



## **Superfund Record of Decision:**

U.S. DOI Sangamo/Crab  
Orchard National Wildlife  
Refuge, IL

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16. Abstract (Limit: 200 words)  The U.S. DOI Sangamo/Crab Orchard NWR site is within the Crab Orchard National Wildlife Refuge, located near Carterville, Illinois. Within the 43,000-acre refuge, lakes and adjacent wetlands support recreational activities on the western portion of the refuge, while the eastern portion is used for manufacturing facilities. Site features in the eastern portion include a plating pond, a drainage pool, and an industrial landfill. The Department of Defense (DOD), the original administrator of the refuge, leased portions to munitions and explosives manufacturers who continue to operate onsite. In 1947, DOD transferred the administration of the refuge to the Department of the Interior (DOI). DOI leased portions of the refuge to manufacturers of PCB-containing transformers and capacitors, automobile parts, fiberglass boats, plated metal parts, and jet engine starters. Solid wastes generated from these industrial activities were disposed of in onsite landfills, while other liquid wastes may have been discharged into nearby surface waters and impoundments. EPA has divided the site into four operable units (OUs) for remediation. This ROD addresses OU1, and focuses on the metal-contaminated soil, sediment, debris, and sludge in three areas of the site. These areas are: the Area 7 Plating Pond (site 15), which is an inactive 45,000 gallon			13. Type of Report & Period Covered  800/000
17. Document Analysis a. Descriptors Record of Decision - U.S. DOI Sangamo/Crab Orchard NWR, IL First Remedial Action Contaminated Media: soil, sediment, debris, sludge Key Contaminants: metals (cadmium, chromium, lead)  b. Identifiers/Open-Ended Terms          c. COSATI Field/Group			
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Abstract (Continued)

pond containing approximately 280 cubic yards of contaminated material; the Old Refuge Shop Drainage Pool and intermittent creek (site 22), which is a collection point for run-off, and contains approximately 5,200 cubic yards of contaminated material; and the Fire Station Landfill (site 29), a 350 by 300 open field containing approximately 14,600 cubic yards of contaminated material. At least three other OUs will be addressed by future RODs, depending on site information collected in the future. The primary contaminants of concern affecting the soil, sediment, debris, and sludge are metals including cadmium, chromium, and lead.

The selected remedial action for this site includes excavating over 20,000 cubic yards of contaminated soil, sediment, debris, and sludge, and temporarily storing the waste onsite until treatment or disposal; treating approximately 9,000 cubic yards of soil, debris, and sediment considered to be RCRA characteristic hazardous waste using stabilization and fixation; disposing of the treated and non-treated soil, debris, and sludge onsite in an industrial (RCRA Subtitle D) landfill; capping the landfill; filling the excavated areas with clean soil; conducting environmental monitoring of ground water, surface water, and leachate, and long-term maintenance of the landfill; and implementing institutional controls, and continuing site access restrictions. The estimated present worth cost for this remedial action is \$2,700,858, which includes an annual O&M cost of \$54,371 for 30 years.

PERFORMANCE STANDARDS OR GOALS: Cleanup goals for soil, sediment, debris, and sludge are based on the risk assessment, a  $10^{-6}$  excess cancer risk level, and a  $HI < 1$ . Chemical-specific goals include cadmium 10 mg/kg, and lead 450 mg/kg. At the Area 7 Plating Pond, all sludge, soil, and sediment contaminated with chromium greater than background will be removed.

**DECLARATION FOR THE RECORD OF DECISION  
CRAB ORCHARD NATIONAL WILDLIFE REFUGE  
METALS AREAS OPERABLE UNIT**

**SITE NAME AND LOCATION**

Sangamo/Crab Orchard National Wildlife Refuge  
Carterville, Illinois

**STATEMENT OF BASIS AND PURPOSE**

This decision document presents the selected remedial action for the Metals Areas operable unit at the Crab Orchard National Wildlife Refuge Site near Carterville, Illinois, which was chosen in accordance with CERCLA, as amended by SARA, and to the extent practicable, the National Contingency Plan. This decision is based on the administrative record file for this Site.

The United States Department of the Interior, the current owner of the site, concurs on the selected remedy.

The State of Illinois has not concurred on the selected remedy.

**ASSESSMENT OF THE SITE**

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present on imminent and substantial endangerment to public health, welfare, or the environment.

**DESCRIPTION OF THE SELECTED REMEDY**

This operable unit is the first of several planned for the Site. The remedy for the first operable unit addresses three distinct sites which contain soil and sediment contaminated primarily with metals such as cadmium, chromium and lead. A preferred alternative was selected by U.S. EPA for a second operable unit, consisting of four distinct sites primarily contaminated with PCBs and lead. Public comment is currently being evaluated on the second operable unit, and the final remedy will be selected after the comments are reviewed. The remedy selected for the Metals Areas operable unit addresses the principle threats posed by the sites comprising the operable unit. The major components of the selected remedy include:

- Excavation of contaminated soil and sediment;
- Treatment by stabilization/fixation of all excavated soil and sediment contaminated with metals that are considered RCRA hazardous because of EP Toxicity to render them non-hazardous;

- On-site disposal of non-RCRA hazardous stabilized/fixed material and untreated residues exceeding the clean up targets in a landfill meeting the requirements of RCRA Subtitle D and 35 Illinois Administrative Code Part 807;
- Environmental monitoring during and after remedial construction to ensure the effectiveness of the remedial action.

#### DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are legally applicable or relevant and appropriate for this remedial action, is cost-effective and consistent with achieving a permanent remedy. This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principle element and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable for this Site. Because this remedy will result in hazardous substances remaining on-Site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Valdas V. Adamkus

3/30/90  
Date

Frank M. Geringer,  
Signature  
Acting Regional Administrator, Region V  
U.S. Environmental Protection Agency

**DECLARATION FOR THE RECORD OF DECISION  
CRAB ORCHARD NATIONAL WILDLIFE REFUGE  
METALS AREAS OPERABLE UNIT**

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Sangamo/Crab Orchard National Wildlife Refuge  
Carterville, Illinois

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Valdas V. Adamkus

Date

3/30/90

Frank M. Irvington,

Signature

Acting Regional Administrator, Region V  
U.S. Environmental Protection Agency

**DECISION SUMMARY - METALS AREAS  
CRAB ORCHARD NATIONAL WILDLIFE REFUGE  
MARION, ILLINOIS**

**I. SITE NAME, LOCATION AND DESCRIPTION**

Sangamo/Crab Orchard National Wildlife Refuge  
Carterville, Illinois

The Crab Orchard National Wildlife Refuge (the Refuge) site lies near Marion, Carterville and Carbondale, Illinois, primarily within Williamson County, extending into Jackson, Union and Johnson Counties in southern Illinois (See Figure 1 in Appendix A). The Refuge consists of approximately 43,000 acres of multiple-use land. The land is used as a wildlife refuge, and also for recreational, agricultural and industrial purposes.

The western end of the Refuge around Crab Orchard Lake is used for recreational purposes while the eastern end is used for manufacturing facilities. Access to the eastern portion is closed to the public, except for limited access to workers at the industrial sites and restricted access to hunters. The study sites which were the focus of the Remedial Investigation (RI) and Feasibility Study (FS) are located in the eastern, closed portion of the Refuge (See Figure 2 in Appendix A).

There are twelve lakes, including Crab Orchard Lake located within the Refuge. Crab Orchard Lake supports a large population of sports fish and is used as a drinking water source for the Refuge and nearby Marion Federal Penitentiary. Wetlands are found in some areas adjacent to the lakes. Wildlife on the Refuge include many game and non-game species. The Refuge has habitat suitable for one endangered species, the Indiana bat, and definitely houses another, with two active bald eagle nests.

**II. SITE HISTORY AND ENFORCEMENT ACTIVITIES**

The Crab Orchard National Wildlife Refuge is owned by the U.S. government and is currently administered by the U.S. Fish and Wildlife Service (FWS) a bureau of the Department of the Interior (DOI). The Refuge was previously administered by the Department of Defense (DOD). During the DOD administration portions of the Refuge were leased to industrial tenants, primarily for the purpose of munitions and explosives manufacturing. At the end of World War II the DOD transferred the Refuge to the DOI. Several other industries moved onto the site to occupy buildings formerly used by the wartime industries. The production of explosives continued to be the principle industry on the Refuge. Other industry included the manufacturing of PCB transformers and capacitors, automobile parts, fiberglass boats, corrugated boxes, plated metal parts, tape, flares and jet engine starters.

Congress, in passing the law that created the Crab Orchard National Wildlife Refuge, mandated a continuing industrial presence on Refuge property. Congress required that the lands must be used in a manner consistent with the needs of industry, as well as those of agriculture,



recreation, and wildlife conservation. The accompanying legislative history indicates the industrial development of Crab Orchard National Wildlife Refuge as central to the viability of the Refuge.

The Crab Orchard enabling legislation (16 U.S.C. 666g) further provides that no jurisdiction shall be exercised by the Secretary of Interior over that portion of such lands and the improvements thereon utilized by the Department of Army directly or indirectly, until determined by the Secretary of the Army, that utilization is no longer required. The DOD is responsible for the cleanup and environmental restoration of those lands which have been under its jurisdiction in accordance with the law.

Disposal activities at the site apparently included dumping of waste material in unused areas of the site, and landfilling of waste materials in unlined landfills which were covered with earth. Other disposal might have included discharge of liquid material to surface water bodies and impoundments. The types of materials disposed of at the Refuge reflect the broad range of substances used in the various industrial and Refuge activities. There are no good estimates of the total volume of disposed material.

The site was proposed for the National Priorities List (NPL) in 1984 and finalized on the NPL in July 1987. The relative roles and responsibilities of other Federal Agencies and the United States Environmental Protection Agency (U.S. EPA) at Federal Facilities like Crab Orchard National Wildlife Refuge are prescribed in Section 120 of CERCLA and Executive Order Number 12580. DOI is responsible for remedial action and compliance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended. The U.S. EPA is responsible for providing assistance and oversight to DOI for actions at the site taken to comply with CERCLA. In addition, U.S. EPA is responsible for final remedy selection at the site.

In addition to the roles and responsibilities of the DOI and U.S. EPA at the Refuge discussed above, DOD may have responsibility for the hazardous substances at the Site, in accordance with Section 107 of CERCLA and under the Defense Environmental Restoration Program. Various other private parties may have responsibility for the hazardous substances at the Refuge in accordance with Section 107 of CERCLA.

In February 1986, the U.S. EPA and FWS entered into a Federal Facility Initial Compliance Agreement, which required the performance of a Remedial Investigation and Feasibility Study (RI/FS). The FWS, in conjunction with Sangamo Weston, Inc., a potentially responsible party (PRP) at the site, began a RI/FS at the Refuge in May 1986. In August 1988, an RI Report was finalized and made available to the public. In August 1989 the FS Report and proposed plans for the first two operable units at the site were made available to the public. The U.S. EPA served as the supporting agency during the RI/FS, and was lead Agency for the development of the proposed plans and this Record Of Decision (ROD). The Illinois Environmental Protection Agency (IEPA) served as a supporting agency for the FS, proposed plans and ROD.

A draft Interagency Agreement (IAG), pursuant to CERCLA Section 120(e)(2) is currently being developed between U.S. EPA, DOI, and IEPA. DOD is also potentially a party to the IAG and is involved in the negotiations. Negotiations on this IAG were started in August 1989, and are expected to be completed in June 1990. The IAG, when finalized, will delineate Agency roles and responsibilities and will stipulate schedules for completion of the remedial action specified in this ROD and remedial action for other operable units.

In July 1989, DOI issued letters pursuant to CERCLA Section 104(e), to request information relating to the identification, nature and quantity of materials treated, stored or disposed at the Refuge, or transported to the Refuge; the nature or extent of any releases or threatened releases of a hazardous substance at the Refuge; and information relating to the recipient's ability to pay for a cleanup. DOI and U.S. EPA are jointly reviewing the responses to these letters to determine whether any of the respondents would be considered PRPs at the site. Special notice letters have not been issued to any PRPs at the site to date.

### III. COMMUNITY RELATIONS HISTORY

Public participation requirements under CERCLA Sections 113(k)(2)(B) and 117 were satisfied during the remedial process. U.S. EPA has been primarily responsible for conducting the community relations program for this site, with the assistance of FWS. The following milestone activities were conducted during the RI/FS:

- Establishment of an Administrative Record at the Southern Illinois University's Morris Library in Carbondale, Illinois and at U.S. EPA, Region V Office in Chicago, Illinois.
- Establishment of additional information repositories at Marion Carnegie Public Library in Marion, Illinois; Crab Orchard National Wildlife Refuge Headquarters in Cartersville, Illinois; and Marion Federal Penitentiary in Marion, Illinois.
- Development of a mailing list of interested citizens, organizations, news media, and elected officials in local, county, state and federal government. Periodic mailings of Fact Sheets and other information.
- Periodic news releases announcing various on-site activities and results of investigations.
- A Fact Sheet in August 1988, explaining the results of the remedial investigation. The Remedial Investigation Report was also released at this time.
- Paid newspaper advertisements in announcing the RI public meeting and the FS and proposed plan availability session and public hearing.

- A public meeting in August 1988, to meet concerned citizens and discuss the results of the remedial investigation. Approximately 100 people attended the meeting.
- A Fact Sheet in January 1989, explaining the Feasibility Study and proposed plan process, discussing remedial technologies under consideration, and announcing a tentative schedule.
- A Fact Sheet in August 1989, explaining U.S. EPA's preferred alternatives for two operable units at the site, and discussing the availability of the FS and proposed plans for those operable units. This Fact Sheet also outlined the other remedial alternatives, announced the public comment period and solicited comment on the alternatives.
- An availability session in August 1989, to informally answer citizens' questions about the FS and proposed plans. Questions were answered by representatives of U.S. EPA, FWS and IEPA.
- A public hearing on August 30, 1989, on the proposed plans and the FS. Comments were taken on the record. Approximately 140 people attended. Presentations were made, and questions were answered by representatives of U.S. EPA, FWS and IEPA.
- A public comment period of thirty days was originally planned, running from August 18, 1989, to September 16, 1989. The public comment period was announced in the proposed plan for the operable unit, in the Fact Sheet of August 1989, and through paid newspaper advertisements in the Southern Illinoisian and the Marion Daily Republic. Based on comment taken at the public hearing on August 30, 1989, the comment period for this operable unit was extended for an additional week, until September 23, 1989. The extension was announced by letters to the individuals and groups on the mailing list, and by a press release.
- An availability session in September 1989, to specifically discuss the Metals Areas operable unit, and to answer questions about this unit. Questions were answered by representatives of U.S. EPA, FWS and IEPA.

A Responsiveness Summary addressing comments and questions received during the public comment period on the RI/FS and proposed plan is included with this Record of Decision as the third section.

This decision document presents the selected remedial action for the Metals Areas operable unit at the Crab Orchard National Wildlife Refuge Superfund site, in Cartersville, Illinois, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the National Contingency Plan. The decision for this operable unit at the site is based on the Administrative Record.

#### IV. SCOPE AND ROLE OF OPERABLE UNIT

The first step in the RI process was a review of available Refuge files and old analytical results to target "study sites" to be investigated in depth. Thirty-three study sites were investigated during the RI, with seven of these carried into the FS for evaluation of remedial alternatives.

As with many Superfund Sites, the problems at the Refuge are complex. The results of the investigations of the study sites indicated that the Refuge consists of several geographically distinct areas with markedly different characteristics. These include differences in the contaminants, in the parties responsible for the contamination, and in the remedial actions and schedules that would be appropriate. Consequently, the Agency decided to address these areas individually as "operable units" of an overall site remedy. The following four operable units have been created:

PCB Areas - those areas contaminated with PCBs, which may also be contaminated with other materials, such as lead and cadmium, including study sites 17, 28, 32 and 33.

Metal Areas - those areas primarily contaminated with heavy metals, including study sites 15, 22 and 29;

Explosive/ Munitions Areas (formerly designated as "DOD Areas") - those areas contaminated with chemicals from explosive or munitions manufacturing, including study sites 3, 4, 5 and 19; and

Miscellaneous Areas - those areas that are thought to require no further work or that will need further investigation, monitoring or maintenance, including sites 7, 7A, 8, 9, 10, 11, 11A, 12, 13, 14, 16, 18, 20, 21, 24, 25, 26, 27, 30, 31, 34, and 35.

Under the National Contingency Plan, response actions may be conducted in operable units, provided such units are consistent with achieving a permanent remedy (40 CFR 300.68(c)(1)). Further, implementation of operable units may begin before selection of a final remedial action if such measures are cost-effective (40 CFR 300.68(c)(3)). These conditions are satisfied in this case. First, the proposed operable units are consistent with achieving a permanent remedy at the Site since they will, in fact, provide permanent remedies for the designated areas. Second, proceeding by operable units is cost-effective in this case because the nature of the problems in the different areas require separate remedies. There cannot be one overall solution to the Site's problems. It is therefore appropriate to consider cost-effectiveness on an operable unit by unit basis, rather than for the Site as a whole.

This Record of Decision addresses the Metals Areas operable unit. The three study sites comprising this operable unit are: the Area 7 Plating

Pond (site 15); the Old Refuge Shop Drainage Pool and Creek (site 22); and the Fire Station Landfill (site 29) (See Figure 2 in Appendix A). The remedy selected will address the principle threats of soil and sediment contamination at all three sites comprising the operable unit and will mitigate against future surface water or groundwater contamination.

The remedy for the Metals Areas operable unit is the first of at least four operable units at the Site. The Metals Area operable unit fits into the overall Site strategy by addressing the principle threats from the three sites contaminated with heavy metals. The Agencies propose to remove and treat the contaminated material and dispose the residue in an on-site landfill. Since the Metals Areas pose some of the greatest threats currently identified at the Refuge, the Agencies want to initiate remedial action for those areas as quickly as possible.

Each of the other operable units is on a separate schedule. The schedule for each operable unit will be established in an upcoming revised Interagency Agreement between U.S. EPA, DOI and IEPA (and potentially DOD), which is expected to be completed in June 1990. Depending on additional information, other operable units may be created or combined, as appropriate.

A Proposed Plan for the PCB Areas operable unit was made available at the same time as the Proposed Plan for the Metals Areas. The Proposed Plan and required publication of notice occurred concurrently for the PCB Areas and Metals Areas operable units. Because of public concern about the incineration component of the preferred alternative, the public comment period for the PCB Areas was extended three times for a total of one hundred and five (105) days of public comment. A final remedy selection for the PCB Areas operable unit is expected by June 1990.

## V. SITE CHARACTERISTICS

The RI/FS was conducted to identify the types, quantities and locations of contaminants at the Site and to develop ways of solving the problems they present. Because of the size of the Site, the first step in the RI process was a review of available Refuge files and old analytical results to target "study sites" to be investigated in depth. The nature and extent of actual or potential contamination related to the study sites was determined by a series of field investigations, including:

- geophysical surveys;
- surface soil sampling;
- exploratory test pit installation and sampling;
- installation and sampling of groundwater monitoring wells;
- surface water sampling; and
- sediment sampling.

Soil and sediment sampling in the three areas comprising the Metals Areas operable unit indicate the non-uniform presence of chromium, cadmium, cyanide and/or lead, and the less consistent presence of other organic

and inorganic contaminants. The three areas are all located in the portion of the Refuge where access is restricted, so human exposure to the contaminants would be sporadic and occasional. However, the areas are wooded and it is likely that wildlife are currently exposed to the contaminants.

The Area 7 Plating Pond (study site 15) is approximately 50 feet long and 30 feet wide (See Figures 3 and 4 in Appendix A). Water depth is estimated to be four feet, resulting in approximately 45,000 gallons of water in the pond. Sediment samples from the Area 7 Plating Pond indicate the presence of chromium, with other organic and inorganic contaminants of less concern found in the sediments, pond water and groundwater. There is an estimated 280 cubic yards of contaminated pond sediment and underlying soil.

