years.

#### 39 40 **5.4.4 Alternatives Considered**

41  
42 Ohio EPA evaluated the remediation alternatives using the above eight criteria. Ohio EPA  
43 considered the "decommissioning cap" alternative, but this alternative does not adequately protect

1 human health and the environment. For example, the Chemfix material, which would purportedly  
2 serve as the "impermeable layer," would not provide a proven long-term barrier to weathering and  
3 infiltration, and would not meet solid waste capping criteria under Ohio Administrative Code Rule  
4 3745-27-11. The Chemfix material itself also contains heavy metal contaminants.

5  
6 Ohio EPA also considered removal of all slag material from the Site and disposal of it elsewhere.  
7 Disposal of this waste following removal from the Site would require transportation and disposal  
8 at the Envirocare facility in Utah. This alternative was determined to be cost prohibitive, in that it  
9 would cost \$169 million. Another factor was that excavation and removal of slag may increase  
10 exposure risks to workers and the public during field work and transportation.

## 11 12 **5.5 East Slag Pile**

### 13 14 **5.5.1 Sale and Removal**

15  
16 The selected remedy includes a six-month period for Shieldalloy to evaluate and submit a report on  
17 the marketability of the slag found in the East Slag Pile. The slag is potentially usable as a "slag  
18 conditioner" in the manufacture of steel, and may be marketable as such. If it is feasible to market  
19 and remove this slag material, Shieldalloy would need to submit an acceptable plan and schedule to  
20 Ohio EPA for accomplishing this option. Shieldalloy would need to ensure that all license  
21 requirements for both generators and users of the material would be met and that worker protection  
22 methods would be employed.

### 23 24 **5.5.2 Capping and Long Term Care**

25  
26 If the East Slag Pile material may not be expeditiously sold and removed, then Ohio EPA's selected  
27 remedy is to cap the East Slag Pile and ensure long term care in the manner discussed for the West  
28 Slag Pile. The cap for the East Slag Pile would be required to meet the same design criteria as the  
29 West Slag Pile (i.e., a low permeability cap designed in accordance with Ohio solid waste rules).

### 30 31 **5.5.3 Performance Standards for the East Slag Pile Cap**

32  
33 The goal of the cap system is to protect human health and the environment. The performance  
34 standards for the cap should meet the standards described in this plan, including applicable  
35 requirements for solid waste caps under Ohio Administrative Code Chapter 3745-27. Further, the  
36 cap should provide sufficient shielding such that any external radiation exposure from the pile does  
37 not exceed background levels.

## 38 39 **5.6 Stormwater Controls for the Site**

40  
41 Shieldalloy has applied for a Stormwater Discharge Permit from Ohio EPA under RC Chapter 6111.  
42 The permit would establish limits on discharges of stormwater runoff from the Site. The permit

1 would control discharges to wetlands, thus further guarding against the impacts to adjoining  
2 wetlands.

## 3 4 **5.7 Former Process and Upland Soil Areas**

### 5 6 **5.7.1 Revegetation**

7  
8 The former Grainal Slag Pile area, former baghouse dust area, empty drum accumulation area, and  
9 the field southeast of the Roaster Building have metal concentrations in soils that exceed the USEPA  
10 benchmark values for plant toxicity. The cause of the plant toxicity was not evaluated further in the  
11 remedial investigation. The field southeast of the Roaster Building, former empty  $V_2O_5$  (vanadium  
12 pentoxide) drum accumulation area, and sediment deltas are lacking in vegetation. Ohio's selected  
13 remedy is for these former process areas to be revegetated and engineering controls implemented  
14 to control erosion. The sedimentation from the North and South sedimentation deltas would also  
15 be removed and the areas revegetated.

16  
17 The manufacturing building has radioactive slag under a portion of the foundation. The slag was  
18 apparently used as fill material. Upon closure of the plant and demolition, this slag material needs  
19 to be properly disposed of in a facility designed and properly licensed to accommodate such  
20 material. It is expected that onsite remediation activities will be complete prior to retrieval of the  
21 slag beneath foundations. Ohio EPA's selected remedy is that the foundation slag and any additional  
22 radioactive material generated after remediation activities would be disposed in a properly licensed  
23 facility.

### 24 25 **5.7.2 Performance Standards for the Former Process Areas**

26  
27 The goal of the selected remedy is the protection of human health and the environment. The  
28 performance standards for the former process areas include the following: to control erosion and  
29 plant toxicity through revegetation; to meet the radiological risk criteria of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ ; to meet  
30 the hazard index goal of 1.0; to implement such institutional controls as may be appropriate for the  
31 residual risk; and to perform confirmatory radiological sampling.

## 32 33 **5.8 Offsite Slag**

34  
35 In the past, slag generated at the facility (including radioactive slag) was used as fill material in the  
36 Cambridge area. Shieldalloy and Cyprus Foote Mineral have proposed that up to 10,000 ft<sup>3</sup> of  
37 radioactive slag from offsite locations be returned to the Site and disposed of on top of the West Slag  
38 Pile. This offsite slag would be excavated at the offsite locations. This proposal is referenced in the  
39 Remedial Investigation/Feasibility report. Ohio EPA's selected remedy is to evaluate this issue  
40 further if firm plans are expeditiously developed for removal of the radioactively contaminated slag  
41 from the offsite locations.

## 5.9 Public Participation

Ohio EPA afforded interested members of the public opportunities to learn more about and comment on Ohio EPA's Preferred Plan. Members of the public could review the Preferred Plan and related documents at the Byesville Public Library and Ohio EPA's offices in Logan, Ohio. Ohio EPA officials held local information sessions on January 6 and 22, 1997, and were available at their offices in Logan and Columbus to discuss the Site. Ohio EPA received comments at the public hearing on January 22, 1997. Ohio EPA extended the period for submitting written comments to February 28, 1997, as a result of a request from an interested person. Ohio EPA gave public notice of these events and opportunities through press releases and newspaper announcements.

## 5.10 Cost

According to the RI/FS report, the projected cost of Ohio EPA's selected remedy is about \$10.3 million. The cost breakdown is as follows:

West Slag Pile	\$ 3,846,000
East Slag Pile (if capping in place)	1,431,000
Onsite Sediment	309,000
Offsite Sediment	1,410,000
Wetland Soil	<u>3,331,000</u>
	\$10,327,000

More detailed costs for remedial design / remedial action, and operation and maintenance would be developed during the remedial design phase.

The costs presented above were obtained from the Feasibility Study. For a detailed breakdown on the costs, please refer to Appendix C and E of the Feasibility Study.

## 5.11 Conclusion

The selected remedy must remain protective of human health and the environment. Ohio EPA expects that implementation of the selected remedies discussed above would protect human health and environment. It is not feasible to treat the slag to remove or eliminate its radioactivity. Installation of solid waste caps, with long-term care, would prevent infiltration of water, thus reducing or eliminating leachate. Stormwater discharges from the Site would be controlled. Removal and containment of contaminated onsite/offsite sediments and wetland soils would address health and ecological risks. Revegetation of former process areas would address plant toxicity and erosion. Confirmatory radiological sampling would ensure that no unacceptable risks from radioactive contaminants remain at the Site. Deed restrictions and institutional controls would also be implemented to prevent unapproved residential development and excavation of the piles and wetland areas. According to the RI/FS report, the projected cost of the remedy is \$10.3 million.

1 Actual or threatened releases of hazardous substances from the Site, if not addressed by  
2 implementing the remedy selected in this Decision Document, may endanger public health, welfare  
3 or the environment. This Decision Document does not preclude Ohio EPA from seeking other  
4 remediation at the Site in the future in a manner not inconsistent with the U.S. Environmental  
5 Protection Agency's National Contingency Plan (NCP) at Title 40 of the Code of Federal  
6 Regulations, Part 300. Procedures under the NCP call for periodic review to ensure that the remedy  
7 will protect human health and the environment. This Decision Document does not address  
8 remediation of Cambridge area locations away from the Site where radioactive slag from the facility  
9 was used as fill material.



U.S.E.I.  
S.E.D.O.







03 DEC 13 1994

Sewer Lift  
Station

V  
Sta

Chapman Run

**LEGEND**

-  Slag pile area
-  Creeks and ponds
-  Roads
-  Buildings
-  Approximate property boundary
-  Contours

Source: Topographic features provided by  
Continental Aerial Surveys, Inc.,  
December 1994



0 400 800  
feet  
Contours in feet

Figure 1. SMC facility.

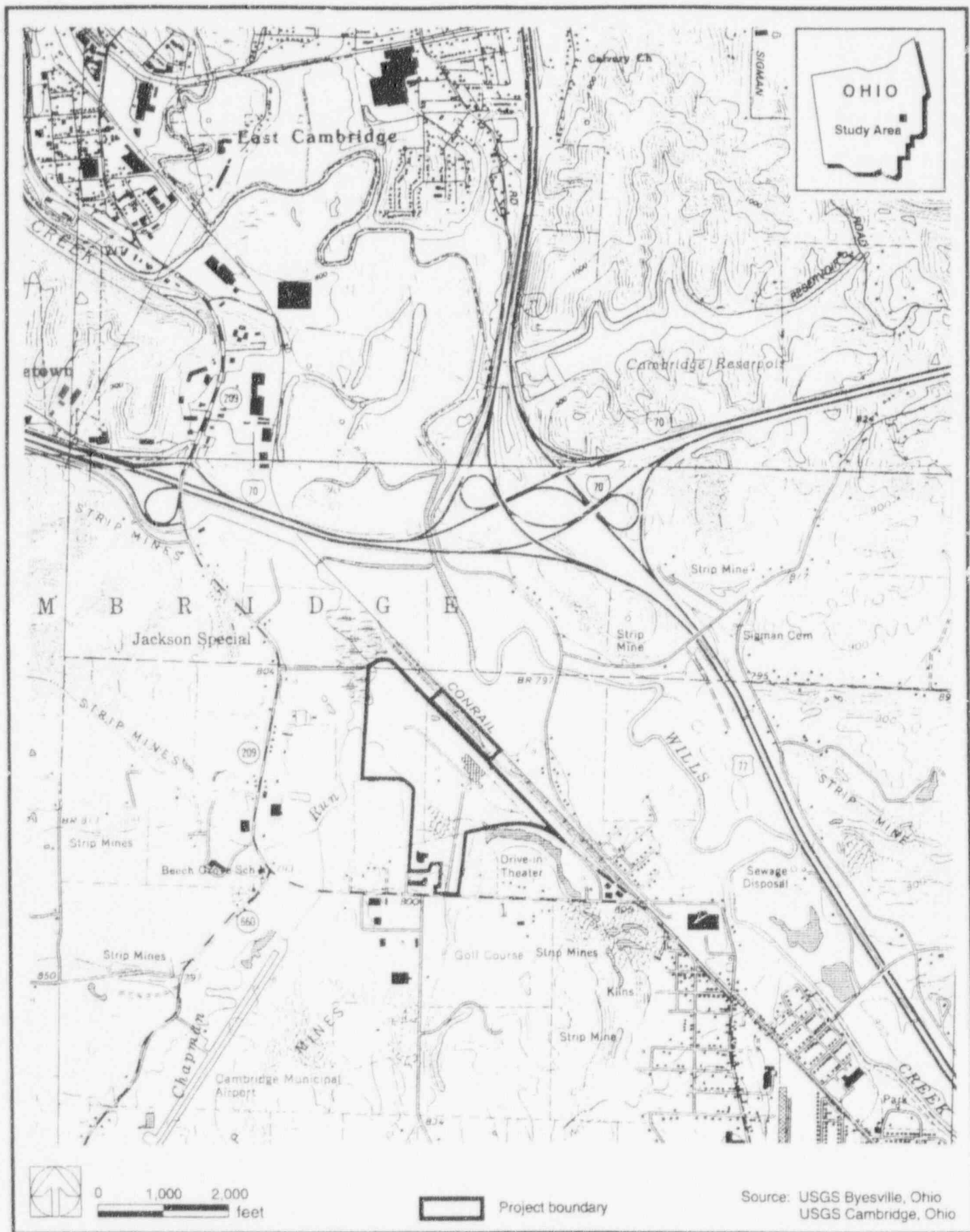


Figure 2. Location of Shieldalloy Metallurgical Corporation, Cambridge, Ohio.

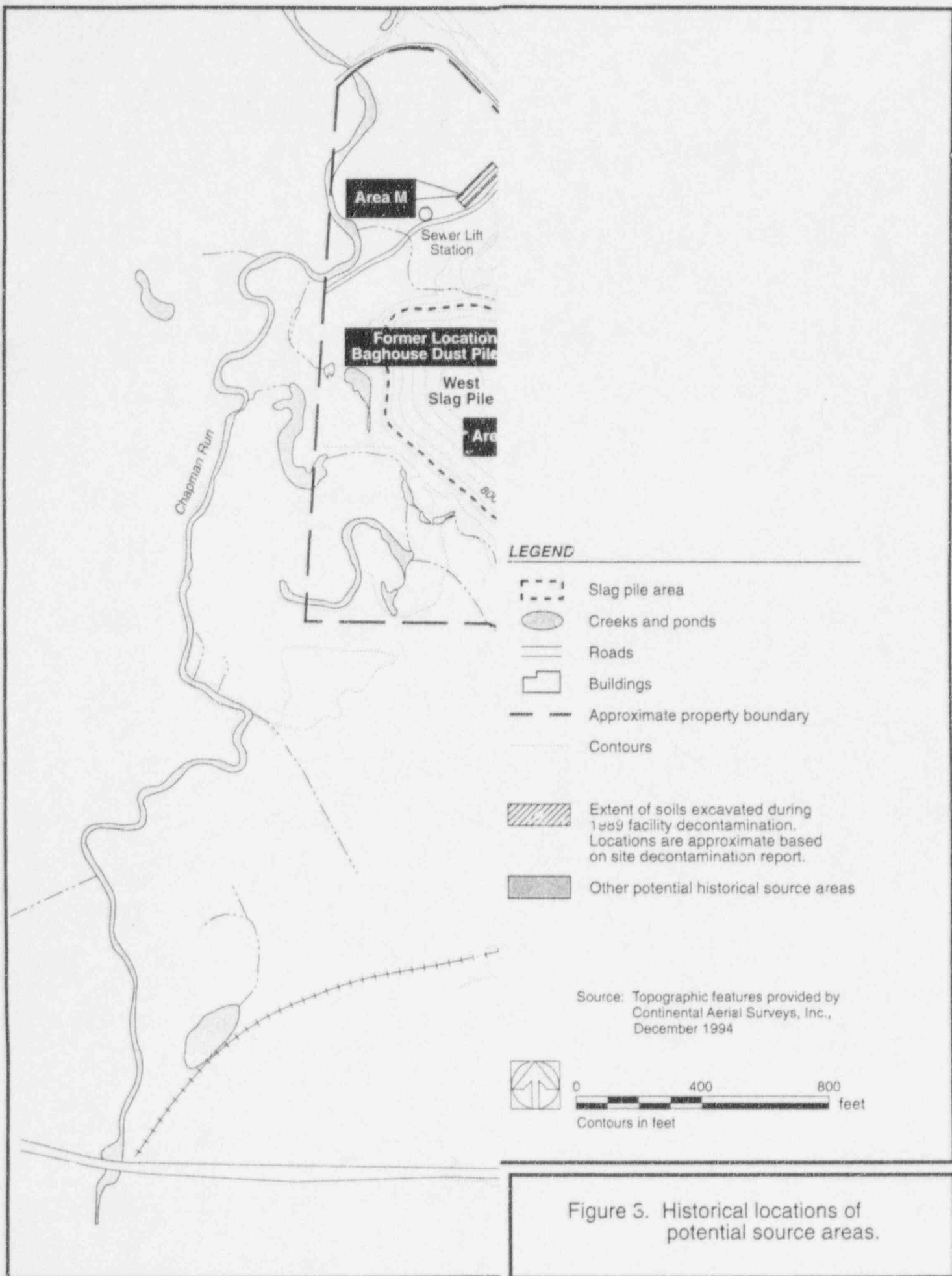
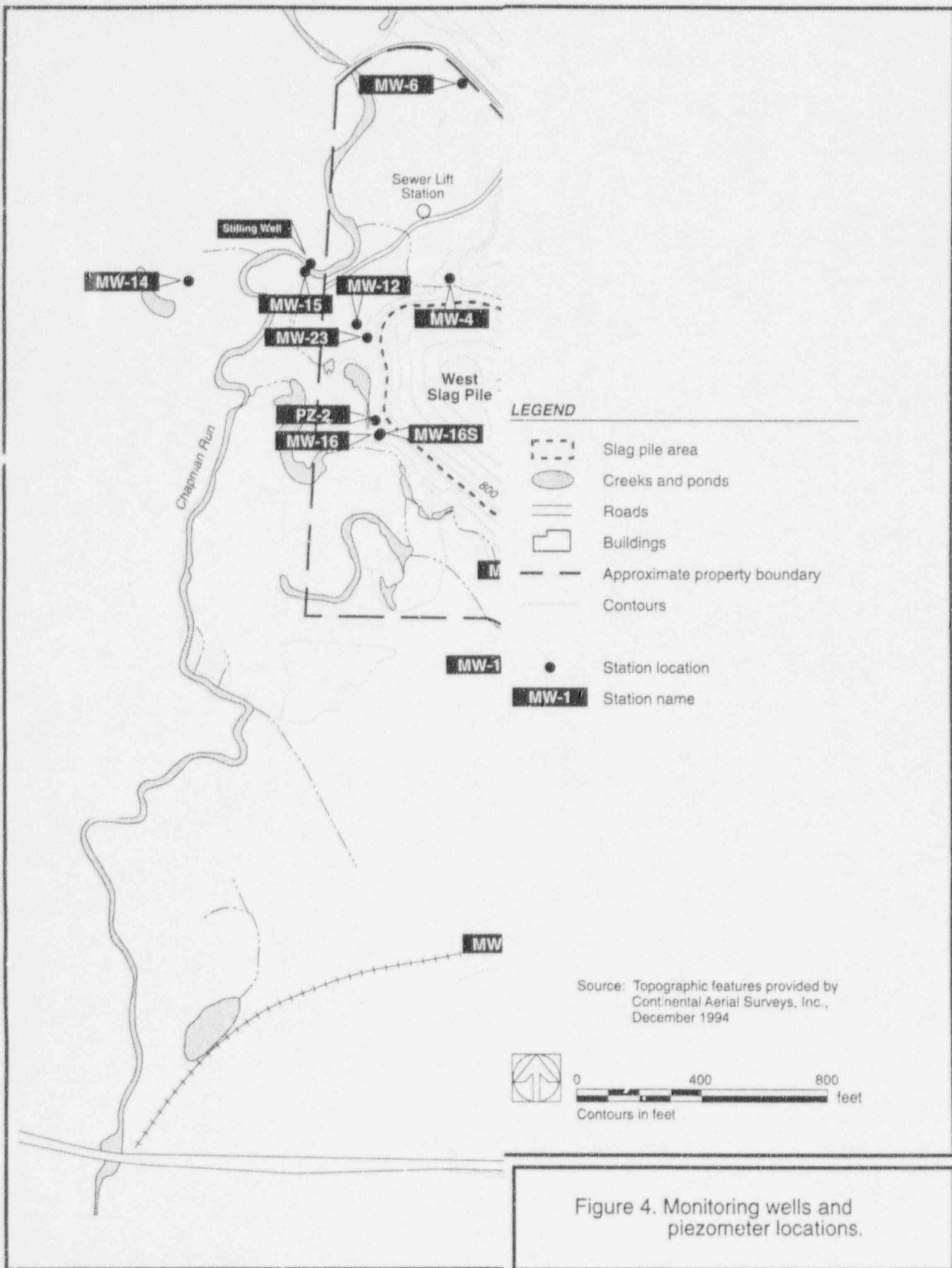
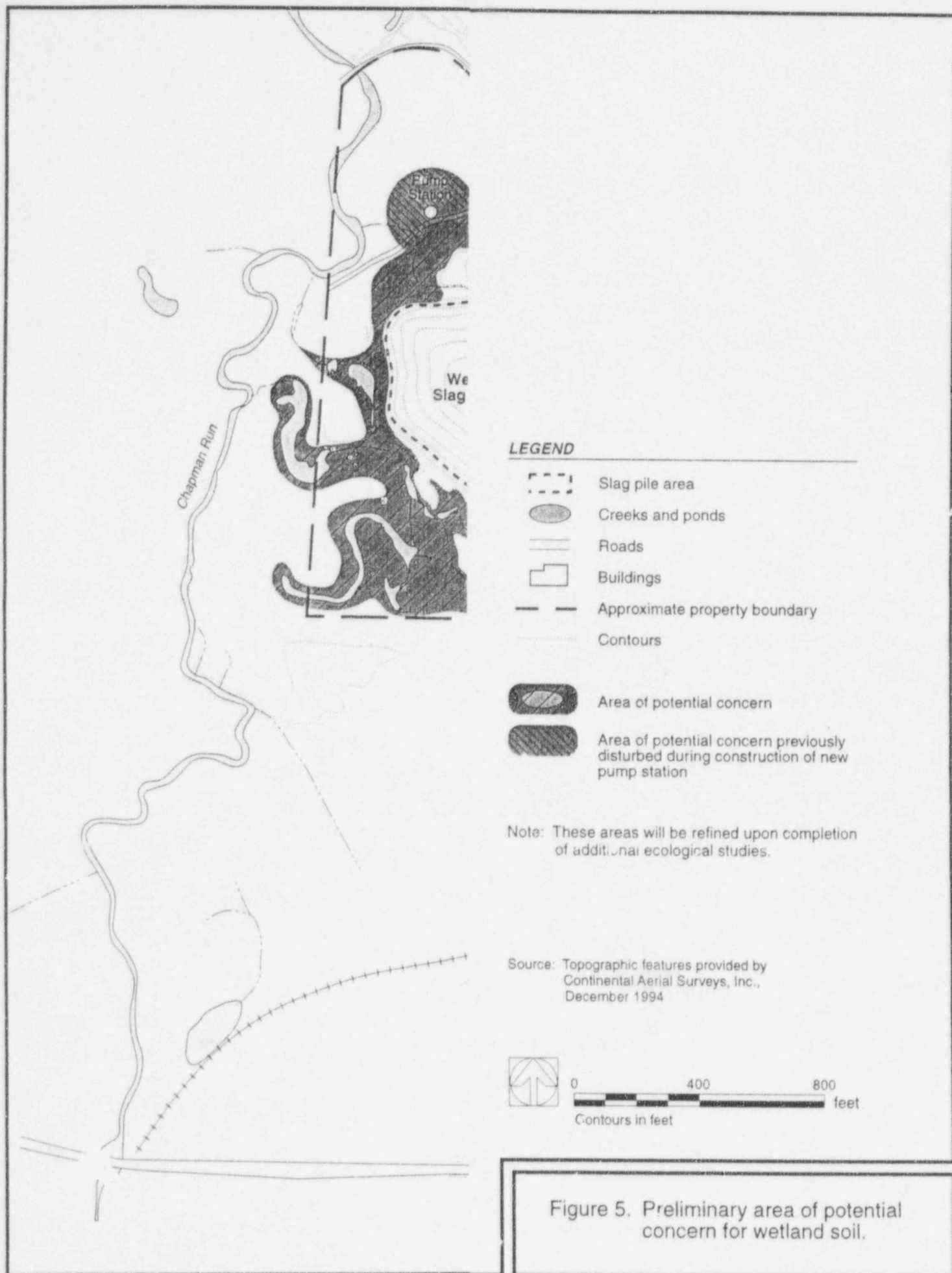
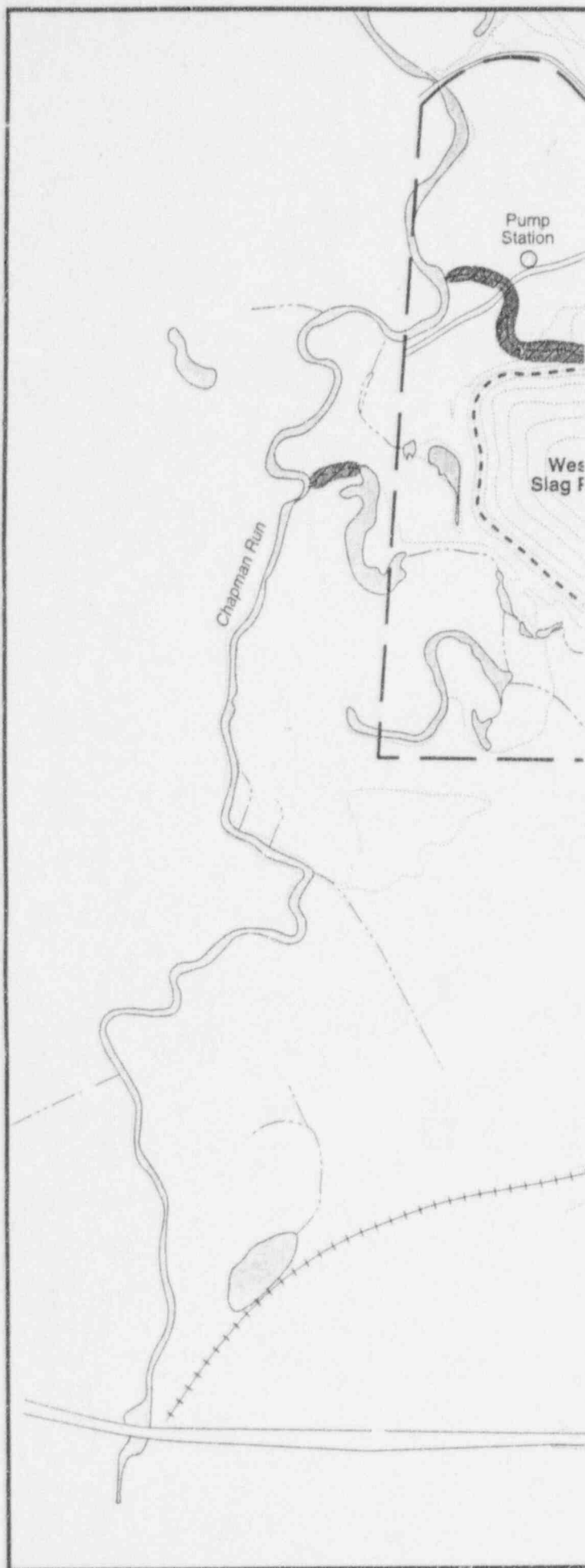


Figure 3. Historical locations of potential source areas.
















#### LEGEND

-  Slag pile area
-  Creeks and ponds
-  Roads
-  Buildings
-  Approximate property boundary
-  Contours
-  Area of potential concern

Note: Areas of potential concern include in-channel sediments only. These areas will be refined through further sampling in the remedial design phase in conjunction with the use of the PRG for sediments and the consideration of other factors (e.g., short term environmental effects).

Source: Topographic features provided by Continental Aerial Surveys, Inc., December 1994



0 400 800 feet  
Contours in feet

Figure 6. Preliminary area of potential concern for onsite sediment.

Note: Area of potential concern extends along Chapman Run to confluence with Wills Creek.



#### LEGEND

- Slag pile area
- Creeks and ponds
- Roads
- Buildings
- Approximate property boundary
- Contours
- Area of potential concern

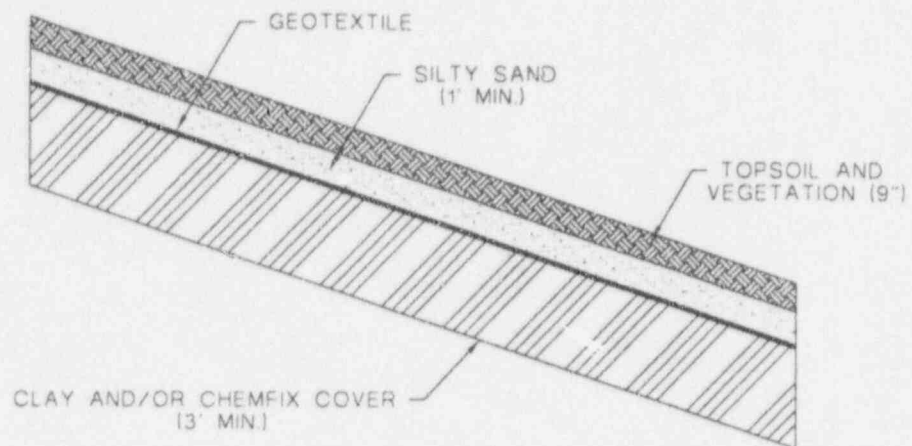
Note: Areas of potential concern include in-channel sediments only. These areas will be refined through further sampling in the remedial design phase in conjunction with the use of the PRG for sediments and the consideration of other factors (e.g., short term environmental effects).

Source: Topographic features provided by Continental Aerial Surveys, Inc., December 1994

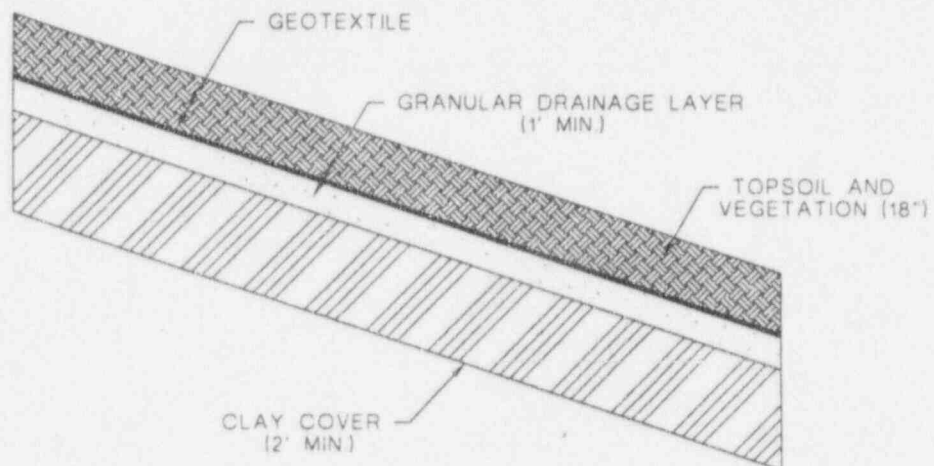


0 400 800  
feet  
Contours in feet

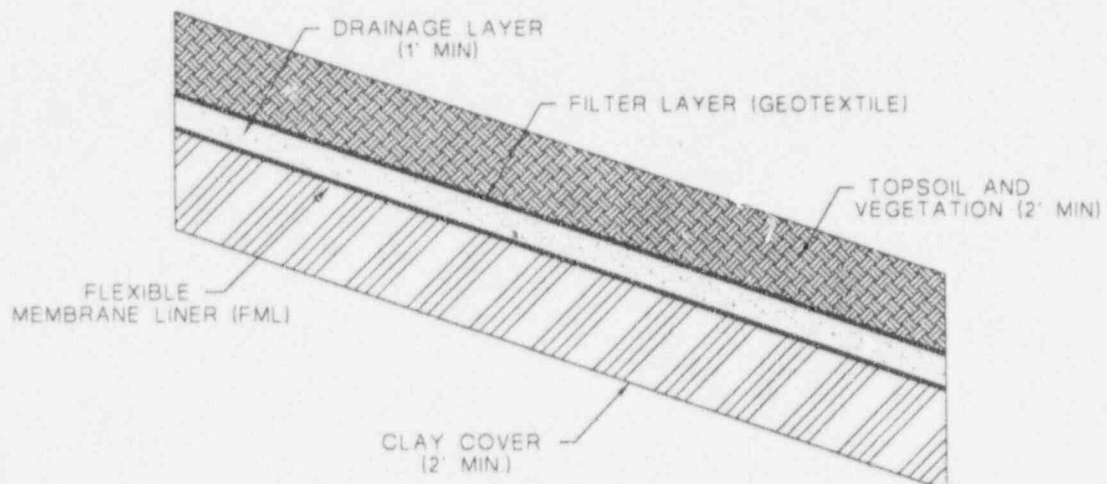
Figure 7. Preliminary area of potential concern for offsite sediment.



### CAP FOR DECOMMISSIONING OF WEST SLAG PILE

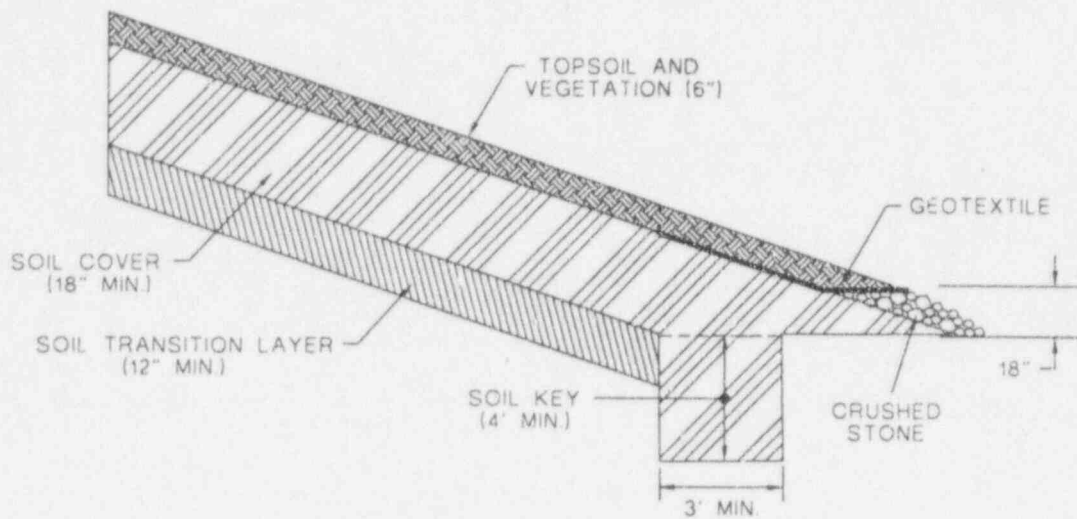


### CAP FOR SOLID WASTE LANDFILL

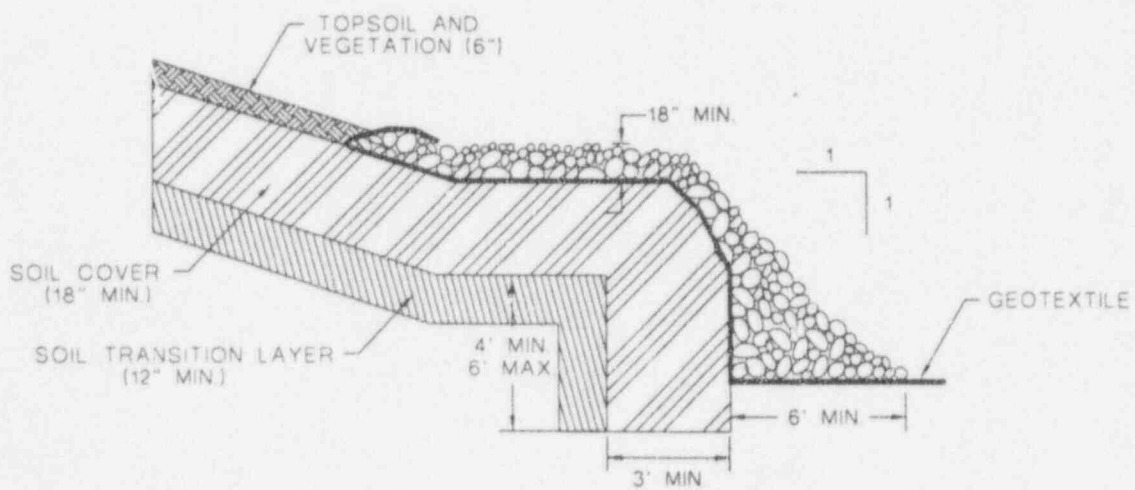


### CAP FOR HAZARDOUS WASTE LANDFILL

Figure 8. Cross sections of caps.



**CONCEPTUAL CAP DESIGN**  
(OUTSIDE OF FLOODPLAIN)



**PLACEMENT OF RIP RAP FOR EROSION PROTECTION**  
(INSIDE FLOODPLAIN)

Figure 9. East slag pile - Cap and erosion control.

OHIO ENVIRONMENTAL PROTECTION AGENCY

RESPONSIVENESS SUMMARY  
FOR THE

SHIELDALLOY METALLURGICAL CORP. SITE  
CAMBRIDGE, OHIO



## RESPONSIVENESS SUMMARY

The purpose of this Responsiveness Summary is to summarize and to provide a brief response to comments made during the public comment period for the Shieldalloy Metallurgical Corporation Site, Cambridge, Ohio ("the Site"). This Responsiveness Summary applies to both written and oral comments. This Responsiveness Summary does not necessarily provide the basis for the Decision Document. In the event of any variance between this Responsiveness Summary and the Decision Document, the Decision Document controls.

This Responsiveness Summary is organized in four parts:

- I. Comments from Shieldalloy and Cyprus Foote Mineral
- II. Comments from U.S. Nuclear Regulatory Commission
- III. Comments from Public Meeting
- IV. Other Written Comments

In general, for more information on the topics raised in the comments, see the Decision Document and the RI/FS report.

### I. COMMENTS FROM SHIELDALLOY AND CYPRUS FOOTE MINERAL

#### A. GENERAL COMMENTS

1. A solid waste cap, per OAC Chapter 3745-27, is unnecessary for the West and East Slag Piles.

Ohio EPA response: Ohio EPA does not agree with the Shieldalloy Metallurgical Corporation (SMC) and Cyprus Foote Mineral (CFM) position that a solid waste cap is unnecessary for the Site. Ohio EPA believes that a solid waste cap is needed to provide long-term protection for the West Slag Pile and, if necessary, the East Slag Pile.

2. The excavated sediments and soils should be placed adjacent to the West Slag Pile, rather than on top of the pile.

Ohio EPA response: Disagree. The placement of soils and sediments atop the West Slag Pile will maximize the area available for placement of offsite slag returned to the Site, if this is allowed in the future.

3. Reconcile cost provisions projections.

Ohio EPA response: The cost revisions presented in the final Feasibility Study will be reflected in the Decision Document.

4. Ohio EPA should affirmatively provide for return of off-site slag onto the Site and placement of it adjacent to the West Slag Pile. SMC and CFM continue to note that Ohio EPA's deferral with respect to this matter is not necessary or appropriate and that issues that do not relate to the on-site placement of this material are outside the scope of the Preferred Plan and Decision Document and do not need to be addressed in them.

Ohio EPA response: Disagree. As noted in the Decision Document, Ohio EPA's selected remedy is to evaluate this issue further if firm plans are expeditiously developed for removal of the radioactively contaminated slag from the offsite locations.

5. Revise the description of radioactive slag. Throughout the document, Ohio EPA refers to ferrocolumbium, ferrovandium, and Grainal slags as "radioactive," which is not accurate. The slags should be identified as containing "elevated levels of naturally occurring radioactivity." Moreover, the Plan incorrectly refers to all Grainal, ferrovandium, and ferrocolumbium slags as radioactive. These materials were at different times made with ores and raw materials from different sources that exhibited varying concentrations of radionuclides.

Ohio EPA response: The Decision Document will not be revised; however, the inclusion of this comment in the comment section serves to clarify SMC/CFM position on the terminology noted.

## **B. SPECIFIC COMMENTS**

1. Comment: 1.0 Introduction, page 4, line 8: SMC and CFM commented that this section of the Plan states that the two slag piles cover a combined area of 14 acres. Area calculations performed during and reported in the RI/FS, which were based on digitized aerial photographs and confirmed by a land survey, show the total area of the two slag piles to be less than 11 acres. This acreage should be reflected in the Decision Document.

Ohio EPA response: Concur. The references to 14 acres in the Preferred Plan will be revised to 11 acres in the Decision Document.

2. Comment: 3.3 Metal Alloy Production, page 10, lines 1 and 2: SMC and CFM note that this section of the Plan states: "...the facility manufactured about six other alloy products (e.g., Grainal®, ferrotitanium, and small amounts of ferrocolumbium)." While this is generally accurate, it does not provide context for the reader to determine the relevant quantities of these alloy products vis-a-vis the various alloys that are discussed in the

preceding sentence. Thus, we suggest that the Decision Document state that "the facility manufactured lesser quantities of Grainal®, Solvan®, ferrotitanium, ferroboron, and ferrocolumbium alloys."

Ohio EPA response: Concur. Ohio EPA will include this language in the Decision Document.

3. Comment: 3.4 Metal Alloy Production, page 10, lines 3 and 4. MC and CFM comment that this section of the Plan states: "The facility used naturally occurring radioactive ores and other raw materials to produce ferrovandium, Grainal®, and ferrocolumbium alloys." More precisely, "The facility used ores or other raw materials containing low levels of naturally occurring radioactivity in the production of some alloys." SMC and Cyprus Foote suggest that Ohio EPA use this latter more precise description.

Ohio EPA response: The sentence will be revised.

4. Comment: 3.4 License for Ferrocolumbium Slag under the Atomic Energy Act, page 10, lines 14 and 15L: SMC and CFM note that the Preferred Plan states that Shieldalloy received a license from NRC in 1987. This sentence should be clarified to state that the license was only for possession of the slag. SMC did not produce ferrocolumbium and did not generate ferrocolumbium slag.

Ohio EPA response: Concur. The sentence will be revised.

5. Comment: 3.5 Slag and Other Wastes, page 10, lines 20 through 22: SMC and CFM note that this section states that the facility manufactured three types of radioactive slag (ferrocolumbium, ferrovandium, and Grainal®). This statement is misleading; not all ferrovandium and Grainal® slags are the same because of the various raw material sources used. Furthermore, not all ferrovandium and Grainal® slags contain elevated concentrations of radionuclides.

Ohio EPA response: The purpose of the sentence is merely to identify the slags that are the primary contributors to the radiation in the slag piles.

6. Comment: 3.5 Slag and Other Wastes, page 10, lines 24 and 25: SMC and CFM note that this section of the Plan states that the facility disposed of most of its waste slags and other wastes in various areas across the Site until the late 1980s. This statement is inaccurate. While slag was placed in piles on site, only small amounts of other materials may have been placed on the piles. Further, no evidence has been found during any of the environmental investigations that chemical or hazardous wastes were placed in the slag piles.

Ohio EPA response: Disagree. During operation of the facility, slags were placed on the East and West Slag Piles. Other wastes were stored in various locations (e.g. Former Baghouse Dust Pile, empty drum accumulation area, former Grainal Slag Pile). In addition to the slags, solid waste was placed on the West Slag Pile and East Slag Pile, including baghouse dusts, scrap barrels, spent carbon anodes, etc.

7. Comment: 3.5 Slag and Other Wastes, page 10, lines 28 and 29: SMC and CFM note that this section states that the Grainal® Pile contained only radioactive Grainal® slag. This statement is incorrect. Only Grainal® made from zircon sands contained elevated concentrations of radionuclides.

Ohio EPA response: Concur. The Decision Document will be revised.

8. Comment: 3.6.1, Partial Decommissioning under the Atomic Energy Act, page 11, lines 4 and 5: SMC and CFM note that this section of the Preferred Plan states "Shieldalloy excavated approximately 140,000 tons of soil and slag, contaminated with chemical and radiological wastes...". The word "chemical" should be removed. Soil from the operational area was excavated on the basis of radiological characteristics only.

Ohio EPA response: The word "chemical" is retained because data from the Remedial Investigation show that soils in operational areas have chemical levels that are higher than background. However, the Decision Document will clarify that soil from the operational area was excavated on the basis of radiological characteristics only.

9. Comment: 3.6.1, Partial Decommissioning under the Atomic Energy Act, page 11, line 17: SMC and CFM note that this section of the Preferred Plan states that "...after adding baghouse dust, Shieldalloy covered the West Slag Pile with geotextile cloth and nine inches of sand." This statement is inaccurate. While the cap material does include baghouse dust, that dust was treated by a proprietary process to reduce the hexavalent chrome and to solidify the material. The resultant Chemfix® material was placed on the West Slag Pile and covered with a geotextile cloth and 12 inches of sand. The Decision Document should be clarified accordingly.

Ohio EPA response: The sentence will be revised to indicate that treated (Chemfix) and untreated baghouse dusts were placed on the West Slag Pile.

10. Comment: 3.6.1 Partial Decommissioning under the Atomic Energy Act, page 11, line 19:

SMC and CFM note that the Plan states that the total area of the West Slag Pile after decommissioning was 11.8 acres. Area calculations performed and reported in the RI/FS, which were based on digitized aerial photographs and confirmed by land surveys, establish the total area of the West Slag Pile as approximately 8.2 acres.

Ohio EPA response: Concur. The revision will be reflected in the Decision Document.

11. Comment: 3.6.1, Partial Decommissioning under the Atomic Energy Act, page 11, lines 21 through 24: SMC and CFM note that this section states that Shieldalloy installed a fence around the East Slag Pile to limit human exposure to radiation consistent with NRC requirements. While Shieldalloy did install a fence around the East Slag Pile in 1992, the purpose was to secure licensed material from unauthorized removal.

Ohio EPA response: The sentence will be revised as follows:

" In 1992, Shieldalloy installed a fence around the East Slag Pile consistent with NRC requirements. A purpose of the fence is to secure licensed material from unauthorized removal."

12. Comment: 4.1, Hydrogeology and Groundwater, page 15, lines 25 and 26: SMC and CFM note that the Plan states that past investigations have "typically entailed the installation and sampling of monitoring wells to monitor the shallow groundwater at the Site." The word "shallow" should be removed from this sentence because it incorrectly implies that only shallow monitoring wells have been installed at the Site. In fact, deep wells and piezometer have also been utilized at the Site. (See page 2-3 of the final Remedial Investigation report.)

Ohio EPA response: Concur. The word "shallow" will be deleted from the text.

13. Comment: 4.1, Groundwater Quality, page 16, lines 20 and 23: SMC and CFM note that this section lists the number of groundwater monitoring wells sampled during each phase of the Remedial Investigation. These sentences should be corrected to state that 24 (not 23) wells were sampled in the first round and 7 wells (not 9) were sampled during the second round.

Ohio EPA response: Concur. Text will be revised to reflect the changes.

14. Comment: 4.2, Onsite Soils, page 17, lines 19 through 22: SMC and CFM note that the Plan states "Soil samples from the perimeter of the slag piles did not have elevated concentrations of metal contaminants, with the exception of soils from 0 to 5 foot depth collected next to the slag piles." In fact, only one sample collected at depths of 0-5 ft. near the slag piles was found to contain elevated concentrations of metals (see page ES-12 of the final Remedial Investigation report). Accordingly, the Plan should be revised to read "...with the exception of a single soil sample collected from the 0-5 ft. depth interval at MW-20 located next to the East Slag Pile."



Ohio EPA response: The comment appears to contradict Figure 43 of the Remedial Investigation which shows elevated vanadium in perimeter soils. The text in the Decision Document will remain unrevised.

15. Comment: 4.2, Onsite Soils, page 17, line 24: SMC and CFM note that this Section states that "Samples at the West Slag Pile contained calcium and magnesium at elevated levels." The words "at the" should be replaced with "collected from beneath..."

Ohio EPA response: Concur. The sentence will read as follows:

"Samples collected from beneath West Slag Pile contained calcium and magnesium at elevated levels."

16. Comment: 4.2, Onsite Soils, page 17, lines 32 through 34: SMC and CFM note that the plan states "The Remedial Investigation detected above-background levels of the radionuclides thorium-230, actinium-227, and radium-228 in samples from the sedimentation delta on the south side of the West Slag Pile...". This statement is not accurate.

Actinium-227 is not present at elevated concentrations in soil. Further, it does not appear that radium-228 is present in such concentrations.

The final Remedial Investigation report states that only thorium-230 was detected in this area. Actinium-227 was discussed in the correspondence in Appendix R of the RI/FS in order to address the presence of elevated levels of actinium-227 in certain slag. However, actinium-227 was never detected in above-background concentrations at the Site. Further, although statistical testing for radium-228 presented in Appendix R showed positive results (i.e., significant with respect to background), the most likely cause was that the background assumed from the thorium decay series (the average for the state of Ohio was used) was too low.

Ohio EPA response: Disagree. Ohio EPA, the Ohio Department of Health (ODH) and SMC/CFM discussed the issue of the presence of Actinium-227 and Radium-228 in soil through several correspondences. In the SMC/CFM's June 26, 1996 letter to ODH, SMC/CFM clearly stated that "For soils, three radionuclides were identified as being significantly greater than background in the Wilcoxon Rank Sum test: actinium-227, radium-224, and radium-228." Although Ra-224 was dropped from the consideration, Ac-227 and Ra-228 were definitely identified as chemicals of potential concern. The background level of Ra-228 was agreed upon by Ohio EPA, SMC and CFM.

17. Comment: 4.4, Transport and Fate of Contaminants, page 18, line 38: SMC and CFM note that this heading appears to be a major subject heading, not a subheading under 4.4 Sediments and Wetland Soil.

Ohio EPA response: Concur. Text will be revised.

18. Comment: 4.7, Atmospheric Transport, page 19, lines 25 and 26: SMC and CFM note that this section states that modeling was conducted to determine concentrations of contaminants in air. However, it fails to report the conclusion of that monitoring. To address this, SMC and Cypress Foote suggest that the following sentence from the final Remedial Investigation report should be added to this section: "The conservative modeling, which included emissions and dispersion calculations, demonstrates that air quality does not pose a risk at the Site."

Ohio EPA response: The above passage from the Remedial Investigation will be revised.

19. Comment: 4.8.1, Human Health Risk Assessment, page 20, lines 7 through 11: SMC and CFM note that this paragraph presents Ohio EPA's radiological risk assessment results. This section should be clarified by adding the following text to the sentence that ends with "October 16, 1996": "...and using conservative assumptions about the presence of actinium-227 and its daughter products." This paragraph should also state that EPA's acceptable risk range is  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ .

Ohio EPA response: The text will be revised.

20. Comment: 4.8.2, Phase I Ecological Assessment, page 21, lines 27 through 31: SMC and CFM note that this section states that certain areas were found to contain metal concentrations in soils which exceed USEPA benchmark values for plant toxicity. It fails to report, however, that subsequent study by a regional expert (Dr. Barbara Andreas of Miami University) found no evidence of phytotoxic effects in vegetation. See page ES-20 of the Remedial Investigation report.

Ohio EPA response: An examination of the noted report by Dr. Andreas reveals that an evaluation of phytotoxicity was not an objective of her study. In addition, significant areas at the Site are devoid of vegetation. The noted observations of Dr. Andreas do not refute USEPA's benchmark values for plant toxicity.

21. Comment: 4.8.2, Phase I Ecological Assessment, page 21, line 43 through page 22, line 5: SMC and CFM note that this paragraph describes the macroinvertebrate communities as being fair to poor and attributes marginal habitat conditions downstream of SMC as being the result of pervasive silt loading. To more accurately describe the conditions encountered, this paragraph should be replaced with the following text: "The macroinvertebrate communities at all stations in Chapman Run were in the fair range, except at river mile 0.9, downstream from the Site, which fell in the poor range. Habitat conditions were marginal at all locations with the worst conditions being downstream of the Site where the substrate is predominantly fine silt. Ohio EPA has concluded that the

macroinvertebrate community at river mile 0.9 is below what would be expected given the habitat conditions."

Ohio EPA response: The above referenced text, as presented in the Preferred Plan, summarizes the conclusions of Ohio EPA's evaluation of Chapman Run and the associated wetlands.

22. Comment: 4.8.3, Phase II Ecological Risk Assessment, page 23, lines 25 and 26: SMC and CFM note that this section of the Plan discusses contaminants present in Chapman Run and the possible sources of these contaminants. The corresponding discussion in the final Remedial Investigation report includes the following statement that was omitted from the Plan:

"The specific contribution of Site chemicals of potential concern to these effects cannot be determined from the available data."

This statement should be added to the Plan.

Ohio EPA response: Regardless of whether or not the Ohio EPA can apportion harm to individual aquatic species in Chapman Run and adjoining wetlands, the overall level of chemicals of potential concern pose risk to the aquatic community in these affected areas.

23. Comment: 5.0, Summary of the Feasibility Study, page 25, line 11, and page 26, line 10: SMC and CFM note that the text "Develop and screen" on page 25, line 11, should be replaced with "Identify and screen."

On page 26, under the heading of Offsite Sediment on line 10, "recanalization" should be replaced with "rechannelization" (and throughout the Plan).

Ohio EPA response: Concur. Both corrections will be included in the Decision Document.

24. Comment: 5.1, West Slag Pile, page 26, lines 29 through 31. SMC and CFM note that the section states that the total area of the West Slag Pile is 11.8 acres. See comment regarding 3.6.1, above, and conform.

This section also states that the West Slag Pile contains "most types of radioactive and nonradioactive slag." This statement should be clarified with the addition of the following language: "that have been historically produced at the SMC Cambridge facility." The unit "tons" should be inserted following the estimated weight of the slag (532,150). Also, the estimated volume should be changed from 222,700 yd<sup>3</sup> to 220,663 yd<sup>3</sup> to be consistent with the Remedial Investigation report.

Ohio EPA response: The sentence will read as follows:

"The West Slag Pile covers approximately 8.2 acres as shown in Figure 1. It includes most types of radioactive and nonradioactive slag that have been generated at the SMC Cambridge facility. The West Slag Pile has an estimated weight of 532,150 tons, and an estimated volume of 220,663 yd<sup>3</sup>."

25. Comment: 5.1.2, Capping in Place, page 27, lines 26 through 27 and 30: SMC and CFM note that the reference to "RC Chapter 3734" on line 30 is inconsistent with the reference on page 28, line 21.

Ohio EPA response: Concur. The text will be revised.

26. Comment: 5.1.2, Decommissioning Cap, page 27, lines 39 through 41: SMC and CFM note that this paragraph inaccurately describes the completion of the decommissioning cap. First, the words "baghouse dust" should be deleted from this sentence because this material was converted into Chemfix®, which then was used for the existing decommissioning cap. Second, line 41 should be replaced with "the new clay layer that extends from the Chemfix® layer down to ground surface, followed with 12 inches of top soil placed over the entire pile. (See Figure 8)."

Ohio EPA response: The paragraph will read as follows:

"Completing the decommissioning cap would first require placing clay around the perimeter of the West Slag Pile. The new clay layer would have a thickness of 3 feet with a permeability  $10^{-6}$  to  $10^{-8}$  cm/sec and would extend from the edge of the Chemfix/baghouse dust layer down to ground surface, followed with 12 inches of silty sand and geotextile fabric. Upon completion of the capping of the perimeter, 9 inches of top soil would be placed over the entire West Slag Pile. (See Figure 8)"

27. Comment: 5.1.2, Hazardous Waste Cap, page 28, line 29: SMC and CFM note that the permeability specification for the 1 foot thick drainage layer should be revised to specify permeability equal to  $1 \times 10^{-2}$  cm/s or greater, not less, as specified in the Plan.

Ohio EPA response: Concur. The text will be revised.

28. Comment: 5.1.2, Cost Estimates for Capping, page 28, line 41 through page 29, line 11: SMC and CFM note that the cost estimates presented in the Plan generally show the difference among the different types of caps but are not fully consistent with the final Feasibility Study report. These costs should be revised to be consistent with the final feasibility study report, or an explanation for the difference should be provided.