The Old Refuge Shop Drainage Pool (study site 22) apparently collects run-off from an industrial area. The water initially drains into a small drainage pool and then flows in an intermittent stream towards Crab Orchard Lake (See Figures 5 and 6 in Appendix A). Sediments in the drainage stream from the Old Refuge Shop are contaminated with cadmium, chromium, cyanide and lead, with some sediments which are hazardous because of their characteristic to leach cadmium and/or chromium (Resource Conservation and Recovery Act (RCRA) characteristic of EP Toxicity); and groundwater in this area is contaminated primarily with cadmium. Studies indicate that contaminants can be found almost the entire downstream distance of about 4450 feet, with an estimated 5,200 cubic yards of contaminated sediment and soil.

The Fire Station Landfill (study site 29) consists of a large open field approximately 350 feet by 300 feet, located east of the Refuge Fire Station (See Figure 7 in Appendix A). Down-slope drainage areas were also investigated. Soil sampling at the Fire Station Landfill showed some localized spots with lead contamination. An estimated 14,600 cubic yards of soil are contaminated with lead, zinc, magnesium and mercury. In addition, soil and groundwater at this study site showed some other inorganic and organic contamination of less concern. These contaminants will be addressed during confirmation sampling, or as part of remedial activities.

## VI. SUMMARY OF SITE RISKS

The RI Report included a risk assessment to define the actual or potential threat that the Site-related contaminants pose to human health and/or the environment. Since the Site is a National Wildlife Refuge, particular attention was paid to the potential impact on wildlife.

The DOI, as trustee for Refuge lands and for fish and wildlife on those lands, must ensure that remedies adequately protect and restore those trustee resources. Doing so, in many cases, requires standards more stringent than or different from those that may apply primarily for human health reasons for some contaminants. The trustee can only agree to a covenant not to sue under Section 122(j) of CERCLA if a FRP agrees to

undertake appropriate actions necessary to protect and restore natural resources damaged by actual or threatened releases of hazardous substances.

The choice of animal species for a risk assessment is dependent upon the availability of information on toxicity, life history, exposure and physiology. Sufficient information is not always available for species that are conspicuous Departmental trust resources. Small mammals are often used in assessments for small contaminated areas because these mammals are frequently at greatest risk. Their limited home range and available toxicity information reduce uncertainties in the resultant assessment. There are no standards for wildlife exposure and wildlife contaminant residues, so risk assessments must be used and exposures must often be compared to toxicity information on other species.

The results of the risk assessment conducted as part of the RI indicate that the following problems present the greatest threat to human health and/or the environment from the three study sites that comprise the Metals Areas operable unit:

- Surface soils and sediments at the Old Refuge Shop could pose a risk to both humans and wildlife by direct contact which results in exposures by ingestion and inhalation;
- Subsurface soils at the Fire Station Landfill threaten burrowing wildlife, especially via inhalation and ingestion exposures; and
- Surface water which may be contaminated by run-off or sediments at the Old Refuge Shop and the Fire Station Landfill threatens wildlife through the ingestion of water or aquatic organisms and threatens humans indirectly through food chain accumulation.

Although contaminants were found in other media (groundwater, sediments at the Area 7 Plating Pond) at the study sites comprising this operable unit, the risk assessment does not indicate that these contaminants currently pose a threat to human health and/or the environment. However, actual or potential future groundwater contamination is of great concern because the aquifer is potentially usable and may discharge to a sensitive ecosystem. The areas comprising the Metals Areas operable unit are within the portion of the Refuge where human access is currently restricted. However, if the restriction is relaxed in the future, the risks to humans could be higher unless remedial action has been taken. Access to wildlife is not restricted.

A summary of the risk assessment from the RI Report for each of the sites comprising the Metals Areas operable unit follows:

A. SITE 15: AREA 7 PLATING POND

## 1. Contaminant Identification

Limited sampling was done on the sediment, pond water and ground water. Results indicated that the sediment contained chromium at around 500 milligrams per kilogram (mg/kg). The sample was not hazardous by the RCRA characteristic test for leachable metals (EP Toxicity). The pond water contained iron at 1000 micrograms per liter (ug/L), which is above the secondary Maximum Contaminant Level (MCL). The ground water contained chromium and a trace of PCBs.

## 2. Exposure Assessment

The exposure assessment portion of the RI Report concluded that there is currently no complete route of exposure to the contaminants found at this site.

## 3. Toxicity Assessment

Chromium exists in two principle states, trivalent (+3) and hexavalent (+6). Trivalent chromium is an essential nutrient required at trace levels for proper glucose metabolism. Chromium's toxicity is principally attributed to the hexavalent state, with potential damage to the liver, kidneys, skin and lungs. Chromium is known to be a human carcinogen by the inhalation route of exposure, but it is not classified by the ingestion route.

## 4. Risk Characterization

The RI Report found no complete pathway of exposure to humans from contaminants; therefore, a risk characterization could not be completed. Without such exposure there is no risk to man from this site under existing conditions. Although contaminants were found in some media (groundwater, sediments), the risk assessment indicates that these contaminants do not currently pose a threat to human health and/or the environment. The iron found in the pond water was not deemed to be a threat because secondary MCLs are established based on aesthetic (taste and smell) rather than health reasons. There is concern that this Pond, unless it is closed, may contribute in the future to environmental problems such as groundwater contamination. Groundwater, as a resource to be protected both because of the potential for future use and because of the likelihood of discharge to a sensitive ecosystem, is of great concern. Access to the Area 7 Plating Pond is currently restricted. However, if access restriction is relaxed in the future, the risks to humans could be higher unless remedial action has been taken.

The sediment analysis completed for the RI was not comprehensive. The RI states that frogs were present on the



site, but does not give an exposure assessment for frogs. Frogs overwinter in sediment and have more permeable skin than most vertebrates. Depending on the conditions of exposure, an assessment for frogs overwintering in the pond could show that they are exposed to toxic concentrations.

Although the pond represents little risk to humans or the environment under current conditions, it is no longer active, and remedial measures for closure were evaluated as part of the FS in order to mitigate future concerns. Future concerns include the potential of groundwater contamination resulting from contaminants in the Pond leaching to the aquifer. Closure of the Pond will prevent any potential future problems.

## B. SITE 22: OLD REFUGE SHOP DRAINAGE POOL

### 1. Contaminant Identification

Sediments in the drainage channel flowing towards Crab Orchard Lake are contaminated with cadmium (range: less than 0.68 mg/kg to 780 mg/kg), chromium (10 to 889 mg/kg), cyanide (130 to 392 mg/kg), and lead (93 to 166 mg/kg). In general, the levels of contaminants are highest near the drainage sump and decrease downstream nearer to Crab Orchard Lake. The cadmium and chromium levels are high enough that the sediment would be considered RCRA hazardous waste for the characteristic of EP Toxicity. Also, ground water in one well showed elevated levels of cadmium above the MCL (25 ug/L) and cyanide above the Illinois General Use Water Standards (70 ug/L).

### 2. Exposure Assessment

The exposure assessment conducted as part of the RI concluded that several media could be impacted by the contaminants at this site, and that there were several potential transport routes. Mean soil and sediment values for cadmium and cyanide were used to conduct the risk assessment.

The presence of contaminants in surface soils and sediments indicates that direct contact by wildlife could result in exposure through ingestion of the soil, sediment or water, and through potential consumption of contaminated vegetation and prey because potential food chain exposure is particularly likely with cadmium; through inhalation, especially by burrowing animals; and through ingestion of sediments and organisms associated with surface water as the contaminants continue to migrate towards Crab Orchard Lake. To assess potential wildlife exposure, an assumption of one hour of active burrowing per day was weighted with a resting exposure estimate including breathing, feeding and grooming activities.

Although access to humans is restricted, the exposure

assessment indicates that there is the potential for occasional recreational users to be exposed via inhalation or ingestion of the contaminants, and through potential food chain accumulation. The exposure assessment assumed limited human access of three visits per year for four hours per visit. It was also assumed that a human might inadvertently consume 100 mg of contaminated soil or sediment per visit by ingestion. (Ingestion of soil is a standard pathway for exposure in humans and wildlife risk assessments.) Inhalation exposure would be commonly assumed for FWS personnel on worksites or for incidental visitors to the contaminated sites.

### 3. Toxicity Assessment

Cadmium is highly toxic with a broad range of systemic effects, particularly to the respiratory, renal and reproductive systems. It is considered a probable human carcinogen by the inhalation route of exposure. Cadmium can bioaccumulate extensively in exposed individuals. Cadmium is particularly toxic to fish, even at low concentrations. It has also been demonstrated to cause birth defects in animals.

The major concern from cyanide exposure is the acute toxicity of hydrocyanic gas (HCN) and simple salts such as sodium cyanide. Cyanide does not bioaccumulate. High levels of cyanide exposure will result in death by cytotoxic anoxia (oxygen will not reach the cells). Also, cyanide can have adverse impacts on the cardiovascular system, the liver, kidneys and the central nervous system.

### 4. Risk Characterization

Using a unit risk factor of  $7.8 \text{ (mg/kg/day)}^{-1}$  for human exposure to inhaled cadmium, the unremediated site shows a potential increased cancer risk of  $2.3 \times 10^{-5}$ . This is based on very limited human exposure, as discussed above. However, the risk characterization indicates that no chronic or acute systemic health effects to humans would result from exposure to the contaminants at the site.

Since the Refuge was established to protect wildlife, the risk assessment also considered risk to wildlife, a primary factor in the selection of the remedy. Small mammals are used in assessments for small contaminated areas because these mammals are frequently at greatest risk, and their small home range and available toxicity information reduces uncertainties in the resultant assessment.

The risk characterization for wildlife compared estimated exposures to cadmium and cyanide for deer, rabbits and mice to data from laboratory tests. The conclusion is that the unremediated site may present concerns for reproductive effects

and other systemic toxicity in vertebrate species. A small animal, such as a mouse, will consume a proportionally very high level of cadmium which could have adverse effects on the individual. Although the RI does not address predators or omnivores, it is reasonable to assume that they could be at greater risk, through consumption of organisms with bioaccumulated levels.

C. SITE 29: FIRE STATION LANDFILL

1. Contaminant Identification

Analysis of soil on the surface and in test pits in this landfill and in the down-slope drainage areas indicate that lead (60 to 2,355 mg/kg), magnesium (1,472 to 40,268 mg/kg), mercury (23 to 290 ug/kg) and zinc (23 to 929 mg/kg) were elevated above background levels. The groundwater contained iron (388 to 4,000 ug/L total, less than 25 ug/L dissolved), manganese (43 to 1,790 ug/L total, 24 to 1,770 ug/L dissolved) and selenium (none detected to 41 ug/L total) above the respective MCLs in some of the samples. However, the MCLs for iron and manganese are secondary, based on odor or taste, and the dissolved levels of selenium are below the MCL (dissolved levels may be more representative of contaminant movement than total levels). The groundwater contained acetone (23-11,500 ug/L) which was believed to be a result of laboratory contamination, and benzene (4 ug/L) in one sample only, below the analytical detection level.

2. Exposure Assessment

The exposure assessment conducted as part of the RI concluded that for the contaminants in the landfill the major exposure routes were inhalation and ingestion of soil, sediment or water by wildlife. The calculations indicated that rabbits had the highest levels of exposure, but intake rates for all other wildlife species for which exposure was calculated (mallards, deer and mice) also exceeded chronic no-effect levels for lead.

The presence of contaminants in sediments resulting from erosion from the landfill indicates that direct contact by wildlife could result in exposure to lead through ingestion of the soil, sediment and water; and through inhalation, especially by burrowing animals. To assess potential wildlife exposure, an assumption of one hour of active burrowing per day was weighted with a resting exposure estimate including breathing, feeding and grooming activities. A level of one half of the highest detected lead level was used to estimate wildlife exposure.

Although access to humans is restricted, the exposure assessment indicates that there is the potential for occasional

recreational users to be exposed via inhalation or ingestion of the contaminants which could be eroded from the landfill. Vegetated areas are unlikely to cause significant exposure to humans, but contaminated soils will be exposed by erosion of ditches and areas with a steep grade. The exposure for humans concluded that the greatest potential exposure was associated with the ingestion and inhalation of eroded soils from these areas. The exposure assessment assumed limited human access of three visits per year for four hours per visit. It was also assumed that a human might inadvertently consume 100 mg of contaminated soil or sediment per visit. (Ingestion of soil is a standard pathway for exposure in humans and wildlife risk assessments.) Inhalation exposure would be commonly assumed for FWS personnel on worksites or for incidental visitors to the contaminated sites. The highest level of lead detected at the site was used to calculate human exposure values.

### 3. Toxicity Assessment

Lead has been shown to distribute in the blood of humans, and can adversely effect the central nervous system, the gastrointestinal tract, the kidneys and blood forming systems. Growing children are particularly sensitive to its impact upon the central nervous system. U.S. EPA has not assessed the carcinogenicity of lead, however there are positive carcinogenicity studies.

### 4. Risk Characterization

Using a chronic, no-effect level of 0.32 mg/kg/day for human exposure to ingested lead, the unremediated site would not result in an exposure that would result in toxic effects. The risk characterization indicated that no chronic or acute systemic health effects to humans would result from exposure to the contaminants at this site.

Significant wildlife exposure is likely. Since the Refuge was established to protect wildlife, the risk assessment also considered risk to wildlife, a primary factor in the selection of the remedy. The risk characterization for wildlife compared estimated chronic lead exposures for deer, mallard ducks, rabbits and mice to U.S. EPA chronic no-effect levels based on rat studies. The conclusion is that the unremediated site would pose a risk for chronic, toxic effects of lead to wildlife.

While potential adverse impacts were identified, the RI did not measure any actual, current impacts on wildlife. Research done by the FWS have indicated the potential for adverse impacts on wildlife above the Site-specific cleanup criteria established by the FWS. There is on-going research by the FWS, Southern Illinois University and others to continue to assess the impacts of contaminants at the Refuge to wildlife. The

Refuge provides suitable habitat for an endangered species, the Indiana bat. Also, the Refuge definitely houses another endangered species, the bald eagle.

Actual or threatened releases of hazardous substances from the sites comprising this operable unit, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, wildlife, or the environment.

## VII. DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for this operable unit explicitly discussed nine alternatives and referenced twenty-two site-specific alternatives that had been developed in the FS. The preferred alternative identified in the Proposed Plan was Alternative 2, which included the following components:

Excavation of Soil and Sediment - Contaminated soil and sediment would be excavated using conventional equipment. The excavated material would be moved to a storage area on-site, where it would be stored until it was treated or disposed.

Stabilization/ Fixation - Soils and sediments which are considered RCRA hazardous because of EP Toxicity (the characteristic to leach metals) would be treated by stabilization/ fixation until they no longer exhibit the characteristic of EP Toxicity and are rendered non-hazardous.

Industrial Landfill - Excavated non-hazardous materials which are untreated or treated by stabilization/ fixation would be placed in an on-site landfill, meeting at a minimum, the applicable or relevant and appropriate requirements of Subtitle D of RCRA and 35 IAC Part 807.

Backfill Excavation - Clean soil would be placed in the areas where contaminated material had been removed.

Monitoring and Maintenance - Groundwater and surface water monitoring would be conducted around the on-site landfill and excavated areas. Inspection and maintenance of the landfill would also be required.

No significant changes have been made to the selected alternative from that discussed in the Proposed Plan for the Metals Areas operable unit.

## VIII. DESCRIPTION OF ALTERNATIVES

During the FS, the FWS and Sangamo Weston, Inc. identified and evaluated a list of alternatives that could be used to address the threats and/or potential threats identified at the study sites within the operable unit. The FWS and Sangamo Weston, Inc. narrowed the list of alternatives based

on their effectiveness (i.e. protection of human health and/or the environment, reliability), implementability (i.e. technical feasibility, compliance with identified State and Federal regulations) and relative costs (i.e. capital, operation and maintenance). The FS included detailed analysis of twenty-two (22) site-specific alternatives.

In the Proposed Plan, five remedial technologies which were incorporated into the twenty-two (22) alternatives in the FS were described. In addition, nine alternatives for remedial action which incorporated the remedial technologies were presented. The nine alternatives included a range of actions from containment of the waste in place to treatment to the maximum extent possible. Public comment was solicited on the nine alternatives which were presented in the Proposed Plan, on the twenty two alternatives discussed in the FS, and on the technologies which were combined to create the various alternatives.

Below is a brief description of the nine alternatives presented in the Proposed Plan:

#### Alternative 1

FS Alternatives: Section 2, 1A; Section 4, 1A; Section 6, 1A  
Estimated Total Remedial Cost: \$5,463,787 present worth  
Estimated Time to Implement: 1 to 2 years

Alternative 1 would address all of the study sites comprising the operable unit, and includes the following components:

Excavation of Soil and Sediment - Contaminated soil and sediment would be excavated using conventional equipment. The excavated material would be moved to a storage area on-site, where it would be stored until treated and/or disposed.

Stabilization/ Fixation - Soils and sediments which are considered RCRA hazardous because of EP Toxicity (the characteristic to leach metals) would be treated by stabilization/ fixation. Stabilization/ fixation is a treatment process where contaminated soils and sediments would be treated with bonding agents which fix contaminants within the stabilized waste. This treatment makes the contaminants more resistant to leaching. Cement-based and lime-based stabilization processes are commonly used for fixation of metals.

Industrial Landfill - Excavated treated and untreated, non-hazardous materials would be placed in an off-Site industrial landfill. This "industrial landfill" would be a solid waste landfill as regulated by Subtitle D of the Resource Conservation and Recovery Act (RCRA) and 35 Illinois Administrative Code (IAC) Part 807. The landfill must have, at a minimum, a single compacted soil liner and drainage layer. After placement of the contaminated soil and sediment, the

landfill would be covered with a cap constructed of compacted soil, a drainage layer, a barrier to prevent burrowing animals, soil fill and topsoil. The final design will be determined by site-specific characteristics, the object being to provide adequate containment of the waste material. Upon completion, the landfill would be vegetated. Groundwater and leachate monitoring, and routine maintenance would be part of the long term requirements.

Backfill Excavation - Clean soil would be placed in the areas where contaminated material had been removed.

#### Alternative 2: U.S. EPA's Preferred and Selected Alternative

FS Alternatives: Section 2, 1B; Section 4, 1B; Section 6, 1B  
Estimated Total Remedial Cost: \$2,700,858 present worth  
Estimated Time to Implement: 1 to 2 years

This Alternative was U.S. EPA's preferred alternative identified in the Proposed Plan and is being selected through this decision document. Alternative 2 includes all of the components included in Alternative 1, and would address all of the study sites comprising the operable unit. The only difference is the location of the industrial landfill. In Alternative 2, the industrial landfill would be located on the Refuge.

#### Alternative 3

FS Alternative: Section 6, 2A  
Estimated Total Remedial Cost: \$1,658,733 present worth  
Estimated Time to Implement: 1 to 2 years

Alternative 3 would address only study site 29, the Fire Station Landfill, and includes the following components:

Excavation of Soil and Sediment - Soils and sediments contaminated with high levels of lead, which would be considered hazardous waste, would be excavated, as described in Alternative 1.

Stabilization/Fixation - Excavated, contaminated soils and sediments would be treated by stabilization/fixation, as described in Alternative 1.

Industrial Landfill - Excavated materials which are treated by stabilization/fixation would be disposed in an off-site industrial landfill, as described in Alternative 1.

Low Permeability Caps - A low permeability cap would be used to cap the area from which excavation has occurred and where contamination remains. Prior to construction the contaminated

area would be sloped and graded to provide drainage and a good construction surface. The cap would be constructed of compacted soil, a drainage layer, soil fill and topsoil. Routine maintenance of the cover would be part of the long term requirements.

#### Alternative 4

FS Alternative: Section 6, 2B  
Estimated Total Remedial Cost: \$1,084,538 present worth  
Estimated Time to Implement: 1 to 2 years

Alternative 4 includes all of the components included in Alternative 3, and would address only study site 29, the Fire Station Landfill. The only difference is the location of the industrial landfill. In Alternative 4, the industrial landfill would be located on the Refuge.

#### Alternative 5

FS Alternatives: Section 2, 2A; Section 4, 2A; Section 6, 3A  
Estimated Total Remedial Cost: \$7,075,984 present worth  
Estimated Time to Implement: 1 to 2 years

Alternative 5 would address all of the study sites comprising the operable unit, and includes the following components:

Excavation of Soil and Sediment - Same as described in Alternative 1.