Ohio EPA response: The cost estimates presented in the Decision Document will be revised to be consistent with the final Feasibility Study.

29. Comment: 5.1.4, Removal and Offsite Disposal, page 30, line 37: SMC and CFM note that the acreage for the West Slag Pile is incorrect. Revise from 11.8 to 8.2.

Ohio EPA response: Concur. The text will be revised.

30. Comment: 5.1.4, Removal and Offsite Disposal, page 31, line 34: this section states that 5,934 rail cars would be required for offsite disposal. The number of rail cars specified in the final Feasibility Study report is 4,865. The Plan should be revised to agree with the final feasibility study report, or an explanation should be provided for the difference.

Ohio EPA response: Concur. The text will be revised to reflect the number of railcars needed as 4,865 which will be consistent with the final Feasibility Study report.

31. Comment: 5.2.2, Capping in Place, page 33, item 3, line 20: SMC and CFM note that this item states that the cap would reduce the flux of radon from the radioactivity in the matrix. A parenthetical sentence should be added that states: "(There is no measurable radon flux from the East Slag Pile, so the cap design includes no consideration of radon flux reduction.)".

Ohio EPA response: Disagree. The text will not be revised.

32. Comment: 5.2.2, Hazardous Waste Cap, page 35, line 7: SMC and CFM note that the permeability specification for the 1 foot thick drainage layer should be revised to specify permeability equal to  $1 \times 10^{-2}$  cm/s or greater, not less, as specified in the Plan.

Ohio EPA response: Concur. The text will be revised.

33. Comments: 5.2.4, Removal and Sale of the Slag, page 37, lines 37 and 38: SMC and CFM note that this section describes the process for crushing and sorting the slag for sale. The sentence stating that it may be possible to separate very large chunks of slag exhibiting radioactivity for offsite disposal should be deleted. There are no plans to segregate any slag from this option based on radioactivity.

Ohio EPA response: Disagree. Although there are no plans as such, it remains possible to separate large slag buttons if it is necessary to do so.

34. Comment: 5.2.4, Cost Estimates, page 38, lines 15 and 16: SMC and CFM note that this section states that the cost to remediate the East Slag Pile may result in a profit; thus, cost estimates were not generated for this alternative. To maintain consistency with the feasibility study report, these lines should be replaced with the following language:



"Because the feasibility of selling the slag in the East Slag Pile has not yet been established, there are no means by which to prepare cost data on it. Once the ongoing evaluation of the feasibility of the sale has been completed, a cost estimate for the sale will be prepared if the evaluation indicates that selling the slag is technically, legally, and economically feasible."

Ohio EPA response: The above sentence will be revised in the Decision Document.

35. Comment: 5.4.3, Recanalization, page 41, line 24: SMC and CFM note that the subject heading should be revised to read "Rechannelization."

Ohio EPA response: Concur. Decision Document will be revised to be consistent with the final Feasibility Study.

36. Comment: 6.1, Selection Criteria, page 48, item 2, lines 16 and 17: SMC and CFM note that the selection criteria listed include "Compliance with all state, federal and local laws and regulations." By law, the criteria include only those laws and regulations that are applicable or relevant and appropriate. The Plan should be revised to reflect this.

Ohio EPA response: The text will be revised as follows:

"Compliance with all State, Federal and Local laws and regulations - addresses whether or not a remedy will attain applicable, relevant and appropriate requirements under federal, state, and local environmental laws;"

37. Comment: 6.3.1, Excavate to Meet Performance Standards, page 49, lines 27 through 33: SMC and CFM note that the need for wetland soil and sediment remediation and the areas and volumes to be remediated will be determined during the Remedial Design phase of the project.

Ohio EPA response: The Decision Document will note that the areas and volumes for the wetland soils and sediments will be determined during the Remedial Design phase. However, the Decision Document will note that the wetland soils and sediment will need to be remediated. Data presented in the feasibility study and the Remedial Investigation (Ecological Risk Assessment Phases I and II) shows that risk exists to potential ecological receptors in these areas. The question of whether or not these areas need remediation was answered during the Remedial Investigation and Feasibility Study.

38. Comment: 6.3.2, Performance Standards for Cleanup of Soils and Sediments, page 50, lines 7 and 11 through 14: SMC and CFM note that this section specifies that the area and volume estimates for onsite sediment and offsite sediment are based on a vanadium concentration of 1,280 mg/kg. This section should be revised to state that the area and

volume estimates used in the Plan, including the figures, is based on a vanadium concentration of 700 mg/kg.

This section also states that a combination of source control and sediment remediation is expected to meet the preliminary remediation goal for surface water (87 µg/L for vanadium). Ohio EPA has not accurately stated the remediation goals for vanadium in surface water. Vanadium concentrations outside the mixing zone should be limited to a maximum of 190 µg/L according to the State's report *Biological, Sediment and Water Quality Study of Chapman Run and Associated Wetlands*. Furthermore, this number should not be applied to onsite intermittent drainage ditches.

Ohio EPA response: Section 5.0 of the Decision Document has a table that sets forth the following preliminary remediation goals (PRGs) for vanadium: 700 mg/kg for wetland soils; 1280 mg/kg for sediments; and 87 ug/l for surface water. The Feasibility Study used a PRG figure of 700 mg/kg to compute the approximate amount of contaminated wetland soils and sediments that would be excavated. The Remedial Design work would compute more precisely the areas and volumes of contaminated soils and sediments to be excavated.

39. Comment: 6.3.2, Performance Standards for Cleanup of Soils and Sediments, page 50, lines 15 and 16. SMC and CFM note that this section refers to a table in Section 6.11 which outlines the cleanup levels for each medium at the Site. There is no Section 6.11 in the Plan.

Ohio EPA response: The reference to Section 6.11 will be deleted from the Decision Document. The sentence will now read: "Please refer to the table in this section..."

40. Comment: 6.3.2, Performance Standards for Cleanup of Soils and Sediments, page 50, lines 30 and 31: SMC and CFM note that this section states that the major radionuclide detected in most media during the Remedial Investigation was thorium-230 (Th-230). This section should be corrected to state that thorium-230 was detected only in soils. Thorium-230 was not detected in surface water or groundwater in concentrations above background.

Ohio EPA response: For soils, please see the comments on Question 4.2 (Onsite Soils, page 17, line 32 through 34). Th-230 was not the only radionuclide identified in the RI/FS report. For groundwater, PTI clearly stated that "The data on radionuclide concentrations in wells MW-09 and MW-19 were used to define background concentrations. Thorium-230 is the only radionuclide that occurs above background concentrations in two of the wells (MW-12 and MW-13)." Therefore, Th-230 was detected in groundwater in concentrations slightly above background at least at MW-12.

41. Comment: 6.3.2, Performance Standards for Cleanup of Soils and Sediments, page 50, lines 33 through 35: SMC and CFM note that this section discusses the results of Ohio EPA's independent data validation, which identifies protactinium-231m and actinium-227 as present in Site soils at levels at least slightly above background. Based on this finding, the Plan presents the recommendation that samples collected during the Remedial Design phase be analyzed for protactinium-231m and actinium-227. The statement regarding the presence of these radionuclides at concentrations above background is incorrect. The statistical comparisons for soil between background and site locations indicated that neither protactinium-231m nor actinium-227 were present in elevated concentrations. (See Appendix R of the Remedial Investigation report.) At the State's request, these two radionuclides and their progeny were included in the risk assessment because they existed in elevated concentrations in the slag.

Ohio EPA response: Please refer to comments on Question 4.2 (Onsite Soils, page 17, line 32 through 34). Pa-231 with a half-life of 3.2E4 years is the parent of Ac-227 with a half-life of 21.6 years. The presence of Ac-227 above background strongly indicates the presence of Pa-231. The state still intends that future analysis for soils during the RI/FS phase be analyzed for Pa-231 and Ac-227.

42. Comment: 6.3.2, Performance Standards for Cleanup of Soils and Sediments, page 51, lines 3 through 15: SMC and CFM note that this section presents a table with vanadium cleanup levels for each medium. The vanadium cleanup level for wetland soils is listed as 700 mg/kg. For consistency with the Remedial Investigation report, this value should be listed as 1,280 mg/kg with a footnote explaining that this value will be refined during the Remedial Design phase.

Ohio EPA response: Please refer to comment 38.

43. Comment: 6.4.1, Capping of the West Slag Pile, page 52, lines 15 through 19: SMC and CFM note that this section states that "Disposal of the solid and/or chemical waste materials currently found in the West Slag Pile would require disposal in either solid waste landfills or hazardous waste facilities." There is no documentation in the Remedial Investigation report that solid wastes or hazardous wastes are present at the Site that would require disposal offsite in a solid waste or hazardous waste facility.

Ohio EPA response: Disagree. The sentence will not be revised.

44. Comment: 6.5, East Slag Pile, page 53, lines 18 through 24 and lines 28 through 32. SMC and CFM note that this section proposes a six-month period for Shieldalloy to evaluate the marketability of the slag found in the East Slag Pile. At this point, it is not possible to commit to a schedule for the evaluation of marketability of the East Slag Pile. In addition, assessing marketability must be coordinated with the NRC. A more appropriate approach for this issue would be to request a plan for the preparation of a

marketing study, which could be updated periodically to report on progress.

Ohio EPA response: Ohio EPA can consider any request to modify the schedule when it reviews SMC and CFM's work plan for the Remedial Design and Remedial Action.

45. Comment: 6.7.2 Controls for Former Process Areas, page 55, lines 17 through 22: SMC and CFM note that this section states that levels of vanadium in the former vanadium pentoxide drum accumulation area would result in unacceptable risks through inhalation of vanadium. Hence, the Plan recommends that future use of this area be controlled through institutional controls and revegetation or removal of contaminated soils. The assertion of unacceptable risks through inhalation of vanadium is not supported by the studies that were conducted at the Site. Indeed, the Remedial Investigation ruled out the inhalation pathways as a potential risk for vanadium (and for any other nonradiological compound). Accordingly, the Plan recommendation for controls in this area is unfounded and unnecessary.

Ohio EPA response: The Decision Document will be revised.

46. Comment: 6.7.2, Controls for Former Process Areas, page 55, lines 24 through 29: SMC and CFM note that this section presents requirements for the proper disposal of radioactive slag that may be present beneath buildings at the Site. The Plan should be revised to note that the final disposition of this material is addressed in the previously prepared Decontamination Report (ENSR Jan. 1990) for the facility.

Ohio EPA response: SMC/CFM comment is noted. No response necessary.

## II. COMMENTS FROM U.S. NUCLEAR REGULATORY COMMISSION

1. Comment: The NRC asked that additional consideration be given to the potential adverse impacts to the ecosystem that could occur from excavating the soil and sediments from the wetlands, ditches, and stream channels. These impacts could include the loss of wetlands, short-term or long-term impairment of wetlands, or loss of Chapman Run habitats. The potential impacts of digging up the wetland soils, on-site sediments, and off-site sediments should be documented, discussed, and considered in the Preferred Plan.

Ohio EPA response: The potential impacts of soil and sediment removal from the affected areas are not specifically discussed in the Preferred Plan, but are documented and discussed in the Feasibility Study, Section 5.3.3, 5.3.4, and 5.3.4. A sentence will be included in the Decision Document that states the following:

"For a more detailed analysis of all the alternatives please refer to the Feasibility Study."

2. Comment: The NRC notes that some of the considered alternatives do not appear to be biologically sound alternatives (e.g., rechannelization, capping the sediments and soils with gravel or top soil, etc.). A rationale as to why these were considered and why they were eliminated would be helpful in the document.

Ohio EPA response: The alternatives were evaluated to provide a broad base from which to choose. Initially, the alternatives were not eliminated from further analysis because it appeared that they had some potential for remediation of the areas of concern. Ohio EPA eliminated these alternatives from further consideration in the Preferred Plan. When evaluated against the nine criteria presented in Section 6.1 of the Preferred Plan, it was determined that they provided only limited benefits.

3. Comment: Page 41 - "Natural Recovery" is misnamed. This alternative involves the introduction of sand into the ecosystem. It is recommended that a true natural recovery alternative be added to the Preferred Plan for the wetland soils, on-site sediments, and off-site sediments. This alternative would assume that the sources of contaminants would be controlled and that the wetland soils, onsite sediments, and offsite sediments would be allowed to naturally recover over time. Periodic monitoring of the site would take place to evaluate the success of the recovery.

Ohio EPA response: The Natural Recovery Alternative for onsite and offsite sediments is given some consideration in the no action alternative. The no action alternative presented for both the onsite and offsite sediment considers taking no action to remove or reduce the contaminants through treatment or removal from the affected areas. Sources of any future contaminants would be controlled through engineering controls and a stormwater



discharge permit would be issued by Ohio EPA. This alternative is discussed in Section 6.6 of the Preferred Plan. See, also, Section 5.4.2 of the Preferred Plan.

4. Comment: The basis of all the costs in the Preferred Plan are not referenced. Costs that are documented in the FS should be referenced as such. A basis or a reference to the basis of all costs that are not from the FS should also be provided.

Ohio EPA response: A new sentence will follow the costs presented in Section 6.9 to clarify the source of the information. The sentence will read as follows:

"The costs presented above were obtained from the Feasibility Study. For a detailed breakdown on the costs, please refer to Appendix C of the Feasibility Study."

See, also, Section 5.0 of the Preferred Plan.

5. Comment: The NRC notes that it appears that the conclusions of the Preferred Plan are inconsistent with the Feasibility Study for the Cambridge facility. The Preferred Plan states on page 49 that, "The preferred alternative includes the excavation and removal of contaminated sediments and soils from on-site drainage channels, sedimentation deltas, wetland soils, and Chapman Run." This is different from the FS, page 602. The FS states that an alternative for wetlands soils could be a combination of focused sediment removal and no action for the remaining areas. Please provide the rationale for these differences.

Ohio EPA response: The Feasibility Study states that a combination of removal and "no-action" may have potential to meet the remedial action objectives for some wetlands soils. This matter would be further studied and addressed during the Remedial Design stage.

6. Comment: The NRC recommends that a different approach be considered for the Preferred Plan. Why not control the sources of the contaminants (i.e., the active slag pile operations) and then allow the natural processes (i.e., wetland bioattenuation, natural sedimentation, and natural biodegradation) to restore the area? This is similar to the approach mentioned on page 6-2 of the FS for wetland soils but would also apply to the on-site sediments and off-site sediments. The natural processes may help the site to recover to the point that the risk becomes acceptable to ecological receptors in the streams and wetlands. If, however (in the future after the west slag pile was capped, as part of the periodic monitoring) it was found necessary to dig up soils and/or sediments and place them on the west slag pile; a new cell could be accommodated easily on top of the pile. By taking this phased approach to the remediation of soil and sediment contamination, wetlands may be preserved and unwanted resuspension of metals could be avoided.

Ohio EPA response: The process of removing contaminated sediments and soil from affected areas will cause disruption; however, the disruption is short term. The disturbed areas can then be allowed to naturally recover and should no longer be impacted by contamination.

7. Comment: Page 50, first paragraph - The NRC requests that a map be included in the Preferred Plan which depicts the expected area of on-site and off-site sediments that would be removed using the 1280 mg/kg criteria.

Ohio EPA response: The figures (Figures 6 and 7) which were attached to the Preferred Plan will be included in the Decision Document. A note will be included following the first sentence on page 50 which refers to the Figures 6 and 7 and the clean up criteria of 1280 mg/kg.

### III. COMMENTS FROM PUBLIC MEETING

1. Comment: Mr. Bauman states that the State of Ohio will receive civil penalties but the local community will get nothing.

Ohio EPA Response: This comment does not apply to the Preferred Plan. Remediation of the Site is for the benefit of the community and state. Civil penalties that would be collected under the proposed consent order would be distributed as required by state law, including Ohio Revised Code Sections 6111.09(B) and 3734.28. RC Section 6111.09 (B) provides for civil penalties to go into (1) the environmental education fund, which was created to develop, implement, and administer a program to enhance public awareness and understanding of issues affecting environmental quality; and (2) the water pollution control administration fund, which supplements other moneys available for the administration and enforcement of Ohio EPA's water pollution control program. R.C. Section 3734.28 allocates some civil penalties to the hazardous waste clean-up fund.

In addition, the proposed Consent Order includes a wetlands project that calls for the enhancement and/or restoration, and preservation, of approximately 40 to 45 acres of wetlands in the vicinity of the Shieldalloy facility, if available, or in the Cambridge, Ohio area. Shieldalloy and Cyprus Foote would expend up to \$276,000 on this project. It is generally recognized that wetlands are one of our most important ecosystems. They are known to cleanse polluted waters, prevent floods, recharge ground water aquifers, and provide unique habitats for a variety of flora and fauna. The community around the Shieldalloy site would receive environmental benefits from the wetlands enhancement/restoration/preservation project that would be undertaken by Cyprus Foote and Shieldalloy.

2. Comment: Mr. Bauman inquired as to lost property values around Shieldalloy.

Ohio EPA Response: Mr. Bauman raises a concern about lost property values caused by the proposed remedy. No documentation has been submitted that demonstrates that property values have actually decreased, or will decrease in the future, due to the preferred remedy. The East and West Slag Piles have been located at the Shieldalloy facility for several decades. The remedy is designed to ensure protection of human health and the environment at the Site and surrounding areas.

3. Comment: Mr. Bauman noted that no health studies on the consumption of wildlife from Shieldalloy property and Chapman Run has been conducted. Wildlife includes cray fish.

Ohio EPA Response: As part of the RI/FS process, health studies were conducted for ingestion of fish caught in Wills Creek/Chapman Run near the Shieldalloy facility. Although no human health risk assessment was specifically conducted for the ingestion

of crayfish, an equivalent assessment was conducted for carp, which is a sediment feeding fish. As summarized in Table 107 of Remedial Investigation report of September 1996, none of the carcinogenic chemicals of concern for off-site water and sediments were detected in fish tissue. The noncancer hazard index is 0.05, which is far below the USEPA human health protection criterion of 1.0. Radiological tissue analyses from fish collected by the Ohio EPA in Wills Creek indicated that thorium and uranium were not detectable in fish tissue.

4. Comment: Mr. Bauman asked why is the State allowing Shieldalloy to place contaminated sediments and soils, following excavation, atop the West Slag Pile, and not requiring disposal in a solid waste facility?

Ohio EPA response: The existing contamination in the onsite/offsite sediments and wetland soils are the result of historical plant operations. Placing contaminated soils and sediments atop the West Slag Pile, and capping both, improves protection of human health and the environment at the Site. The cap would have to be inspected regularly and repaired if needed.

5. Comment: Mr. Bauman requested clarification on the risks from inhalation of dusts during removal of the slag from the Site.

Ohio EPA response: An important pathway for public exposure to radiation is through inhalation of suspended radioactive particulate in the air. The mechanical disturbance involved in removing the slag from the Site, including heavy digging operations, would generate higher emissions of dust particles. Therefore, higher particulate concentrations in the air would result. In general, the Particulate Emission Factor with construction activity can be *one thousand times* higher than without such activity.

6. Comment: Mr. Bauman stated that the State has affected the citizens of Guernsey County's ability to recoup losses by the Covenant Not to Sue in the Consent Order and the omission of a recitation of violations of Ohio laws, rules or regulations.

Ohio EPA response: This comment does not address the Preferred Plan. The proposed Consent Order does not apply to any individual rights of citizens.

7. Comment: Mr. Bauman asked why the community will not be afforded the protection of a 450 acre buffer around the slag piles. The buffer will be a requirement for the proposed low level radioactive waste disposal site to be sited in Ohio.

Ohio EPA response: A buffer is not a requirement for remediation of existing contaminated sites. Ohio EPA notes that the proposed Consent Order would potentially require the purchase of wetlands in the areas surrounding the Site.

8. Comment: Mr. Bauman asked why the community will not be reimbursed for the loss of property values as will those who will be affected by the proposed low level radioactive disposal site.

Ohio EPA response: Please refer to comments two and six.

9. Comment: Mr. Bauman requested that the comment period be extended 60 days from the deadline of January 29, 1997.

Ohio EPA response: Upon receiving requests for an extension of the comment period, Ohio EPA granted a 30-day extension until February 28, 1997 to stay consistent with the court schedule in SMC's bankruptcy case.

10. Comment: Mr. Bauman states that the risk scenarios presented in the Preferred Plan are incorrect and improper. Specifically, the farm family scenario improperly places the family's farm well not atop the east or west slag pile or even atop the sediments pile, but instead places it in a safe zone between the two piles away from any and all contaminants and radioactive materials.

Ohio EPA response: The comment appears to refer the Environmental Impact Study (EIS) being prepared by the U.S. Nuclear Regulatory Commission. The farm family risk assessment as described above was unnecessary for RI/FS Report due to the absence of ground water contamination.

11. Comment: Mr. Bauman stated that the radiological risks to the hypothetical farm family are incorrect and do not accurately estimate the risks for this scenario. The exposure to a farm family would be in excess of 6,000 millirems per year.

Ohio EPA response: See comment ten. A dose assessment for the radionuclides contained in the West Slag Pile was conducted and documented in the RI/FS report. The calculation modeled the migration of radionuclides through multiple environmental media, including groundwater, over time and calculated the impact of this migration on a family living on the site. The calculated maximum dose occurred 1,000 years after completion of the remediation. That dose was about  $1.196 \times 10^{-5}$  mrem/year, which is far below many guidelines. The capped slag pile would be under institutional control. No wells would be allowed to be installed through the capped pile.

12. Comment: Mr. Bauman states that Ohio EPA data shows that groundwater surrounding the East Slag Pile fails to meet state and federal safe drinking water standards. Mr. Bauman asks how, based on this information, will the State approve insitu disposal of the slags.



Ohio EPA response: The parameters of concern at this site (e.g. vanadium, chromium, radiological parameters) were not found at concentrations that would indicate that a release to ground water from the East or West Slag Piles had occurred. This was based upon two separate sampling events of the monitoring network at the site. The presence of sodium, magnesium and alkalinity in the one well near the East Pile was used as justification for implementing measures to protect ground water, even though the ground water monitoring results had indicated that the site had not impacted ground water for the parameters of concern.

13. Comment: Mr. Bauman expressed concern that Ohio EPA is prepared to select the remedy of capping even though the Remedial Investigation/Feasibility Study shows that the cap will fail in the future.

Ohio EPA response: According to the Remedial Investigation and the Feasibility Study, the solid waste cap has an estimated life of over 1000 years, provided that long-term maintenance is conducted. Long-term maintenance and management of the Site would be assured through the use of a financial assurance mechanism.

Please refer to Appendix E of the Feasibility Study for more information.

14. Comment: Mr. Bauman questioned why Ohio EPA's Preferred Plan does not evaluate an alternative which includes the removal of the Chemfix material. The commentor stated that Chemfix contains hazardous wastes (i.e. chromium, vanadium) which is leaching from this material.

Ohio EPA response: The material would be protected from weathering once capped with a solid waste cap. Once the Chemfix material is capped onsite, it would receive a similar degree of protection as if it had been removed and disposed of in a solid waste landfill.

15. Comment: Mr. Bauman requested that the Ohio EPA require a hazardous waste cap for the West Slag Pile and East Slag Pile.

Ohio EPA response: The results of the Feasibility Study show that, in this case, the additional components in a hazardous waste cap would not be necessary in order to protect human health and the environment. A solid waste cap provides the needed protection.

16. Comment: Mr. Bauman requested that any and all documents be released to members of the community.

Ohio EPA response: Under Section 149.43 of the Ohio Revised Code, the State of Ohio has the responsibility to make available to any person all public records that pertain to a particular matter of interest. All public records related to the Shieldalloy site can be made



promptly available to any person desiring to see them by making arrangements with Ohio EPA's Southeast District Office, (614) 385-8501.

17. Comment: Mr. Bauman asked why Senate Bill 130 does not apply to the Shieldalloy site.

Ohio EPA response: Whether or not radioactive waste at the Site may be classified as "low-level radioactive waste," the acts of disposal and commingling at the Site took place prior to enactment of Senate Bill 130.

18. Comment: Randi Pokladnik requested an extension of the comment period due to inaccessibility of the material. All the material is located at the Byesville Public Library, which limits the number of copies one can make to twenty.

Ohio EPA response: Please refer to comment number nine above.

19. Comment: Randi Pokladnik asked if abandoned mines below the slag piles could subside creating a ground and surface water contamination problem.

Ohio EPA response: During the Remedial Investigation, mining maps for the Shieldalloy site and vicinity were obtained from the Ohio Department of Natural Resources (ODNR), Division of Reclamation. The maps for this area show that the area directly below was not deep mined, shallow mined or stripped mined. Figure 17 of the Remedial Investigation shows the location of mining activities in and around Shieldalloy.

Additionally, borings were obtained during the installation of monitoring wells and piezometer. The borings show that no voids were found which would indicate that abandoned mines exist within close proximity of the slag piles. Section 5.2.2 of the Remedial Investigation discusses site geology.

20. Comment: Randi Pokladnik stated that data from the remedial investigation shows that in addition to radioactive contaminants, PCB is present. She expressed concern with the onsite incineration of PCB.

Ohio EPA response: During the Remedial Investigation, soil samples were collected and analyzed for chemical and radiological contaminants. PCB was a potential chemical of concern, initially, but the data shows no unacceptable risks. From these results it was determined that remediation of PCBs is not required.

21. Comment: Randi Pokladnik asked if the human health risk assessment evaluates risks to children.

Ohio EPA response: Risks to children were evaluated as part of the human health risk assessment. Risk was calculated for children who could potentially ingest soil, sediment,

and wetland soils from the site. Hypothetical risk was calculated for children with a dermal exposure to sediments, wetland soils, and surface water. For more information, please refer to Section 6 of the Remedial Investigation. The calculations and exposure assumptions for each scenario is presented in Tables 94 - 100.

In addition to the chemical risk assessments noted above, hypothetical radiological risks to children were calculated. Table 119, Remedial Investigation, is a summary of exposure estimates for the consumption of vegetables, meat and milk from the Shieldalloy property. In sum, the remedy accounts for and addresses risk to children.

22. Comment: The cost of the caps are incorrectly estimated. The cost of the caps are closer to \$20 - \$25 million, not \$8 million as presented in the Preferred Plan and public meeting.

Ohio EPA response: The cost estimates presented in the Preferred Plan are based upon information presented in the Feasibility Study (Appendix C and E). The cost estimates for a solid waste cap for both the East and West Slag Piles were evaluated by the Ohio EPA's Division of Solid and Infectious Waste Management (DSIWM). The DSIWM determined that the costs presented in the Feasibility Study, and thus the Preferred Plan, are consistent with municipal solid waste landfills currently operating in the area.

For a detailed overview of all capping costs please refer to Appendix C and E of the Feasibility Study.

#### IV. OTHER WRITTEN COMMENTS

1. Comment: The commentor noted that a more "immediate action" should be taken to close the Site, thus protecting the community and environment in a more timely manner.

Ohio EPA response: The timeframe of 3 to 5 years as presented by Ohio EPA during the public meeting is a conservative estimate which the Agency considers realistic to complete remediation activities at the Site.

2. Comment: A commentor noted that an alternative should be evaluated which looks at excavating on-site slag and moving it to an abandoned strip mine or other location.

Ohio EPA response: Moving the material to a strip mine would increase risks compared to onsite containment. Furthermore, there is no provision in Ohio's coal mining law that would allow for such disposal in this instance.

3. Comment: One commentor asked if there was any danger of radioactive contaminants in the air from the Shieldalloy site.

Ohio EPA response: During the investigation of the Shieldalloy site, the air pathway was evaluated. It was determined that the slag, as it currently exists in the East and West Slag Piles, is not easily disturbed with air movement. Due to the hardness of the slag, large amounts of dust are not released. The remedy includes capping, which would further reduce dust emissions in the long term. The remaining areas of the Site and adjacent wetlands are covered by vegetation or water. Currently there is not appreciable risk from dust from the Site.

4. Comment: One commentor questions the threat to human health the slag poses and the need to address any of the environmental concerns at the Site. Additionally, the commentor notes that the State should leave the Site alone, not hold public meetings to inform the public of the results of the studies, and not require Shieldalloy and Cyprus Foote Mineral to spend money to remediate the Site.

Ohio EPA response: The results of the human health risk assessment, as conducted during the remedial investigation, identified the following media as presenting potential risks to human health or the environment:

- East and West Slag Piles
- Offsite slag (included for the purpose of evaluating site remedial alternatives: offsite slag is not otherwise evaluated in the feasibility study)
- Wetland soil

- Onsite sediment
- Offsite sediment (Chapman Run)
- Surface water

As demonstrated in the Feasibility Study, the Site poses risks to human health and the environment. The Decision Document sets out Ohio EPA's selected remedy to protect human health and the environment in a cost effective manner.

5. Comment: Several commentors expressed concern regarding slag from past Shieldalloy/Cyprus Foote Mineral operations which had been transported offsite to private properties.

Ohio EPA response: If firm plans are expeditiously developed for the remediation of this slag, Ohio EPA will evaluate whether to provide for return of the slag to the Site.

STATE OF OHIO, ex rel.  
BETTY D. MONTGOMERY,  
ATTORNEY GENERAL OF OHIO,

vs.

AND

Defendants.

PERMANENT INJUNCTION  
CONSENT ORDER

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## I. INTRODUCTION

WHEREAS, the State of Ohio by its Attorney General, at the written request of the Director of the Ohio Environmental Protection Agency, has filed its Complaint in the above-captioned case against Shieldalloy Metallurgical Corporation ("Shieldalloy") and Cyprus Foote Mineral Company ("Cyprus Foote") ("Defendants", as defined in Section IV. DEFINITIONS) pursuant to Ohio Revised Code ("R.C.") Chapters 3734 and 6111, the regulations promulgated thereunder and other laws;

WHEREAS, the State of Ohio's Complaint seeks an injunction for Defendants to investigate, to abate and to prevent migration of alleged pollution and contamination and to take other actions at the facility currently owned by Shieldalloy on State Route ("S. R.") 209, Guernsey County, Ohio (the "Site," as defined in Section IV. DEFINITIONS), and alleges violations of Ohio solid waste, hazardous waste, and water pollution and other laws at the Site;

WHEREAS, Shieldalloy, which is the current owner of the Site, and Cyprus Foote, which is the successor to the former owner of the Site, entered into a Consent Order for Preliminary Injunction ("COPI") with the State of Ohio which the Court issued on July 11, 1995;

WHEREAS, the COPI provided for the Defendants to complete a Remedial Investigation and Feasibility Study ("RI/FS") for the Site, the objectives of which were: (1) to complete a remedial investigation of the Site to determine the nature and extent of alleged contamination at the Site; and (2) to develop and evaluate an

appropriate response to the alleged contamination employing sound scientific, engineering and construction practices.

WHEREAS, Ohio EPA has approved Defendants' RI/FS report;

WHEREAS, Ohio EPA has issued a Preferred Plan that sets forth Ohio EPA's preferred alternative for remediation at the Site, and issued public notice of the Preferred Plan to solicit public comments;

WHEREAS, Ohio EPA has planned a public meeting in order to provide information and answer questions about the Preferred Plan to the general public, and to receive both oral and written comments from the public about the Preferred Plan;

WHEREAS, Ohio EPA will issue a Decision Document that selects the remedy for the Site, which will be based on the analysis presented in the Preferred Plan and RI/FS report, comments received from the public, and any other new or significant information received and generated, during and after the public comment period (once issued, the Decision Document will become Appendix C to this Consent Order);

WHEREAS, Shieldalloy and Cyprus Foote have agreed to enter into this Consent Order with the State of Ohio;

WHEREAS, the objectives of this Consent Order include the protection of human health and the environment by requiring Defendants to abate and to prevent the migration of alleged pollution and contamination through implementation of a Remedial Design ("RD") and Remedial Action ("RA")

(collectively "RD/RA"), performance of Operation and Maintenance ("O&M") and other Work at the Site, and the taking of certain other actions.

WHEREAS, the remediation and other Work to be performed under this Consent Order apply to alleged pollution and contamination from radioactive waste and other Waste Material at the Site;

WHEREAS, on May 27, 1987, the U.S. Nuclear Regulatory Commission ("NRC") issued License No. SMB-1507 to Shieldalloy concerning the possession of certain radioactive material at the Site, which license has been amended from time to time;

WHEREAS, Shieldalloy is preparing to decommission certain radioactive material at the Site under the Atomic Energy Act, 42 U.S.C. 2014, et seq., and regulations of NRC promulgated thereunder;

WHEREAS, on July 25, 1996, NRC published in the Federal Register (61 FR 38789) notice of the availability of its Draft Environmental Impact Statement concerning the decommissioning of certain radioactive material at the Site;

WHEREAS, R.C. Chapter 3748 provides the Ohio Department of Health with regulatory authority over "radioactive material" within the meaning of R.C. Section 3748.01;

WHEREAS, R.C. Section 3748.03 directs the Ohio Department of Health to enter into negotiations with NRC for an agreement for the State of Ohio to exercise licensing and other regulatory authority in lieu of regulation by NRC under the



Atomic Energy Act, 42 U.S.C. 2014, et seq. (i.e., for the State of Ohio to become an "Agreement State");

WHEREAS, the Ohio Environmental Protection Agency confers with NRC and the Ohio Department of Health on matters relating to radioactive waste at the Site;

WHEREAS, the Ohio Environmental Protection Agency confers with the Department of the Interior, U.S. Fish and Wildlife Service, on matters relating to natural resource damages at the Site;

WHEREAS, Defendants do not admit the allegations set forth in the Complaint and deny any violation of any state or federal statute, regulation or common law;

WHEREAS, on September 2, 1993, Shieldalloy filed a voluntary petition for relief under chapter 11, title 11, United States Code with the United States Bankruptcy Court, Southern District of New York, In re: Shieldalloy Metallurgical Corp., Civ. No. 93 B 44469 (JLG) (the "Bankruptcy Case");

WHEREAS, Shieldalloy believes that expeditious resolution of the State of Ohio's enforcement action against Shieldalloy in this Case and claims in the Bankruptcy Case will facilitate reorganization in its Bankruptcy Case;

NOW, THEREFORE, without adjudication or admission of any issue of fact or law, and upon consent of the Parties hereto, it is hereby ORDERED, ADJUDGED AND DECREED as follows:

## II. JURISDICTION

1. The Parties agree that the Court has jurisdiction over them and the subject matter of the Complaint and that venue is proper in this Court for the purposes and duration of this Consent Order. Solely for purposes of this Consent Order, and the underlying Complaint, the Complaint states a claim upon which relief can be granted and Defendants are proper parties to this action.

## III. PARTIES BOUND

2. The provisions of this Consent Order shall apply to and be binding upon Plaintiffs and the Defendants, their successors in interest and assigns, and others to the extent provided by Ohio Civil Rule 65(D). Nothing herein is intended to expand or limit the scope of Ohio Civil Rule 65(D).

3. No change in corporate ownership or status of Defendants, including but not limited to any transfer of assets of real or personal property, shall in any way alter Defendants' rights or obligations under this Consent Order. Defendants shall provide a copy of this Consent Order to any subsequent owner(s) or successor(s) prior to the transfer of the company's ownership rights.

4. Defendants shall provide a copy of this Consent Order to each general contractor and subcontractor hired by, or who will provide work or services on behalf of, Defendants related to this Consent Order.

#### IV. DEFINITIONS

5. As used in this Consent Order, the following terms, words, and abbreviations shall have the meanings provided below:

- A. "CERCLA" shall mean the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601, et seq., as amended.
- B. "Certification of Completion" shall mean the approval of Defendants' construction completion report pursuant to Section 3.4.3 of the RD/RA SOW.
- C. "Consent Order" shall mean this Permanent Injunction Consent Order.
- D. "COPI" shall mean the Consent Order for Preliminary Injunction issued by this Court on July 11, 1995.
- E. "Contractor" shall mean a qualified contractor retained by the Defendants pursuant to this Consent Order, and any subcontractor, representative, agent, employee, or designee thereof.
- F. "Days" shall mean calendar days, including weekends and holidays.
- G. "Decision Document" shall mean the document issued by Ohio EPA setting forth the remedial action requirements for the Site.
- H. "Defendants" shall mean the Shieldalloy Metallurgical Corporation and Cyprus Foote Mineral Company, individually and collectively.
- I. "Director" shall mean the Director of the Ohio Environmental Protection Agency and the Director's duly authorized representatives.
- J. "Document" shall mean any record, report, photograph, videotape, correspondence, computer disk or tape, recorded or retrievable information of any kind, including raw data, narrative reports, and any and all documentary

evidence, relating to the treatment, storage, or disposal, and concerning the investigation and remediation of Waste Material at the Site. "Document" shall be construed broadly to promote the effective sharing between Defendant(s) and Ohio EPA of information and views concerning the Work to be performed pursuant to this Consent Order.

- K. "Effective Date" shall mean the date that the Guernsey County Court of Common Pleas enters this Consent Order.
- L. "Feasibility Study" ("FS") shall mean the development, evaluation, and analysis of remedial alternatives in accordance with state and federal environmental laws and with the COPI.
- M. "NCP" shall mean the National Oil and Hazardous Substances Pollution Contingency Plan, referred to in CERCLA as the National Contingency Plan, and codified at 40 C.F.R. Part 300, as amended.
- N. "OEPA" or "Ohio EPA" shall mean the Ohio Environmental Protection Agency or its Director and his/her designated representatives as the context or other law or regulation may require, or successor agencies.
- O. "Operation and Maintenance" ("O&M") shall mean all activities required to maintain the effectiveness of the Remedial Action as required under the approved Operation and Maintenance Plan required or contemplated by this Consent Order and the Statement of Work (SOW).
- P. "Oversight Costs" shall mean all direct and indirect costs of oversight incurred by the State of Ohio in verifying the work to be performed by Defendants pursuant to the COPI and this Consent Order, or otherwise implementing or enforcing the COPI and this Consent Order, including but not limited to the costs of payroll, fringe benefits, contractors, travel, oversight, samples, laboratory analysis, data management, safety and general equipment, supplies, general maintenance, reviewing or developing work

plans, reports, or other items pursuant to the COPI and this Consent Order.

- Q. "Paragraph" shall mean a portion of the Consent Order identified by an arabic numeral or an upper case letter.
- R. "Parties" shall mean the State of Ohio and the Defendants.
- S. "Performance Standards" shall mean the cleanup standards and other measures of achievement of the goals of the Remedial Action, set forth in Section 6 of the Decision Document and Section 2.0 of the RD/RA SOW.
- T. "Preferred Plan" shall mean the document prepared by Ohio EPA that presents to the public Ohio EPA's preferred alternative for the pollution abatement/cleanup of the Site. The Preferred Plan includes a brief summary of the alternatives evaluated in the detailed analysis of the Feasibility Study, and identification of key factors that lead to selection of the preferred alternative.
- U. "Remedial Action" ("RA") shall mean those activities, except for Operation and Maintenance, to be undertaken by Defendants to implement the approved Remedial Design, and other plans approved by Ohio EPA, in accordance with the RD/RA Statement of Work, the final Remedial Design and Remedial Action Workplan, the Decision Document and other plans approved by Ohio EPA.
- V. "Remedial Design" ("RD") shall mean the design of, in accordance with Ohio law and this Consent Order, detailed engineering plans, specifications, construction drawings and other plans deemed by Ohio EPA to be sufficient to implement the remedy selected by Ohio EPA in the Decision Document, in accordance with the RD/RA Statement of Work, the final Remedial Design and Remedial Action Workplan and other plans approved by Ohio EPA.
- W. "Remedial Design/Remedial Action" ("RD/RA") shall mean the Remedial Design and the Remedial Action together.



- X. "RD/RA Statement of Work" ("RD/RA SOW") shall mean the Statement of Work for implementation of the Remedial Design, Remedial Action, and Operation and Maintenance at the Site, as set forth in Appendix A to this Consent Order and any modifications made in accordance with this Consent Order. The RD/RA Statement of Work is not specific to this Site, and shall be used as an outline in developing workplans specific to this Site.
- Y. "Remedial Investigation/Feasibility Study" ("RI/FS") shall mean the Remedial Investigation and Feasibility Study together.
- Z. "Remedial Investigation" ("RI") shall mean the investigation conducted in accordance with state environmental laws and the COPI by Defendants to determine the nature and extent of contamination at the Site, and includes the gathering of all necessary data to support the Feasibility Study.
- AA. "Response Costs" shall mean all costs incurred by the State of Ohio pursuant to the COPI and this Consent Order verifying the Work, doing the Work or otherwise implementing or enforcing the COPI and this Consent Order, including, but not limited to, payroll costs, contractor costs, travel costs, direct costs, indirect costs, legal and enforcement related costs, Oversight Costs, laboratory costs, the costs of reviewing or developing plans, reports, and other items.
- BB. "Section" shall mean a portion of this Consent Order identified by a roman numeral.
- CC. "Site" shall mean the property currently owned by Shieldalloy Metallurgical Corporation on S.R. 209, Guernsey County, Ohio, as well as any area adjacent to the property, where the treatment, storage, and/or disposal of Waste Material have occurred, and/or the discharge of Waste Material into waters of the State have occurred, including any area inside or outside of the property where Waste Material from the property have migrated.
- DD. "Waste Material" shall mean (1) any "hazardous waste" as that term is defined under R.C. Section 3734.01(J); (2) any

"solid waste" as that term is defined under R.C. Section 3734.01(E); (3) any "industrial waste" as that term is defined under R.C. Section 6111.01(C); (4) any "other wastes" as that term is defined under R.C. Section 6111.01(D); (5) any "hazardous substances" as that term is defined under Section 101(14) of CERCLA, 42 U.S.C. §9601(14); (6) any "hazardous waste constituent" as that term is defined under Rule 3745-50-10(A)(43) of the Ohio Administrative Code ("OAC"); and (7) any radioactive waste, including but not limited to waste containing "source material," "special nuclear material" or "by product material" as those terms are defined under the Atomic Energy Act, 42 U.S.C. 2014, et seq, and R.C. Chapter 3748, and naturally-occurring radioactive material and accelerator-produced radioactive material as those terms are defined under R.C. Chapter 3748.

EE. "Work" shall mean all activities Defendants are required to perform under this Consent Order.

FF. "Workplans" shall mean those documents which are to be submitted to Ohio EPA by Defendants pursuant to this Consent Order detailing the requirements for support of the RD/RA, O&M, Additional Work, Wetlands Work and other Work required under this Consent Order. Each required workplan shall include a detailed description of the proposed design and/or implementation activities; a time schedule for conducting those activities; and personnel and equipment needs.

6. Except as otherwise defined above, the terms used in this Consent Order shall have the same meaning as used in R.C. Chapters 3734 and 6111 and the regulations promulgated thereunder.

#### V. COMPUTATION OF TIME

7. In computing any period of time under this Consent Order, where the last day would fall on a Saturday, Sunday or State of Ohio or federal holiday, the

period shall run until the end of the next day that is not a Saturday, Sunday or State of Ohio or federal holiday.

## **VI. DESIGNATION OF SITE COORDINATORS**

8. The Defendants shall designate a site coordinator and an alternate site coordinator to oversee and implement all Work required by this Consent Order and to coordinate with the Ohio EPA site coordinator.

9. Within ten (10) days of the Effective Date of this Consent Order, Defendants shall notify Ohio EPA in writing of the name, address, and telephone number of their designated site coordinator and alternate site coordinator. If a designated site coordinator or alternate site coordinator is changed, the identity of the successor will be given to the other Party at least five (5) days before the changes occur, unless impracticable, but in no event later than the actual day the change is made.

10. To the maximum extent practicable, except as specifically provided in this Consent Order, communications between the Parties regarding the implementation of this Consent Order shall be made between the Defendants' site coordinators and the Ohio EPA site coordinator. Defendants' site coordinator, or alternate, shall be available, including for communication with Ohio EPA, for the duration of this Consent Order. Each Party's site coordinator shall be responsible for assuring that all communications from the other Party are appropriately disseminated and processed. Defendants' site coordinator or alternate shall be

present on the Site or on call during all hours of Work at the Site. The absence of the Ohio EPA site coordinator shall not be cause for the stoppage of Work unless otherwise provided by Ohio EPA in writing.

11. Without limitation of any authority conferred by law on Ohio EPA, the authority of the Ohio EPA site coordinator includes, but is not limited to:

- A. Taking samples and directing the type, quantity and location of samples to be taken by Defendants pursuant to an approved Workplan;
- B. Observing, taking photographs, or otherwise recording information related to the implementation of this Consent Order, including the use of any mechanical or photographic device;
- C. Directing that Work stop whenever the site coordinator for Ohio EPA determines that the activities at the Site may create or exacerbate a substantial threat to public health or safety, or threaten to cause or contribute to air or water pollution or soil contamination;
- D. Conducting investigations and tests related to the implementation of this Consent Order;
- E. Inspecting and copying records, operating logs, contracts and/or other documents related to the implementation of this Consent Order subject to Section XVII. ACCESS TO INFORMATION AND RECORDS RETENTION;
- F. Assessing Defendants' compliance with this Consent Order;
- G. Conducting inspections at any time of all areas of the Site (see Section VII. SITE ACCESS RESTRICTIONS);
- H. Directing actions taken at the Site pursuant to this Consent Order; and,
- I. Reviewing and approving or disapproving all Workplans, reports, studies and other documents that Defendants are

required to submit pursuant to this Consent Order, including authorities as provided under Section XIV.  
REVIEW OF SUBMITTALS.

#### VII. SITE ACCESS RESTRICTIONS

12. Defendants shall implement the Site Access Restrictions Workplan as approved by Ohio EPA under the COPI, until new Site Access Restrictions are approved and implemented pursuant to the approved RD/RA Workplan. This Section does not limit the right of the State of Ohio to access the Site under Section XVIII. SITE ACCESS.

#### VIII. REMEDIAL DESIGN/REMEDIAL ACTION AND OPERATION AND MAINTENANCE

13. Defendants shall implement Remedial Design/Remedial Action ("RD/RA") and Operation and Maintenance ("O&M") for the Site pursuant to the terms of this Consent Order. All Work performed pursuant to this Consent Order shall be under the direction and supervision of a contractor(s) with expertise in remediation of the Waste Material at the Site. Defendants shall notify Ohio EPA in writing of the name of the supervising contractor and any and all subcontractors to be used in carrying out the terms of this Consent Order. The RD/RA Workplan and O&M Workplan shall be developed and will be reviewed for consistency with the NCP, and the most current version of applicable guidance documents as set forth in Appendix B hereto.

A. Within fourteen (14) days of the Effective Date of this Consent Order, Defendants shall meet with the Ohio EPA to discuss the requirements of the RD/RA Workplan, unless otherwise mutually agreed upon by the Parties.

B. Within sixty (60) days of the Effective Date of this Consent Order, Defendants shall submit to Ohio EPA for review and approval pursuant to Section XIV. REVIEW OF SUBMITTALS a Workplan for the implementation of the Remedial Design and Remedial Action for the Site ("Remedial Design and Remedial Action Workplan" or "RD/RA Workplan"). The RD/RA Workplan shall provide for the design and implementation of the remedial action as set forth in the Decision Document issued by Ohio EPA consistent with Section X. SELECTION OF THE REMEDY of the COPI.

C. By ninety (90) days prior to the scheduled completion date of the Remedial Action as specified in the approved RD/RA Workplan, Defendants shall submit to Ohio EPA for review and approval, pursuant to Section XIV. REVIEW OF SUBMITTALS, a plan for the implementation of Operation and Maintenance at the Site, including provision for Operation and Maintenance of the East Slag Pile and West Slag Pile for one thousand (1000) years or such shorter period as may be approved by Ohio EPA ("O&M Workplan").

D. The RD/RA and O&M Workplans shall be developed in conformance with this Consent Order, the RD/RA SOW, the guidance documents listed in Appendix B, attached hereto and incorporated fully herein, the National Contingency Plan and R.C. Chapters 3734 and 6111. If Ohio EPA determines that any



additional or revised guidance documents affect the Work to be performed in implementing the RD/RA Workplan and/or the O&M Workplan, Ohio EPA will notify Defendants, and Defendants shall modify the RD/RA Workplan, O&M Workplan and other affected documents accordingly.

E. Upon approval of the RD/RA Workplan by Ohio EPA, Defendants shall implement the Work detailed therein in accordance with the schedule contained in the approved RD/RA Workplan. Upon approval of the O&M Workplan by Ohio EPA, Defendants shall implement the Work detailed therein in accordance with the schedule contained in the approved O&M Workplan. Defendants shall submit all plans, reports, or other deliverables required under the approved RD/RA Workplan and under the approved O&M Workplan, in accordance with the approved schedule, for review and approval pursuant to Section XIV. REVIEW OF SUBMITTALS of this Consent Order.

F. The requirements of this Section as to RD/RA Work only (not O&M Work) shall terminate upon issuance by Ohio EPA of a Certification of Completion.

#### IX. PERIODIC REVIEW TO ASSURE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

14. If the Work performed by the Defendants pursuant to this Consent Order results in any Waste Material remaining at the Site, the State of Ohio may review the Work at least once every five (5) years after approval by Ohio EPA of the

Certification of Completion of the Remedial Action to evaluate whether the Remedial Action continues to be protective of human health and the environment.

15. During the 30-year period following Ohio EPA's approval of the Certification of Completion, upon written request of Ohio EPA, Defendant shall conduct and submit to Ohio EPA pursuant to Section XIV. REVIEW OF SUBMITTALS such studies and investigations as are necessary to evaluate whether the remedial action continues to be protective of human health and the environment; provided, Ohio EPA may request not more than six distinct sets of studies and investigations during the 30-year period pursuant to this paragraph.

16. If Ohio EPA determines that further response action is appropriate for protection of human health and the environment at the Site, then Ohio EPA may take any appropriate action, including any of the following actions: 1) initiate Additional Work under Section X. ADDITIONAL WORK, to the extent such Section is applicable; 2) exercise any lawful authority under this Consent Order or in any other proceeding, including issuance of an administrative order or initiation of judicial proceedings, to compel Defendants and/or any other person to perform additional response action to assure protection of human health and the environment; or 3) institute proceedings against Defendants to recover the State of Ohio's costs of doing remediation activities at the Site.

## X. ADDITIONAL WORK

17. Ohio EPA or Defendants may determine that in addition to the tasks defined in the approved RI/FS Workplan, RD/RA Workplan, and O&M Workplan and other requirements of this Consent Order, additional Work may be necessary to achieve and maintain the Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the Decision Document.

18. In the event that Ohio EPA determines that additional Work is necessary to achieve and maintain the Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the Decision Document, Ohio EPA will orally notify Defendants and submit a written request to them explaining the need for and detailing the nature of the additional Work. Within thirty (30) days of receipt of written notice from Ohio EPA that additional Work is necessary, Defendants shall prepare and submit a Workplan for Ohio EPA's review and approval for the performance of the additional Work ("Additional Work Workplan"). Defendants shall develop the Additional Work Workplan in conformance with this Consent Order, the RI/FS SOW or RD/RA SOW as applicable, the National Contingency Plan, the guidance documents listed in Appendix B, and K.C. Chapters 3734 and 6111. Upon approval of the Workplan by Ohio EPA pursuant to Section XIV. REVIEW OF SUBMITTALS, Defendants shall implement the Workplan for additional Work in accordance with the schedules contained therein.

19. In the event that Defendants determine that additional Work is necessary to achieve and maintain the Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the Decision Document. Defendants shall submit a written request for approval to Ohio EPA explaining the need for and detailing the nature of the additional Work prior to performing the additional Work. Upon agreement by Ohio EPA of Defendants' request, Defendants shall develop an Additional Work Workplan in conformance with this Consent Order, the applicable SOW, National Contingency Plan, the guidance documents listed in Appendix B, and R.C. Chapter 3734 and 6111. Upon approval of the Workplan by Ohio EPA pursuant to Section XIV. REVIEW OF SUBMITTALS, Defendants shall implement the Workplan for additional Work in accordance with the schedules contained therein.

20. In the event that additional Work is necessary for any task described in this Consent Order, the deadline for completing such task(s) shall be extended by the amount of time required to perform the additional Work required, including the period for time required to plan and/or obtain approval from Ohio EPA for the performance of such Work.

21. Any determination(s) that additional Work is necessary pursuant to this Section X. ADDITIONAL WORK must be made on or before the thirtieth anniversary of the Certification of Completion.

22. Defendants may invoke the procedures set forth in Section XXVIII. DISPUTE RESOLUTION to dispute Ohio EPA's determination that Additional

Work is necessary to achieve and maintain the Performance Standards or to carry out and maintain the effectiveness of the remedy set forth in the Decision Document.

#### XI. WETLANDS WORK

23. Within ninety (90) days after approval of the Remedial Design in accordance with the approved RD/RA Workplan, Defendants shall submit to Ohio EPA for review and approval pursuant to Section XIV. REVIEW OF SUBMITTALS a Workplan ("Wetlands Workplan") for the enhancement and/or restoration, and preservation, of approximately 40 to 45 acres of wetlands in the vicinity of the Site consistent with the terms of this Section. Should such acreage not be reasonably available within the vicinity of the Site, Defendants' Workplan shall provide for the enhancement and/or restoration, and preservation, of approximately 50 acres of wetlands in the Cambridge, Ohio area. subject to Ohio EPA approval. Property priced at a significant cost over reasonable market rates is not "reasonably available." The Wetlands Workplan shall contain work schedules and shall be developed in accordance with Appendix D.

24. Upon approval of the Wetlands Workplan by Ohio EPA, Defendants shall implement the approved Wetlands Workplan in accordance with the schedule contained in the approved Workplan. Defendants shall submit all plans, reports, or other deliverables required under the approved Wetlands Workplan, in accordance

with the approved schedule, for review and approval pursuant to Section XIV.  
REVIEW OF SUBMITTALS of this Consent Order.

25. Defendants may petition Ohio EPA for approval to cease doing work otherwise required under the approved Wetlands Workplan to the extent the cost will exceed the sum of Two Hundred Seventy-Six Thousand Dollars (\$276,000). Defendants must show that they have spent, or will spend, the sum of Two Hundred Seventy-Six Thousand Dollars (\$276,000) pursuant to the approved Wetlands Workplan. Defendants shall provide details in the Wetlands Workplan of cost estimates for the Work thereunder. This Section does not require Defendants to spend more than Two Hundred Seventy-Six Thousand Dollars (\$276,000) in actual costs incurred in performing the Work required under the approved Wetlands Workplan. The purchase price of any property necessary for the creation and/or enhancement shall not be included in the actual costs of the wetlands Work.

26. Defendants shall purchase, or obtain a conservation easement on, real property that is subject to wetlands creation or enhancement under the Wetlands Workplan, and shall maintain such property consistent with the Wetlands Workplan for so long as the Defendants have a real property interest in the wetlands property.

27. Defendants shall not convey any title, easement or other interest in the property that is subject to the Wetlands Workplan which could affect the goals of



this Section of the Consent Order without a provision in the deed requiring compliance with the Wetlands Workplan.

## **XII. STORMWATER CONTROL**

28. Within sixty (60) days from the Effective Date of this Consent Order, Shieldalloy shall submit to Ohio EPA a complete application for a stormwater permit under R.C. Chapter 6111 for the Site in accordance with Section XIV. REVIEW OF SUBMITTALS.