RCRA Landfill - Contaminated soil and sediment which is considered RCRA hazardous waste because of EP Toxicity would be disposed off-Site in a RCRA Landfill. Hazardous soil and/or sediment is expected only at the Old Refuge Shop and the Fire Station Landfill (study sites 22 and 29). Subtitle C of RCRA regulates certain activities involving hazardous waste. A RCRA landfill is one that meets the design criteria required by Subtitle C of this law. The landfill would be constructed of a composite soil and synthetic bottom liner, a drainage layer, a synthetic membrane liner, and a second drainage layer. After placement of the contaminated material, the RCRA landfill would be covered with a cap constructed of compacted soil, a synthetic membrane, a drainage layer, soil fill, and topsoil. Upon completion, the RCRA landfill would be vegetated. Groundwater and leachate monitoring, and routine maintenance would be part of the long term requirements.

Industrial Landfill - Excavated contaminated soil and sediment which is not a hazardous waste would be disposed of off-Site in an industrial landfill, as described in Alternative 1.

Backfill Excavation - Clean soil would be placed in the areas



where contaminated material had been removed.

#### Alternative 6

FS Alternatives: Section 2, 2B; Section 4, 2B; Section 6, 3B  
Estimated Total Remedial Cost: \$2,798,825 present worth  
Estimated Time to Implement: 1 to 2 years

Alternative 6 includes the all of the components included in Alternative 5, and would address all of the study sites comprising the operable unit. The only difference is the location of the industrial and RCRA landfills. In Alternative 6, the landfills would be located on the Refuge.

#### Alternative 7

FS Alternatives: Section 2, 2C; Section 6, 3E  
Estimated Total Remedial Cost: \$1,047,111 present worth  
Estimated Time to Implement: 1 year

Alternative 7 would address the Area 7 Plating Pond and the Fire Station Landfill (study sites 15 and 29) and includes the following components:

Low Permeability Caps - Contaminated soils and/or sediments would be left in place in the Area 7 Plating Pond and the Fire Station Landfill and each would be covered with a low permeability cap, as described in Alternative 3. Prior to construction, any wet areas would be dewatered and the area would be shaped and graded to provide a good construction surface.

#### Alternative 8

FS Alternative: Section 6, 3C  
Estimated Total Remedial Cost: \$2,716,361 present worth  
Estimated Time to Implement: 1 to 2 years

Alternative 8 would address only the Fire Station Landfill (study site 29) and includes the following components:

Excavation of Soil and Sediment - Soils and sediments contaminated with high levels of lead, which would be considered hazardous waste because of the characteristic to leach metals, would be excavated, as described in Alternative 1.

RCRA Landfill - Excavated contaminated soil and sediment which is considered hazardous waste would be disposed off-site in a RCRA Landfill, as described in Alternative 5.

Backfill Excavation - Clean soil would be placed in the areas

where contaminated material had been removed.

Low Permeability Cap - Contaminated, non-hazardous soils and/or sediments would be left in place at the Fire Station Landfill and would be covered with a low permeability cap, as described in Alternative 3. Prior to construction, any wet areas would be dewatered and the area would be shaped and graded to provide a good construction surface.

#### Alternative 9

FS Alternative: Section 6, 3D  
Estimated Total Remedial Cost: \$844,627 present worth  
Estimated Time to Implement: 1 to 2 years

Alternative 9 includes all of the components included in Alternative 8, and would address only study site 29, the Fire Station Landfill. The only difference is the location of the RCRA landfill. In Alternative 9, the RCRA landfill would be located on the Refuge.

#### No Action Remedial Alternative

FS Alternatives: 15-3, 22-3, 29-4  
Estimated Total Remedial Cost: \$455,530 present worth  
Estimated Time to Implement: less than 1 year

The Superfund program requires that the "no action" alternative be considered at every site. Under this alternative the only actions at any of the contaminated areas might include monitoring, fencing or site use limitations. All wastes, routes of contaminant migration, and long-term human and environmental exposure pathways will remain unchanged. This alternative would not reduce the threats to human health and/or the environment identified at the site.

### **IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES**

The Selected Alternative for the Metals Areas operable unit at the Crab Orchard National Wildlife Refuge is Alternative 2, as outlined above. This alternative involves excavation of metal-contaminated soil and sediment, treatment of hazardous materials by stabilization/ fixation to render it non-hazardous, and disposal in an on-site industrial landfill. Based on current information, this alternative provides the best balance among the nine criteria that U.S. EPA uses to evaluate alternatives. This section provides a summary of the comparative analysis of the alternatives for the Metals Areas operable unit.

Overall Protection. Each alternative, with the exception of the no action alternative, would provide adequate protection of human health and the environment for those sites specifically addressed. Protection would result by eliminating, reducing,

or controlling risk through treatment, engineering controls, or institutional controls. However, those alternatives which address only one or two of the three study sites comprising the operable unit eliminate, reduce or control risk only for those study sites addressed, and not the whole operable unit. In order to meet the threshold criterion of protectiveness, the Alternatives which address only one or two of the study sites would have to be combined to provide overall protection for the operable unit. The Selected Alternative addresses the principle threats to public health and the environment for all of the study sites by removal and treatment to the maximum extent practicable of contaminated soil and sediment and containment of the residues.

**Compliance with ARARs.** All alternatives would meet all applicable or relevant and appropriate requirements of Federal and State environmental laws. Potential ARARs for each alternative are extensively discussed in the FS report. The selected alternative, Alternative 2, will comply with all ARARs. Specific ARARs for the remedy are discussed in Section XI.B of this Decision Summary. Upcoming RCRA land disposal restrictions may require characteristic hazardous waste to be treated prior to disposal, which could make certain alternatives (particularly Alternatives 5, 6, 8, and 9) non-compliant with RCRA ARARs.

**Long-term Effectiveness and Permanence.** The Selected Alternative would provide the greatest long-term effectiveness and permanence. It would involve removal of approximately 20,000 cubic yards of contaminated soil and sediment, of which approximately 9,000 cubic yards is estimated to be RCRA hazardous. This contaminated soil and sediment constitutes the principle threat from this operable unit. The Selected Alternative also addresses the threat from surface water by removing the material that could contaminate the water. All of the hazardous metal contamination will be treated by stabilization/ fixation to render it non-hazardous, with secure containment of the residues. The treatment provides a demonstrated, effective rendering of hazardous material to a state where it is non-hazardous.

The alternatives differ in whether treatment will be utilized, the volumes of soil and sediment to be excavated and/or treated, and ultimate disposal location. Alternative 1 uses the same degree of treatment and containment of the contaminated material as the Selected Alternative, with the only difference being the location of the landfill. However, the Agencies believe that it is easier to ensure the long-term permanence and effectiveness of a dedicated landfill built on-site. Alternatives 5, 6, 7, 8, and 9 do not involve any treatment of the waste, and rely on containment for long-term effectiveness. Alternatives 3, 4, 8, and 9 would require a

smaller volume of the contaminated material to be excavated and some contaminated material would be contained in place. The effectiveness of containment will depend on long-term operation and maintenance. Alternatives 3 and 4 also involve treatment by stabilization/ fixation, but the volume to be treated would be less.

For all of the alternatives, the long-term risks associated with exposure to and migration of the remaining wastes and treatment residues would be reduced by effective treatment and/or engineered controls to ensure operation and maintenance of the landfills, maintenance of the caps/covers, groundwater monitoring and monitoring of drainageways and Crab Orchard Lake.

**Reduction of Toxicity, Mobility, or Volume.** The Selected Alternative and Alternative 1 will provide treatment to the maximum extent possible for the hazardous wastes. Treatment will render these wastes non-hazardous. The mobility of the metals is reduced by stabilization/ fixation and containment. Although this treatment process increases the volume of the treated material, it does not increase the mass of the hazardous components.

Alternatives 3 and 4 utilize treatment by stabilization/ fixation on some of the hazardous waste. However, the volume to be treated would be less because Alternatives 3 and 4 only address the contamination at one of the three study sites in the operable unit. Therefore, overall reduction of mobility for the operable unit would be less for Alternatives 3 and 4 than for Alternatives 1 and 2. The other alternatives use containment technology to control the mobility of the contaminated material. None of the other alternatives would reduce toxicity, mobility or volume as much as the Selected Alternative and Alternative 1.

**Short-term Effectiveness.** All of the alternatives under consideration could present a threat to workers and the environment during the construction/implementation phase of the remedial action because of the potential for dust generation or the movement of contaminated sediments in surface water. Some care must be taken during excavation of contaminated sediments from the Old Refuge Shop Drainageway (site 22), involved in Alternatives 1, 2, 5 and 6, to prevent movement of the contaminated sediments into the water, and subsequently into Crab Orchard Lake. This could be accomplished by completing the excavation during the dry season when the intermittent stream is dry. The utilization of various protective measures will minimize threats to workers. The estimated time for implementation is roughly equal for the various alternatives, and is not expected to exceed two years for any of the alternatives.

**Implementability.** All of the alternatives use standard, reliable technologies which are feasible for implementation. The equipment and labor is readily available for all of the technologies. All of the alternatives would be considered technically implementable.

Administrative feasibility is greatest for the Selected Alternative and Alternatives 4 and 7 because these three avoid potential RCRA land disposal issues and involve on-site construction. Alternatives which utilize off-site disposal (Alternatives 1, 3, 5, and 8) may encounter problems with administrative feasibility because available capacity for off-site disposal is a potential problem. Also, upcoming RCRA land disposal restrictions and existing State of Illinois land disposal restrictions may require characteristic hazardous waste to be treated prior to disposal, which could make certain alternatives infeasible (particularly Alternatives 5, 6, 8, and 9).

**Cost.** For the Selected Alternative and each other Alternative, the total remedial costs (capital plus operation and maintenance) in present net worth are:

- Selected Alternative (Alternative 2)	\$2,700,858
- Alternative 1	\$5,463,787
- Alternative 3	\$1,658,733
- Alternative 4	\$1,084,538
- Alternative 5	\$7,075,984
- Alternative 6	\$2,789,825
- Alternative 7	\$1,047,111
- Alternative 8	\$2,716,361
- Alternative 9	\$844,627

The Selected Alternative is less expensive than four of the other alternatives. The alternatives that utilize off-site disposal tend to be more expensive than those utilizing on-site disposal.

**Support Agency Acceptance.** The U.S. Department of Interior supports the Selected Alternative. The State of Illinois has not supported the Selected Alternative at this time. Illinois has expressed concerns with the technical design of the solid waste landfill. (See Appendix C.)

**Community Acceptance.** A thirty day public comment period was originally scheduled to run from August 18, 1989, to September 16, 1989. Based on concerns expressed at the public hearing on August 30, 1989, the comment period was extended until September 23, 1989. Two commentators presented oral comments at the hearing specifically concerned with the Metals Areas operable unit and several others made comments related to the

Superfund decision-making processes. Thirty-one (31) letters relating to the Metals Areas Proposed Plan were received during the public comment period, including three from organizations. The comments received have been summarized and addressed in the Responsiveness Summary portion of this ROD.

The comments received during the public comment period are one measure of the community's acceptance of U.S. EPA's proposed remedial action. Over half of the comments received were concerned with the Superfund process rather than the specific remedy. The public was very unsatisfied with the Superfund decision-making process, and felt that the process does not accommodate public concerns. Many of the other comments focussed on technical questions and concerns and did not explicitly disagree with the proposed remedy. Some commentors, not the majority, expressed a preference for an alternative remedy to that proposed by the Agencies. The alternative that was most frequently supported by the commentors that expressed a preference different than that proposed was an off-Site landfill rather than an on-Site landfill. These comments are all addressed in the Responsiveness Summary.

Another measure of community acceptance is the activities undertaken by the Agencies pursuant to the Community Relations Plan (CRP). The CRP documents community relations activities, and will provide a measure of community acceptance in addition to the comments received during the comment period. The CRP supports that the community is dissatisfied with the Superfund process and is very concerned with the proposed remedy for the PCB Areas operable unit.

In conclusion, the community near the Refuge does not fully accept the remedy selected for the Metals Areas operable unit. However, the non-acceptance is based more on dissatisfaction with the Superfund process and the community's role in decision-making than with the technical components of the remedy. In order to broaden the community's role at this Site, U.S. EPA is expanding the CRP, and will work with the community to address all comments and concerns as the remedial design and remedial action go forward.

In summary, at this time the Selected Alternative represents the best balance among the alternatives of the evaluation criteria used to evaluate remedies.

#### **X. THE SELECTED REMEDY**

The Selected Alternative, Alternative 2 as outlined above, would permanently remediate the three study sites comprising the Metal Areas operable unit. Excavation of contaminated soil and sediment would address the principle threats to human health and the environment that

currently exist, and would prevent future threats and environmental degradation. Stabilization/ fixation of hazardous soil and sediment which is contaminated with metals will constitute treatment to the maximum extent practicable. Containment in a secure, on-Site, solid waste landfill of any metal bearing or stabilized waste will allow safe long-term control of this material. The labor and equipment necessary to implement the Selected Alternative are currently available. Specific details on various aspects of the selected remedy follow.

#### A. MAJOR COMPONENTS OF REMEDY

**Excavation of Soil and Sediment** - Contaminated soil and sediment will be excavated using conventional equipment. The excavated material will be moved to a storage area on-site, where it will be stored until it is treated or disposed. Design of the project will include methods to prevent contaminated sediment from moving into surface water and methods to minimize dust. Design will also include considerations to ensure compliance with ARARs. The excavated material will be sampled to determine whether it is hazardous, and hazardous and non-hazardous material will not be mixed.

**Stabilization/ Fixation** - Soils and sediments which are considered RCRA hazardous because of EP Toxicity (the characteristic to leach metals) will be treated by stabilization/ fixation. Stabilization/ fixation is a treatment process where contaminated soils and sediments will be treated with bonding agents which fix contaminants within the stabilized waste. This treatment makes the contaminants more resistant to leaching. Cement-based and lime-based stabilization processes are commonly used for fixation of metals. During Design, appropriate mixtures of treatment materials will be evaluated to assess their ability to immobilize the contaminants at the Site and to effectively render the material non-hazardous. Also, a treatment quality assurance plan will be developed to document the performance of the full scale treatment process.

**Industrial Landfill** - Excavated treated and untreated non-hazardous materials will be disposed in an on-Site industrial landfill. This "industrial landfill" will be a solid waste landfill as regulated by Subtitle D of RCRA and 35 IAC Part 807. The landfill will be constructed, at a minimum, with a single compacted soil liner and drainage layer. After placement of the contaminated soil and sediment, the landfill will be covered with a cap constructed, at a minimum, of compacted soil, a drainage layer, a barrier to prevent burrowing animals, soil fill and topsoil. The final design will be determined by site-specific characteristics, the object being to provide adequate containment of the waste material. The final location of the on-Site landfill will be determined by investigations during the remedial design phase to establish good siting characteristics. Upon completion, the landfill will be covered and vegetated. Groundwater and leachate monitoring, and routine maintenance will be part of the long term requirements.

**Backfill Excavation** - Clean soil will be placed in the areas where

contaminated material had been removed.

**Monitoring and Maintenance** - The on-Site landfill and excavated areas will require monitoring of groundwater and surface water. Long-term maintenance will be required for the landfill.

The components of this Selected Remedy are conceptual, and are based on desired performance standards and ARARs. As a result of the remedial design and construction processes some changes may be made to the design features outlined above.

#### B. CLEAN UP TARGETS

Clean up targets have been set for the study sites comprising the Metals Areas operable unit. The targets are based on the risk assessment performed in the RI Report, which evaluates potential risk to human health and the environment. The targets were then further refined to reflect DOI's specific concerns and statutory mandates for the protection of fish and wildlife at the Refuge, and U.S. EPA's regional and national policies in establishing clean up targets. The clean up standards for the study sites in the Metals Areas operable unit are discussed briefly below. Since some compounds will remain at the Refuge in an on-site landfill, the effectiveness of the remedy will have to be re-evaluated at least every five years.

##### 1. Site 15: Area 7 Plating Pond

Discharge standards for the pond water will be established to comply with the effluent standards and water quality standards of the Clean Water Act and State requirements.

All sludges in the pond and contaminated underlying soil containing chromium in excess of naturally occurring background levels will be removed.

##### 2. Site 22: Old Refuge Shop Drainage Pool

Attempts will be made to complete all remedial action for this site during the dry season so that there is no water in the drainage stream. If water must be discharged during the remediation, standards will be established to comply with the effluent standards and water quality standards of the Clean Water Act and State requirements.

All sediments and soil containing cadmium in excess of 10 mg cadmium per kg dry soil will be removed. Removal based upon this criterion should address all of the other contaminants at the site. However, the risk from all of the chemical contaminants present above naturally occurring background levels in the soil and sediment shall not exceed an excess cancer risk of one in one million ( $10^{-6}$ ) and shall not exceed any non-cancer chronic health effects.



The groundwater will be monitored during and after remediation of the site. The monitoring results will be evaluated to assure that after completion of the remediation of the contaminated soils and sediments the risk from all of the contaminants in the groundwater above naturally occurring background levels shall not exceed an excess cancer risk of one in one million ( $10^{-6}$ ) and shall not exceed any non-cancer chronic health effects.

### 3. Site 29: Fire Station Landfill

All contaminated soil and sediment in this landfill in excess of 450 mg lead per kg dry soil will be removed. Lead contamination was only found in isolated "hot spots" at this study site.

The groundwater will be monitored during and after remediation of the site. The monitoring results will be evaluated to assure that after completion of the remediation of the contaminated soils and sediments the risk from all of the contaminants in the groundwater above naturally occurring background levels shall not exceed an excess cancer risk of one in one million ( $10^{-6}$ ) and shall not exceed any non-cancer chronic health effects.

## C. COST

### 1. Direct Capital Costs

The direct capital cost estimates include site preparation, excavation, treatment, placement, landfill construction, cover construction, backfilling of excavated areas, verification sampling, construction health and safety, and installation of fencing and monitoring wells. The breakdown for each study site follows:

Site 15: 280 cubic yard	\$55,876
Site 22: 5,200 cubic yards	\$370,467
Site 29: 14,600 cubic yards	\$859,910

### 2. Indirect Capital Costs

The indirect capital cost estimates include a contingency allowance of 25 percent, engineering fees of 15 percent, and legal fees of 5 percent of the direct capital costs. The breakdown for each study site follows:

Site 15:	\$25,148
Site 22:	\$166,710
Site 29:	\$386,960

### 3. Operation and Maintenance Costs

Operation and maintenance cost estimates include site maintenance and inspection, sampling and analysis, and a reserve fund and insurance. The breakdown for annual costs for operation and maintenance for each study site follows:

Site 15:	\$9,228
Site 22:	\$18,269
Site 29:	\$26,874

### 4. Total Present Value Cost

The total present value cost estimate includes all of the costs listed above for each of the sites, and estimates an operation and maintenance period of thirty years with a five percent interest rate. The total present worth cost estimate for the selected remedy is \$2,700,858.

## XI. STATUTORY DETERMINATIONS

### A. PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The Selected Alternative is protective of public health and the environment for the three study sites comprising the Metals Areas operable unit. Also, the chosen remedy is consistent with the mission of the Refuge, which is to provide a safe and protective setting for wildlife. The Selected Alternative provides adequate protection by a combination of treatment of contaminated soil and sediment by stabilization/ fixation, the engineered control of an on-site solid waste landfill for the treated and untreated contaminated material, and institutional controls by continuing to restrict public access, particularly to the constructed landfill. The remedial alternatives, including on-site landfills, were developed with the understanding that the site would continue to be a wildlife refuge, with restricted public access in order to protect the wildlife. An interagency agreement will require DOI maintain the on-site landfill and to provide access restrictions for the landfill if the land use were to change in the future.

The cleanup targets for the study sites comprising the operable unit have been established so that human exposure levels will be reduced for the sum of all contaminants to no greater than a  $10^{-6}$  excess cancer risk level. In addition, the non-carcinogenic hazard indices for the sum of all contaminants shall be less than one. Also, chemical specific cleanup targets have been established by the FWS which are believed to be protective of wildlife at this site. The cleanup targets established in this document are consistent with DOI's concerns and statutory mandates. Implementation of the selected remedy will not pose unacceptable short-term risks and will not cause cross-media impacts.