## **XIII. CLOSURE OF SOUTH BAGHOUSE DUST WASTEPILE**

29. Shieldalloy is ordered and enjoined to comply with the closure plan for the south baghouse dust (D007) wastepile located at the Site, as approved by Ohio EPA, including schedules specified therein, and with Ohio Administrative Code ("OAC") Rules 3745-66-10 through 3745-66-20. Nothing in this paragraph is intended to limit Ohio EPA's authority to approve, or Shieldalloy's opportunity to request, a modification to the requirements of the approved closure plan.

30. Within sixty (60) days of completion of closure of the south baghouse dust (D007) wastepile, Shieldalloy shall submit certification of closure to Ohio EPA in accordance with OAC Rule 3745-66-15.

#### XIV. REVIEW OF SUBMITTALS

31. Ohio EPA agrees to review any Workplan, report, study, or other document that Defendants are required under this Consent Order to submit to Ohio EPA, in accordance with this Consent Order, applicable policies, guidelines and appropriate state and federal laws. Upon review, Ohio EPA may in writing:

- A. Approve the submission in whole or in part;
- B. / Approve the submission upon specified conditions;
- C. Direct Defendants to modify the submission;
- D. Disapprove the submission i. whole or in part, notifying Defendants of the deficiencies; or
- E. Any combination of the above.

32. In the event of approval or approval upon condition by Ohio EPA, Defendants shall proceed to take any action required by the submission as approved or conditionally approved by Ohio EPA. Ohio EPA may approve a modification to an approved submission, including without limitation, a modification based on a requirement imposed by the Atomic Energy Act, 42 U.S.C. 2014, et seq., or regulations promulgated thereunder.

33. In the event that Ohio EPA initially disapproves a submission, in whole or in part, and notifies Defendants of the deficiencies. Defendants shall within fourteen (14) days, or such longer period of time as specified by Ohio EPA in writing, correct the deficiencies and resubmit to Ohio EPA for approval a revised submission. By agreement of the site coordinators, the Defendants may only resubmit such portions pertaining to the notice of deficiency. The revised

submission shall incorporate all of the changes, additions, and/or deletions specified by Ohio EPA in its notice of deficiency. Any Work done by Defendants prior to Ohio EPA's approval of a submission of a corresponding deliverable is subject to being revised.

34. In the event that Ohio EPA disapproves a revised submission, in whole or in part, Ohio EPA may again require Defendants to correct the deficiencies and incorporate all changes, additions, and/or deletions within fourteen (14) days, or such period of time as specified by Ohio EPA in writing. In the alternative, Ohio EPA retains the right to perform any or all of the Work required under this Consent Order and recover all costs associated with such Work not inconsistent with the NCP.

35. Defendants reserve the right to invoke the Dispute Resolution provisions of this Consent Order with respect to any original or revised submission that Ohio EPA disapproves, directs Defendants to modify, or approves upon condition, whether in whole or in part, and with respect to Ohio EPA's decision on a request to modify an approved submission.

36. All Workplans, reports, or other items required to be submitted to Ohio EPA under this Consent Order shall, upon approval by Ohio EPA, be deemed to be incorporated in and made an enforceable part of this Consent Order and, upon such approval, shall be deemed not inconsistent with the NCP in the opinion of the Ohio EPA. In the event that Ohio EPA approves a portion of a Workplan, report, or

other item, the approved portion shall be deemed to be incorporated in and made an enforceable part of this Consent Order.

37. The Defendants' and Ohio EPA's site coordinators may jointly agree to minor field changes to be made by the Defendants to any document, workplan, report, or study approved by the Ohio EPA. Defendants shall notify Ohio EPA's site coordinator of the nature of and reasons for any desired modification by Defendants. Within five (5) days of agreement by Ohio EPA's and the Defendants' site coordinators, the Defendants' site coordinator shall submit written notification describing the agreed minor field changes to Ohio EPA's site coordinator for review and approval. Ohio EPA agrees to document such an agreement by letter to the Defendants' site coordinator setting forth the nature and extent of the minor field changes to be made.

38. In the event of disapproval of any second or subsequent submittal under Section XIV. REVIEW OF SUBMITTALS, or any noncompliance with the terms of or deadlines under this Consent Order, Ohio EPA may conduct any of the Work required under this Consent Order and recover all costs associated with such Work.

#### XV. DOCUMENT SUBMITTAL

39. Unless otherwise provided in this Consent Order, all documents required to be submitted pursuant to this Consent Order shall be sent by certified

mail return receipt requested, overnight mail, or personal delivery, or equivalent, to the following addresses:

Ohio Environmental Protection Agency  
1800 WaterMark Drive  
P.O. Box 1049  
Columbus, Ohio 43216-1049  
ATTN: Records Officer, DERR

and

Ohio Environmental Protection Agency  
Southeast District Office  
2195 Front Street  
Logan, Ohio 43138  
ATTN: Site Coordinator, Shieldalloy Metallurgical Corp. Site

and

Ohio Department of Health  
246 North High Street, 7th Floor  
Columbus, Ohio 43266  
ATTN: Site Contact Shieldalloy Metallurgical Corp. Site

Defendants shall provide the State of Ohio with additional copies of documents upon request.

40. All correspondence to be sent to Defendants will be directed to the following addresses:

C. Scott Eves  
Shieldalloy Metallurgical Corporation  
12 West Boulevard  
P.O. Box 768  
Newfield, NJ 08344

and

Patrick Lee  
Cyprus Foote Mineral Company  
9100 East Mineral Circle  
Englewood, CO 80112

#### XVI. DEFENDANTS' PROGRESS REPORTS

41. Unless otherwise directed by Ohio EPA, Defendants shall submit a written progress report to Ohio EPA by the tenth (10th) day of every month. At a minimum, each progress report shall:

- A. Identify the Site and activity;
- B. Describe the status of the Work and actions taken towards achieving compliance with this Consent Order during the reporting period and activities which are scheduled for the next month;
- C. Describe difficulties encountered during the reporting period and actions taken to rectify any deficiencies;
- D. Describe activities planned for the next month;
- E. Identify changes in key personnel;
- F. List target and actual completion dates for each element of activity, including project completion; and
- G. Provide an explanation for any deviation from any applicable schedules.

#### XVII. ACCESS TO INFORMATION AND RECORDS RETENTION

42. Upon written request, Defendants shall promptly provide to Ohio EPA copies of all non-privileged documents and information within their possession or control, or that of their contractors or agents relating to events or conditions at the



Site including, but not limited to, manifests, reports, correspondence, or other documents, photos, or audiovisual information related to the Work.

43. Unless Defendants claim upon submittal and show that a document or other information submitted to Ohio EPA pursuant to this Consent Order is confidential under the provisions of OAC Rule 3745-50-30(A) or R.C. Section 6111.05(A), Ohio EPA may release the document or other information to the public without notice to Defendants.

44. If Defendants assert that certain documents or other information are privileged and/or confidential under state law, Defendants shall provide Ohio EPA with the following:

- A. The title of the document or information;
- B. The date of the document or information;
- C. The name and title of the author of the document or information;
- D. The name and title of each addressee and recipient;
- E. A general description of the contents of the document or information; and,
- F. The privilege or basis of confidentiality being asserted by Defendants and the basis for the assertion.

45. No claim of confidentiality or privilege shall be made with respect to any data relating to this Consent Order, including but not limited to all sampling, analytical, monitoring, or laboratory reports.

46. Defendants shall preserve and maintain in a readable format all documents and other information within its possession or control, or within the

possession of its contractors or agents, which in any way relate to the Work under this Consent Order, or Work under the COPI, notwithstanding any document retention policies to the contrary. Defendants may preserve such documents by microfiche, or other electronic or photographic device. Unless otherwise agreed by the parties, on or after the fifteenth (15th) anniversary of the issuance of the Certification of Completion, Defendants may discard such documents; provided, that Defendants have given Ohio EPA six (6) months advance notice of their intent to discard such documents, and have made the documents available to Ohio EPA for Ohio EPA to review, copy and retain them.

#### XVIII. SITE ACCESS

47. The State of Ohio, its employees and agents, shall have full access to the Site at all reasonable times without the need for a warrant, as may be necessary for the implementation of this Consent Order. Access under this Consent Order shall be for the limited purpose of carrying out the following activities and related activities of this Consent Order:

- A. Monitoring the Work;
- B. Conducting sampling;
- C. Inspecting and copying non-privileged records, operating logs, contracts, and/or other documents related to the implementation of this Consent Order;
- D. Verifying any data and/or other information submitted to Ohio EPA; and,

- E. Doing Work or other remediation activities at this Site not inconsistent with the Decision Document or this Consent Order.

48. To the extent that the Site or any other property to which access is required for the implementation of this Consent Order is owned or controlled by persons other than Defendants, Defendants shall use their best efforts to secure from such persons access for Defendants and Ohio EPA as necessary to effectuate this Consent Order. Copies of all access agreements obtained by Defendants shall be submitted to Ohio EPA within ten (10) days of receipt by Defendants. If any access required to effectuate this Consent Order is not obtained within thirty (30) days of the Effective Date of this Consent Order, or within thirty (30) days of the date that Ohio EPA notifies Defendants in writing that additional access beyond that previously secured is necessary, Defendants shall promptly notify Ohio EPA in writing of the steps Defendants have taken to obtain access. Ohio EPA may, as it deems appropriate, assist Defendants in obtaining access.

49. This Section shall not be construed to eliminate or restrict any right of access or right to seek access to the Site which the State may otherwise have under federal or state law.

#### **XIX. DEED RESTRICTION**

50. Within thirty (30) days of approval of the Remedial Design under Section VIII. REMEDIAL DESIGN/REMEDIAL ACTION AND OPERATION AND MAINTENANCE of this Consent Order, Shieldalloy shall place a deed restriction on the deed to property at the Site owned by Shieldalloy with the County Recorders

Office for Guernsey County, Ohio. The deed restriction shall describe this Consent Order and any monitoring or containment devices and/or development or use restriction on the Site. The deed restriction shall be developed in accordance with the RD/RA Workplan and O&M Workplan and approved by Ohio EPA.

51. Shieldalloy shall not convey any title, easement or other interest in the property which is part of the Site which could affect the goals of this Consent Order without a provision in the deed requiring continued compliance with this Consent Order.

52. Shieldalloy shall not remove, alter or terminate the deed restriction in the property which is part of the Site without prior approval of Ohio EPA.

#### XX. PERMANENT INJUNCTION

53. Shieldalloy is hereby permanently enjoined and ordered to comply with R.C. Chapters 3734 and 6111 and rules promulgated thereunder, including but not limited to any terms or conditions of any permits and any renewals or modifications thereof issued under these statutes. Shieldalloy is further permanently enjoined from discharging any pollutants, industrial waste or other wastes into waters of the State without first obtaining an NPDES permit issued by the Director of Environmental Protection, and any other permit required by state and/or federal law.

## XXI. FINANCIAL ASSURANCE

54. Within thirty (30) days from the Effective Date of this Consent Order, Defendants (individually and/or collectively) shall provide financial assurance for remediation of the West Slag Pile and East Slag Pile in the amount of \$5.6 million in accordance with OAC Rule 3745-66-43. Each year by the anniversary date of the Effective Date of this Consent Order, Defendants (individually and/or collectively) shall perform an annual review and adjustment of such financial assurance in accordance with OAC Rules 3745-66-42 and 3745-66-43.

55. Within thirty (30) days of approval of the "Derivation of Cleanup Levels for Wetland Soils" (a document that is part of the Remedial Design) or within fourteen (14) months from the Effective Date of this Consent Order, whichever is earlier, Defendants (individually and/or collectively) shall provide financial responsibility for remediation of the wetlands, sediments, soils, and other areas surrounding the West Slag Pile and East Slag Pile at the Site in accordance with OAC Rule 3745-66-43 in an amount up to \$3.4 million. Each year by the anniversary date of the Effective Date of this Consent Order, Defendants (individually and/or collectively) shall perform an annual review and adjustment to provide financial assurance in accordance with OAC Rules 3745-66-42 and 3745-66-43.

56. Within thirty (30) days from the Effective Date of this Consent Order, Defendants shall provide financial assurance for Operation and Maintenance of the site, including one thousand (1000) years of Operation and Maintenance of the East

Slag Pile and West Slag Pile in accordance with an annuity/trust option approved by Ohio EPA consistent with Appendix E or with OAC Rules 3745-66-44 and 3745-66-45. Each year by the anniversary date of the Effective Date of this Consent Order, Defendants shall perform an annual review and adjustment of such financial assurance in accordance with OAC Rules 3745-66-44 and 3745-66-45.

57. Nothing in this Section XXI. FINANCIAL ASSURANCE prevents the use of alternative language for financial mechanisms as approved by Ohio EPA.

## XXII. REIMBURSEMENT OF COSTS

58. Defendants shall reimburse the State of Ohio for all Response Costs incurred by the State of Ohio in connection with oversight of remediation of the Site, including without limitation Response Costs incurred for Oversight or other activities contemplated by this Consent Order that are not inconsistent with the NCP. The obligations of Section XXVI of the COPI on reimbursement of costs shall continue in effect as provided in Section XXIX. TERMINATION OF CONSENT ORDER FOR PRELIMINARY INJUNCTION of this Consent Order

59. Within thirty (30) days of the Effective Date of this Consent Order, or of the confirmation of Shieldalloy's Plan of Reorganization in the Bankruptcy Case, whichever is later, unless otherwise agreed to by the Parties, Defendant Shieldalloy shall pay the amounts specified below:

- A. An Allowed General Unsecured Claim that Ohio shall have against Shieldalloy in the Bankruptcy Case in the amount of (i) Sixteen Thousand Five Hundred Sixty-Two Dollars and Fifty-Five cents (\$16,562.55) for prepetition response costs incurred by



Ohio EPA at the Site; and (ii) Ten Thousand Three Hundred Dollars (\$10,300.00) for prepetition response costs incurred by the Ohio Department of Health at the Site;

- B. An Allowed Administrative Claim that Ohio shall receive from Shieldalloy in the Bankruptcy Case in the amount of One Hundred and Two Thousand Six Hundred Twenty Dollars and Eighty-Six cents (\$102,620.86) for Ohio EPA's postpetition response costs incurred for the Site, including time and analytical lab charges, for the period from September 3, 1993 through January 17, 1995.

60. Within thirty (30) days of the Effective Date of this Consent Order, Defendant Cyprus Foote shall remit payment of One Hundred Twenty-Five Thousand Eight Hundred Eighty-Three Dollars and Forty-Two Cents (\$125,883.42) for Response Costs incurred by the State of Ohio prior to January 18, 1995. (\$119,183.42 for Ohio EPA; \$6,700 for ODH).

61. Ohio EPA will submit to Defendants at least annually an itemized statement of the State of Ohio's Response Costs. Defendants shall pay such Response Costs, subject to Section XXVIII. DISPUTE RESOLUTION, within thirty (30) days of receipt of the itemized statement. Failure to include response costs in an annual statement does not preclude submission of such costs in a subsequent annual statement. With respect to this Section XXII. REIMBURSEMENT OF COSTS, Section XXVIII. DISPUTE RESOLUTION of this Consent Order shall apply only to disputes over the accuracy of the State of Ohio's request for reimbursement and over whether the costs are not inconsistent with the NCP.

62. Defendants shall remit payments to the State of Ohio under this Section as follows:

- A. For costs incurred by Ohio EPA, payment shall be made by certified check payable to "Treasurer, State of Ohio", and shall be forwarded to the Fiscal Officer, Ohio EPA, P.O. Box 1049, 1800 WaterMark Drive, Columbus, Ohio 43216-1049, ATTN: Edith Long (or successor). A copy of the transmittal shall be sent to the Fiscal Officer, DERR, Ohio EPA, P.O. Box 1049, 1800 WaterMark Drive, Columbus, Ohio 43216-1049, ATTN: Patricia Campbell (or successor).
- B. For costs incurred by the Ohio Department of Health, payment shall be made by certified check payable to "Treasurer, State of Ohio" and shall be forwarded to the Fiscal Officer, Ohio Department of Health, 7th Floor, 246 North High Street, Columbus, Ohio 43215 Attn: Fiscal Officer. A copy of the transmittal shall be sent to the Fiscal Officer, DERR, Ohio EPA, P.O. Box 1049, 1800 WaterMark Drive, Columbus, Ohio 43216-1049, ATTN: Patricia Campbell (or successor).
- C. For costs incurred by the Ohio Attorney General's office, payment shall be made by certified check payable to "Treasurer, State of Ohio," and shall be delivered to Matthew A. Sanders, Administrative Assistant, or his successor, Environmental Enforcement Section, Ohio Attorney General's Office, 30 East Broad Street, 25th Floor, Columbus, Ohio 43215-3428.
- D. For costs incurred by any other agency of the State of Ohio in connection with oversight of remediation or Work at the Site, payment shall be made by certified check payable to "Treasurer, State of Ohio", and shall be forwarded as specified in writing by the Ohio Attorney General's Office.

### **XXIII. POTENTIAL FORCE MAJEURE**

63. If any event occurs which causes or may cause a delay in Defendants' compliance with any requirement of this Consent Order, Defendants shall notify Ohio EPA in writing within fourteen (14) days from when a Defendant knew, or by the exercise of due diligence should have known, of the event, describing in detail

the anticipated length of the delay, the precise cause or causes of delay, the measures taken and to be taken by Defendants to prevent or minimize the delay and the timetable by which those measures will be implemented. Defendants will adopt all reasonable measures to avoid or minimize any such delay.

64. In any action by the State of Ohio to enforce any of the provisions of this Consent Order, or in a dispute resolution under Section XXVIII. DISPUTE RESOLUTION, Defendants may raise at that time the question of whether they are entitled to a defense that their conduct was caused by circumstances beyond their control such as, by way of example and not limitation, acts of God, strikes, acts of war, civil disturbances. While the State of Ohio does not agree that such a defense exists, it is, however, hereby agreed by Defendants and the State of Ohio that it is premature at this time to raise and adjudicate the existence of such a defense and that the appropriate point at which to adjudicate the existence of such a defense is at the time, if ever, that a proceeding to enforce this Consent Order is commenced by the State or during dispute resolution pursuant to Section XXVIII. DISPUTE RESOLUTION. At that time the burden of proving that any delay was or will be caused by circumstances beyond the control of Defendants shall rest with Defendants. Failure by Defendants to timely comply with the notice requirements of this Section shall constitute a waiver by Defendants of any right they may have to raise such a defense. Changes in Defendants' financial circumstances shall not in any event constitute circumstances beyond the control of Defendants.

#### XXIV. STIPULATED PENALTIES

65. In the event that Defendants fail to comply with any requirement of this Consent Order, Defendants are liable for and shall immediately pay stipulated penalties in accordance with the following schedule for each failure to comply:

- a. For each day of each failure to comply with a requirement or deadline of this Consent Order, up to and including fifteen (15) days – Two Hundred and Fifty Dollars (\$250) per day for each requirement or deadline not met.
- b. For each day of each failure to comply with a requirement or deadline of this Consent Order, from sixteen (16) days to thirty (30) days – Five Hundred Dollars (\$500) per day for each requirement or deadline not met.
- c. For each day of each failure to comply with a requirement or deadline of this Consent Order, from thirty-one (31) days to sixty (60) days – One Thousand Dollars (\$1,000) per day for each requirement or deadline not met.
- d. For each day of each failure to comply with a requirement or deadline of this Consent Order, over sixty-one (61) days – One Thousand Five Hundred Dollars (\$1,500) per day for each requirement or deadline not met.

66. Any payment required to be made under the provisions of this Section of the Consent Order shall be made by delivering to Plaintiff, c/o Matthew A. Sanders, Administrative Assistant, or his successor, Environmental Enforcement Section, Ohio Attorney General's Office, 30 East Broad Street, 25th Floor, Columbus, Ohio 43215-3428, a certified check or checks made payable to "Treasurer, State of Ohio", for the appropriate amount within forty-five (45) days from the date of the failure to meet the requirement or deadline of this Consent Order. The payment of the stipulated penalty shall be accompanied by a letter briefly describing the type of violation, deadline or requirement not met and date upon which the violation of

this Consent Order occurred. The payment of stipulated penalties by Defendants and the acceptance of such stipulated penalties by Plaintiff for specific violations pursuant to this Section shall not be construed to limit Plaintiff's authority to seek additional relief or to otherwise seek judicial enforcement of this Consent Order. The check will be paid pursuant to R.C. 3734.28.

67. On or after the tenth (10th) anniversary of the Certification of Completion, Defendants may ask the State of Ohio to agree to terminate the requirements of this Section in whole or in part based upon a showing that Defendants have been in full compliance with the Consent Order for the most recent ten (10) years, including having performed all Work and paid all Response Costs due and owing.

#### **XXV. CIVIL PENALTY**

68. Within thirty (30) days of the Effective Date of this Consent Order or of confirmation of Defendant Shieldalloy's Plan of Reorganization in the Bankruptcy Case, whichever is later, Defendant Shieldalloy shall pay to the State of Ohio a civil penalty of Fifty-Five Thousand Dollars (\$55,000).

69. Within thirty (30) days of the Effective Date of this Consent Order, Defendant Cyprus Foote shall pay to the State of Ohio a civil penalty of One Hundred Thousand Dollars (\$100,000).

70. Payments required by this section shall be paid by delivering a certified check or checks to c/o Matthew A. Sanders, Administrative Assistant, or his

successor, at the Office of the Attorney General of Ohio, Environmental Enforcement Section, 30 East Broad Street, 25th Floor, Columbus, Ohio 43215-3428. The checks shall be made payable to "Treasurer, State of Ohio" and will be paid pursuant to the requirements of R.C. 6111.09(B) for Defendant Cyprus Foote's civil penalty and pursuant to R.C. 3734.28 for Defendant Shieldalloy's civil penalty.

#### XXVI. SUPPLEMENTAL ENVIRONMENTAL PROJECT

71. In lieu of paying additional civil penalties and in furtherance of the mutual objectives of Ohio EPA and Defendant Cyprus Foote in improving the environment and reducing impacts to waters of the State of Ohio, and in furtherance of settlement of natural resource damages under Section 107(a) of CERCLA, Defendant Cyprus Foote shall: (1) pay to the Ohio EPA Forty-Nine Thousand Nine Hundred Dollars (\$49,900) for a study on cost effective water pollution prevention, such as a Great Lakes Initiative study, to be performed by the Ohio EPA or its designated contractor; and (2) be required to perform Wetlands Work as required in Section XI. WETLANDS WORK.

72. Within thirty (30) days from the Effective Date of this Consent Order, Defendant Cyprus Foote is required to pay and deliver a certified check in the amount of Forty-Nine Thousand Nine Hundred Dollars (\$49,900) as required in the preceding paragraph to c/o Matthew A. Sanders, Administrative Assistant, or his successor, at the office of the Attorney General of Ohio, Environmental Enforcement Section, 30 East Broad Street, Columbus, Ohio 43215-3428. The check



shall be made payable to "Treasurer, State of Ohio" and will be deposited into the State Account established as "4K4 Line item #715\_650, for the Division of Surface Water-Foster Wheeler Contract" fund of the Ohio EPA or such other fund as may be specified by Ohio EPA for conducting a study on water pollution control.

## XXVII. INDEMNITY

73. Defendants agree to indemnify, save, and hold harmless the State of Ohio from any and all claims or causes of action arising from, or on account of, the State of Ohio's oversight of activities at this Site during the duration of this Consent Order, and/or acts or omissions of the Defendants, their officers, employees, receivers, trustees, agents, or assigns, in carrying out any activities pursuant to this Consent Order. The State of Ohio shall not be considered a party to and shall not be held liable under any contract entered into by Defendants in carrying out the activities pursuant to this Consent Order. Consistent with federal, state and common law, nothing in this Consent Order shall render Defendants liable to indemnify the State of Ohio for any negligent or other tortious act or omission of the State of Ohio occurring outside of the State of Ohio's exercise of its discretionary functions. Discretionary functions of the State of Ohio include, but are not limited to, the State of Ohio's review, approval or disapproval of Work performed pursuant to this Consent Order. Defendants and the State of Ohio will cooperate in the defense of any claim or action against the State of Ohio which may be the subject of this indemnity.

### XXVIII. DISPUTE RESOLUTION

74. The site coordinators shall, whenever possible, operate by consensus. In the event that Defendants have a good faith dispute involving the implementation of this Consent Order, the site coordinators shall have ten (10) days from the date the dispute arises to negotiate in good faith in an attempt to resolve the dispute. This ten (10) day period may be extended by mutual agreement of the Parties.

75. In the event the site coordinators are unable to reach consensus on the dispute, each site coordinator shall reduce his/her position to writing within ten (10) days of the end of the good faith negotiation period described in the preceding paragraph. Those written positions shall be immediately exchanged by the site coordinators. Following the exchange of written positions, the site coordinators shall have an additional ten (10) days to resolve the dispute.

76. If Ohio EPA does not concur with the position of the Defendants, the Ohio EPA site coordinator will notify Defendants in writing. Upon receipt of such written notice, Defendants shall have ten (10) days to forward a request for resolution of the dispute, along with a written statement of the dispute, to the Chief of the Division of Emergency Response and Remediation ("DERR") at Ohio EPA. The statement of dispute shall be limited to a concise presentation of the Defendants' position on the dispute. The Chief of DERR, or his/her designee, will resolve the dispute based upon and consistent with this Consent Order, applicable policies and guidance documents, and appropriate state and federal laws, and notify

Defendants of the resolution within fourteen (14) days of the Defendants' request for dispute resolution.

77. Any Defendant may petition the Court within fourteen (14) days of receipt of the Chief of DERR's written notification of dispute resolution as described in the preceding paragraph. The Court shall affirm the Chief of DERR's resolution of the dispute unless the petitioning Defendant demonstrates that the resolution was unlawful or unreasonable within the meaning of R.C. Chapter 3745 or inconsistent with the Consent Order.

78. The pendency of dispute resolution set forth in this Section shall not affect the time period for completion of the Work to be performed under this Consent Order, unless otherwise agreed by the Parties. Ohio EPA will agree to a reasonable extension of time for performance of Work required under this Consent Order to the extent that such Work is directly affected by the dispute.

79. Within thirty (30) days of resolution of any dispute, Defendants shall incorporate the resolution and final determination into the appropriate Workplan, schedule or procedures and proceed to implement this Consent Order according to the amended Workplans, schedule or procedures as approved.

80. Unless otherwise expressly provided for in this Consent Order, the Dispute Resolution procedures of this Section shall be the exclusive mechanism for Defendants to resolve disputes arising under or with respect to this Consent Order. Nothing herein alters the jurisdiction of the Environmental Review Appeals Commission under R.C. Chapter 3745.

81. In any dispute subject to dispute resolution, the Parties may, by written agreement, modify the procedures in the first three paragraphs of this Section.

#### **XXIX. TERMINATION OF CONSENT ORDER FOR PRELIMINARY INJUNCTION**

82. As of the Effective Date of this Consent Order, the COPI is terminated except as to Section XVI of the COPI and except as otherwise provided in Section XXVI of the COPI.

#### **XXX. SATISFACTION OF LAWSUIT**

83. Plaintiff alleged in its Complaint that Defendants operated the facility at the Site in such a manner as to cause violations of R.C. Chapters 3734 and 6111, the rules promulgated thereunder, as well as other state laws. Except as otherwise provided in Section XXXII. RESERVATIONS OF RIGHTS, compliance with the terms of this Consent Order shall constitute full satisfaction of any civil liability by Defendants for all claims alleged in the Complaint. Nothing in this Section shall apply to new conditions at or new information about the Site, or to any violations arising out of acts or omissions first occurring after the Effective Date of this Consent Order.

#### **XXXI. COVENANT NOT TO SUE**

84. In consideration of the actions that will be performed and the payments that will be made by Defendants under this Consent Order, and except as

provided under Section XXXII. RESERVATION OF RIGHTS, the State covenants not to sue Defendants pursuant to Section 107(a) of CERCLA for (1) recovery of Response Costs for approved Work performed under this Consent Order; and (2) recovery of damages to natural resources. These covenants not to sue are conditioned upon compliance by Defendants with this Consent Order. These covenants not to sue do not extend to persons other than Defendants and their successors and assigns.

#### XXXII. RESERVATION OF RIGHTS

85. The State of Ohio reserves the right to seek additional relief from this or any other Court, including, but not limited to, additional preliminary and/or permanent injunctive relief, civil penalties and cost recovery for work beyond this Consent Order. Except as specifically provided otherwise in Section XXXI. COVENANT NOT TO SUE, the State of Ohio reserves any and all claims it may have against Defendants under CERCLA, except for natural resource damages and Response Costs incurred prior to issuance of the COPI. This reservation also explicitly includes any and all claims the State of Ohio may have concerning any disposal of Waste Material by Defendant(s) at any location other than the Site. This Consent Order in no way waives any defenses which Defendants may have as to such additional relief.

86. Except as otherwise specifically provided under Section XXX. SATISFACTION OF LAWSUIT, the State of Ohio expressly reserves, and this

Consent Order shall be without prejudice to, any civil or criminal claims, demands, rights, or causes of action, judicial or administrative, the State of Ohio may have or which may in the future accrue against Defendants or others, regardless of whether such claim, demand, right or cause of action was asserted in the Complaint. This Consent Order in no way waives any defenses which Defendants may have as to such claims, demands, rights or causes of action.

87. All Workplans, reports or other items required to be submitted to Ohio EPA under this Consent Order, and approved by Ohio EPA, are deemed not inconsistent with the National Contingency Plan in the opinion of Ohio EPA.

88. Nothing herein shall limit the authority of the State of Ohio to undertake any action against any entity, including Defendants, to eliminate or control conditions which may present a threat to the public health, safety, welfare or environment, and to seek cost reimbursement for any such action. The State reserves all rights under R.C. Section 3734.20. This Consent Order in no way waives any defenses which Defendants may have as to such claims, demands, rights or causes of action.

89. Nothing herein shall be construed to relieve Defendants of any obligation to comply with the Atomic Energy Act, 42 U.S.C. 201, et seq., or regulations promulgated thereunder, and R.C. Chapters 3734, 3748 and 6111 including, without limitation, any regulation, license or order issued under these Chapters, and any other applicable federal, state or local statutes, regulations or ordinances, including but not limited to permit requirements.



90. Entering into this Consent Order, the Consent Order itself, or the taking of any action in accordance with it do not constitute an admission by Defendants of any factual or legal matters or opinions set forth herein. Defendants do not admit liability under any of the counts of the Complaint or any other law, rule or regulation for any purpose or admit any issues of fact or law, any wrongdoing, or any responsibility with regard to Waste Material, releases or threatened releases of hazardous substances at or from the Site, other pollutants listed in the Complaint, or with regard to any contamination at or from the Site. Defendants do not admit and reserve their rights to contest or legally challenge jurisdiction and venue with regard to activities not required or contemplated by the COPI or this Consent Order. Nothing in this Consent Order is intended to limit any settlement that one or more of the Parties may reach concerning an agreed discharge of a claim and/or administrative expense against Shieldalloy in the Bankruptcy Case. Nothing herein absolves Defendants from the duty to comply with this Consent Order and surviving provisions of the COPI.

91. Defendants reserve all rights that they may have against each other under all federal, state and local laws, except as may be set forth in a separate agreement or agreements.

92. The State of Ohio reserves all rights as to any person other than Defendants.

### XXXIII. APPENDICES

93. All appendices to this Consent Order are incorporated by reference as if fully restated herein into and are an enforceable part of this Consent Order. The following appendices are or will be attached to this Consent Order at the time of signing by the Parties on the Effective Date:

- A. "Appendix A" is the RD/RA Statement of Work;
- B. "Appendix B" is the List of U.S. EPA and Ohio EPA Guidance Documents;
- C. "Appendix C" is the Decision Document;
- D. "Appendix D" is a list of the monitoring requirements for wetland mitigation.
- E. "Appendix E" describes the use of annuities and trusts to provide financial assurance for Operation and Maintenance at the Site.

### XXXIV. MODIFICATION

94. No modification shall be made to this Consent Order without the written agreement of the Parties and the Court.

### XXXV. RETENTION OF JURISDICTION

95. This Court shall retain jurisdiction of this matter for the purpose of administering and enforcing Defendants' compliance with this Consent Order.

### XXXVI. COURT COSTS

96. Defendants shall pay the court costs of this action.

#### XXXVII. SIGNATORIES

97. Each undersigned representative of each respective Defendant understands the terms and conditions of this Consent Order and certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Order and to execute and legally bind the respective Defendants to this document.

#### XXXVIII. ENTRY OF CONSENT ORDER AND FINAL JUDGMENT BY CLERK

98. The Parties recognize that entry of this Consent Order will avoid the potential of prolonged and complicated litigation between the Parties. The Parties further recognize, and the Court by entering this Consent Order finds, that this Consent Order is fair, reasonable and in the public interest.

99. The parties agree and acknowledge that this Consent Order is being made available for public participation under state requirements and in a manner consistent with 40 C.F.R. §123(d)(1)(iii), by providing for notice of the lodging of this Consent Order, opportunity for public comment and the consideration of any public comment. The State of Ohio and each Defendant reserve the right to withdraw consent to this Consent Order upon filing with this Court notice of such withdrawal in the event that (1) the remedial activities selected in the Decision Document issued by Ohio EPA differ in any material respect from the remedial activities proposed by Ohio EPA in the Preferred Plan; or (2) the parties cannot agree to changes proposed by the State of Ohio to this Consent Order as a result of public comment. The right to withdraw consent as set forth in this paragraph shall only

exist for the period of time between issuance of the Decision Document and the end of the fifteenth (15) day after issuance of the Decision Document, unless otherwise agreed in a joint notice filed by the Parties with the Court. After expiration of the time period for withdrawal of consent as set forth in this paragraph, the Parties agree that as of March 31, 1997 this Court may enter this Consent Order, provided no withdrawal of consent has been timely filed with the Court.

100. Upon the signing of this Consent Order by the Court, the Clerk of Courts is hereby directed to enter it upon the journal. Within three (3) days of entering the judgment upon the journal, the Clerk is hereby directed to serve upon all parties notice of the judgment and its date of entry upon the journal in the manner prescribed by Rule 5(B) of the Ohio Rules of Civil Procedure and note the service in the appearances docket.

IT IS SO ORDERED:

EFFECTIVE UPON AND ENTERED THIS \_\_\_\_ DAY OF \_\_\_\_\_, 1997.

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JUDGE DAVID E. ELLWOOD  
COURT OF COMMON PLEAS  
GUERNSEY COUNTY

BETTY D. MONTGOMERY  
ATTORNEY GENERAL OF OHIO

BY: 

ROBERT J. KARL (0042292)

JAMES O. PAYNE, JR. (0008129)

LUANN L. HOOVER (0062404)

Assistant Attorneys General  
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State of Ohio

SHIELDALLOY METALLURGICAL CORP.

BY: 

C. SCOTTEVES


Vice President/Environmental Services

SHIELDALLOY METALLURGICAL CORP.

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BY:   
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(202) 682-7000

Attorney for Defendant Shieldalloy  
Metallurgical Corporation

BY: \_\_\_\_\_

**RICHARD FAHEY (0013131)**

Arter & Hadden

10 West Broad Street

Columbus, Ohio 43215

(614) 221-3155

Attorney for Defendant Shieldalloy  
Metallurgical Corporation

CYPRUS FOOTE MINERAL COMPANY

BY: \_\_\_\_\_

Name \_\_\_\_\_

Title \_\_\_\_\_

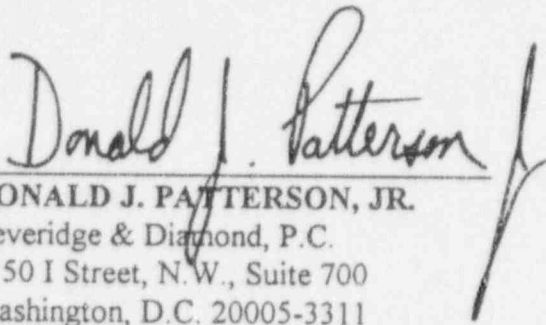
Cyprus Foote Mineral Company

9100 East Mineral Circle

Englewood, CO 80112

CYPRUS FOOTE MINERAL COMPANY

By:



DONALD J. PATTERSON, JR.  
Beveridge & Diamond, P.C.  
1350 I Street, N.W., Suite 700  
Washington, D.C. 20005-3311  
(202) 789-6000

Attorney for  
Defendant Cyprus Foote Mineral Company

Date: December 23, 1996

## Appendix A

### STATE OF OHIO MODEL STATEMENT OF WORK FOR THE REMEDIAL DESIGN AND REMEDIAL ACTION AT

Shieldalloy Metallurgical Corp. Site  
Cambridge, Ohio

#### 1.0 PURPOSE

The purpose of this Remedial Design/Remedial Action Statement of Work (RD/RA SOW) is to define the procedures the Respondents shall follow in designing and implementing the selected remedy for the **Shieldalloy Metallurgical Corp. Site** as described in this SOW and the Director's Final Findings and Orders (Orders) to which it is attached. The Division of Emergency and Remedial Response (DERR) will document the selection of a remedy for the site in a Decision Document. The intent of the remedy is to protect the public health and/or the environment from the actual or potential adverse effects of the contaminants discovered at and related to the site. Further guidance for performing the RD/RA work tasks may be found in the U.S. EPA Superfund Remedial Design and Remedial Action Guidance document (OSWER Directive 9355.0-4A). All applicable regulatory requirements pertaining to the selected remedy and RD/RA activities shall be followed.

The Ohio EPA shall provide oversight of the Respondent's activities throughout the RD/RA. The Respondent's shall support the Ohio EPA's initiatives and conduct of activities related to the implementation of oversight activities.

#### 2.0 DESCRIPTION OF THE REMEDIAL ACTION/ PERFORMANCE STANDARDS

Specifications of the major components of the remedial action to be designed and implemented by the Respondents are described below. Performance standards shall include cleanup standards, standards of control, quality criteria, and other requirements, criteria or limitations as established in the Decision Document, this SOW and the Orders to which it is attached.

#### 3.0 SCOPE OF THE REMEDIAL DESIGN AND REMEDIAL ACTION

The Remedial Design/Remedial Action (RD/RA) shall consist of seven principal tasks described below. Each task shall be completed and required documentation shall be submitted in accordance with the schedules established in the Orders and in the RD/RA Work Plan approved by Ohio EPA. All work related to this SOW shall be performed by the Respondent(s) in a manner consistent with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA)

as amended, 42 USC 9601, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300 (1990), and other applicable federal and state rules and regulations.

#### Task Summary

- 3.1 Task I: RD/RA Work Plan
  - 3.1.1 Site Access
  - 3.1.2 Pre-Design Studies Plan
  - 3.1.3 Regulatory Compliance Plan
  - 3.1.4 Natural Resource Damage Assessment
- 3.2 Task II: Pre-Design Studies
- 3.3 Task III: Remedial Design
  - 3.3.1 General Requirements for Plans and Specifications
  - 3.3.2 Design Phases
  - 3.3.3 Estimated Cost for Remedial Action
  - 3.3.4 Remedial Action Implementation Plan
  - 3.3.5 Community Relations Support
- 3.4 Task IV: Remedial Action Construction
  - 3.4.1 Preconstruction Inspection and Conference
  - 3.4.2 Design Changes During Construction
  - 3.4.3 Remedial Action Construction Completion and Acceptance
  - 3.4.4 Community Relations Support
- 3.5 Task V: Five-Year Reviews
- 3.6 Task VI: Operation and Maintenance/Performance Monitoring
  - 3.6.1 Reporting During Operation and Maintenance
  - 3.6.2 Completion of Remedial Action Report
- 3.7 Task VII: Reporting Requirements
  - 3.7.1 Monthly Progress Reports during RD and RA Construction
  - 3.7.2 Summary of Reports and Submittals

### **3.1 TASK I: RD/RA WORK PLAN**

The Respondent(s) shall submit a work plan for the Remedial Design and Remedial Action (RD/RA) to the Ohio EPA for review and approval, which presents the overall strategy for performing the design, construction, operation, maintenance and monitoring of the Remedial Action (RA). The work plan shall provide a detailed discussion of the specific tasks necessary to implement the selected remedy, including a description of the technical approach, personnel requirements, plans, specifications, permit requirements and other reports described in this SOW



The work plan shall document the responsibilities and authority of all organizations and key personnel involved with the development and implementation of the RD/RA. The qualifications of key personnel directing the RD/RA tasks, including contractor personnel, shall be described.

The work plan shall include schedules fixed in real time for the development of the (RD) and implementation of the RA, including milestones for the submittal of the document packages for Ohio EPA review and meetings for discussion of the submittals. The RD/RA Work Plan must be reviewed and approved by the Ohio EPA prior to initiation of field activities or proceeding with the RD.

Specific requirements to be addressed by the RD/RA Work Plan are described in the following sections.

#### **3.1.1 Site Access**

All site access agreements necessary to implement the RD and RA shall be obtained by the Respondent(s) prior to the initiation of any activities to be conducted under the Work Plan. Site access agreements shall extend for the duration of all remedial activities and shall include allowance for all operation and maintenance considerations and State oversight activities. The work plan shall describe the activities necessary to satisfy these requirements.

#### **3.1.2 Pre-Design Studies Plan**

The Respondent(s) shall develop a plan to complete the following pre-design studies, which are required to design and fully implement the remedial action.

**[Describe any pre-design studies required to support the RD/RA.]**

The Pre-Design Studies Plan, as a component of the RD/RA Work Plan, will identify and describe, in detail, activities necessary to conduct the pre-design studies identified above. The plan shall include sufficient sampling, testing, and analyses to develop quantitative performance, cost and design data for the selected remedy.

At the discretion of the Site Coordinator for the Ohio EPA, the PDSP may be submitted for review and comment under separate cover from the work plan in accordance with the schedule established in the Orders. The PDSP must be approved by the Ohio EPA prior to initiation of associated field activities or treatability studies.

The Pre-Design Studies Plan shall include, as necessary, a Field Sampling Plan, a Quality Assurance Project Plan and a Health and Safety Plan (HSP). Section 4.0 of this SOW describes the required content of supporting plans such as the Field Sampling Plans, Quality Assurance Project Plans and Health and Safety Plans.

Prior to development of the Pre-Design Studies Plan, there shall be a meeting of the Site Coordinator for the Ohio EPA and the Project Manager representing the Respondent(s) to discuss scope, objectives, quality assurance and quality control issues, resources, reporting, communication channels, schedule, and roles of personnel involved. Other personnel representing the Respondent(s) and Ohio EPA, who may be needed to fully discuss the issues involved, should also participate in this

meeting. Guidance documents to be consulted in developing the Pre-Design Studies Plan include U.S. EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies (EPA/540/G-89/004, October 1988) and Guide for Conducting Treatability Studies Under CERCLA (EPA/540/2-89/058, December 1989), as well as others listed in Appendix A, attached to this SOW.

The pre-design studies will be conducted as described under Task II.

### **3.1.3 Regulatory Compliance Plan**

It shall be the responsibility of the Respondent(s) to ensure compliance with all applicable regulatory state and federal requirements for the RD/RA activities to be conducted at the site. The Respondent(s) shall develop a plan to identify and to satisfy all applicable state and federal laws and regulations for the RD/RA. The plan will include the following information:

- 1) Permitting authorities
- 2) Permits required to conduct RD/RA activities
- 3) Time required by the permitting agency(ies) to process permit applications
- 4) Identification of all necessary forms
- 5) Schedule for submittal of applications
- 6) All monitoring and/or compliance testing requirements

The Respondent(s) shall identify in the plan any inconsistencies between any regulatory requirements or permits that may affect any of the work required. The plan shall also include an analysis of the possible effects such inconsistencies may have on the remedial action, recommendations, and supporting rationale for the recommendations. The Regulatory Compliance Plan shall be submitted to the Ohio EPA as part of the RD/RA Work Plan.

### **3.1.4 Natural Resource Damage Assessment**

If natural resources are or may be injured as a result of a release, the Respondent(s) shall ensure that the trustees of the effected natural resources are notified. The trustees will initiate appropriate actions and provide input into the RD/RA in order to minimize or mitigate natural resource damages in accordance with the NCP and 43 CFR part 11. Trustees define "injury" as "a measurable adverse change, either long- or short-term, in the chemical or physical quality of a natural resource resulting either directly or indirectly from exposure to a discharge of oil or release of a hazardous substance. The respondent(s) shall make available to the trustees all necessary information and documentation needed to assess actual or potential natural resource injuries.

## **3.2 TASK II: PRE-DESIGN STUDIES**

The Respondent(s) shall schedule and detail the work necessary to accomplish the pre-design studies described in the Pre-Design Studies Plan submitted with the RD/RA Work Plan. The requirements of this section shall apply to studies undertaken to refine the understanding of the nature and extent of contamination at the site, as well as to bench and pilot scale treatability studies

For any such studies required, the Respondent(s) shall furnish all services, including necessary field work, materials, supplies, labor, equipment, superintendence, and data interpretation. Sufficient sampling, testing, and analyses shall be performed to provide the technical data necessary to support the remedial design effort with the goal of optimizing the required treatment and/or disposal operations and systems.

The Respondent(s) shall submit a draft Pre-Design Studies report for Ohio EPA's review and comment when the investigation and/or testing required by the Pre-Design Studies Plan is complete. The draft report shall present investigation/testing data and results along with an analysis of the implications those results have on the RD/RA, including a cost analysis, when appropriate. The draft report shall be submitted prior to the preliminary design submittal in accordance with the schedule specified in the Orders and approved RD/RA Work Plan. After making any required corrections or modifications based on Ohio EPA comments, the Respondent(s) shall submit the final report with the Preliminary Design Report, unless otherwise specified in the approved RD/RA Work Plan.

### **3.2.1. Reporting Requirements for Groundwater data.**

The respondent(s) shall submit all groundwater data and monitoring well construction data. The respondent(s) shall implement a groundwater monitoring program as identified in the RD workplan or as required by Ohio EPA. Respondents shall submit all groundwater data and monitoring well construction data on a 3.5 inch diskette using the most current version of the U.S.EPA developed Ground Water Information Tracking System (GRITS) database software. GRITS is free software, and can be obtained by calling EPA office of Research and Development (ORD), at 513-569-7562, ask for Document # EPA/625/11-91/002. Respondents shall submit one copy of each round of sampling data on printed paper in addition to the diskette format. The printed copy will be the official copy of the data.

## **3.3 TASK III: REMEDIAL DESIGN**

The Respondent(s) shall prepare and submit to the Ohio EPA, in accordance with the schedule set forth in the compliance schedule of the Orders, construction plans, specifications and supporting plans to implement the remedial action at **Shieldalloy Metallurgical Corp. Site** as defined in the Purpose and Description of the Remedial Action sections of this SOW, the Decision Document, and the Orders.

### **3.3.1 General Requirements for Plans and Specifications**

The construction plans and specifications shall comply with the standards and requirements outlined below. All design documents shall be clear, comprehensive and organized. Supporting data and documentation sufficient to define the functional aspects of the remedial action shall be provided. Taken as a whole, the design documents shall demonstrate that the remedial action will be capable of meeting all objectives of the Decision Document, including any performance standards.

The plans and specifications shall include the following:

- 1) Discussion of the design strategy and design basis including

- a. Compliance with requirements of the Decision Document and the Orders and all applicable regulatory requirements;
  - b. Minimization of environmental and public health impacts;
- 2) Discussion of the technical factors of importance including:
  - a. Use of currently accepted environmental control measures and technologies;
  - b. The constructability of the design;
  - c. Use of currently accepted construction practices and techniques;
- 3) Description of the assumptions made and detailed justification for those assumptions;
- 4) Discussion of possible sources of error and possible operation and maintenance problems;
- 5) Detailed drawings of the proposed design including, as appropriate:
  - a. Qualitative flow sheets;
  - b. Quantitative flow sheets;
- 6) Tables listing equipment and specifications;
- 7) Tables giving material and energy balances;
- 8) Appendices including:
  - a. Sample calculations (one example presented and clearly explained for significant or unique calculations);
  - b. Derivation of equations essential to understanding the report;
  - c. Results of laboratory tests, field tests and any additional studies.

### 3.3.2 Design Phases

The Respondent(s) shall meet when necessary with Ohio EPA representatives to discuss design issues. The design shall be developed and submitted in the phases outlined below to facilitate progression toward an acceptable and functional design. Submittals shall be made in accordance with the compliance schedule in the Orders, and the schedule in the approved RD/RA Work Plan.

#### 3.3.2.1 Preliminary Design

A Preliminary Design, which reflects the design effort at approximately 30% completion, shall be submitted to the Ohio EPA for review and comment. At this stage of the design process, the Respondent(s) shall have verified existing conditions at the site that may influence the design and implementation of the selected RA. The Preliminary Design shall demonstrate that the basic technical requirements of the remedial action and any permits required have been addressed. The Preliminary Design shall be reviewed to determine if the final design will provide an operable and usable RA that will be in compliance with all permitting requirements and response objectives. The Preliminary Design submittal shall include the following elements, at a minimum:

- Preliminary plans, drawings and sketches, including design calculations,

- Results of treatability studies and additional field sampling;
- Design assumptions and parameters, including design restrictions, process performance criteria, appropriate unit processes for treatment systems, and expected removal or treatment efficiencies for both the process and waste (concentration and volume);
- Proposed cleanup verification methods, including compliance with applicable laws and regulations;
- Outline of design specifications;
- Proposed sitting/locations of processes/construction activity;
- Expected long-term operation and monitoring requirements;
- Real estate and easement requirements;
- Preliminary construction schedule, including contracting strategy.

The supporting data and documentation necessary to define the functional aspects of the RA shall be submitted with the Preliminary Design. The technical specifications shall be outlined in a manner that anticipates the scope of the final specifications. The Respondents shall include design calculations with the Preliminary Design completed to the same degree as the design they support.

If the Pre-Design Studies Report required under Task II have not been submitted prior to submission of the Preliminary Design, it shall be submitted with the Preliminary Design. Any revisions or amendments to the Preliminary Design required by the Ohio EPA shall be incorporated into the subsequent design phase.

### **3.3.2.2 Intermediate Design**

Complex project designs necessitate preparation and Ohio EPA review of design documents between the preliminary and prefinal design phases. The Respondent(s) shall submit intermediate design plans and specifications to the Ohio EPA for review and comment when the design is approximately 60% complete in accordance with the schedule in the approved RD/RA Work Plan. All plans, specifications, design analyses and design calculations submitted to the Ohio EPA shall reflect the same degree of completion. The Respondent(s) shall ensure that any required revisions or amendments resulting from the Ohio EPA's review of the Preliminary Design are incorporated into the Intermediate Design.

The Intermediate Design submittal shall include the following components:

- Design Plans and Specifications
- Draft Construction Quality Assurance Plan
- Draft Performance Standard Verification Plan
- Draft Operation and Maintenance Plan
- Health and Safety Plan

The design shall include a Construction Quality Assurance Plan, a Performance Standard Verification Plan, an Operation and Maintenance Plan, and a Health and Safety Plan. The Performance Verification Plan shall include a Field Sampling Plan and a Quality Assurance Project Plan, as necessary. Section 4.0 of this SOW describes the required content of the supporting plans. The final



Pre-Design Studies Report shall also be included, it has not already been submitted. Revisions or amendments to the Intermediate Design required by Ohio EPA shall be incorporated into the Prefinal Design.

### **3.3.2.3 Prefinal Design**

The Respondent(s) shall submit a Prefinal Design for Ohio EPA review in accordance with the schedule in the approved RD/RA Work Plan when the design effort is at least 90% complete. The Respondent(s) shall ensure that any modifications required by the Ohio EPA's prior review of related Pre-design Studies Reports, technical memoranda, the Preliminary and Intermediate Designs, and the QAPP and HSP are incorporated into the Prefinal Design submittal. The Prefinal Design submittal shall consist of the following components, at a minimum:

- Design Plans and Specifications
- Construction Quality Assurance Plan
- Performance Standard Verification Plan
- Operation and Maintenance Plan
- Remedial Action Implementation Plan
- Cost Estimate
- Health and Safety Plan

General correlation between drawings and technical specifications is a basic requirement of any set of working construction plans and specifications. Before submitting the remedial design specifications with the Prefinal Design, the Respondent(s) shall: (1) Coordinate and cross-check the specifications and drawings; (2) Complete the proofing of the edited specifications and required cross-checking of all drawings and specifications.

The Respondent(s) shall prepare and include in the technical specifications governing any treatment systems; contractor requirements for providing appropriate service visits by qualified personnel to supervise the installation, adjustment, startup and operation of the treatment systems; and appropriate training for operational procedures once startup has been successfully accomplished.

The Ohio EPA will provide written comments to the Respondents indicating any required revisions to the Prefinal Design. Comments may be provided as a narrative report and/or markings on design plan sheets. Revisions to the plans and specifications required by Ohio EPA shall be incorporated into the Final Design. At the discretion of the Site Coordinator, the Respondents shall also return to Ohio EPA all marked-up prints as evidence that the plans have been completely checked. The Prefinal Design submittal may serve as the Final Design, if Ohio EPA has no further comments and notifies the Respondent(s) that the Prefinal Design has been approved as the Final Design.



#### **3.3.2.4 Final Design**

Following incorporation of any required modifications resulting from the Ohio EPA's review of the Prefinal Design submittal, the Respondent(s) shall submit to the Ohio EPA the Final Design which is 100% complete in accordance with the approved schedule described in the RD/RA Workplan. The Final Design submittal shall include all the components of the Prefinal Design and each of those components shall be complete. At the discretion of the Site Coordinator, any marked-up prints or drawings, which the Ohio EPA may have provided by way of comments on previous design submittals shall be returned to the Ohio EPA, if they have not already been returned.

The Respondent(s) shall make corrections or changes based on Ohio EPA comments on the Final Design submittals. The revised Final Design shall then be submitted in their entirety to the Ohio EPA for approval as the completed Final Design. Upon approval of the Site Coordinator, final corrections may be made by submitting corrected pages to the Final Design design documents. The quality of the Final Design submittal should be such that the Respondent(s) would be able to include them in a bid package and invite contractors to submit bids for the construction project.

#### **3.3.3 Estimated Cost of the Remedial Action**

The Respondent(s) shall refine the cost estimate developed in the Feasibility Study to reflect the detailed plans and specifications being developed for the RA. The cost estimate shall include both capital and operation and maintenance costs for the entire project. To the degree possible, cost estimates for operation and maintenance of any treatment system shall be based on the entire anticipated duration of the system's operation. The final estimate shall be based on the final approved plans and specifications. It shall include any changes required by the Ohio EPA during Final Design review, and reflect current prices for labor, material and equipment.

The refined cost estimate shall be submitted by the Respondents with the Prefinal Design and the final cost estimate shall be included with the Final Design submittal.