The Selected Alternative would clean up the three study sites that comprise the operable unit so that future access restrictions to those areas would not be needed. Because the chosen remedy will leave contaminants at the site in an on-site landfill, CERCLA Section 121(c) requires that the remedy be reviewed at least every five years to ensure that it continues to be protective to public health and the environment.

B. COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selected remedy will comply with all Federal and any more stringent State ARARs. No waiver of an ARAR will be required. The major ARARs that will be attained by the components of the selected remedy are listed below. The ARARs listed below may not be all inclusive, and implementation of the ARARs will be determined during remedial design and remedial action.

1. Surface Water Discharge

Clean Water Act

- If pond water from site 15 or stream water from site 22 must be discharged to a surface water body during site preparation, the discharge shall meet the effluent standards and prohibitions established under Sections 301, 302, 303, 307, 318 and 405 of the Clean Water Act (40 CFR 122.41 and 122.44).

2. Excavation of Soil and Sediment

Resource Conservation and Recovery Act, Subtitle C

- Excavated material which is RCRA hazardous will be handled and stored in accordance with the substantive technical standards applicable to generators of hazardous waste and for owners and operators of hazardous waste storage facilities (40 CFR 262.34; and 264, Subparts B, C, I, J, and L).

- Excavated material which is RCRA hazardous will be handled and stored in accordance with the land disposal restrictions (40 CFR 268).

- The excavation activities, when completed shall meet the closure performance standards for clean closure (40 CFR 264, Subpart G)

- The excavation and storage activities must also meet any more stringent State of Illinois equivalent provisions (35 IAC Part 724 design requirements).

Clean Air Act

- During excavation the national ambient air quality standards

(NAAQS) for particulate matter and lead shall not be exceeded (40 CFR 50.6 and 50.12).

### 3. Stabilization/ Fixation

#### Resource Conservation and Recovery Act, Subtitle C

- RCRA hazardous material will all be treated by this process to render it non-hazardous. The treatment shall be in accordance with any promulgated treatment standards for waste which is EP Toxic for cadmium, chromium or lead (40 CFR 268 for D006, D007 and/or D008 waste).

- Treatment shall be in units designed to meet the substantive technical requirements for either containers, tanks, waste piles or miscellaneous units (40 CFR 264, Subparts I, J, L or X).

- Treatment units must meet any more stringent regulatory design standards of the State of Illinois (35 IAC Part 724).

#### Clean Air Act

- During treatment the NAAQS for particulate matter and lead shall not be exceeded (40 CFR 50.6 and 50.12).

### 4. Disposal or Decontamination of Equipment

#### Resource Conservation and Recovery Act, Subtitle C

- During closure all equipment, structures and soils that are used on/with RCRA hazardous materials must be properly decontaminated or disposed (40 CFR 264.114).

- Decontamination of equipment structures and soils that are used on/with RCRA hazardous materials must meet any more stringent regulatory decontamination or disposal standards of the State of Illinois (35 IAC Part 724).

### 5. Industrial Landfill

#### Solid Waste Disposal Act as amended by RCRA Subtitle D

- The design and operation of the on-site solid waste disposal cell will meet the substantive technical requirements of the RCRA, Subtitle D guidelines for the land disposal of solid waste (40 CFR 241, Subpart B).

- The design and operation of the landfill will meet any more stringent technical regulations of the State of Illinois (35 IAC Part 807).

6. Backfill Excavation

Clean Air Act

- During backfilling activities the NAAQS for particulate matter shall not be exceeded (40 CFR 50.6).

7. Monitoring and Maintenance

Resource Conservation and Recovery Act, Subtitle C

- Groundwater monitoring for the excavated study sites shall be in accordance with the groundwater monitoring requirements of RCRA (40 CFR 264, Subpart F).

Solid Waste Disposal Act as amended by RCRA Subtitle D

- Groundwater and leachate monitoring for the on-site landfill shall be in accordance with the RCRA Subtitle D, solid waste landfill requirements (40 CFR 241.204).
- Groundwater and leachate monitoring for the on-site landfill will meet any more stringent technical regulations of the State of Illinois (35 IAC Part 807).

8. Personnel Protection

Occupational Safety and Health Act (OSHA)

- During all remedial activities the requirements of the Occupational Safety and Health Act for the training and safety of workers will be observed (29 CFR 1910.120 and 1926, Subparts C, D, E, and F).

9. Cleanup Standards

Crab Orchard Enabling Legislation (16 U.S.C. 666f and g)

National Wildlife Refuge Administration Act (16 U.S.C. 668dd)

- The chemical specific cleanup targets which have been established for the study sites comprising the Metals Areas, and any others that will be established for this operable unit will be consistent with DOI concerns and statutory requirements, such as those cited above.

In implementing the selected remedy, U.S. EPA, DOI and IEPA have agreed to consider a number of procedures that are not legally binding. These include, but are not limited to: U.S. EPA's Risk Assessment Guidance for Superfund; U.S. EPA's Superfund Remedial Design and Remedial Action Guidance; U.S. EPA's RCRA Technical Enforcement Guidance Document; State of Illinois Waste Management Facilities Design Criteria; State of

Illinois Monitoring Well Construction and Installation Criteria; FWS Master Plan for Crab Orchard National Wildlife Refuge; and FWS Refuge Manual.

C. COST EFFECTIVENESS

The selected remedy for this operable unit appears to be cost-effective. The costs are reasonable for the overall effectiveness of the chosen remedy. Other Alternatives which provided less long-term effectiveness and permanence; less reduction of toxicity, mobility or volume; or less implementability were more costly.

D. UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The Selected Alternative for the Metals Areas operable unit utilizes permanent solutions and treatment technologies to the maximum extent practicable.

The evaluation of the five primary balancing criteria is discussed in Part IX, above. The analysis of the criteria supports the selection of Alternative 2, as being the best balance among the Alternatives. The analysis of the criteria supports that the Selected Remedy utilizes permanent solutions to the maximum extent practicable. A brief review of the five primary balancing criteria follows:

**Long-term Effectiveness and Permanence.** The Selected Alternative would provide the greatest long-term effectiveness and permanence. It would involve removal of approximately 20,000 cubic yards of contaminated soil and sediment, of which approximately 9,000 cubic yards is estimated to be RCRA hazardous. This contaminated soil and sediment constitutes the principle threat from this operable unit. All of the RCRA hazardous metal contamination will be treated by stabilization/fixation with secure containment of the residues and the untreated non-hazardous waste. The treatment provides a demonstrated, effective rendering of hazardous material to a state where it is non-hazardous. The long-term risks associated with exposure to and migration of the wastes and treatment residues would be reduced by excavation of all of the contaminated material, effective treatment and secure engineered controls.

**Reduction of Toxicity, Mobility, or Volume.** The Selected Alternative will provide treatment to the maximum extent possible for the approximately 9,000 cubic yards of RCRA hazardous wastes. Treatment will render these wastes non-hazardous. The mobility of the metals is reduced by stabilization/fixation and containment. Although this treatment process increases the volume of the treated material, it does not increase the mass of the hazardous components.

**Short-term Effectiveness.** All of the alternatives under consideration could present a threat to workers and the environment during the construction/implementation phase of the remedial action because of the potential for dust generation or the movement of contaminated sediments in surface water. The estimated time for implementation is roughly equal for the various alternatives, and is not expected to exceed two years for any of the alternatives. The short-term effectiveness should be roughly equal for any of the alternatives.

**Implementability.** The Selected Alternative uses standard, reliable technologies which are feasible for implementation. The equipment and labor is readily available for all of the technologies. The Selected Alternative would be considered technically implementable.

Administrative feasibility is greatest for the Selected Alternative, among others, because it avoids potential RCRA land disposal issues and involves on-Site construction. Alternatives which utilize off-Site disposal may encounter problems with administrative feasibility because available capacity for off-Site disposal is a potential problem. Also, upcoming RCRA land disposal restrictions and existing State of Illinois land disposal restrictions may require characteristic hazardous waste to be treated prior to disposal, which could make certain alternatives infeasible.

**Cost.** The Selected Alternative is less expensive than four of the other alternatives. The alternatives that utilize off-Site disposal tend to be more expensive than those utilizing on-Site disposal.

Alternative 2 was selected as the final remedial action for the Metals Areas operable unit because it provides the greatest long-term effectiveness and permanence and reduction of toxicity, mobility and volume through treatment. The costs are in the middle of costs for all of the alternatives, and its short-term effectiveness is equivalent to the other alternatives. Also, the Selected Alternative is equally implementable from a technical point of view, and will avoid future RCRA land disposal restrictions.

#### **E. PREFERENCE FOR TREATMENT AS A PRINCIPLE ELEMENT**

The selected remedy uses treatment as a principle element to address the threats posed by the sites comprising the Metal Areas operable unit. The results of the risk assessment conducted as part of the RI indicate that the greatest threat to human health and/or the environment is from contaminated soil and sediment, and potential surface water contamination resulting from run-off from the uncontrolled areas. The Selected Alternative requires that excavated soil and sediment which is hazardous because of the characteristic to leach metals be treated by stabilization/ fixation to render the material non-hazardous and to

reduce mobility of the contaminants. This treatment technology has been demonstrated to be extremely effective for soil and sediment contaminated with metals.



**RESPONSIVENESS SUMMARY FOR THE RECORD OF DECISION  
CRAB ORCHARD NATIONAL WILDLIFE REFUGE  
METALS AREAS OPERABLE UNIT**

**RESPONSIVENESS SUMMARY OVERVIEW**

The United States Environmental Protection Agency (U.S. EPA) recently held a public comment period from August 18, 1989, through September 23, 1989, for interested parties to comment on the Proposed Plan for remediating contamination problems at the Metals Areas operable unit of the Crab Orchard National Wildlife Refuge Superfund site near Carterville, Illinois. Comments were also taken on any documents in the administrative record, including the Remedial Investigation/Feasibility Study (RI/FS). The required public hearing on August 30, 1989, focused on the results of the FS and U.S. EPA's preferred remedial alternative (Proposed Plan). Comments were taken on both the Metals Areas and PCB Areas operable units at the hearing on August 30, 1989. The public comment period was held in accordance with Section 117 of CERCLA.

The purpose of this responsiveness summary is to document the U.S. EPA's and the U.S. Department of Interior's (DOI) responses to comments received during the public comment period. These comments were considered prior to selection of the final remedy for the Metals Areas operable unit at the Crab Orchard National Wildlife Refuge Superfund site, which is detailed in the Record of Decision (ROD).

**BACKGROUND ON COMMUNITY INVOLVEMENT**

The DOI, in conjunction with U.S. EPA is responsible for conducting the community relations program for this site. A community relations plan (CRP) was established by DOI for the Refuge in June 1987. It established a process to develop a two-way flow of project information between local officials, concerned citizens, the media and DOI. The CRP was updated in July 1988, to broaden U.S. EPA's role in community relations activities. Four information repositories were established in the local area, at the Marion Federal Penitentiary, the Marion Carnegie Public Library, the Crab Orchard National Wildlife Refuge Headquarters and the Morris Library at Southern Illinois University in Carbondale. Several different press releases and fact sheets were issued to announce field activities and the findings of the RI and FS. A public meeting on the findings of the RI was held in Carterville in August 1988. Community relations activities are summarized in the ROD, if additional information is desired.

**PUBLIC HEARING**

The required public hearing on the Proposed Plans for the Metals Areas and PCB Areas operable units was held from 7:00 p.m. to 10:30 p.m., at the John A. Logan College in Carterville, Illinois. Approximately 140 persons attended including the U.S. Congressman for the district, several local or federal officials or their representatives, representatives of some companies or industries that have been tenants at the Refuge, and members of the press (television, radio and newspapers).

## SUMMARY OF SIGNIFICANT COMMENTS RECEIVED AND RESPONSES

Questions and comments received during the public comment period are paraphrased and organized into three discrete sections within this summary: those received at the public hearing; written comments from individuals; and written comments from organizations. The Agencies' response is given after each question or comment.

### Comments Received at the Public Hearing

#### Comment 1:

Several commentors stated that the time for public comment was too short because of the technical complexity and length of the reports. They felt that the comment period should be extended, with periods suggested ranging from two weeks to two months.

#### Response 1:

The National Contingency Plan (NCP) requires that the Feasibility Study (FS) be available for public comment for not less than twenty one days (40 CFR 300.67(d)). Because of concern that twenty one days was not sufficient time to review and comment on the FS, the original comment period for this operable unit was thirty days. Based on concern expressed at the public hearing on August 30, 1989, the public comment period was extended for an additional seven days, making a total comment period of thirty seven days. Since most of the comments received at the hearing were concerned with the second operable unit, the PCB Areas, that comment period was extended for a longer period of time.

#### Comment 2:

A commentor suggested that the metal bearing material be placed in above ground storage and monitored until future technologies develop.

#### Response 2:

CERCLA Section 121(b) requires that U.S. EPA "... conduct an assessment of permanent solutions and alternative treatment technologies or resource recovery technologies that, in whole or in part, will result in a permanent and significant decrease in the toxicity, mobility or volume of the hazardous substance, pollutant, or contaminant.... The President shall select a remedial action that is protective of human health and the environment, that is cost effective, and that utilizes permanent solutions and alternative treatment technologies or resource recovery to the maximum extent practicable."

While above ground storage can be designed which is protective of public health and the environment, a remedy which required storage until future technologies develop would not meet the statutory requirement to select permanent solutions. The remedy selected would also not result in a

permanent decrease of toxicity, mobility, or volume. Because the remedy proposed by the commentor would not meet the statutory requirements, it could not be selected by U.S. EPA.

Comment 3:

One commentor questioned the characterization of the operable units as "PCB" and "Metals" units, since every one of the seven sites comprising the two operable units has metal contamination.

Response 3:

Operable unit, as defined in the NCP is "a discrete part of the entire response action that decreases a release, threat of release, or pathway of exposure". The requirements for operable units is that they must be consistent with a permanent remedy and cost effective (40 CFR 300.68(c)). The PCB and Metals Areas operable units have been created in accordance with the requirements of the NCP. The characterization of the operable units at the site is not intended to be misleading, and the titles of the operable units are simply a means of characterizing the major contaminants within each unit. This does not mean that other contaminants may not be present, as is the case of the PCB Areas operable unit, where lead contamination has always been acknowledged and discussed.

Comment 4:

One commentor questioned the evaluation made through the RI/FS process that contaminated groundwater does not pose a risk at the site. He felt that although access to groundwater is restricted there is potential risk because groundwater can move off-site.

Response 4:

The RI/FS did incorporate considerations of access restrictions when evaluating the risk from groundwater at the site. This is a reasonable exposure scenario for the current situation at the site. However, the clean-up targets that were discussed in the Proposed Plan require that groundwater monitoring continue during and after removal of the source of contamination, and that groundwater contamination cannot exceed risk based levels at any point where there is a reasonable chance of exposure. If groundwater levels do exceed these levels, separate remedial action will be evaluated for the contaminated groundwater. This would include potential off-site contamination, or other future use scenarios.

Comment 5:

One commentor questioned whether the proposed stabilization/ fixation treatment process is safe, and whether it is a proven technology.

Response 5:

For metal bearing wastes, stabilization/ fixation is a proven technology which successfully immobilizes the metal contaminants. The treatment process will be carefully designed to ensure safety during operation, and to prevent fugitive emissions during processing. The monitoring requirements for the process will be developed as part of remedial design, and this monitoring will ensure successful treatment and safe operations.

Comment 6:

One commentor stated that an off-site landfill might be safer than an on-site landfill because of the hydrologic and geologic characteristics of the Refuge. He stated that cost of the off-site landfill seemed to be a main reason that this alternative was not preferred. Also, he stated that if a landfill is built on-site, that the period for monitoring of the landfill has not been well defined.

Response 6:

The U.S. EPA considered the safety of both off-site and on-site landfills prior to selecting its preferred alternative. The evaluation was done under the criterion which assesses long term effectiveness and permanence. The results of the RI indicate that there are several potentially suitable areas on the Refuge to site a landfill, which include suitable hydrologic and geologic characteristics.

Cost is one criterion which is weighed before the U.S. EPA proposes or selects a remedy. The cost of off-site landfilling was greater than on-site landfilling without significant benefits in any of the other evaluation criteria categories, including no significant increase in long term effectiveness. Since none of the other nine criteria strongly favor off-site disposal of the waste, the greater costs weigh against an off-site landfill. In addition, the Agencies believe that there are advantages in the category of long term effectiveness and permanence because an on-site landfill will prevent comingling of the waste with materials that could increase the mobility of the contaminants.

In addition, Section 121(b)(1) of CERCLA states "The offsite transport and disposal of hazardous substances or contaminated materials without such treatment should be the least favored alternative remedial action where practicable treatment technologies are available." This statutory preference would indicate that off-site disposal alternatives without prior treatment should not be favored by U.S. EPA.

Written Comments and Questions From Individuals

Comment 7:

Several commentors stated that the time allowed for public comment was too short, that the process is a token gesture, and that the comment

period and process is not fair to the public.

Response 7:

The NCP establishes a regulatory framework for the implementation of CERCLA. As discussed in Response 1, the NCP includes provisions for the minimum requirements for public participation. Among these requirements is that the Feasibility Study (FS) be available for public comment for not less than twenty one days (40 CFR 300.67(d)). As was stated in Response 1, the original comment period for this operable unit was longer than the minimum requirement, and an additional extension to the comment period was granted based on comments at the public hearing. The total comment period for this operable unit was thirty seven (37) days.

All public comment which was received during the comment period was seriously considered prior to the final decision on a remedial action. Just because one individual comment may not have changed the final decision, it does not mean that the process is a "token gesture". Comments received expressed a diversity of opinion about what action is needed to clean up the site, and not all opinions could be satisfied by any one decision. Also, community acceptance is only one of nine criteria used to evaluate remedial alternatives, and must be weighed against the other criteria.

With respect to the issue of "fairness to the public", U.S. EPA attempts both to respond to the public and to get sites cleaned up fast, as required by Congress. The Agency tries to allow the maximum public participation consistent with an expeditious cleanup of hazardous materials. In addition, all regulations, including the NCP which establishes the public participation procedures, undergo a period of public comment before they are finalized. The public has had opportunities to comment on the Superfund process as a whole, and the regulations reflect those comments. Different individuals within "the public" have different ideas and priorities. The procedural regulations are an attempt to balance various individual concerns.

Comment 8:

Several commentators stated that the criteria for community acceptance has not been met.

Response 8:

The criteria of community acceptance is discussed extensively in Section IX of the Decision Summary portion of this ROD.

Comment 9:

Some commentators felt that U.S. EPA has not provided enough information to the public, or has not communicated adequately with people in the local communities.

Response 9:

None of the commentors stated explicitly which information that they thought was lacking, nor did they state whether information was incomplete in the Administrative Record. The Administrative Record constitutes the basis upon which the U.S. EPA's decisions are made and, as such, contains all of the information which is pertinent to the remedial decision. Copies of the Administrative Record have been available for inspection at information repositories located at the Morris Library at Southern Illinois University in Carbondale, Illinois and at U.S. EPA's Region V office in Chicago, Illinois.

Two informal availability sessions and a formal public hearing were held during the public comment period where questions on the Metals Areas proposed plan were answered. In addition, several Fact Sheets have been widely distributed by U.S. EPA to provide summaries of information. The Agency representatives also distributed their telephone numbers and would have met with or talked to any concerned member of the public to provide additional information, if this had been requested.

Comment 10:

Some commentors stated that the time of the meeting on September 18, 1989, was bad for the public because of their schedules. Also, one commentor said that all meetings should be on the record.

Response 10:

The meeting on September 18, 1989, was an availability session to try to answer any additional questions before the end of the public comment period. The intent of the meeting was not to take comment for the record. A public hearing where official comment was taken on the record was held on August 30, 1989, after which the public had twenty four (24) days to submit any additional comments in writing. Informal availability sessions are frequently held during Superfund projects, and transcripts are usually not kept. Because individuals have different schedules, there can be no time that is convenient for everyone. This availability session did not adjourn until 6:45 pm, and the majority of people were at the meeting at 3:30. People who could not attend the meeting who had questions could have contacted the U.S. EPA staff on the Agency's toll free telephone line.

Comment 11:

Some commentors criticized the public comment period because the reports were only available at the start of the comment period, and that these reports are lengthy and highly technical, making them difficult to review.