#### **3.3.4 Remedial Action Implementation Plan**

The Respondent(s) shall develop a Remedial Action Implementation Plan to help coordinate implementation of the various components of the RA. It shall include a schedule for the RA that identifies timing for initiation and completion of all critical path tasks. The Respondent(s) shall specifically identify dates for completion of the project and major interim milestones in conformance with the approved RD/RA Workplan schedule. The Remedial Action Implementation Plan is a management tool which should address the following topics:

- 1) Activities necessary to fully implement each of the components of the RA;
- 2) How these activities will be coordinated to facilitate construction/implementation in accordance with the approved schedule;
- 3) Potential major scheduling problems or delays, which may impact overall schedule;

- 4) Lines of communication for discussing and resolving problems, should they arise;
- 5) Common and/or anticipated remedies to overcome potential problems and delays.

The Remedial Action Implementation Plan shall be submitted with the Prefinal Design for review and comment by the Ohio EPA. The final plan and RA project schedule shall be submitted with the Final Design for review and approval.

### **3.3.5 Community Relations Support**

A community relations program will be implemented by the Ohio EPA. The Respondent(s) shall cooperate with the Ohio EPA in community relations efforts. Cooperation may include participation in preparation of all appropriate information disseminated to the public, and in public meetings that may be held or sponsored by the Ohio EPA concerning the site.

## **3.4 TASK IV: REMEDIAL ACTION CONSTRUCTION**

Following approval of the Final Design submittal by the Ohio EPA, the Respondent(s) shall implement the designed remedial action(s) at **Shieldalloy Metallurgical Corp. Site** in accordance with the plans, specifications, Construction Quality Assurance Plan, Performance Standard Verification Plan, Health and Safety Plan, Remedial Action Implementation Plan, Quality Assurance Project Plan, and Field Sampling Plan approved with the final design. Implementation shall include the activities described in the following sections.

### **3.4.1 Preconstruction Inspection and Conference**

The Respondent(s) shall participate in a preconstruction inspection and conference with the Ohio EPA to accomplish the following:

- Review methods for documenting and reporting inspection data
- Review methods for distributing and storing documents and reports
- Review work area security and safety protocol
- Discuss any appropriate modifications to the Construction Quality Assurance Plan to ensure that site specific considerations are addressed. The final CQAP shall be submitted to the Ohio EPA at this time, if it has not already been submitted.
- Introduce key construction contractor, engineering and project management personnel and review roles during construction activities
- Conduct a site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations

The Respondent(s) shall schedule the preconstruction inspection and conference to be held within 10

days of the award of the construction contract. The preconstruction inspection and conference shall be documented by a designated person and minutes shall be transmitted to all parties by the Respondent(s) to all parties in attendance.

### **3.4.2 Design Changes During Construction**

During construction, unforeseen site conditions, changes in estimated quantities of required construction materials and other problems associated with the project are likely to develop. Such changing conditions may require either major or minor changes to the approved final design. Certain design changes will require approval of the Ohio EPA prior to implementation to ensure that the intent and scope of the remedial action is maintained. Changes, which could alter the intent or scope of the RA, may require a revision to the Decision Document and a public comment period.

Changes to the remedial design which require Ohio EPA written approval prior to implementation include:

- Those that involve the deletion or addition of a major component of the approved remedy (e.g. changing one treatment system for another; deleting any designed layer of a multi-layer cap)
- Those that result in a less effective treatment for wastes associated with the site
- Any changes that may result in an increase of the exposure to chemicals of concern and/or risk to human health or the environment as compared to the goals for the completed remedial action as stated in the Orders and this SOW
- Those that result in a significant delay in the completion of the RA
- Any other changes that alter or are outside of the scope or intent of the approved remedial design

Ohio EPA shall be notified of other changes made during construction through daily inspection reports and monthly progress reports.

### **3.4.3 Remedial Action Construction Completion and Acceptance**

As the construction of the remedial action nears completion, the following activities and reporting shall be completed by the Respondent(s) to ensure proper project completion, approval, closeout and transition to the operation and maintenance/monitoring phase.

#### **3.4.3.1 Prefinal Construction Conference**

Within seven days of making a preliminary determination that construction is complete, the Respondent(s) shall provide written notification to the Ohio EPA and a prefinal construction conference shall be held with the construction contractor(s) to discuss procedures and requirements for project completion and closeout. The Respondent(s) shall have responsibility for making arrangements for the conference. Participants should include the Project Manager for the

Respondents, the Site Coordinator for the Ohio EPA, all contractors involved with construction of the remedial action(s) and the remedial design agent (person(s) designed the remedy), if requested.

A list of suggested items to be covered at the conference includes, but is not limited to the following:

- Final Operation and Maintenance (O&M) Plan submission, if it has not been submitted already
- Cleanup responsibilities
- Demobilization activities
- Security requirements for project transfer
- Prefinal inspection schedule
- Operator training

The prefinal conference shall be documented by a designated person and minutes shall be transmitted to all parties in attendance by the respondents.

#### **3.4.3.2 Prefinal Inspection**

Following the prefinal construction conference, a prefinal inspection of the project will be conducted. The prefinal inspection will be led by the Ohio EPA with assistance from the party with primary responsibility for construction inspection, if requested.

The prefinal inspection will consist of a walk-through inspection of the entire site. The completed site work will be inspected to determine whether the project is complete and consistent with the contract documents and the approved RD/RA Work Plan. Any outstanding deficient or incomplete construction items should be identified and noted during the inspection.

When the RA includes construction of a treatment system, the facility start-up and "shakedown" shall have been completed as part of the RA. "Shakedown" is considered to be the initial operational period following start-up during which adjustments are made to ensure that the performance standards for the system are reliably being achieved. The contractor shall have certified that the equipment has performed to meet the purpose and intent of the contract specifications. Retesting shall have been successfully completed where deficiencies were revealed. Such shakedown may take several months. Determination of remedy effectiveness for other types of remedial actions will be based on the PSVP.

If construction of major components of a remedial action is performed in distinct phases or under separate contracts due to the complex scope of the site remedy, it may be appropriate to conduct the prefinal inspections of those components separately. The approved RAIP should identify those projects and components, which should be handled in that manner.

Upon completion of the prefinal inspection, an inspection report shall be prepared by the Respondent(s) and submitted to Ohio EPA with the minutes from the prefinal conference. A copy of the report will be provided to all parties in attendance at the inspection. The report will outline the outstanding construction items, actions required to resolve those items, completion date for those items and a date for the final inspection. Ohio EPA will review the inspection report and notify the Respondent(s) of any disagreements with it.

#### **3.4.3.3 Final Inspection**

Within seven days following completion of any outstanding construction items, the Respondent(s) shall provide written notification to the Ohio EPA and schedule a final inspection. A final inspection will be conducted by the Ohio EPA with assistance from the party having primary responsibility for construction inspection, if requested.

The final inspection will consist of a walk-through inspection of the project site focusing on the outstanding construction items identified during the prefinal inspection. The Prefinal Inspection Report shall be used as a checklist. The contractor's demobilization activities shall have been completed, except for equipment and materials required to complete the outstanding construction items. If any items remain deficient or incomplete, the inspection shall be considered a prefinal inspection requiring another prefinal inspection report and final inspection.

As with the prefinal inspection, it may be appropriate to conduct final inspections of major components of a remedial action separately. Such projects and components should be identified in the approved Remedial Action Implementation Plan.

#### **3.4.3.4 Construction Completion Report and Certification**

Upon satisfactory completion of the final inspection, a Construction Completion Report shall be prepared by the Respondent(s) and submitted to the Ohio EPA within 30 days after the final inspection. The report shall include the following elements:

- 1) A brief description of the outstanding construction items from the prefinal inspection and an indication that the items were satisfactorily resolved;
- 2) A synopsis of the work defined in the approved RD/RA Work Plan and the Final Design and certification that this work was performed;
- 3) An explanation of any changes to the work defined in the approved RD/RA Work Plan and Final Design, including as-built drawings of the constructed RA facilities, and why the changes were necessary or beneficial for the project;
- 4) Certification that the constructed RA or component of the RA is operational and functional.

The construction completion report will be reviewed by the Ohio EPA. If Ohio EPA's review indicates that corrections or amendments to the report are necessary, comments will be provided to the Respondent(s). The Respondent(s) shall submit a revised construction completion report based



on Ohio EPA comments to the Ohio EPA within 30 days of receipt of those comments. Upon determination by the Ohio EPA that the report is acceptable, written notice of Ohio EPA's approval of the construction completion report will be provided to the Respondent(s).

#### **3.4.4 Community Relations Support**

The Respondents shall provide support for Ohio EPA's community relations program during remedial action implementation as described in Section 3.3.5.

### **3.5 TASK V: FIVE-YEAR REVIEWS**

At sites where contaminants will remain at levels that will not permit unrestricted use of the site, a review will be conducted no less frequently than once every five years to ensure that the remedy continues to be protective of human health and the environment. This is known as the "five-year review". The Respondent(s) shall complete five-year reviews no less often than every five years after the initiation of the remedial action or until contaminant levels allow for unrestricted use of the site. Further guidance for performing five-year review work tasks may be found in the U.S. EPA OSWER Directive 9355.7-02, Structure and Components of Five-Year Reviews.

The more specific purpose of the reviews is two-fold: (1) to confirm that the remedial action as specified in the Decision Document and as implemented continues to be effective in protecting human health and the environment (e.g., the remedy is operating and functioning as designed, institutional controls are in place and are protective); and (2) to evaluate whether original cleanup levels remain protective of human health and the environment. A further objective is to evaluate the scope of operation and maintenance, the frequency of repairs, changes in monitoring indicators, costs at the site, and how each of these relates to protectiveness.

Fifteen months prior to the due date for completion of a five-year review, the Respondent(s) shall meet with Ohio EPA to discuss the requirements of the five-year review. The review must be completed within five years following the initiation of the remedial action. The scope and level of review will depend on conditions at the site. The scoping effort should include a determination by the Site Coordinator and Respondent(s) as to whether available monitoring data and other documentation will be sufficient to perform the five-year review or whether a field sampling effort will be a necessary component of the review. Within three months of the meeting, the Respondent(s) shall develop and submit a workplan to Ohio EPA that shall describe, at a minimum, the following activities and documentation:

#### **1. Document Review**

- a. Background Information
  1. Decision Document
  2. Decision Document Summary
  3. Administrative or Judicial Order for RD/RA
  4. Completion of Remedial Action Report



- b. Design Review
  - c. Maintenance and Monitoring
    - 1. O&M Manual
    - 2. O&M Reports
    - 3. Groundwater Monitoring Plan
    - 4. Monitoring Data and Information
2. Standards Review
- a. Specific performance standards required by Decision Document
  - b. Changing Standards
    - 1. Laws and Regulations applicable to conditions and activities at the site
  - c. Risk Assessment
    - 1. As summarized in the Decision Document
    - 2. Review for changes in exposure pathways not previously evaluated
3. Interviews
- a. Background Information
    - 1. Previous Staff Management
    - 2. Nearest Neighbors, Respondent(s)
  - b. Local Considerations
    - 1. State Contacts
    - 2. Local Government Contacts
  - c. Operational Problems
    - 1. Plant Superintendent
    - 2. O&M Contractors
4. Site Inspection/Technology Review
- a. Performance and Compliance
    - 1. Visual Inspection
  - b. Offsite Considerations
  - c. Recommendations
5. Report
- a. Background
    - 1. Introduction

2. Remedial Objectives
3. Review of Applicable Laws and Regulations
- b. Site Conditions
  1. Summary of Site Visit
  2. Areas of Noncompliance
- c. Risk Assessment
- d. Recommendations
  1. Technology Recommendations
  2. Statement on Protectiveness
  3. Timing and Scope of Next Review
  4. Implementation Requirements

If sampling and analysis of environmental samples is required under the five-year review, the Respondent(s) are required to prepare and submit with the workplan other supporting plans. Supporting plans may include a Quality Assurance Project Plan, Field Sampling Plan and Health and Safety Plan. The purpose and content of these supporting plans are discussed in Section 4 of this SOW. The Five-Year Review Workplan must be reviewed and approved by the Ohio EPA prior to initiation of field activities or proceeding with the five-year review.

The Five-Year Review Report will be reviewed by the Ohio EPA. If Ohio EPA's review indicates that corrections or amendments to the report are necessary, comments will be provided to the Respondent(s). The Respondent(s) shall submit a revised Five-Year Review Report based on Ohio EPA comments to the Ohio EPA within 30 days of receipt of those comments.

### **3.6 TASK VI: OPERATION AND MAINTENANCE/PERFORMANCE MONITORING**

The Respondents shall implement performance monitoring and operation and maintenance procedures as required by the approved Performance Standard Verification Plan and approved Operation and Monitoring Plan for the RA once it is demonstrated that the RA components are operational and functional.

#### **3.6.1 Reporting During Operation and Maintenance**

##### **3.6.1.1 Operation and Maintenance Sampling and Analysis Data**

Unless otherwise specified in the approved O&M Plan, sampling, analysis, and system performance data for any treatment system or other engineering systems required to be monitored during the O&M Phase shall be submitted by the Respondent(s) to the Ohio EPA on a monthly basis. These monthly submittals will form the basis for the annual progress report described below in Section 3.6.1.2

### **3.6.1.2 Progress Reports During Operation and Maintenance**

The Respondent(s) shall prepare and submit annual progress reports during the operation and maintenance/performance monitoring phase of the RA. When appropriate, the RD/RA Work Plan shall specify progress reports during O & M to be submitted more frequently.

The O&M progress reports shall contain the same information as required for the monthly progress reports for the RD and RA construction phases, as specified in Section 3.6.1 of this SOW. It shall also include an evaluation of the effectiveness of any treatment and engineering systems in meeting the cleanup standards, performance standards and other goals of the RA as defined in the Orders, this SOW, the RD/RA Work Plan and the approved Final Design.

### **3.6.2 Completion of Remedial Action Report**

At the completion of the remedial action, the Respondent(s) shall submit a Completion of Remedial Action Report to the Ohio EPA. The RA shall be considered complete when the all of the goals, performance standards and cleanup standards for the RA as stated in the Decision Document, this SOW, and the approved Final Design (including changes approved during construction) have been met. The report shall document that the project is consistent with the design specifications, and that the RA was performed to meet or exceed all required goals, cleanup standards and performance standards. The report shall include, but not be limited to the following elements:

- 1) Synopsis of the remedial action and certification of the design and construction;
- 2) Listing of the cleanup and performance standards as established in the Decision Document and the Orders, any amendments to those standards with an explanation for adopting the amendments;
- 3) Summary and explanation of any changes to the approved plans and specifications. An explanation of why the changes were necessary should be included and ,where necessary, Ohio EPA approval of the changes should be documented.
- 4) Summary of operation of treatment systems including monitoring data, indicating that the remedial action met or exceeded the performance standards or cleanup criteria;
- 5) Explanation of any monitoring and maintenance activities to be undertaken at the site in the future as outlined in Section 3.0 of this RD/RA SOW.

## **3.7 TASK VII: REPORTING REQUIREMENTS**

The Respondent(s) shall prepare and submit work plans, design plans, specifications, and reports as set forth in Tasks I through V of this SOW to document the design, construction, operation, maintenance, and performance monitoring of the remedial action. Monthly progress reports shall be prepared, as described below, to enable the Ohio EPA to track project progress.

### 3.7.1 Monthly Progress Reports during RD and RA Construction

The Respondent(s) shall at a minimum provide the Ohio EPA with monthly progress reports during the design and construction phases of the remedial action containing the information listed below. When appropriate, the RD/RA Work Plan shall specify progress reports to be submitted more frequently.

- 1) A description of the work performed during the reporting period and estimate of the percentage of the RD/RA completed
- 2) Summaries of all findings and sampling during the reporting period
- 3) Summaries of all changes made in the RD/RA during the reporting period, indicating consultation with Ohio EPA and approval by the Ohio EPA of those changes, when necessary
- 4) Summaries of all contacts with representatives of the local community, public interest groups or government agencies during the reporting period
- 5) Summaries of all problems or potential problems encountered during the reporting period, including those which delay or threaten to delay completion of project milestones with respect to the approved work plan schedule or RAIP schedule
- 6) Summaries of actions taken and being taken to rectify problems
- 7) Summaries of actions taken to achieve and maintain cleanup standards and performance standards
- 8) Changes in personnel during the reporting period
- 9) Projected work for the next reporting period
- 10) Copies of daily reports, inspection reports, sampling data, laboratory/monitoring data, etc.

### 3.7.2 Summary of Reports and Submittals

A summary of the information reporting requirements contained in this RD/RA SOW is presented below:

- **Draft RD/RA Work Plan**  
(Health and Safety Plan)  
(Regulatory Compliance Plan)
- **Final RD/RA Work Plan**  
(Health and Safety Plan)

- (Regulatory Compliance Plan)
- **Draft Pre-Design Studies Plan**  
(QAPP)  
(FSP)
- **Final Pre-Design Studies Plan**  
(QAPP)  
(FSP)
- **Pre-Design Studies Reports (Draft)**
- **Preliminary Design Documents**  
(Pre-Design Studies Reports - Final)
- **Intermediate Design Documents**  
(Draft CQAP)  
(Draft PSVP)  
(Draft O & M Plan)  
(Health and Safety Plan)
- **Prefinal Design Documents**  
(CQAP)  
(PSVP)  
(O & M Plan)  
(Draft RAIP)  
(Health and Safety Plan)
- **Final Design Documents**  
(CQAP)  
(PSVP)  
(O & M Plan)  
(Draft RAIP)  
(Health and Safety Plan)
- **Preconstruction Inspection and Conference Report**
- **Monthly Progress Reports During FD/RA**
- **Notification of Preliminary Completion of Construction**
- **Final O & M Plan**
- **Prefinal Inspection Report**
- **Notification for Final Inspection**

- Construction Completion Report
- O & M Sampling Data
- Progress Reports during O&M/Performance Monitoring period
- Completion of Remedial Action Report
- Five-Year Review Workplan
- Five-Year Review Report

#### 4.0 CONTENT OF SUPPORTING PLANS

The documents listed in this section shall be prepared and submitted as outlined in Section 3.0 of this SOW to support the activities necessary to design and fully implement the RA. These supporting documents include a Quality Assurance Project Plan (QAPP), a Field Sampling Plan (FSP), a Health and Safety Plan (HSP), a Construction Quality Assurance Plan (CQAP) and a Performance Standard Verification Plan (PSVP). The following sections describe the required contents of each of these supporting documents.

#### 4.1 QUALITY ASSURANCE PROJECT PLAN

The Respondent(s) shall prepare a site-specific Quality Assurance Project Plan (QAPP) to cover sample analysis and data handling based on guidance provided by the Ohio EPA. Refer to the list of Ohio EPA and U.S. EPA guidance documents in Exhibit A attached to this SOW. A QAPP shall be developed for any sampling and analysis activities to be conducted as pre-design studies and submitted with the Pre-Design Studies Plan for Ohio EPA review and approval.

During the remedial design phase the Respondent(s) shall review all remedial design information and modify or amend the QAPP developed for the Pre-Design Studies Plan, as necessary, to address the sampling and analysis activities to be conducted during implementation of the Remedial Action, including activities covered by the PSVP and O&M Plan. An amended QAPP shall be submitted with the Intermediate Design documents for review and comment by Ohio EPA. A final Quality Assurance Project Plan, which incorporates comments made by the Ohio EPA, shall be submitted for approval with the Final Design documents. Upon agreement of the Site Coordinator, the Respondent(s) may submit only the amended portions of the QAPP developed for the PDSP with the Intermediate, Pre-Final and Final Design documents.

The Respondent(s) shall schedule and attend a pre-QAPP meeting with representatives of Ohio EPA to discuss the scope and format of the QAPP. For sites where the Site Coordinator and Project Manager agree that a pre-QAPP meeting is not needed, this meeting may be omitted. The QAPP shall, at a minimum, include



1. Data Collection Strategy

The strategy section of the QAPP shall include but not be limited to the following:

- a. Description of the types and intended uses for the data, relevance to remediation or restoration goals, and the necessary level of precision, accuracy, and statistical validity for these intended uses;
- b. Description of methods and procedures to be used to assess the precision, accuracy and completeness of the measurement data;
- c. Description of the rationale used to assure that the data accurately and precisely represent a characteristic of a population, variation of physical or chemical parameters throughout the Site, a process condition or an environmental condition. Factors which shall be considered and discussed include, but are not limited to:
  - i) Environmental conditions at the time of sampling;
  - ii) Sampling design (including number, location and distribution);
  - iii) Representativeness of selected media, exposure pathways, or receptors; and
  - iv) Representativeness of selected analytical parameters.
  - v) Representativeness of testing procedures and conditions; and
  - vi) Independence of background or baseline from site influences.
- d. Description of the measures to be taken to assure that the following data sets can be compared quantitatively or qualitatively to each other:
  - i) RD/RA data collected by the Respondent over some time period;
  - ii) RD/RA data generated by an outside laboratory or consultant employed by the Respondent versus data collected by the Respondent, and;
  - iii) Data generated by separate consultants or laboratories over some time period not necessarily related to the RD/RA effort.
  - iv) Data generated by Ohio EPA or by an outside laboratory or consultant employed by Ohio EPA;
- e. Details relating to the schedule and information to be provided in quality

assurance reports. These reports should include but not be limited to:

- i) Periodic assessment of measurement data accuracy, precision and completeness;
- ii) Results of performance audits;
- iii) Results of system audits;
- iv) Significant quality assurance problems and recommended solutions; and
- v) Resolutions of previously stated problems.

## 2. Sample Analysis

The Sample Analysis section of the Quality Assurance Project Plan shall specify the following:

- a. Chain-of-custody procedures, including:
  - i) Identification of a responsible party to act as sample custodian at the laboratory facility authorized to sign for incoming field samples, obtain documents of shipment and verify the data entered onto the sample custody records;
  - ii) Provision for a laboratory sample custody log consisting of serially numbered lab-tracking report sheets; and
  - iii) Specification of laboratory sample custody procedures for sample handling, storage and dispersment for analysis.
- b. Sample storage procedures and storage times;
- c. Sample preparation methods;
- d. Analytical procedures, including:
  - i) Scope and application of the procedure;
  - ii) Sample matrix;
  - iii) Potential interferences;
  - iv) Precision and accuracy of the methodology;
  - v) Method detection limits;

- vi) Special analytical services required to ensure contract required detection limits do not exceed known toxicity criteria; and
  - vii) Verification and reporting of tentatively identified compounds.
- e. Calibration procedures and frequency;
- f. Data reduction, validation and reporting;
- g. Internal quality control checks, laboratory performance and systems audits and frequency, including:
  - i) Method blank(s);
  - ii) Laboratory control sample(s);
  - iii) Calibration check sample(s);
  - iv) Replicate sample(s);
  - v) Matrix-spiked sample(s);
  - vi) "Blind" quality control sample(s);
  - vii) Control charts;
  - viii) Surrogate samples;
  - ix) Zero and span gases; and
  - x) Reagent quality control checks.
- h. Preventative maintenance procedures and schedules;
- i. Corrective action (for laboratory problems); and
- j. Turnaround time.

### 3. Modeling

The Modeling section of the Quality Assurance Project Plan shall apply to all models used to predict or describe fate, transport or transformation of contaminants in the environment and shall discuss:

- a. Model assumptions and operating conditions;

- b. Input parameters; and
- c. Verification and calibration procedures.

4. In Situ or Laboratory Toxicity Tests

The Toxicity Test section of the Quality Assurance Project Plan shall apply to all tests or bioassays used to predict or describe impacts of contaminants on a population, community, or ecosystem level.

5. Data Record

The QAPP shall also provide the format to be used to present the raw data and the conclusions of the investigation, as described in a, b, and c below:

- a. The data record shall include the following:
  - i) Unique sample or field measurement code;
  - ii) Sampling or field measurement location and sample or measurement type;
  - iii) Sampling or field measurement raw data;
  - iv) Laboratory analysis ID number;
  - v) Property or component measured; and
  - vi) Result of analysis (e.g., concentration).
- b. Tabular Displays

The following data shall be presented in tabular displays:

- i) Unsorted (raw) data;
- ii) Results for each medium, organism, or for each constituent measured;
- iii) Data reduction for statistical analysis;
- iv) Sorting of data by potential stratification factors (e.g., location, soil layer, topography, vegetation form);
- v) Summary data (i.e., mean, standard deviation, min/max values, and sample number), and

- vi) Comparisons with background or reference data.

c. Graphical Displays

The following data shall be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three dimensional graphs, etc.):

- I) Display sampling locations and sampling grid;
- ii) Indicate boundaries of sampling area, and areas where more data are required;
- iii) Display levels of contamination at each sampling location or location from which organism was taken;
- iv) Display geographical extent of contamination;
- v) Display contamination levels, averages and maxima;
- vi) Illustrate changes in concentration in relation to distance from the source, time, depth or other parameters;
- vii) Indicate features affecting intramedia transport and show potential receptors;
- viii. Compare nature and extent of contamination with results of ecological or biological sampling or measurements; and
- ix) Display comparisons with background or reference analyses or measurements.

## 4.2 FIELD SAMPLING PLAN

### 1. Sampling

The Sampling section of the Field Sampling Plan shall discuss:

- a. Sufficient preliminary sampling to ensure the proper planning of items b. through o. below;
- b. Selecting appropriate sampling locations, depths, vegetation strata, organism age, etc. and documenting relevance of sample for intended

biological toxicity tests or analyses;

- c. Providing a sufficient number of samples to meet statistical or other data useability objectives;
- d. Measuring all necessary ancillary data such as ambient conditions, baseline monitoring, etc.;
- e. Determining environmental conditions under which sampling should be conducted;
- f. Determining which media, pathways, or receptors are to be sampled (e.g., ground water, air, soil, sediment, biota, etc.);
- g. Determining which parameters are to be measured and where;
- h. Selecting the frequency and length of sampling period;
- i. Selecting the sample design (e.g., composites, grabs, random, repeated, etc.);
- j. Selecting the number, location, media or organisms for determining background conditions or reference conditions (refer to Appendix B, Background Sampling Guidance, of Ohio EPA's How Clean Is Clean Policy);
- k. Measures to be taken to prevent contamination of the sampling equipment and cross contamination between sampling points;
- l. Documenting field sampling operations and procedures, including;
  - i) Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample (e.g., filters and adsorbing reagents);
  - ii) Procedures and forms for recording the exact location and specific considerations associated with sample acquisition;
  - iii) Documentation of specific sample preservation method;
  - iv) Calibration of field devices;
  - v) Collection of replicate and field duplicate samples;
  - vi) Submission of field-biased and equipment blanks, where appropriate;



- vii) Potential interferences present at the site or facility;
- viii) Construction materials and techniques associated with monitoring wells and piezometers;
- ix) Field equipment listing and sample containers;
- x) Sampling order; and
- xi) Decontamination procedures.
- m. Selecting appropriate sample containers;
- n. Sample preservation; and
- o. Chain-of-custody, including:
  - i) Standardized field tracking reporting forms to establish sample custody in the field prior to and during shipment;
  - ii) Sample sealing, storing and shipping procedures to protect the integrity of the sample; and,
  - iii) Pre-prepared sample labels containing all information necessary for effective sample tracking.

## 2. Field Measurements

The Field Measurements section of the Field Sampling Plan shall discuss:

- a. Selecting appropriate field measurement locations, depths, organism age etc.;
- b. Providing a sufficient number of field measurements that meet statistical or data useability objectives;
- c. Measuring all necessary ancillary data such as ambient or baseline environmental conditions;
- d. Determining conditions under which field measurement should be conducted;
- e. Determining which media, pathways, or receptors are to be addressed by appropriate field measurements (e.g., ground water, air, soil, sediment, biota, etc.);
- f. Determining which physical, chemical, or biological parameters are to

be measured and where;

- g. Selecting the frequency and duration of field measurement; and
- h. Documenting field measurement operations and procedures, including:
  - I) Procedures and forms for recording raw data and the exact location, time and Site specific considerations associated with the data acquisition;
  - ii) Calibration of field devices;
  - iii) Collection of replicate measurements;
  - iv) Submission of field-biased blanks, where appropriate;
  - v) Potential interferences present at the Site;
  - vi) Construction materials and techniques associated with monitoring wells and piezometers used to collect field data;
  - vii) Field equipment listing;
  - viii) Order in which field measurements were made; and
  - ix) Decontamination procedures; and
- I. Selecting the number, location, media, and organisms for determining background or reference conditions.

#### 4.3 SITE HEALTH AND SAFETY PLAN

The Respondent(s) shall submit a Health and Safety Plan (HSP) to the Ohio EPA with the RD/RA Work Plan for any on-site activities taking place during the design phase. The Respondent(s) shall review the remedial design information and modify the HSP developed for the RD/RA Work Plan, as necessary, to address the activities to be conducted on the site during implementation of the Remedial Action. It shall be designed to protect on-site personnel and area residents from physical, chemical and other hazards posed by the construction, operation and maintenance activities of the Remedial Action.

The Respondent(s) shall prepare a site HSP which is designed to protect on-site personnel and area residents from physical, chemical and all other hazards posed by RD/RA activities. The HSP shall address the following topics:

- I Major elements of the Health and Safety Plan shall include

- a. Facility or site description including availability of resources such as roads, water supply, electricity and telephone service;
- b. Description of the known hazards and an evaluation of the risks associated with the incident and with each activity conducted;
- c. Listing of key personnel (including the site safety and health officer) and alternates responsible for site safety, response operations, and for protection of public health;
- d. Delineation of work area, including a map;
- e. Description of levels of protection to be worn by personnel in the work area;
- f. Description of the medical monitoring program for on-site responders;
- g. Description of standard operating procedures established to assure the proper use and maintenance of personal protective equipment;
- h. The establishment of procedures to control site access;
- i. Description of decontamination procedures for personnel and equipment;
- j. Establishment of site emergency procedures;
- k. Availability of emergency medical care for injuries and toxicological problems;
- l. Description of requirements for an environmental monitoring program. (This should include a description of the frequency and type of air and personnel monitoring, environmental sampling techniques and a description of the calibration and maintenance of the instrumentation used.);
- m. Specification of any routine and special training required for responders; and
- n. Establishment of procedures for protecting workers from weather-related problems.

2. The Health and Safety Plan shall be consistent with:

- a. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985),

- b. CERCLA Sections 104(f) and 111(c)(6)
- c. EPA Order 1440.3 -- Respiratory Protection;
- d. EPA Order 1440.2 -- Health and Safety Requirements for Employees Engaged in Field Activities;
- e. EPA Occupational Health and Safety Manual;
- f. EPA Interim Standard Operating Safety Procedures and other EPA guidance as developed by EPA;
- g. OSHA regulations particularly in 29 CFR 1910 and 1926;
- h. State and local regulations; and
- I. Site or facility conditions.

#### **4.4 CONSTRUCTION QUALITY ASSURANCE PLAN**

The Respondent(s) shall develop a Construction Quality Assurance Plan (CQAP) based on the plans and specifications and performance standards for the RA. The CQAP is a site specific document that shall specify procedures to ensure that the completed remedial action work meets or exceeds all design criteria and specifications. A draft CQAP shall be submitted with the Intermediate Design submittal for review and comment by the Ohio EPA. Subsequent drafts shall be submitted with the Prefinal and Final Design submittals that incorporate comments made by the Ohio EPA. Certain aspects of the CQAP, for example personnel names and qualifications, may not be known at the time of design approval. A complete and final CQAP shall be submitted to Ohio EPA for approval prior to the start of construction. At a minimum, the CQAP shall address the elements listed below.

##### **4.4.1 Responsibility and Authority**

The responsibility and authority of all organizations (i.e. technical consultants, construction firms, etc.) and key personnel involved in the construction of the remedial action(s) shall be described fully in the CQAP. The Respondent(s) shall provide a copy of the approved CQAP to each organization with responsibility and authority for implementing the CQAP. The Respondent(s) shall also identify a CQA officer and the necessary supporting inspection staff.

##### **4.4.2 Construction Quality Assurance Personnel Qualifications**

The qualifications of the Construction Quality Assurance officer and supporting inspection personnel shall be presented in the CQAP to demonstrate that they possess the training and experience necessary to fulfill their identified responsibilities.

#### **4.4.3 Inspection Activities**

The observations and tests that will be used to monitor the construction and/or installation of the components of the remedial action shall be described in the CQAP. The plan shall include scope and frequency of each type of inspection. Inspections shall verify compliance with the design, applicable requirements of state and federal law and performance standards. Inspections shall also ensure compliance with all health and safety standards and procedures. The CQAP shall include provisions for conducting the preconstruction, prefinal and final inspections and associated meetings as described in Section 5.4 of this SOW.

#### **4.4.4 Sampling Requirements**

The sampling activities necessary to ensure that the design specifications and performance standards are achieved shall be presented in the CQAP. The description of these activities shall include sample sizes, sample locations, frequency of sampling, testing to be performed, acceptance and rejection criteria, and plans for correcting problems as addressed in the design specifications.

#### **4.4.5 Documentation**

Reporting requirements for CQA activities shall be described in detail in the CQAP. This shall include such items as daily summary reports, meeting reports, inspection data sheets, problem identification and corrective measures reports, design acceptance reports and final documentation. Provisions for the storage of all records shall be presented in the CQAP.

### **4.5 PERFORMANCE STANDARD VERIFICATION PLAN**

A Performance Standard Verification Plan shall be prepared to consolidate information for required testing, sampling and analyses to ensure that both short-term and long-term performance standards for the RA are met. Performance standards may include clean-up standards for contaminated environmental media as well as the measurement of the effectiveness of engineering controls or other controls used to control migration of or exposure to contaminants. For example, the containment of a plume of contaminated ground water by pumping wells would be a performance standard requiring verification. The PSVP should describe the measurements to be taken, such as water levels in monitoring wells and piezometers, along with any analyses to be conducted on the data obtained, such as ground water modeling, to verify that the plume is contained. The PSVP shall include a FSP and a QAPP for any sampling and analyses to be conducted.

The Draft PSVP shall be submitted with the Intermediate Design for review and comment by the Ohio EPA. The final PSVP, which fully addresses comments made by the Ohio EPA must be submitted with and approved as part of the Final Design.

## 4.6

## OPERATION AND MAINTENANCE PLAN

The Respondent(s) shall prepare an Operation and Maintenance Plan (O&M Plan) to cover long term operation and maintenance of the RA. Operation and maintenance for all components of the remedial action, shall begin after it is demonstrated that those components are operational and functional. The plan, at a minimum, shall be composed of the elements listed below.

1. Normal Operation and Maintenance
    - a. Description of tasks for operation
    - b. Description of tasks for maintenance
    - c. Description of prescribed treatment or operating conditions
    - d. Schedules showing the frequency of each O&M task
  2. Potential Operating Problems
    - a. Description and analysis of potential operating problems
    - b. Sources of information regarding potential operating problems
    - c. Description of means of detecting problems in the operating systems
    - d. Common remedies for operating problems
  3. Routine Monitoring and Laboratory Testing
    - a. Description of monitoring tasks
    - b. Description of required laboratory tests and interpretation of test results
    - c. Required QA/QC procedures to be followed
    - d. Schedule of monitoring frequency and provisions to discontinue, if appropriate
- Note: Information on monitoring and testing that is presented in the PSVP should be referenced, as appropriate, but should not be duplicated in the O&M Plan.
4. Alternative O&M
    - a. Description of alternate procedures to prevent undue hazard, should systems fail
    - b. Analysis of the vulnerability and additional resources requirements should a failure occur
  5. Safety Plan
    - a. Description of safety procedures, necessary equipment, etc. for site personnel
    - b. Description of safety tasks required in the event of systems failure (may be linked to the Site Safety Plan developed for the RD/RA)
  6. Equipment
    - a. Description of equipment necessary to the O&M Plan
    - b. Description of installation of monitoring components
    - c. Description of maintenance of site equipment
    - d. Replacement schedule for equipment and installed components
  7. Annual O&M Budget



- a. Costs for personnel
  - b. Costs for preventative and corrective maintenance
  - c. Costs of equipment and supplies, etc.
  - d. Costs of any contractual obligations (e.g., lab expenses)
  - e. Costs of operation (e.g., energy, other utilities, etc.)
8. Records and Reporting Mechanisms Required
- a. Daily operating logs
  - b. Laboratory records
  - c. Records for operating costs
  - d. Mechanism for reporting emergencies
  - e. Personnel and maintenance records
  - f. Monthly/semi-annual reports to Ohio EPA

The Respondent(s) shall submit a draft O&M Plan to the Ohio EPA for review and comment with the Intermediate Design submittal. Subsequent drafts of the O&M Plan shall be submitted with the Prefinal and Final Design submittals, which reflect the refined plans and specifications of those submittals and any comments made by the Ohio EPA. The final O&M Plan shall be submitted by the Respondent(s) prior to or at the completion of construction of the remedial action and shall incorporate any modifications or corrections required by the Ohio EPA.

## EXHIBIT A

### OHIO EPA AND U.S. EPA GUIDANCE DOCUMENTS FOR REMEDIAL DESIGN / REMEDIAL ACTION

1. How Clean Is Clean, Final, Ohio EPA, Division of Emergency and Remedial Response, Policy No. DERR-00-RR-009, July 26, 1991
2. Background Guidance, Final, Ohio EPA, Division of Emergency and Remedial Response, July 26, 1991
3. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, OSWER 9355.3-01, EPA/540/G-89/004, October 1988
4. Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring Programs, Ohio EPA, Division of Drinking and Ground Waters, Final, February 1995
5. Guidance for Remedial Actions for Contaminated Ground Water at Superfund Sites, OSWER Directive 9283.1-2, EPA/540/G-88/003, December 1988, Interim Final
6. Data Quality Objectives for Remedial Response Activities, Volume I - Example Scenario, OSWER Directive 9355.0-7B, EPA/540/G-87/004, March 1987
7. Superfund Remedial Design and Remedial Action Guidance, OSWER 9355.0-4A, June 1986
8. Guidelines and Specifications for Preparing Quality Assurance Project Plans, Ohio EPA, Division of Emergency and Remedial Response, Policy No. DERR-00-RR-008, March 1990
9. CERCLA Compliance With Other Laws Manual - Part I, OSWER Directive 9234.1-01, EPA/540/G-89/006, August 1989, Interim Final
10. CERCLA Compliance With Other Laws Manual - Part II, OSWER Directive 9234.1-02, EPA/540/G-89/009, August 1989, Interim Final
11. U.S. EPA Integrated Risk Information System (IRIS) Data Base
12. U.S. EPA Health Effects Assessment Summary Tables, Office of Emergency & Remedial Response, published annually
13. Guide for Conducting Treatability Studies Under CERCLA, EPA/540/2-89/058,

December 1989, Interim Final

14. Final Covers for Hazardous Waste Landfills and Surface Impoundments, EPA/530/SW-89/047, July 1989
15. Requirements for Hazardous Waste Landfill Design, Construction, and Closure, EPA/625/4-89/022, August 1989
16. Technical Guidance Document: Construction Quality Assurance for Hazardous Waste Land Disposal Facilities, EPA/530/SW-86/031, October 1986
17. Technical Guidance Document: Inspection Techniques for the Fabrication of Geomembrane Field Seams, EPA/530/SW-91/051, May 1991
18. Technical Guidance for Corrective Measures - Subsurface Gas, EPA/530/SW-88/023, March 1985
19. Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities, EPA/600/R-93/182, September 1993
20. Structure and Components of Five-Year Reviews, OSWER Directive 9355.7-02, May 1991

## Appendix B

### OHIO EPA AND U.S. EPA GUIDANCE DOCUMENTS

#### Statement of Purpose and Use of This Guidance Document List:

The purpose of this list of Ohio EPA and U.S. EPA policies, directives and guidance documents is to provide a reference of the documents which provide essential direction and guidance for conducting investigations, evaluating alternative remedial actions, and designing and implementing selected remedial actions at sites for which the Division of Emergency and Remedial Response has authority over such activities. Certain sites may have contaminants or conditions which are not fully addressed by the documents in this list. There is an evolving body of policy directives, guidance and research documentation which should be utilized, as necessary, to address those conditions and contaminants not encompassed by the documents in this list. For sites where activities are conducted in response to an administrative or judicial order, this list would be an attachment to the order and would govern the work conducted pursuant to it. When entering into or issuing an order for a particular site, Ohio EPA reserves the right to modify this list to fully address the site conditions.

#### OHIO EPA POLICIES AND GUIDANCE DOCUMENTS

1. Background Sampling Guidance, Final, Ohio EPA, Division of Emergency and Remedial Response, July 26, 1991
2. Best Available Treatment Technologies (BATT) for Remedial Response Program Sites, Ohio EPA Policy No. DERR-00-RR-016, Final, October 23, 1992
3. Guidelines and Specifications for Preparing Quality Assurance Project Plans, Ohio EPA, Division of Emergency and Remedial Response, Policy No. DERR-00-RR-008, March 1990
4. How Clean is Clean, Final, Ohio EPA, Division of Emergency and Remedial Response, Policy No. DERR-00-RR-009, July 26, 1991
5. Procedures for Evaluation of Response Action Alternatives and Remedy Selection for Remedial Response Program Sites, Ohio EPA Policy No. DERR-00-RR-019, Final, October 23, 1992
6. Technical Guidance Manual for Hydrogeologic Investigations and Ground Water

Monitoring Programs, Ohio EPA, Division of Drinking and Ground Waters, Final, February 1995

7. Wastewater Discharges Resulting from Clean-Up of Response Action Sites Contaminated with Volatile Organic Compounds, Ohio EPA Policy No. DSW-DERR 0100.027, Final, September 22, 1994

Also, if there are any aquatic ecological concerns for the site under investigation please consult the following Biological Criteria documents:

- 8a. Biological Criteria for the Protection of Aquatic Life: Volume I. The Role of Biological Data in Water Quality Assessment. Ohio EPA, Division of Surface Water, 1987
- 8b. Biological Criteria for the Protection of Aquatic Life: Volume II. Users Manual for Biological Field Assessment of Ohio Surface Waters. Ohio EPA, Division of Surface Water, 1987
- 8c. Addendum to Biological Criteria for the Protection of Aquatic Life: Volume II. Users Manual for Biological Field Assessment of Ohio Surface Waters. Ohio EPA, Division of Surface Water, 1989
- 8d. Biological Criteria for the Protection of Aquatic Life: Volume III. Standardized Biological Field Assessment of Ohio Surface Waters. Ohio EPA, Division of Surface Water, 1989
- 8e. Rankin, E.T. 1989. The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application. Ohio EPA, Division of Surface Water, 1990

#### U.S. EPA GUIDANCE DOCUMENTS AND OTHER USEFUL GUIDANCE

9. CERCLA Compliance with Other Laws Manual - Part I, OSWER Directive 9234.1-01, EPA/540/G-89/006, August 1988, interim final
10. CERCLA Compliance with Other Laws Manual - Part II, OSWER 9234.1-01, EPA/540/G-89/006, August 1988, interim final
10. A Compendium of Technologies Used in the Treatment of Hazardous Wastes, EPA/625/8-87/014, September 1987

12. A Rationale for the Assessment of Errors in the Sampling of Soils, EPA/600/4-90/013, July 1990
13. Assessment of Technologies for the Remediation of Radioactively Contaminated Superfund Sites, EPA/540/2-90/001, January 1990
14. Closure of Hazardous Waste Surface Impoundments, SW-873, September 1980
15. Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites, OSWER Directive 9355.3-11, EPA/540/P-91/001, February 1991
16. Data Quality Objectives Process for Superfund, Interim Final Guidance, OSWER Directive 9355.9-01, EPA/540-R-93-071, September 1993
17. Ecological Assessments of Hazardous Wastes Sites: A Field and Laboratory Reference, EPA/600/3-89/013, March 1989
18. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments
19. Exposure Factors Handbook, EPA/600/8-89/043, March 1990
- 20.\* Guidance for Remedial Actions for Contaminated Ground Water at Superfund Sites, OSWER Directive 9283.1-2, EPA/540/G-88/003, December 1988, interim final
21. Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA, Interim Final, OSWER 9355.3-01, EPA/540/G-89/004, October 1988
- 22.\* Guidance on Remedial Actions for Superfund Sites with PCB Contamination, OSWER Directive 9355.4-01, EPA/540/G-90/007, August 1990
23. Guidance Document on the Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities, EPA, 1989
24. Guidance on Applying the Data Quality Objectives Process for Ambient Air Monitoring Around Superfund Sites (Stages 1 & 2), EPA/540/4-89/015, August 1989
25. Guidance for Data Usability in Risk Assessment, OSWER Directive 9285.7-05,



- EPA/540/G-90/008, October 1990, interim final
- 26.\* Guide for Decontaminating Buildings, Structures, and Equipment at Superfund Sites, EPA/600/2-85/028, March 1985
  27. Guide for Conducting Treatability Studies Under CERCLA: Soil Vapor Extraction, EPA/540/2-91/019A, September 1991, interim guidance
  28. Guide for Conducting Treatability Studies Under CERCLA: Aerobic Biodegradation Remedy Screening, EPA/540/2-91/013A, July 1991, interim guidance
  29. Guide for Conducting Treatability Studies Under CERCLA, EPA/540/2-89/058, December 1989, interim final
  30. Handbook - Permit Writer's Guide to Test Burn Data - Hazardous Waste Incineration, EPA/625/6-86/012, September 1986
  - 31.\* Handbook - Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration, EPA/625/6-89/023, January 1990
  32. Handbook - Dust Control at Hazardous Waste Sites, EPA/540/2-85/003, November 1985
  - 33.\* Handbook - Guidance on Setting Permit Conditions and Reporting Trial Burn Results - Volume II of the Hazardous Waste Incineration Guidance Series, EPA/625/6-89/019, January 1989
  34. Handbook on In Situ Treatment of Hazardous Waste-Contaminated Soils, EPA/540/2-90/002, January 1990,
  35. Handbook for Stabilization/Solidification of Hazardous Wastes, EPA/540/2-86/001, June 1986
  36. Handbook - Hazardous Waste Incineration Measurement Guidance Manual - Volume III of the Hazardous Waste Incineration Guidance Series, EPA/625/6-89/021, June 1989
  37. Leachate Plume Management, EPA/540/2-85/004, November 1985
  38. Preparation Aids for the Development of Category 1 Quality Assurance Project Plans,

EPA/6008-91-003, February 1991

39. Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures, Interim Final, EPA/540/G-90/004, April 1989
40. RCRA Ground Water Monitoring Technical Enforcement Guidance Document (TEGD), OSWER Directive 9950.1, September 1986
41. Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002, December 1989
42. Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part B), "Development of Risk-based Preliminary Remediation Goals," OSWER Directive 9285.7-01B, December 1991, Interim
43. Risk Assessment Guidance for Superfund: Volume II - Environmental Evaluation Manual, OSWER Directive 9285.7-01, EPA/540/1-89/001A, March 1989, interim final
44. Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," OSWER Directive 9285.6-03, March 1991, interim final
45. Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part C), "Risk Evaluation of Remedial Alternatives," OSWER Directive 9285.7-01C, December 1991, Interim
- 46.\* Seminar Publication - Requirements for Hazardous Waste Landfill Design, Construction, and Closure, EPA/625/4-89/022, August 1989
47. SW 846, Test Methods for Evaluating Solid Waste, 3rd Edition and appropriate updates, November 1986.
48. Stabilization/Solidification of CERCLA and RCRA Wastes - Physical Tests, Chemical Testing Procedures, Technology Screening and Field Activities, EPA/625/6-89/022, May 1989
49. Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 18th Edition, 1992

- 50.\* Superfund Remedial Design and Remedial Action Guidance, OSWER 9355.0-4A, June 1986
- 51. Superfund Exposure Assessment Manual, OSWER Directive 9285.5-1, EPA/540/1-88/001, April 1988
- 52. Superfund Ground Water Issue: Ground Water Sampling for Metals, EPA/540/4-89/001, March 1989
- 53.\* Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments, EPA/530-SW-89-047, July 1989
- 54.\* Technical Guidance Document: Inspection Techniques for the Fabrication of Geomembrane Field Seams, EPA/530/SW-91/051, May 1991
- 55. Technical Guidance for Corrective Measures - Subsurface Gas, EPA/530-SW-88-023, March 1985
- 56. Technical Guidance Document: Construction Quality Assurance and Quality Control for Waste Containment Facilities, EPA/600/R-93/182, September 1993
- 57. U.S. EPA Integrated Risk Information System (IRIS) Data Base
- 58. U.S. EPA Health Effects Assessment Summary Tables, Office of Emergency & Remedial Response, published annually
- 59. U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA-540/R-94-013, February 1994
- 60. U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA-540/R-94-012, February 1994

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Notes:

- 1) Documents and guidances denoted by an asterisk (\*) are those which may be important to the Remedial Design/Remedial Action phase of a project but generally will have limited relevance to the Remedial Investigation/Feasibility Study process.

- 2) This list of guidance documents is updated periodically. You should check with Ohio EPA to verify that this list is the most current available.

# Appendix C

to be  
added later

## APPENDIX D

### LIST OF MONITORING REQUIREMENTS FOR WETLAND MITIGATION

1. The Wetlands Workplan shall include the following parameters to be sampled during the growing season:
  - a. Soils data: soil probes or test pits to initially delineate hydric soils;
  - b. Vegetative sampling including the following:
    - i. percent vegetative cover by community type; percent unvegetated; percent open water;
    - ii. number of communities and dominant species;
  - c. Hydrology testing: water level readings at selected locations within the mitigation site; and
  - d. Any other parameters specified in the Wetlands Workplan.
2. Nothing in this Appendix D precludes additional monitoring or other requirements in the Wetlands Workplan.



## APPENDIX E

### FINANCIAL ASSURANCE - ANNUITY/TRUST OPTION

This Appendix describes the use of annuities and trusts as an option to provide financial assurance for Operation and Maintenance (O & M) at the Site for one thousand (1000) years. This annuity/trust option for financial assurance has two parts:

1. For financial assurance for years one to one hundred (1 - 100), Defendants shall establish a trust in accordance with OAC Rule 3745-66-45 (or alternative trust language approved by Ohio EPA) and an annuity approved by Ohio EPA. The initial schedule of cash outlays from the annuity to the trust shall be no less than the amounts set forth in Exhibit 1 to this Appendix E and shall begin January 1, 1998. The beneficiary or annuitant of the annuity will be the trust.
2. For financial assurance for years one hundred to one thousand (100 - 1000), Defendants shall establish a Perpetual Care Trust in accordance with OAC Rule 3745-66-45 (or with alternative trust language approved by Ohio EPA). The initial trust amount shall be \$113,331.00. All proceeds from the trust shall be reinvested into the trust during years one to one hundred (1 to 100).

Shieldalloy Metallurgical Corp.

Cash Flow Schedule for Long Term Operation and Maintenance Costs for Slag Piles at Cambridge Site\*

Year	Source															
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16
Discount Rate	8.00% (PTI)															
Reference Rate	5.69% 10 Average GDP Outlook															
1st Year Annual Inspection Cost	\$18,700 (PTI) - 1st 30 years only															
14th Year Annual Inspection Cost	\$1,300 (PTI) - Begins 31st year															
Every 5th Year Annual Inspection Cost	\$5,000 (PTI) - Begins 31st year															
16 Year Annual Topsoil Maintenance	\$27,000 (PTI) - Begins year 1															
Cash Outlay Quarterly Inspections (20 yrs.)	\$22,475	\$23,235	\$24,000	\$24,847	\$25,691	\$26,545	\$27,405	\$28,272	\$29,145	\$30,025	\$30,910	\$31,800	\$32,695	\$33,595	\$34,500	\$35,412
Cash Outlay Annual Inspections (1000 yrs.)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Cash Outlay Annual Topsoil Maintenance (1000 yrs.)	\$32,451	\$33,554	\$34,675	\$35,815	\$36,974	\$38,150	\$39,342	\$40,550	\$41,775	\$43,016	\$44,274	\$45,548	\$46,838	\$48,144	\$49,466	\$50,804
Total	\$54,926	\$56,789	\$58,675	\$60,662	\$62,665	\$64,695	\$66,747	\$68,817	\$70,905	\$73,011	\$75,135	\$77,275	\$79,430	\$81,604	\$83,796	\$86,016

Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
\$43,865	\$45,356	\$46,896	\$48,493	\$50,142	\$51,846	\$53,609	\$55,432	\$57,316	\$59,255										
\$0	\$0	\$0	\$0	\$0	\$0	\$26,833	\$3,854	\$3,985	\$4,120	\$4,260	\$31,716	\$4,555	\$4,710	\$4,870	\$5,035	\$37,487	\$5,364	\$5,567	\$5,756
\$63,334	\$65,487	\$67,714	\$70,016	\$72,397	\$74,858	\$77,404	\$80,035	\$82,756	\$85,570	\$88,480	\$91,488	\$94,598	\$97,815	\$101,140	\$104,579	\$108,135	\$111,812	\$115,613	\$119,544
\$107,199	\$110,844	\$114,612	\$118,509	\$122,538	\$126,705	\$131,016	\$135,471	\$140,078	\$144,838	\$149,752	\$154,820	\$159,943	\$165,121	\$170,354	\$175,642	\$181,085	\$186,684	\$192,439	\$198,351

Year 61	Year 62	Year 63	Year 64	Year 65	Year 66	Year 67	Year 68	Year 69	Year 70	Year 71	Year 72	Year 73	Year 74	Year 75	Year 76	Year 77	Year 78	Year 79	Year 80
2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081
\$11,616	\$86,475	\$12,419	\$12,841	\$13,278	\$13,729	\$102,210	\$14,679	\$15,178	\$15,694	\$16,227	\$120,808	\$17,349	\$17,937	\$18,549	\$19,180	\$142,791	\$20,506	\$21,204	\$21,916
\$241,245	\$240,448	\$257,929	\$266,699	\$275,766	\$285,142	\$294,837	\$304,862	\$315,227	\$325,945	\$337,027	\$348,486	\$360,334	\$372,588	\$385,154	\$398,352	\$411,896	\$425,901	\$440,381	\$455,336
\$252,861	\$335,923	\$270,348	\$279,540	\$289,044	\$298,871	\$397,047	\$319,540	\$330,405	\$341,638	\$353,254	\$469,294	\$377,684	\$390,525	\$403,803	\$417,532	\$554,687	\$446,407	\$461,585	\$477,271

Year 81	Year 82	Year 83	Year 84	Year 85	Year 86	Year 87	Year 88	Year 89	Year 90	Year 91	Year 92	Year 93	Year 94	Year 95	Year 96	Year 97	Year 98	Year 99	Year 00
2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101
\$22,670	\$168,773	\$24,238	\$25,062	\$25,914	\$26,795	\$199,483	\$28,648	\$29,522	\$30,829	\$31,670	\$235,780	\$33,851	\$35,012	\$36,202	\$37,433	\$278,583	\$40,022	\$41,383	\$42,744
\$470,836	\$496,845	\$503,397	\$520,513	\$536,210	\$556,509	\$575,431	\$594,995	\$615,225	\$636,143	\$657,772	\$680,136	\$703,201	\$727,171	\$751,995	\$777,460	\$803,603	\$831,226	\$859,487	\$887,787
\$493,606	\$558,617	\$527,035	\$545,575	\$564,124	\$583,304	\$774,913	\$623,643	\$644,847	\$666,772	\$689,442	\$915,916	\$737,121	\$762,183	\$788,098	\$814,893	\$1,082,576	\$871,248	\$900,870	\$930,492