Response 11:

The RI report and much of the information in the Administrative Record

had been available to the public since August 1988, which is a year before the start of the public comment period. A meeting to describe the results of the RI and to explain the next steps in the process was held in August 1988. A Fact Sheet describing some of the types of technologies being considered as remedies was issued to the mailing list of concerned parties in January 1989. This Fact Sheet also described the tentative schedule for the remedial decision; listed the criteria by which the alternatives would be screened; solicited public input on the remedy selection; and described the public participation process. This Fact Sheet was an attempt to alert the public early so that they would be aware of their role, their contributions to the process and the limitations of the Superfund decision-making process.

The NCP discusses the information that should be available in the RI and FS (40 CFR 300.68). Because these reports form a significant portion of the basis of the Agency's decisions, the information is highly detailed and technical. Since they can be difficult to review, that is why the RI was made available as soon as it was finalized, and why the Fact Sheet to discuss the FS process was prepared.

Comment 12:

One commentator stated that although some reports have been available to the public for some time, there is a difference in public concern between what pollution exists and which technologies will be used to clean it up.

Response 12:

As discussed in Response 11, a Fact Sheet describing some of the types of technologies considered for the Refuge was issued in January 1989, and comments on remedial alternatives were solicited at that time. No comments were received regarding any of the technologies under consideration until the public hearing on August 30, 1989.

Comment 13:

Two commentators stated that the Superfund process is detrimental to the public's interest, that the process causes incomplete investigations, that the need to show results promotes the selection of faulty technology, and that criticism of the Superfund program is leading to haste at this site.

Response 13:

As discussed in Response 7, the Superfund process is codified into regulations in the NCP (40 CFR 300). The regulations are intended to establish procedures that allow for public participation at all Superfund sites. Further, these regulations were open to public comment before they were finalized, and reflect the comments received. Procedures were established within this framework to require the public's interest to be treated equivalently at all sites, and not on a random, site specific basis.

As discussed in Response 11, the NCP establishes the requirements of the RI and FS. The U.S. EPA believes that the RI and FS reports for the Metals Areas operable unit have met these requirements. Further, the requirements for investigations promulgated in CERCLA Section 104(b) have been met. The investigation at the Refuge is adequate to support the remedial decision being made for the Metals Areas operable unit.

The issue of criticism of Superfund and the need to show results resulting in hasty decisions or faulty technologies has been raised on a national level, as well as at this site. It is true that Congress has directed the Agency to move faster on Superfund projects, in general. However, this does not mean that at this particular site a poor quality decision is the result. The decision to increase speed on projects was not made as a trade off to quality, and U.S. EPA believes that good remedial decisions can be made at sites in a timely and efficient manner.

Comment 14:

Some commentators expressed concern that U.S. EPA's decision on the selected alternative would not be in the best interest of the local community. Specific concerns are the impacts on their lives and futures, the impacts on enrollment at Southern Illinois University, and the impacts on tourism.

Response 14:

The impact of remedial alternatives on local communities is evaluated in the categories of short term effectiveness and long term effectiveness and permanence. As discussed in Response 6, there is strong statutory preference against movement of waste to another community without prior treatment. The remedial design will prevent adverse short term impacts to the area, such as potential dust generation or surface water run-off by using engineering methods to prevent these from occurring.

The long term impacts of an on-site, solid waste landfill were evaluated, and this disposal method should prevent any future problems by containing the treated waste. There will be a site-specific, comprehensive, on-going inspection and monitoring program to ensure the safety of the landfill.

The impacts of the chosen remedy on enrollment or tourism are no greater than the other alternatives, and are much less than the adverse effects on tourism that have occurred because of the existing contamination problem at the Refuge. Refuge figures indicate that annual numbers of visitors to the Refuge declined from 1,200,000 to 800,000 because the public is aware of existing contamination problems. Cleaning these problems up can only improve tourism and decrease adverse impacts on the nearby community.



**Comment 15:**

One commentor felt that not enough information has been provided on the long term effects of the clean up actions.

**Response 15:**

The evaluation of long term effects for each of the alternatives, including the chosen alternative is presented in the FS, and was summarized in the Proposed Plan for the operable unit.

**Comment 16:**

Several commentors expressed concern that excavation of the contaminated soil and sediment could cause air problems, especially dust, that might be harmful. They felt that safeguards are necessary to prevent the escape of contaminated dust, or to clean up any dust that is created. Also, there was concern with movement of the contaminated material into water.

**Response 16:**

U.S. EPA is aware that excavation of contaminated soil and sediment has the potential to create cross-media impacts, such as releases of dust to the air or run-off to surface water. Safeguards are established as a part of the remedial design to prevent these potential adverse impacts. Specific design features will address dust suppression and run-off control. The design will also include methods to control dust emissions from the stabilization/ fixation treatment process. In addition to the engineering controls to prevent releases of contaminants, the remedial design will include monitoring requirements to ensure that the control processes are working and a contingency plan on how to address and correct any malfunction that could damage the environment.

**Comment 17:**

Two commentors felt that the FS does not give enough site-specific details about the remedial alternatives, the specific techniques to be used, the contractors to do the work, or treatability tests.

**Response 17:**

The FS Report includes details about general specifications of each of the remedial alternatives considered. The FS Report does not go into extensive site-specific details regarding each alternative, but does provide a discussion of chemical, location and action specific Applicable or Relevant and Appropriate Regulations (ARARs) for the alternatives. For example, the FS includes a discussion of the design requirements for hazardous waste landfills, but does not include design drawings and specifications for a hazardous waste landfill at the Refuge. Design drawings and specifications are not included because only one remedial alternative will be chosen, and it would be costly and time consuming to

produce specific designs for all alternatives. The purpose of the FS is to provide a reasoned choice among alternatives. Specific design details are not necessary to make such a choice.

Moreover, until the remedial action is selected, the contractors to do the work cannot be hired. Similarly, techniques to implement the construction and operation of the remedial action and treatability tests to establish implementation parameters cannot be finalized until the action is selected and the design documents finalized. The FS does provide enough information for each of the alternatives to be evaluated against the nine criteria, the statutory requirements of CERCLA, and compared to each other.

The fact that this information is not developed as part of the FS Report does not mean that the public will not have a chance to continue to review and comment on the remedial design and remedial action documents and work plan. As material is developed it will be placed in the information repository, and otherwise provided to the public.

Comment 18:

One commentor requested a tour of the contaminated sites.

Response 18:

Tours of the contaminated sites are available by arrangement with the Crab Orchard National Wildlife Refuge Manager. He will arrange for individuals or small groups to see the areas of contamination, in compliance with the site safety plan and Refuge requirements. The Refuge Manager can be reached at (618) 997-3344.

Comment 19:

One commentor asked whether incineration is feasible for the metal contaminated material.

Response 19:

Incineration is not feasible for the metal contamination because incineration technology has no effect on the toxicity, mobility or volume of metal contaminants.

Comment 20:

One commentor questioned whether the control sites identified in the RI are truly representative.

Response 20:

Two sites, study sites 30 and 31, were selected as control sites and some of the samples taken from Crab Orchard Lake were taken as control samples. The rationale for the selection of the sites is explained in

Section 3.5 of the RI Report. Site 31 was selected as a "Refuge background" because it was believed to be remote from any industrial activities. Site 30 was selected to establish whether there are low levels of dispersed explosive residuals in the former Department of Defense areas. The results of the investigation of these study sites is discussed in Section 8 of the RI Report. The quality assurance/ quality control of the first phase of samples was questionable, and therefore the use of the data is limited.

The data from the control sites was not used as a basis for determining the clean up targets for the Metals Areas operable unit. The contaminants at the study sites comprising the Metals operable unit will be remediated to risk based levels rather than to background levels. Because of the possible limitations of the data derived from the background samples taken during the RI, decisions have not been based solely on these data.

Comment 21:

One commentor expressed concern that cost will be the primary factor in choosing who does the remedial work, and that a cheap contractor may be bad.

Response 21:

In awarding a contract for the remedial work the primary concern is that the contractor can perform the necessary work. Cost is a secondary criterion and is only considered to choose between contractors who are capable. The Federal Agencies have specific regulations that apply to the spending of Federal money to do the remedial work. In awarding a contract for the remedial work, the U.S. EPA must comply with the regulations of 40 CFR Part 33. The determination of the final award will consider cost only after the bidders demonstrate that they can meet the other evaluation criteria. If the Agencies allow or require a responsible party to perform the work, the responsible party will be responsible for the selection of the contractor. However, the choice will be subject to Agency approval after a determination that the selected contractor is qualified to perform the work.

Comment 22:

Several commentors questioned the appropriateness of the creation of the "PCB" and "Metals" Areas as separate operable units. Because of the diversity of contaminants at the sites and the occurrence of metals at the PCB sites and possibly PCBs at one Metals site, the commentors wondered if the operable units were an oversimplification and if the preferred alternatives would address all of the contaminants at the sites.

Response 22:

As discussed in the response to Comment 3, U.S. EPA believes that the

creation of separate operable units for the Metals and PCB Areas is appropriate. The creation of these operable units meets the statutory and regulatory requirements of CERCLA and the NCP. As stated above, the titles of the operable units are simply a means of characterizing the major contaminants within each unit. This does not mean that other contaminants may not be present. However, the selected remedy for the Metals Areas operable unit will address all of the contaminants of concern found at the three study sites comprising the operable unit and the remedy selected in the future for the PCB Areas operable unit will address the contaminants at those sites.

Comment 23:

One commentor stated that IEPA must "retain their power to guide and monitor federal EPA remediation action on the Refuge".

Response 23:

The IEPA does retain all of its legal authorities at this site. IEPA has been, and will continue to be, a partner to U.S. EPA and DOI in the remedial action at the Refuge. During the remedial design and remedial action for this operable unit, and for all Superfund activities for other operable units IEPA will continue to provide input, and be actively involved with the ongoing activities.

Comment 24:

Several commentors questioned the permanence and safety of stabilization/fixation as a treatment process. Concerns include: potential leaching of the metals in the future; the impact on the metal contamination if the stabilizers don't last or the process breaks down; the opinion that stabilization/fixation may not be a proven technology; and concern that the treatment can't last forever, so we are only postponing contamination to the future.

Response 24:

Stabilization/fixation is a proven technology and has been demonstrated as the best demonstrated available technology (BDAT) for treatment of hazardous wastes containing cadmium, chromium, lead, nickel, silver, arsenic and selenium. Because the contaminated soil and sediment in the Metals Areas operable unit contain cadmium, chromium and lead, this treatment is the BDAT for these contaminants. Data indicate that the stabilization/fixation process is permanent and that the stabilizers "last". The stabilizers are generally a mixture of lime, fly ash, pozzolans or other ingredients that create a cement type of reaction. If this material should weather or break down for some reason, the contaminants may still be trapped in the cement matrix. There are no adverse impacts on the metals from the materials used in the treatment process.

Stabilization/fixation treatment, while shown to immobilize the metal

contaminants, does not destroy them. The selected remedy requires the disposal of the treated hazardous and untreated non-hazardous material in an on-site landfill. The landfill operates as an additional safety measure in case the stabilization/ fixation process becomes less effective in the future. Because the contaminants will remain in a treated form on-site, CERCLA requires that the effectiveness of the remedy be evaluated at a minimum of every five years. In addition, the operation and maintenance activities for landfills require periodic monitoring to assess whether leachate is produced and if so, whether contaminants are found in the leachate. If the on-going monitoring and evaluation indicate that the treatment process has ceased to work, the remedy will be re-evaluated. Also, if the monitoring indicates that contaminants are found in the leachate, the need for corrective action will be assessed before the contaminants can migrate out of the landfill. These activities will prevent adverse impacts from occurring in the future.

Comment 25:

Several commentors questioned the safety, permanence and/or appropriateness of a landfill on the Refuge. Because of these concerns, several commentors stated that an off-site hazardous waste landfill should be used, or if an on-site landfill is used it should meet RCRA standards rather than solid waste standards for the design because of the extra protection the RCRA design would provide.

Specific concerns include:

- a. the appropriateness of the site geology;
- b. the high water table at the site which could effect the landfill liner;
- c. potential location of the landfill in or near a wetland;
- d. location of the landfill over the New Madrid fault line;
- e. the long term effectiveness and permanence of a landfill, and whether future clean-up of the material would be required;
- f. the fact that the exact location of the on-site landfill was not identified in the FS;
- g. the potential for food chain accumulation from an on-site landfill; and
- h. whether a National Wildlife Refuge should be used as a site for a landfill.

Response 25:

Because metal contamination can be treated but not permanently destroyed, the remedial alternatives evaluated in the FS all included a component of long-term containment (except the no action alternative). The FS Report includes an assessment of both on-site and off-site landfills, with or without treatment of the material prior to disposal. The alternatives of on-site versus off-site landfiling were compared against the nine criteria used to evaluate potential remedies, and were also evaluated against the goals and mission of the DOI for long-term Refuge management.

The comparative assessment of the landfill locations indicate that an on-site landfill is preferred. The Agencies believe that it is easier to ensure the long-term effectiveness and permanence of an on-site landfill for the treated material through aggressive long-term operation, monitoring and maintenance. Disposal of the treated material in an off-site landfill may allow the material to be mixed with other waste which might adversely effect the treatment process and increase the mobility of the contaminants. In addition, the costs of an off-site landfill are significantly higher without providing any additional benefit.

CERCLA states that "The off site transport and disposal of hazardous substances or contaminated materials ... should be the least favored alternative remedial action ...." IEPA has assessed the capacity of commercial landfills in the State of Illinois and indicate that capacity is limited. In addition, DOI believes that an on-site landfill is consistent with its mission and obligations for the Refuge. Because the Agencies believe that an on-site landfill is safe and provides the best balance of the remedy selection criteria, an on-site landfill has been selected as the disposal component of the final remedy.

A solid waste landfill was selected because the regulatory requirements for landfill design are based on the type of waste to be disposed. A RCRA landfill is required for the disposal of hazardous waste, as defined in 40 CFR 261.3. Since the material to be disposed here will not be a hazardous waste when it is disposed, a RCRA landfill design will not be selected as an ARAR. However, as part of the remedial design process various landfill designs will be evaluated to see which design provides the necessary containment of the waste. The final landfill design will be based on technical requirements, and will meet, at a minimum, the legal design requirements.

Specific concerns are addressed below:

a. The RI included hydrogeological investigations including a review of existing data, and the performance of geophysical surveys, soil borings, soil sampling, groundwater sampling and monitoring, well installation, permeability testing, groundwater elevation monitoring, and an engineering survey of the installed wells. This program is described in detail in Chapter 4 of the RI Report. Selected soil samples were analyzed by standard test methods to provide information on soil composition and remedial alternatives. In general, areas of contamination and some areas considered for the on-site landfill are underlain by silty clay, with hydraulic conductivities typical of the soils encountered. The data suggest that there are areas with suitable geologic characteristics for the siting of a landfill. Before the final location of the landfill is identified additional soil borings will be taken to determine the specific site geology and to establish that the ARARs regarding location standards have been met.

b. The hydrogeological investigations performed during the RI are described in paragraph a above. Shallow groundwater at the sites investigated was generally found at a depth of 1 to 17 feet below ground surface. There is typically a fluctuation of 3 to 10 feet among wells between the wet (winter) and dry (summer) seasons. Groundwater flow is generally towards Crab Orchard Lake, with local flow impacted by local surface water features. The water table measurements indicate that there are areas at the Site that have a lower water table than other areas. Additional data for groundwater elevations at the potential locations for the on-site landfill will be taken prior to finalization of the location. The final location must comply with all ARARs regarding location standards and groundwater protection.

c. The Agencies have agreed that the landfill will not be located in a wetland; nor will it be located where it will adversely impact wetlands. All of the Agencies are extremely concerned with the preservation of wetlands, and are committed to their protection. Executive Order 11990, entitled "Protection of Wetlands", dated May 24, 1977, requires Federal Agencies to avoid adversely impacting wetlands, to minimize destruction and to preserve the values of wetlands. The requirements for U.S. EPA to implement this order are found in 40 CFR 6.302 and Appendix A to Part 6. U.S. EPA and DOI fully intend to comply with these requirements, and will implement the selected remedial action to avoid adverse impacts to wetlands.

d. Seismic standards have been promulgated for hazardous waste facilities, including landfills (40 CFR 264.18(a)). The purpose of the standards is to protect units from deformation and displacement resulting from the movement of faults. The intent of the standards is to ban the placement of a hazardous waste facility on or near faults that are likely to experience displacement in the future. Although the material to be disposed will not be a hazardous waste, U.S. EPA would have similar concerns regarding damage to the solid waste landfill. Geologic evidence indicates that faults which have moved in recent times (Holocene times, the last 11,000 years) are the ones most likely to move in the future. Evidence reviewed for the rulemaking indicated that in the Eastern United States the risk of any fault displacing and deforming the earth's surface is very low, and that even historical shocks such as the New Madrid have not broken the ground to form obvious fault traces. Because of the low likelihood of displacement or deformation, the Eastern United States (including Illinois) was eliminated from the seismic standards.

e. The long term effectiveness and permanence of landfill alternatives was discussed in the FS Report. Because the metal contaminants cannot be destroyed, the selected remedy combines treatment and containment to provide the greatest long term effectiveness and permanence that can be achieved for the wastes. No future clean-up of the material is expected to be required. The secure landfill will be routinely inspected, monitored and maintained to ensure that its integrity is preserved. If these

regularly scheduled inspections, or if the statutory five year review indicate the potential for adverse environmental or public health impacts, the remedy will be re-evaluated.

f. The exact location of the on-site landfill was not identified in the FS, although several locations were proposed. The Refuge is a large area and there are several potential locations that would meet the requirements of an on-site landfill. The RI Report provides an initial hydrogeologic assessment of many of the study sites. This data can be extrapolated to indicate good candidate areas for further investigation during the design phase of the remediation. The remedial design will include further investigations of the most suitable areas before the final locale is selected. The final location will be the one which is the most appropriate and least disruptive to the Refuge of those that meet all of the legal requirements and standards discussed in the ROD.

g. Accumulation of contaminants in the food chain should not result from an on-site landfill. The secure landfill combined with the treatment process will result in immobilization and containment of the contaminants. This will make the contaminants unavailable for accumulation in the food chain. The unremediated study sites currently allow the potential for contaminants to get into the food chain by movement via surface water. Upon completion of the clean up of the study sites, no food chain accumulation will occur from the remediated sites because the source of contamination will be eliminated.

h. The issue of whether a National Wildlife Refuge should be used as a site for a landfill was extensively discussed within the FWS and DOI. DOI is authorized by Congress to manage the Crab Orchard National Wildlife Refuge in accordance with its mission. DOI has determined that an on-site landfill can be constructed and maintained in accordance with its mission. While all of the Agencies realize that a pristine Refuge would be ideal, this is unrealistic in light of the fact that landfills and other contaminated areas already existed on the land when it was turned over to DOI. In evaluating the benefits versus the liabilities in removing the contaminated material from the Refuge, the Agencies believe that an on-site landfill is the best solution. This landfill will be constructed and operated to promote safety and health and to protect wildlife and the human users of the Refuge.

Comment 26:

One commentor stated that the siting criteria for an on-site landfill would be more lax than those required for off-site landfills.

Response 26:

Siting criteria for the selected on-site landfill are discussed in the ARARs section of the ROD, and include the requirements of 40 CFR 241 and



IAC Title 35, Part 807. The criteria are equally stringent for on-site or off-site landfills.

Comment 27:

One commentor questioned whether it is technically feasible to retrofit a large concrete tank which is located on the site to meet the design requirements of the landfill.

Response 27:

There is a five million gallon concrete tank on the Refuge which was constructed as a water reservoir in 1942. Based on an initial engineering review of the as-built drawings of the tank it appears to be technically feasible that the tank could be retrofitted to meet the design requirements of the selected landfill. However, before this would be chosen as the final landfill site, an assessment would be made as part of the design process to establish whether the current condition and setting of the tank would meet all of the ARARs.

Comment 28:

One commentor asked whether there is available capacity at the Refuge for on-site storage of the material.

Response 28:

The Refuge contains a number of concrete bunkers which were constructed for the DOD to protectively store explosives and munitions. These bunkers are currently used and are not available for storage of the contaminated soil and sediment which will be excavated from the three study sites comprising this operable unit. There is no other available storage capacity on the Refuge for large volumes of contaminated material. In addition, as discussed in the response to Comment 2, long term storage of the hazardous material would not meet the requirement for the selection of a permanent remedy.

Comment 29:

Several commentors stated that cost was a primary factor in proposing an on-site landfill rather than an off-site landfill.

Response 29:

As discussed in the response to Comment 6, cost is one of the nine criteria which are evaluated before the final remedy selection is made. At the Refuge, an off-site landfill would not provide any additional benefits over an on-site landfill, and would have a higher cost.

Comment 30:

One commentor was concerned that opening "closed areas" would expose the

public to the wastes.

Response 30:

The areas of the Refuge that are "closed areas" have restricted access in order to foster and protect the wildlife population and to provide a permanent sanctuary for wildlife. The three study sites that comprise the Metals Areas operable unit will continue to have restricted access after they are cleaned up, in accordance with the general Refuge requirements. However, after clean up of the sites, restrictions will not be necessary to protect public health because contaminants will not remain above the clean up targets. The landfill which will be built to contain the treated waste will have particular access restrictions to prevent human contact with the material.

Comment 31:

Some commentators felt that the criteria of "short term effectiveness" had not been met because of the short review time allowed the public and because of the impacts to the community.

Response 31:

The criteria of "short term effectiveness" reflects impacts on the community from the remedial action while the action is on-going and does not include whether the public feels that they have had enough time to review the documents. The public's feelings on the Superfund process are a part of the "community acceptance" criteria. The short term impacts to the community from the selected alternative and the other remedial alternatives were evaluated in the FS Report. The short term impacts were viewed as being roughly equal for all of the alternatives considered (except "no action").

Comment 32:

Several commentators stated that other alternatives might be better, including:

- a. two commentators felt that technologies from the Superfund Innovative Technology Evaluation (SITE) program should be considered;
- b. one commentator felt that recovery technologies had not been considered;
- c. one commentator preferred that the material be left in place until there is a safe way to handle the problem;
- d. one commentator felt that it would be sufficient to fence off and seal off the material;
- e. one commentator preferred disposal in above ground storage, with monitoring;
- f. one commentator felt that several alternatives discussed in the proposed plan would be preferable, including alternatives 1, 3, 4, 5, or 9; and

- g. one commentor felt that an unspecified, "less harmful" solution should be found.

Response 32:

U.S. EPA has evaluated a number of other alternatives and has determined that the selected alternative is preferable. The basis for this determination is provided in the Decision Summary for this ROD. The Agencies believe that the selected remedy best meets the statutory requirements and provides the best balance among the alternatives.

Specific comments are addressed below:

a. Stabilization/ fixation technologies are included for evaluation in the SITE program. At least seven proprietors of solidification and stabilization technologies have been included in the SITE program. While stabilization/fixation has been accepted as BDAT for metals (see comment 24 above), the purpose of the SITE program is to evaluate particular proprietary processes or different waste conditions such as co-contamination. In addition, vitrification processes are included in the SITE program, and were evaluated in the FS. Therefore, the technologies from the SITE program have been considered.

b. U.S. EPA maintains information on technologies suitable for the treatment of various types of hazardous wastes. Among the information which is available and updated on a regular basis are reports on treatment technologies in use, treatability studies and reports on developing innovative technology. In assessing the treatment technologies available for the metal bearing waste from the Metals Areas operable unit these sources were consulted. Consideration of the applicability of a technology includes an evaluation of whether the technology has been demonstrated to be effective, if the process is available at full scale, if it has potential adverse effects on the co-contaminants, and legal restrictions on what type of treatment may be used. Stabilization/ fixation technologies are likely to be selected in May 1990, under RCRA as the only appropriate treatment for certain of the wastes found in the Metals Areas operable unit. Further, this treatment method is the only technology demonstrated to be effective for the metal contamination.

Recovery technologies are not available for the contaminants found at the study sites comprising the Metals Areas operable unit. Technologies such as those used in mining have not been applied to hazardous waste and have not been shown to achieve the cleanup targets required. Soil washing is one technology which has potential to be used on metal contamination. This process extracts contaminants from the soil using a liquid medium as a washing solution. This technology will reduce the volume of contaminated soil and increase the concentration of the contaminants in the residual. The potential theoretically exists that the metal

contaminants could be concentrated to the point where recovery was feasible. However, there are several reasons that this technology was not considered for the metal contamination at the Refuge (other than the legal restrictions on treatment placed by RCRA). The reasons include: 1) the process is not commercially available for soils contaminated with metals; 2) the process works best on coarser soils, while the soil at the Refuge tend to be the fine particles (silts and clays) so the feasibility of the treatment is questionable; 3) lead contamination poses problems for the process because lead is not chemically associated with any particular fraction of the soil and therefore there are difficulties in washing it; 4) the cadmium, chromium and lead react differently to chemical and physical conditions so that a washing solution suitable for all of them would be difficult to specify; and 5) concentrating the metal contamination from the soil and sediment at the Refuge might make the concentrations high enough to render the immobilization treatment less effective.

c. The "no action" alternative was considered for this operable unit, as required by law. The no action alternative would include leaving the material in place. As discussed in the FS, if no action is taken to remediate the sites the risks that currently exist will continue. It is the U.S. EPA's determination that leaving the material in place without taking remedial action would result in actual or threatened releases of hazardous substances from this site, which may present an imminent and substantial endangerment to public health, welfare, or the environment. The remedy selected for the Metals Areas operable unit was assessed for its short-term and long-term effectiveness and permanence. This assessment indicates that the selected remedy is "safe", and is "safer" than leaving the material in place.

d. As discussed in section c above, leaving the material in place without a remedial action would not be protective of human health and the environment. This is true even if the areas are fenced off, because the potential exists for migration of the contaminants by surface water or for wildlife to be exposed. Also, a fence is not considered a long-term method of isolating contamination. If the commentor meant a cover system or cap as the method of sealing off the material, this alternative was evaluated. Some of the contaminated material is sediments found in drainageways and an intermittent stream. It would be possible to cover this material in place, but the implementability would be more difficult than other construction activities, the long-term effectiveness and permanence of doing so would not be as great as other remedies and long-term monitoring would be more difficult. Also, covering the material in place would not reduce the toxicity, mobility or volume of the contaminants.

e. See the response to comment 2 above regarding disposal in above ground storage with monitoring.

f. An extensive discussion as to why the selected alternative was chosen over other alternatives, including alternatives 1, 3, 4, 5, or 9, is provided in the Decision Summary of this ROD. The selected remedy is protective of human health and the environment, attains Federal and State requirements that are legally applicable or relevant and appropriate for this remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable for this site. In addition, U.S. EPA believes that the selected alternative provides the best balance among the nine selection criteria.

g. The commentator who wanted the unspecified, "less harmful" solution did not state what types of solutions might be preferable. One of the requirements for the remedies under consideration is that they be implementable. If technology is not available or has not been developed, that technology cannot be selected as the remedial alternative. Also, the commentator did not specify what harm would result from the selected alternative. U.S. EPA does not believe that "harm" will result from the selected remedy, either in the short-term or long-term.

#### Written Comments and Questions From Organizations

Several organizations presented comments in writing. Each group's comments are presented in a separate section below.

##### Wilderness Society

###### Comment 33:

The Wilderness Society states that the public has been given little information about the situation, yet are "asked to vote on an action". They state that "...alternatives should be presented and discussed, impacts analyzed and public comment sought and considered."

###### Response 33:

U.S. EPA's decision-making and public participation processes for CERCLA sites are processes where alternatives are presented and discussed, impacts analyzed and public comment sought and considered. The public has not been "asked to vote on an action", and, in fact, public acceptance is only one of nine criteria which are considered before a final selection of the remedy is made. U.S. EPA's decision-making and public participation processes are discussed in the responses to comments 1, 7, 9, 11 and 13 above. As stated, U.S. EPA has an obligation to meet several statutory mandates in choosing a final remedy for a site. In meeting its statutory requirements U.S. EPA will balance public concerns, but the final remedy will not necessarily be that preferred by the

public, but will be that which best meets all of the legal requirements.

Comment 34:

The Wilderness Society expressed concerns with compliance with the requirements of the National Environmental Policy Act (NEPA). They stated that an RI/FS and ROD cannot substitute for an Environmental Impact Statement (EIS), and that an EIS must be completed before action can be taken at the site.

Response 34:

NEPA establishes a national policy requiring every Federal Agency to incorporate consideration of environmental factors into its decision making process, and the EIS process was developed to do so. U.S. EPA has reviewed the applicability of the EIS requirement of Section 102(2)(C) of NEPA to remedial actions taken at Superfund sites. Region V's position is that the RI/FS and remedy selection process under CERCLA ensure that the EIS requirements for adequate consideration of environmental factors and for public participation have been met by the CERCLA procedures. U.S. EPA is the lead Agency at this NPL site, and retains authorities for remedial actions taken at the Refuge. Therefore, U.S. EPA is not required to complete a separate EIS for the remedial actions contemplated at the Refuge. Based on this interpretation, U.S. EPA has determined that a separate study such as an EIS is not required for Superfund actions at the Refuge.

The Shawnee Group of the Sierra Club

Comment 35:

The Sierra Club felt that more time for the public to review and research the data from the site would have been beneficial because of the length and complexity of the material. They stated that the Agencies have been studying the problem for years, while the public has had very little time.

Response 35:

The time provided for public review of the material and Proposed Plan is discussed in the responses to comments 1, 7 and 11 above.

Comment 36:

The Sierra Club thought that it was compromising that Sangamo Weston, Inc., a company that formerly operated at the site, conducted the RI/FS. They felt that this was a conflict of interest, and that the company should not investigate their own errors. Also, the Sierra Club felt that Sangamo Weston, Inc. should not be allowed to choose contractors for the remedial action, or monitor or inspect the sites during or after cleanup.

**Response 36:**

Since the Crab Orchard National Wildlife Refuge is owned by the Federal government, particular legal standards of CERCLA apply. Section 120(e)(1) of CERCLA states that "...the department, agency, or instrumentality which owns or operates such facility shall, in consultation with the Administrator and appropriate State authorities, commence a remedial investigation and feasibility study for such facility." U.S. EPA would therefore consider that the requirement to conduct the RI/FS is strictly DOI's. Nothing in CERCLA prevents DOI from entering into an agreement with another party for that party to assist DOI with its obligation. If the work performed by the other party is inadequate, U.S. EPA can reject the work and require DOI to do additional work. In this case, Sangamo Weston, Inc. and DOI entered into an independent, voluntary agreement to perform the RI/FS. If the work performed by Sangamo Weston, Inc. had been inadequate, U.S. EPA would have required DOI to conduct additional studies as the basis for the remedial decision made here. Rather than waste the efforts made, U.S. EPA participated in reviews of data and draft documents generated by Sangamo Weston, Inc. and DOI.

Congress has directed U.S. EPA on the broader issue of how to work with private parties that may have been responsible for contamination at Superfund sites. Because of limited resources, Congress has established provisions in CERCLA that allow private parties to do work at Superfund sites (Sections 106 and 122 of CERCLA). If a private party is performing work, U.S. EPA still retains the responsibility to ensure that it is done correctly and to require all additional work necessary. U.S. EPA would ensure the quality of the work by a constant oversight process. U.S. EPA may allow or require Sangamo Weston, Inc. or other potentially responsible parties to perform remedial action activities at the Refuge. If so, the work would be under the supervision of U.S. EPA and the other Agencies.

**Comment 37:**

The Sierra Club asked why the Agencies did not consider or rejected alternatives that extract metals from soil prior to landfilling. They felt that methods that have been proven for mining of ore could reduce the volume of material that would be landfilled.

**Response 37:**

See the response to comment 32.b above.

**Comment 38:**

The Sierra Club strongly supported an on-site landfill if an appropriate location can be found, but had some concerns with the landfill proposal, including:

- a. They felt that a RCRA landfill design is preferable to a solid

waste landfill design because the extra liner provides extra protection against leakage if the treatment method were to fail and addresses the RCRA concerns, such as changing RCRA regulations requiring treatment of the waste material; and

b. They felt that one of the proposed locations at Ogden Ave. and Route 148 is unsuitable because it is a wetland, and that a better location should be found on-site.

Response 38:

An on-site landfill has been selected as a component of the final remedy for the Metals Areas operable unit. The basis for this decision is discussed in the Decision Summary portion of this ROD. U.S. EPA believes that the data in the RI indicates that there are appropriate locations for citing a landfill at the Refuge. The specific concerns are addressed below:

a. As discussed in the response to comment 25 above, a solid waste landfill design was selected rather than a RCRA landfill design because the regulatory requirements for landfill design are based solely on the type of waste to be disposed. The stabilization/fixation component of the selected remedy was chosen because it effectively immobilizes the metal contaminants. Since the waste is considered hazardous because of the propensity of the metals to leach, once it has been treated it will no longer be hazardous waste. Therefore, the RCRA standards will no longer be legally applicable unless there is a reason to apply them in order to protect public health or the environment. As stated, various landfill designs will be evaluated during the design phase to see which design provides the necessary containment of the waste. This will include assessments of the proposed liner systems to evaluate their performance if leachate is produced.

b. As discussed in the response to comment 25.c, the Agencies strongly support the protection of wetlands and are committed to their protection. The landfill will not be located in a wetland, or where it will adversely impact a wetland. U.S. EPA is required by 40 CFR 6.302(a) "...to determine if proposed actions will be in or affect wetlands.", in accordance with the procedures set forth in Appendix A to 40 CFR 6. Under these procedures the FWS is responsible for maintaining an inventory of national wetlands, and for preparing maps documenting their locations. The concrete tank discussed in comment 27 above is one of the potential sites for the landfill, and is located near Ogden Ave. and Route 148. According to the national inventory of wetlands the tank is not in a wetland or an area that could impact a wetland. As the location of the on-site landfill is finalized, documentation will be maintained to demonstrate that wetlands will not be impacted.



Sangamo Weston, Inc.

Comment 39:

Sangamo Weston, Inc. commented that they oppose U.S. EPA's decision to treat the Metals and PCB Areas as separate operable units. They feel that the study sites addressed in the FS should be treated as one operable unit with a single "consolidated" remedy. They state that "...the reasons provided by EPA for the dual operable unit approach are unfounded, that the NCP criteria for using operable units are not met, and that having two operable units is not cost-efficient." Specific comments or issues follow:

- a. Sangamo Weston, Inc. stated that drafts of the FS were reviewed by DOI, U.S. EPA and IEPA, and that at no time during the preparation and review of that document was the separation of the study sites into operable units suggested. Also, no express analysis of the dual operable unit approach was made in the FS.
- b. Sangamo Weston, Inc. questioned the grounds listed as some of the reasons for the creation of operable units in U.S. EPA's Proposed Plans for the Metals and PCB Areas. They felt that the statements made in the Proposed Plans do not provide grounds for the proposed operable units. Specifically:
  - (1) Differences in contaminants - Sangamo Weston, Inc. states that "The presence of metals contamination at all six sites makes the sites more similar than different in terms of the nature of the substances present and the types of remedial actions that may be needed."
  - (2) Isolated geographical locations - Sangamo Weston, Inc. depicted that the study sites comprising each operable unit are not in isolated geographic locations, and "...are close enough to be readily consolidated for purposes of taking remedial action..."
  - (3) Possibly different PRPs - Sangamo Weston, Inc. commented that this issue is irrelevant to the proposed use of two operable units rather than one. They felt that neither DOI or U.S. EPA has engaged in a significant search for PRPs, and that DOI is an important PRP as the owner and operator of the site. Sangamo Weston, Inc. states "EPA has provided no basis for handling the Refuge areas, all of which are under the ownership and control of a single PRP, as two separate remedial actions."
  - (4) Different types of remedial actions that would apply - Sangamo Weston, Inc. states that "...there is nothing in the nature of the contaminants present at the six sites that mandates the use of different remedial technologies or multiple Records of Decision." They express concern that the creation of separate operable units suggests that the sites are

necessarily subject to different remedial actions. Further, they believe that the analysis in the FS supports the selection of essentially the same remedy (treatment by stabilization followed by secure containment) for all of the study sites addressed in the FS. Even if an alternative remedy is chosen for the PCB Areas, Sangamo Weston, Inc. expressed that there are similarities and areas of potential overlap.

(5) Differences in schedules - Sangamo Weston, Inc. expresses that differences in schedules will result solely because U.S. EPA has separated the study sites into operable units. They feel that there is no public health or environmental reason to proceed more promptly at a subset of the study sites. Further, they declare that there have been "...no observed adverse impact on human health or wildlife" and that "...neither the Metals Areas or PCB Areas contain substances that are presently migrating to any significant extent".

c. Sangamo Weston, Inc. believes that the requirements listed in the NCP for the creation of operable units have not been met. The NCP discusses that response actions may be divided into operable units if the operable units are cost effective and consistent with achieving a permanent remedy. Sangamo Weston, Inc. states that the division of the study sites discussed in the FS into two operable units is not cost effective. Specific comments about the cost-effectiveness follow:

(1) Sangamo Weston, Inc. believes that the use of two operable units rather than one for the study sites addressed in the FS will result in losses of efficiency and diseconomies in areas including: design; administration; mobilization; land disposal facilities; analytical services; excavation methods and equipment; stabilization methods and equipment; and backfill methods and equipment.

(2) Sangamo Weston provided tables that they believe demonstrate that developing two landfills for the two operable units will be 53% more costly than a single landfill for a consolidated remedy. They state that the additional expenditure for developing a second landfill will be \$700,000, that this extra cost will be a direct result of inefficiency in having two operable units, and will provide no health or environmental benefit.

d. In addition, Sangamo Weston references the preamble to the proposed revisions to the NCP and comments that the following criteria were not addressed in the Proposed Plans and have not been met "...pressing problems that will worsen if they are not addressed pending action at other areas, or if there is an opportunity to undertake a limited action that will achieve significant risk reduction quickly and site problems are not interrelated".

Response 39:

U.S. EPA stands by its decision to create two separate operable units from the study sites discussed in the FS. These operable units will continue to be called the "Metals Areas" and the "PCB Areas". As discussed in the responses to comments 3 and 22 above U.S. EPA believes that the operable units have been created in accordance with the requirements of the NCP, including the criterion of cost-effectiveness. The remedies selected for each operable unit will contribute to a permanent remedy for the site. Responses to specific comments follow:

a. It is true that drafts of the FS were reviewed by DOI, U.S. EPA and IEPA, and that O'Brien & Gere was not requested during the preparation and review of that document to separate the study sites into operable units. Also, none of the Agencies requested analysis of the dual operable unit approach to be made in the FS. Note, however, that the U.S. EPA had no contractual relationship with either Sangamo Weston, Inc. or O'Brien & Gere, and no power to require O'Brien & Gere to develop the FS in accordance with the concept of dual operable units.

In any case, there is no requirement that the FS explicitly discuss the operable unit approach as long as the decision is a logical outgrowth of the information in the Administrative Record. Since the FS assesses each study site individually and then considers consolidated alternatives, the concept of grouping of the study sites is implicit in the FS. Also, since the study sites which were carried forward into the FS did not encompass all of the sites studied in the RI, the concept of treating the sites carried into the FS as a higher priority subset leading to the complete site remediation implies the creation of operable units at the Refuge. Since the FS contains all of the elements necessary to analyze two operable units rather than either six or one, it was not necessary to change the format of the FS.

b. The preamble to the proposed revisions to the NCP discusses operable units. It states "The appropriateness of dividing remedial actions into operable units is determined by considering the interrelationship of site problems and the need or desire to initiate actions quickly. To the degree that site problems are interrelated ... it may be most appropriate to address the problems together. However, where problems are reasonably severable, phased responses implemented through a sequence of operable units may promote more rapid risk reduction." U.S. EPA listed its reasons for the creation of operable units in Proposed Plans for the Metals and PCB Areas. These reasons support the support the severability of the remedial actions and address the issue of interrelatedness of the problems in the operable units. Specific comments are addressed below:

- (1) Differences in contaminants - The presence of organic contaminants, and specifically of PCBs, in the PCB operable

unit makes those sites more different than similar to the sites with strictly inorganic contamination. The physical and chemical nature of organic and inorganic contaminants are significantly different. These contaminants frequently result from different waste sources. The presence of metals contamination at all six sites does not justify that the sites are sufficiently similar to be lumped together.

(2) Isolated geographical locations - Of the seven study sites carried into the FS only two (sites 32 and 33) are adjacent, contiguous areas of contamination. The other five study sites are in discreet geographical locations and the data generated in the RI indicates that the periods of operation and disposal for these areas were different. This supports the conclusion that the areas are reasonably severable. While the study sites "...are close enough to be readily consolidated for purposes of taking remedial action..." movement of waste between any of the discreet areas must comply with ARARs, whether the study sites are handled as one or multiple operable units. The creation of two operable units would not preclude a coordination of the remedies.

(3) Possibly different FRPs - The issue of different FRPs is not irrelevant to the proposed use of two operable units rather than one when considering whether the operable units are interrelated. One reason to create operable units is to "...undertake a limited action that will achieve significant risk reduction quickly." Where Site problems may be divisible, the identification of FRPs associated with particular problems aids in assessing whether enforcement or remedial action funded by DOI is the strategy most likely to expedite rapid risk reduction. U.S. EPA is currently engaged in a significant search for FRPs. U.S. EPA and DOI both understand DOI's responsibility to clean up the site. However, this does not mean that there are not other parties with liability.

(4) Different types of remedial actions that would apply - The preamble to the proposed revisions to the NCP discusses that "the bias for action" allows expedited review when "ARARs, guidance or program precedent indicate a limited range of appropriate response alternatives (e.g., PCB standards for contaminated soils ...)". Since the limitations imposed on the remedial alternatives for each of the operable units are different (e.g., TSCA requirements only for the PCB Areas and RCRA requirements for both operable units), this supports the severability of the units. While it is true that "...there is nothing in the nature of the contaminants present at the six sites that mandates the use of different remedial technologies or multiple Records of Decision", the types of treatment and containment technologies are on the whole different for the types of waste present in each operable unit. The creation of separate operable units is not meant to suggest that the sites

are necessarily subject to different remedial actions. However, since the remedial options are different depending on the type of contaminants present, the comparative analysis of the remedies must be different.

U.S. EPA will address the issue of whether the FS supports essentially the same remedy in the ROD for the PCB areas. The issue as raised by Sangamo Weston, Inc. questions the proposed remedy for the PCB Areas rather than for the Metals Areas. Sangamo Weston, Inc.'s assessment of the remedial alternatives supports the remedy selected by U.S. EPA for the Metals Areas. Whatever alternative is selected for the PCB Areas, there is nothing to prevent coordinated remedial action in the areas where there are similarities and areas of potential overlap.

(5) Differences in schedules - Differences in schedules might result because of the assessment of whether an enforcement or U.S. government-financed approach to the remedial action is most appropriate. The "bias for action" discussed in the proposed revisions to the NCP stresses that the approach most likely to meet the requirements of CERCLA in the most expeditious manner should be used. The RI Report has documented potential adverse impacts to public health and the environment from the contaminated areas. The RI information provides the grounds for imminent and substantial endangerment. Given this situation, the schedules for each operable unit should allow for remediation as quickly as possible.

c. U.S. EPA disagrees with Sangamo Weston, Inc.'s assessment, and believes that the requirements listed in the NCP for the creation of operable units have been met. The NCP (40 CFR 300.68(c)) provides that response actions may be divided into operable units if the operable units are cost effective and consistent with achieving a permanent remedy. Sangamo Weston, Inc. did not challenge that the remedy for the Metals Areas was consistent with a permanent remedy. U.S. EPA believes that the division of the seven study sites carried into the FS into two operable units is cost effective. While some cost savings could be obtained by combining the remedial actions, the benefits from initiating remedial action for each of the operable units as quickly as possible under CERCLA outweigh the small incremental cost difference. Specific responses to the comments about cost-effectiveness follow:

(1) The FS Report provides for each of the six areas discussed to be treated as separate units and provides cost estimates for this. In addition, some cost savings are documented by the estimates for the consolidated alternatives. Many of the areas that Sangamo Weston, Inc. stated will result in losses of efficiency and diseconomies were estimated on a unit price basis and should result in little extra cost because the total units of material to be handled remain the same. The FS supports the conclusion that there is no price differential for

a consolidated remedy in the categories of analytical services, excavation methods and equipment, stabilization methods and equipment, and backfill methods and equipment.

In the area of administration, the efficiency of managing one operable unit with multiple sub-contracts will not be very different from the efficiency of managing separate contracts for the two operable units. Also, the administration of the oversight and inspection of multiple ongoing activities at one versus two operable units is not significantly simpler or more efficient. In the area of mobilization and demobilization there should be little impact from creating two operable units rather than one because either more equipment and manpower would be mobilized at one time to meet the needs of a single, large-scale construction period or additional construction seasons would require remobilization for the larger volume of waste managed in one operable unit.

The estimates for design are based as a straight percentage of the direct capital costs whether the estimate is for a single study site or for one consolidated approach. Since the percentage remains constant, the savings on design would occur from savings on direct capital costs. As discussed above, the savings on direct capital costs are not expected to be significantly different because most of the costs reflect price per unit of material handled, and the units remain constant regardless of how many operable units are created. One possible difference in capital costs is in the difference in costs resulting from one landfill versus two landfills potentially resulting from two operable units. This issue is discussed in paragraph (2) below.

(2) U.S. EPA believes that the tables that were submitted with the comments from Sangamo Weston, Inc. use some cost estimates that are inconsistent with those in the FS. The cost estimates for two landfills versus one landfill were recalculated by U.S. EPA using cost figures more consistent with the FS (see Tables 1 and 2 in Appendix C). The U.S. EPA estimates indicate that the total cost for two landfills resulting from two operable units will be approximately \$300,000 more than a single landfill for one consolidated operable unit, rather than the \$700,000 estimated by Sangamo Weston, Inc. The remedy for the PCB Areas operable unit has not yet been selected. However, the cost of the preferred alternative for the PCB Areas is \$25,000,000. If the preferred alternative is selected the total cost of the remedies for both operable units is \$27,000,000. Therefore, the price differential of \$300,000 is only about 1% of the total cost. Given the uncertainties in estimating remedial costs and a contingency allowance of 25%, this cost differential may not be measurable. Even if Sangamo's estimate of \$700,000 were more accurate the price differential would be less than 3% of the total estimated

remedial cost, which would still be difficult to measure. These estimates include the differential for extra design costs. If another remedy is selected for the PCB Areas operable unit, the cost differential might be a higher percentage of the total cost, but would still be within the range of the contingency allowance.

The use of two operable units would not necessarily require that two landfills be constructed. There is nothing to prevent coordination in the design phase to develop one landfill. However, the additional expenditure for developing a second landfill, if resulting from the use of separate operable units will not render the operable units cost inefficient since the extra cost is insignificant to the total cost of the remedies.

d. In paragraph b above the issues raised in the preamble to the proposed revision to the NCP are addressed. The above discussion focuses on the issues of interrelatedness of the operable units and the most effective means of achieving risk reduction for each of the sites. These criteria were not specifically addressed in the Proposed Plans, but as discussed above, were considered prior to the formation of operable units.

Comment 40:

Sangamo Weston, Inc. is concerned that the cleanup targets for the Metals Areas are overly stringent or overbroad in light of the risk assessment in the RI/FS. They state that the cleanup standards require refinement. Specific concerns with the cleanup standards follow:

a. Sangamo Weston, Inc. felt that the threshold criteria above which excavated soil would be treated and below which they would be disposed without treatment was not clear in the Proposed Plan. They felt that an approach consistent with RCRA and other laws would be to treat by stabilization/ fixation only the excavated material that exhibits the characteristic of Extraction Procedure (EP) Toxicity when tested in accordance with U.S. EPA protocols.

b. Sangamo Weston, Inc. objects to the blanket application of a cleanup criteria for soil and sediment of  $1 \times 10^{-6}$  excess cancer risk. The reasons for their objection follow:

(1) They state that the compound specific cleanup targets as developed in the RI/FS are sufficient because they were developed to protect against the potential risks of the substances identified in the RI/FS, and that "There is no need to specify a cleanup criterion in the ROD for other substances that have not been discovered ...".

(2) They are concerned that U.S. EPA failed to assure that calculations of cumulative risk would be based on "realistic and site-specific exposure scenarios rather than on potentially

inappropriate general assumptions."

(3) Further, they believe that "The  $10^{-6}$  risk level should not be a rigid requirement, but at most a goal to be considered.", and that the ROD should provide for the cleanup goal to be stipulated as a excess risk range of  $10^{-4}$  to  $10^{-7}$ .

c. Sangamo Weston, Inc. states that they believe the stated cleanup level for groundwater of  $10^{-6}$  excess cancer risk is inappropriate for several reasons. These reasons are outlined below:

(1) Because there are no current users of the Refuge groundwater, and no future use is expected for groundwater, there are no receptors for this route of exposure. Sangamo Weston, Inc. states that the ROD should therefore not establish a specific groundwater cleanup standard.

(2) The RI/FS did not analyze impacts of using a  $10^{-6}$  risk level as a cleanup standard for groundwater, and Sangamo Weston, Inc. expressed concern that this standard might require substance-specific cleanup levels that are below the method detection limits for such compounds. This would make the cleanup level technically impracticable to attain at the site.

(3) As with soil and sediment, Sangamo Weston, Inc. is concerned that U.S. EPA has not assured that the calculation of risk will reflect realistic and site-specific exposure scenarios.

(4) As with soil and sediment, the use of  $10^{-6}$  as the cleanup standard rather than a risk range of  $10^{-4}$  to  $10^{-7}$  is inappropriate.

Response 40:

In order to clarify some of the issues raised by Sangamo Weston, Inc. and to address some of their concerns, the U.S. EPA has expanded the discussion of the cleanup standards in the Decision Summary portion of this ROD. Specific concerns are addressed below:

a. U.S. EPA agrees with Sangamo's position with regard to the threshold criteria delineating which waste must be treated and which waste will be landfilled without treatment. This was always the Agencies' intent. In the Proposed Plan the criteria for the stabilization/ fixation treatment process was "Soils and sediments which are considered hazardous because of their characteristic to leach metals would be treated...". The intent of this was to require treatment of only material which is RCRA hazardous because of the characteristic to leach metals (EP Toxicity). Language has been added in the Decision Summary portion of this ROD to clarify this.



b. U.S. EPA is retaining the  $1 \times 10^{-6}$  excess cancer risk as a cleanup standard for soil and sediment for this operable unit. This criterion is established for the protection of public health and is based on Region V's policy regarding cleanup standards at Superfund sites. The  $10^{-6}$  excess risk standard has been selected in numerous RODs issued by Region V in the past, and is consistent with criteria established at other sites when multiple contaminants are present. Responses to Sangamo Weston, Inc.'s specific comments follow:

(1) The compound specific cleanup targets as developed in the RI/FS, the Proposed Plan and this ROD were developed to protect against the potential risks of the target substances identified in the RI/FS, including the risks to exposed wildlife for the specific compounds addressed. However, the target compounds were refined without estimating the risk from other compounds that were found at the study sites. The risk assessment assumed that many of these other compounds would be addressed by the remediation for specific chemicals. However, U.S. EPA must assure that this occurs and the  $10^{-6}$  excess risk level is the criterion against which this will be assessed. CERCLA would require that hazardous substances that "have not been discovered" must also be addressed if they are found at the site.

(2) U.S. EPA's policy in assessing risk from Superfund sites is that the assessment be based on a reasonable, worst case risk assessment. Therefore, in estimating the residual risk from the remediated areas the calculations of risk to establish whether the cleanup target has been met will be based on "realistic and site-specific exposure scenarios rather than on potentially inappropriate general assumptions." The final assessment will follow the U.S. EPA guidance on how to perform risk assessments.

(3) U.S. EPA guidance allows for consideration of cleanup targets within an excess risk range of  $10^{-4}$  to  $10^{-7}$ . However, U.S. EPA Region V has established  $10^{-6}$  as a cleanup target, as a policy for Superfund sites based on the Waste Management Division's decision on acceptable risk management practices. The  $10^{-6}$  risk level is not a rigid requirement for all Superfund sites in the Region, but a target to attempt after the other statutory requirements have been considered. However, cleanup targets are established in each ROD on a site specific basis for each Superfund site. There is no evidence that the  $10^{-6}$  excess cancer risk cleanup target for the Metals Areas operable unit is in conflict with the statutory mandates of CERCLA. Also, the risk assessment in the RI supports that these levels are attainable for the study sites to be addressed. Therefore, this risk level will be retained as the cleanup level for the soil and sediment in this operable unit.

c. In the preamble to the proposed revisions to the NCP, U.S. EPA's approach to groundwater remediation is discussed. The preamble states "The goal of EPA's Superfund approach is to return usable ground waters to their beneficial uses within a timeframe that is reasonable given the particular circumstances of the site." The groundwater at the Refuge is a usable resource and contributes flow to a unique environment. The RI Report indicated that there was groundwater contamination associated with the Metals Areas operable unit, but did not document risks from the groundwater. U.S. EPA believes that the removal of sources of contamination will control any potential groundwater problems. However, if monitoring activities during and after remediation indicate that there is potential risk from the groundwater, additional remediation activities will be considered.

Since a remedy other than source control was not selected for groundwater, the  $10^{-6}$  excess cancer risk target level discussed in the Proposed Plan and selected in this ROD will not necessarily be a cleanup level, but will trigger a review of conditions at the sites. Language has been added to the Decision Summary portion of the ROD to clarify this. In addition to the excess cancer risk standard to trigger a review of the groundwater conditions at the study sites, there are standards for non-cancer chronic health effects. These standards have also been clarified in this ROD.

Specific comments are addressed below:

(1) Groundwater is an environmental media that has been impacted by the past disposal activities at the study sites comprising the Metals Areas operable unit. Because groundwater is a valuable resource, U.S. EPA's goal is to maintain the beneficial uses of groundwater. In addition, the groundwater at some of the study sites discharges to Crab Orchard Lake and potential discharge of contaminants to the Lake is a concern. As discussed above, since the risk from the sites should be addressed by the removal of contaminant sources, the standards specified in the ROD are not cleanup standards, but standards to evaluate how effective source control has been. If the standards specified in the ROD are exceeded, the groundwater situation will be evaluated to determine if further remedial action is necessary.

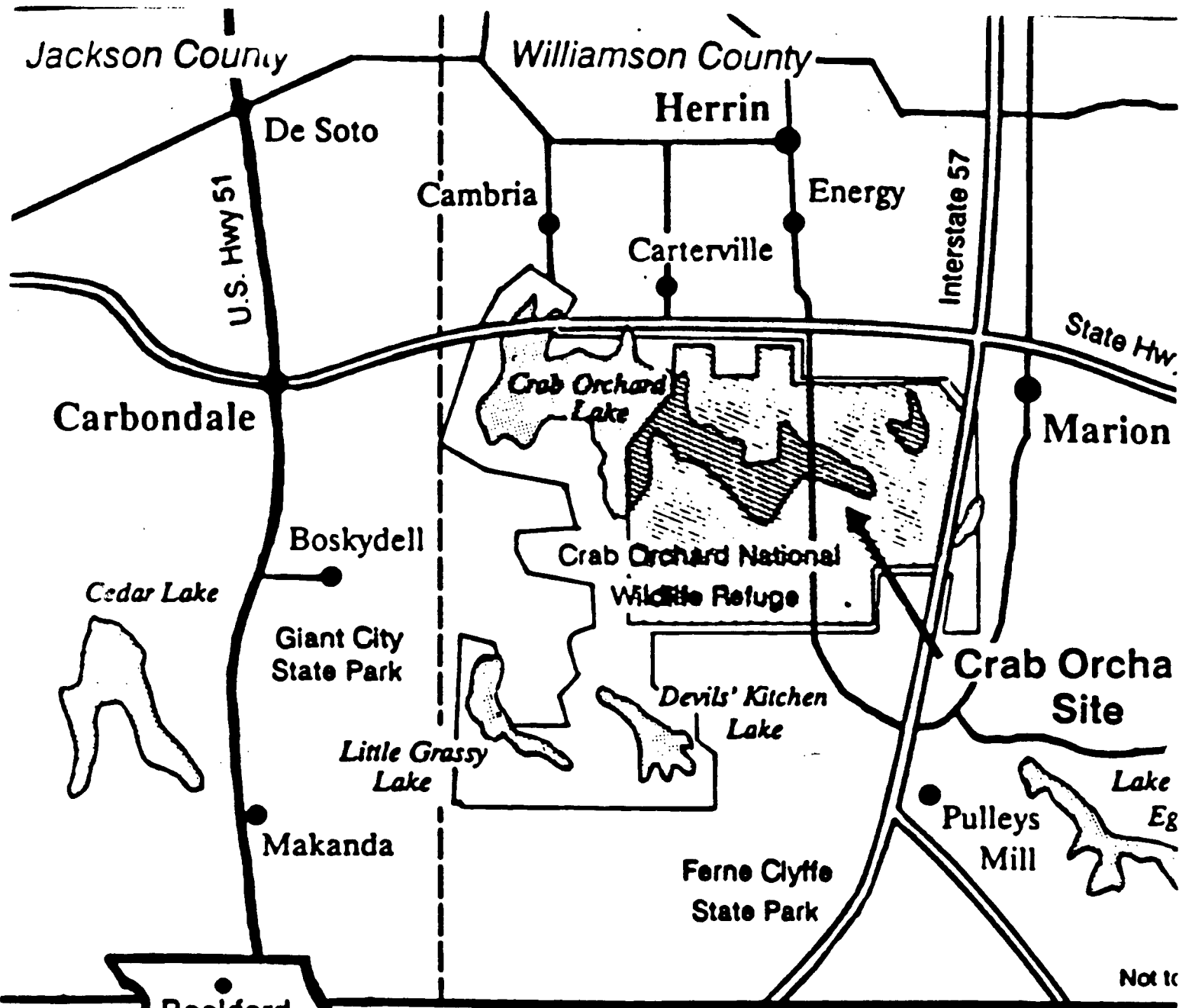
(2) As stated, the standards specified in this ROD for groundwater are not cleanup standards, but triggers for further review and evaluation of groundwater conditions. Therefore, the RI/FS did not have to analyze the impacts of using this as a cleanup standard for groundwater. Sangamo Weston's concern regarding substance-specific levels that are below the method detection limits for such compounds is one which is easily addressed in the remedial design phase. Remedial design and remedial action will require a workplan that specifies, among other things, the monitoring constituents for groundwater and

the quality assurance required. The risk assessment is most likely to include constituents that have actually been detected in accordance with the approved Quality Assurance Project Plan.



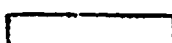
(3) As discussed in paragraph b(2) above, the risk assessment calculations for groundwater will reflect realistic and site-specific exposure scenarios, in accordance with U.S. EPA guidance.

**CRAB ORCHARD NATIONAL WILDLIFE REFUGE  
METALS AREAS OPERABLE UNIT ROD**

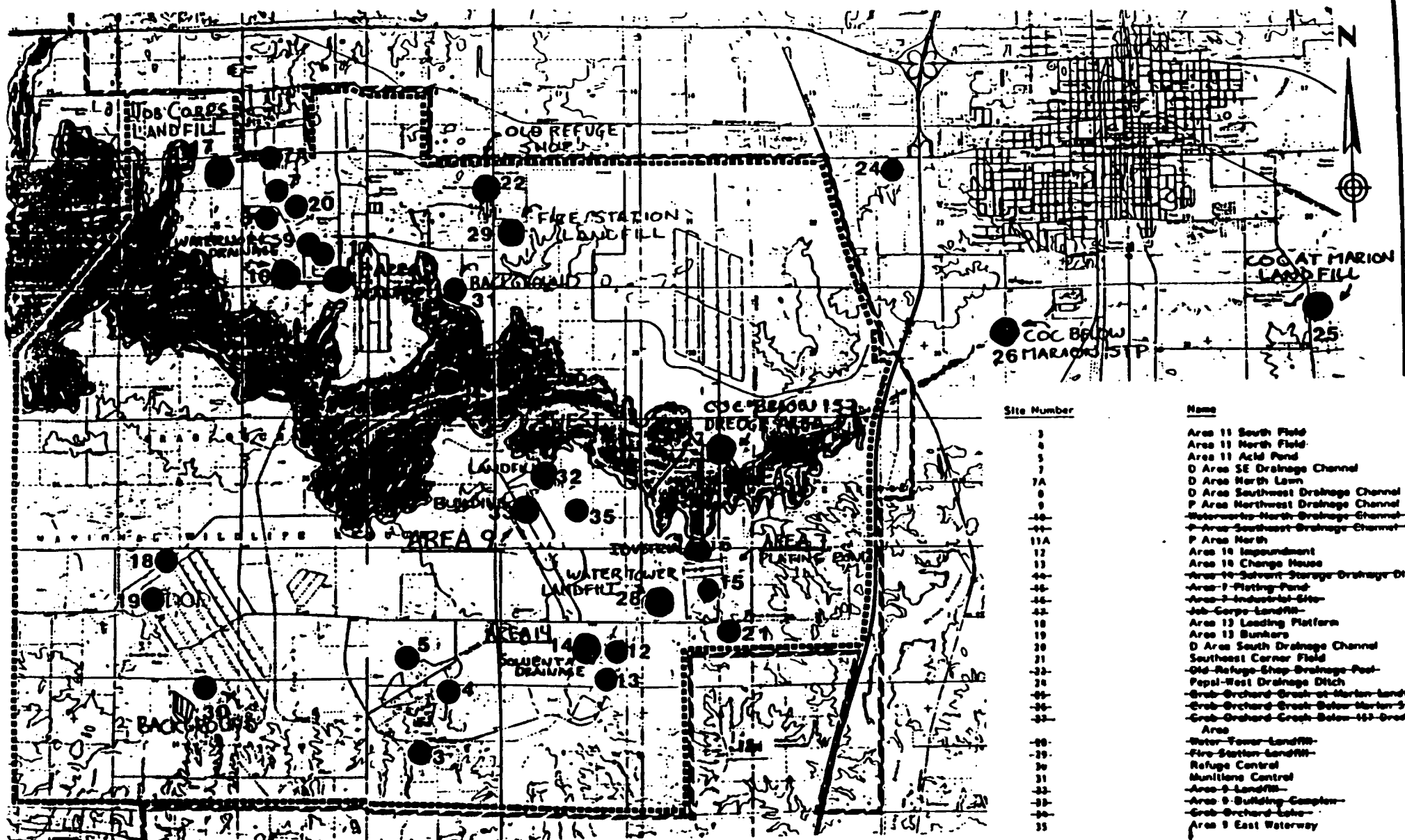
**APPENDIX A  
FIGURES**



**Figure 1**  
**Site Area Map**  
**Crab Orchard Site**  
**Williamson County, Illinois**

-  Refuge Boundary
-  Closed Site Area
-  Surface Water





# Site Number

## Name

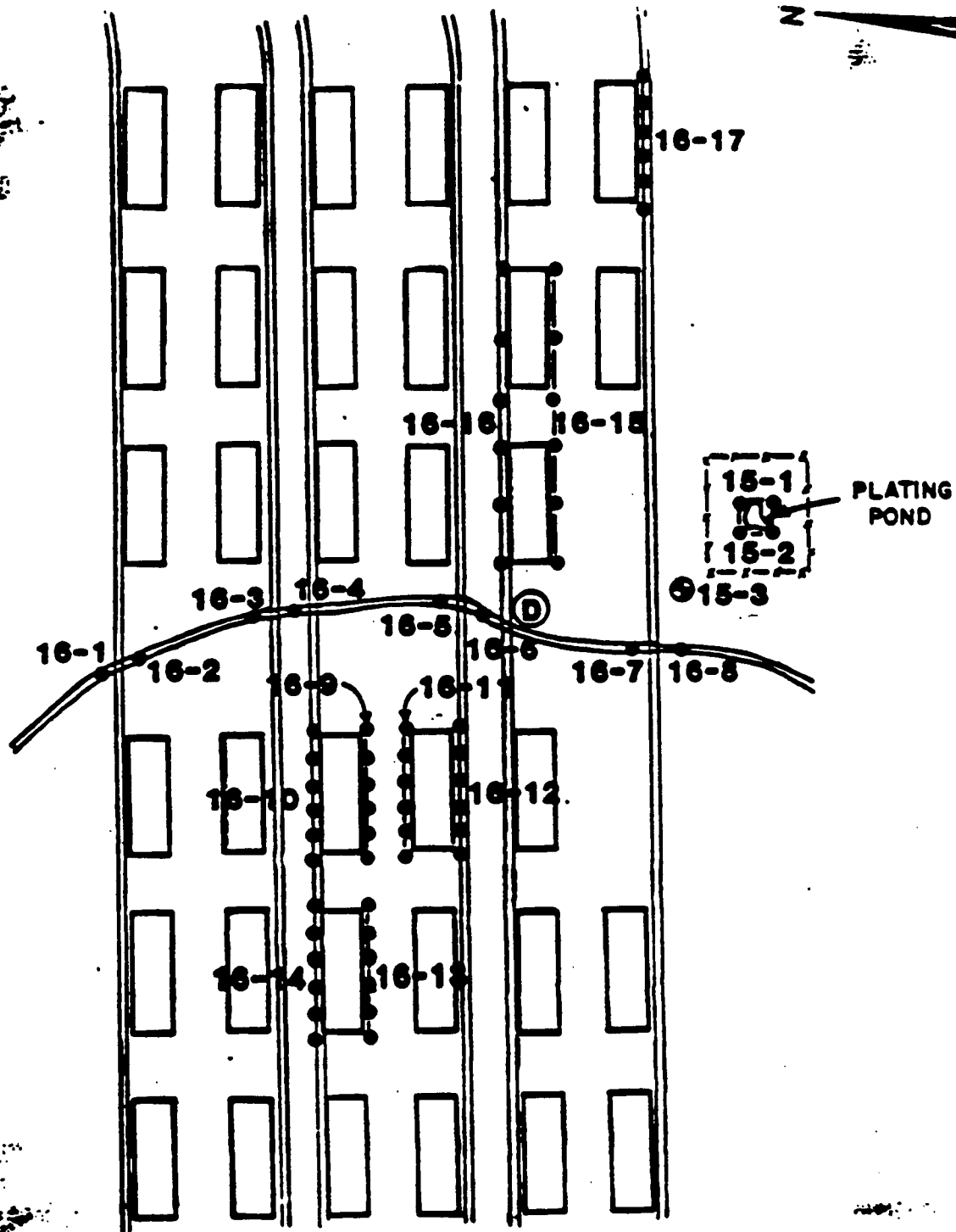
1	Area 11 South Field
2	Area 11 North Field
3	Area 11 Acid Pond
4	Area SE Drainage Channel
5	Area North Lawn
6	Area Southwest Drainage Channel
7	Area Northwest Drainage Channel
8	Waterworks North Drainage Channel
9	Area Southeast Drainage Channel
10	Area North
11	Area 10 Impoundment
12	Area 10 Change House
13	Area 10 Solvent Storage Drainage Ch
14	Area 10 Flitting Pond
15	Area 10 Industrial Site
16	Job Corps Landfill
17	Area 13 Leading Platform
18	Area 13 Bunkers
19	Area South Drainage Channel
20	Southeast Corner Field
21	Old Refuge Shop Drainage Post
22	Peppal West Drainage Ditch
23	Crab Orchard Creek at Marion Land
24	Crab Orchard Creek Below Marion S
25	Crab Orchard Creek Below 151 Dred
26	Area
27	Water Tower Landfill
28	Fire Station Landfill
29	Refuge Control
30	Munitions Control
31	Area 9 Landfill
32	Area 9 Building Complex
33	Crab Orchard Lake
34	Area 9 East Waterway
35	

## CRAB ORCHARD NATIONAL WILDLIFE REFUGE LOCATIONS OF SAMPLING SITES

- MOVED TO FS
- MONITORING
-

Figure 3

SITE 15-AREA 7 PLATING POND  
SITE 16-AREA 7 INDUSTRIAL PAFI  
PHASE I



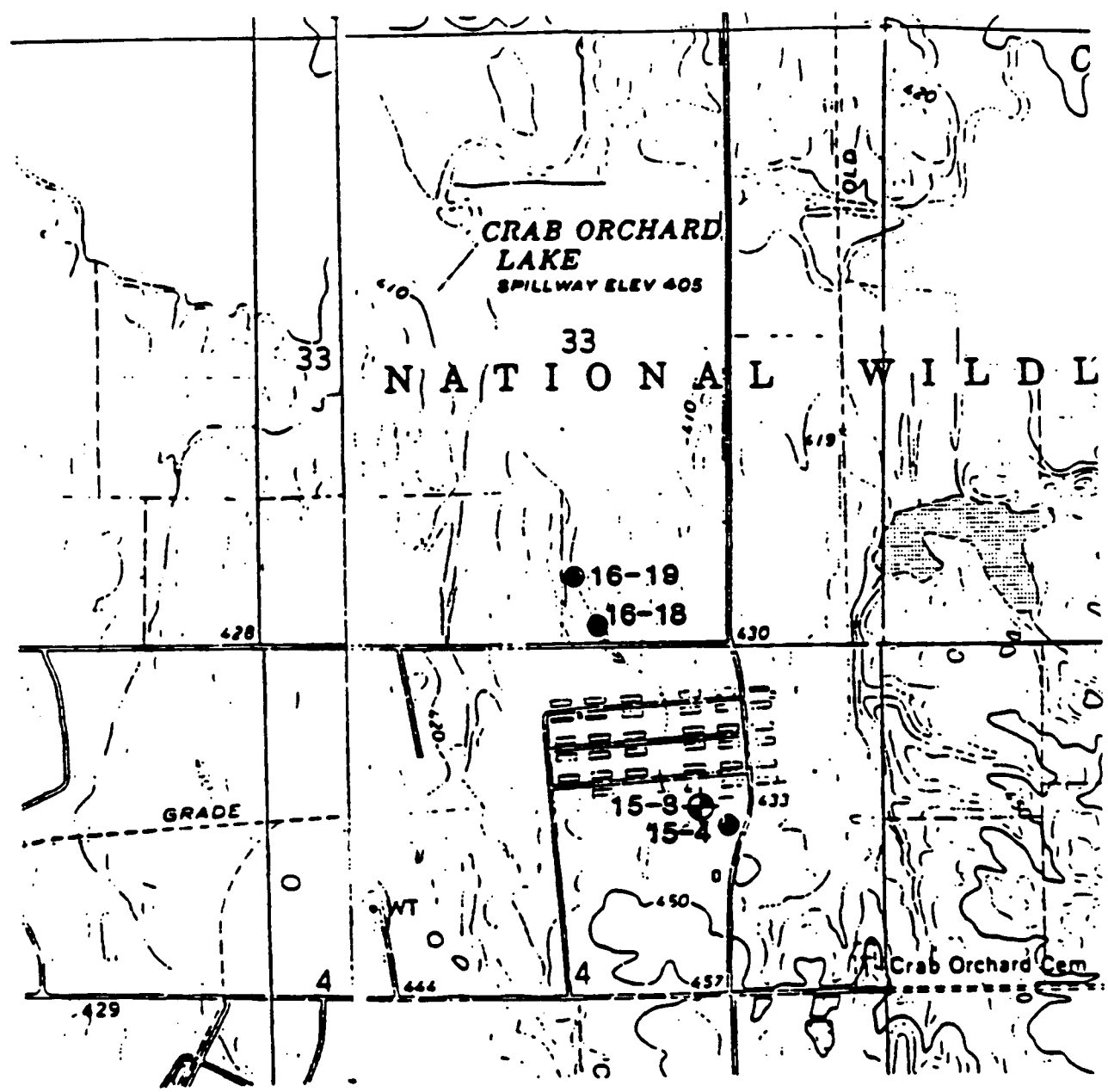
① - DECONTAMINATION AREA

APPROXIMATE SCALE

0 100 200  
(FEET)

FIGURE 4

SITES 15 & 16  
SAMPLING LOCATIONS  
PHASE II



◆ Shallow well

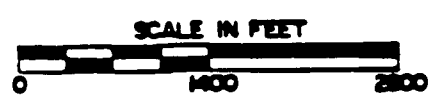
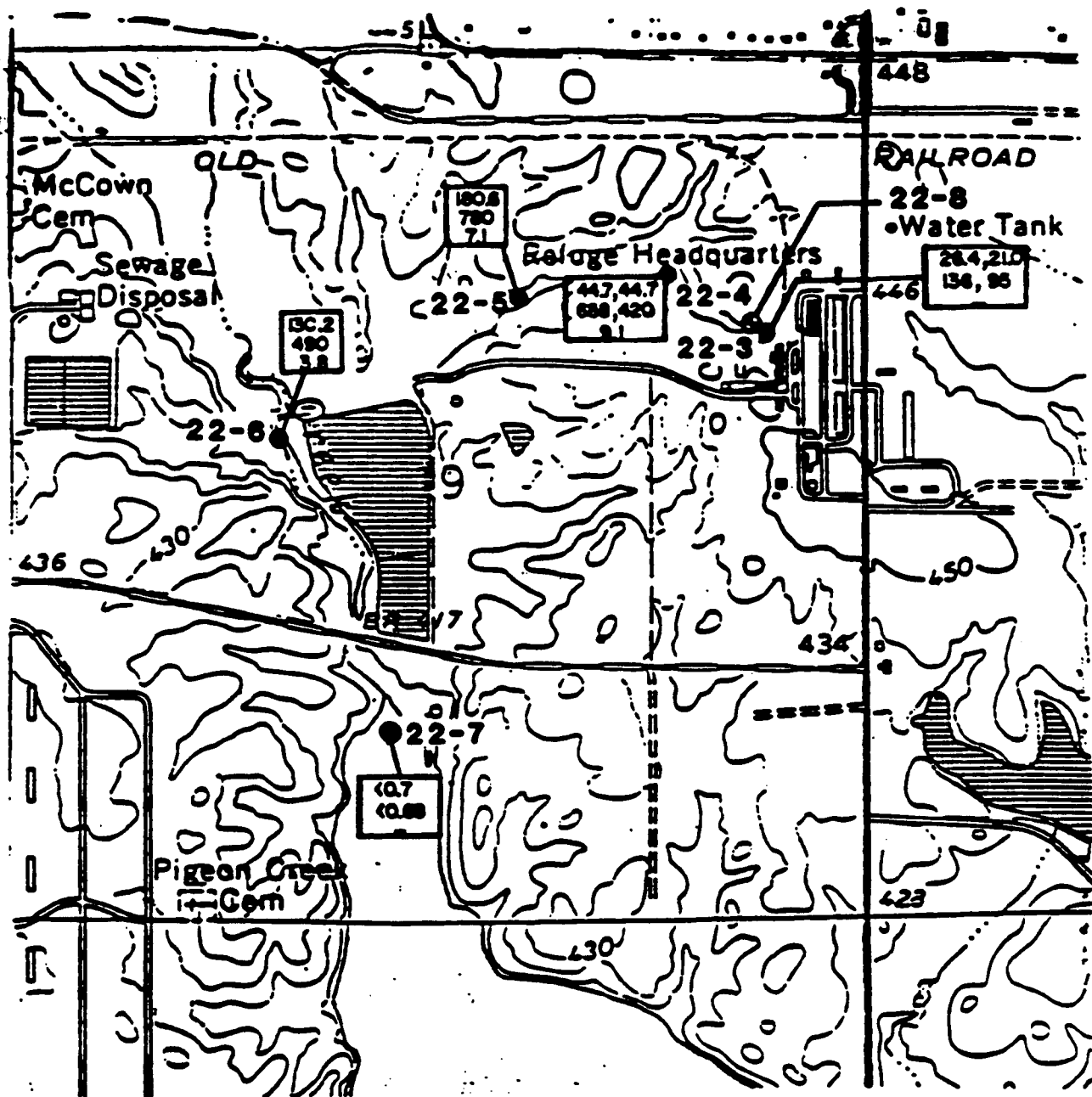




FIGURE 5

# SITE 22 SAMPLING LOCATIONS PHASE II



## SEDIMENT CONCENTRATIONS

130.2	Total Cyanide (mg/kg)
490	Total Cadmium (mg/kg)
3.8	EP Cadmium (mg/L)

Shallow well

SCALE IN FEET



FIGURE

# SITE 22 OLD REFUGE SHOP PHASE I

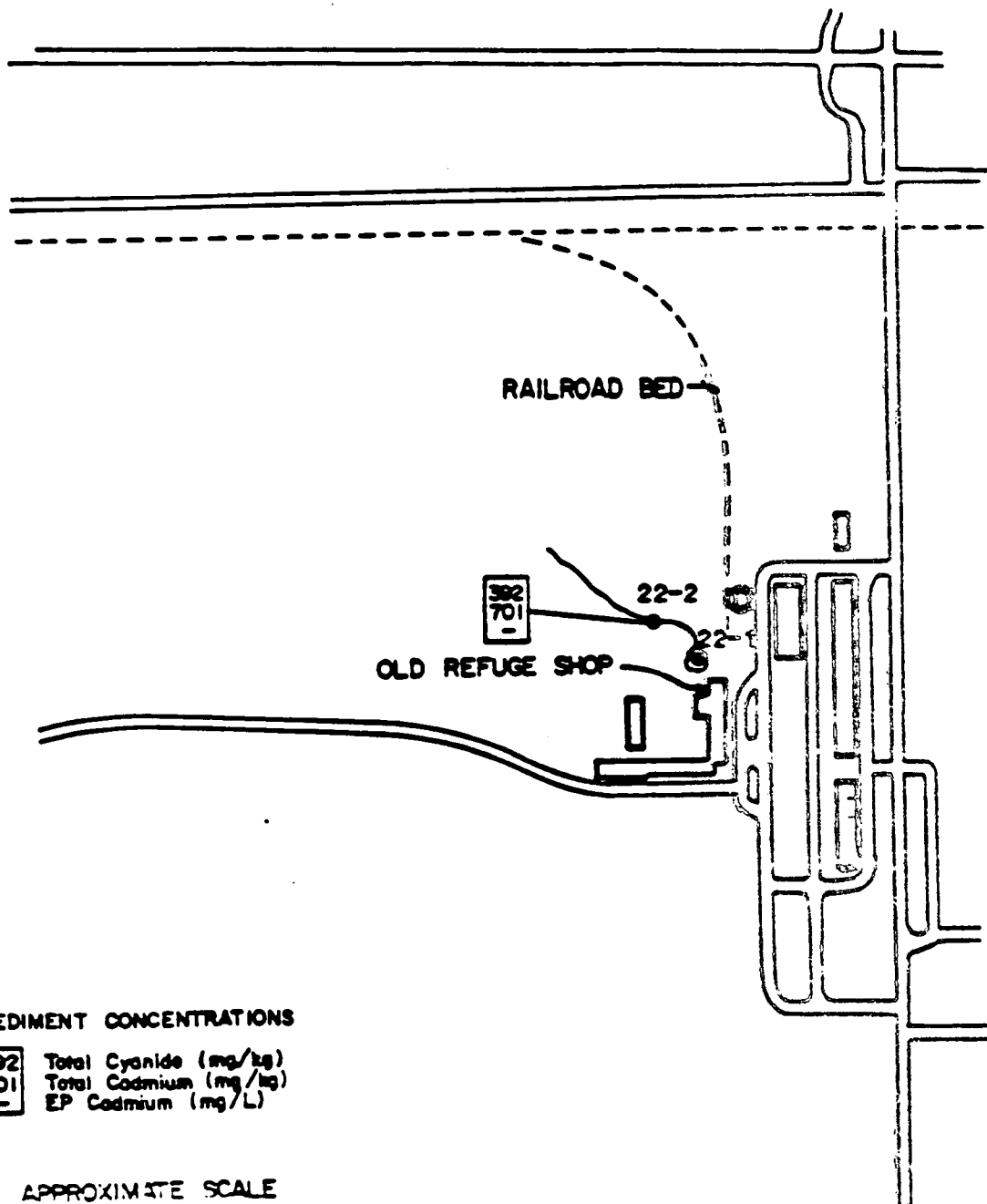
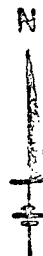


FIGURE 7



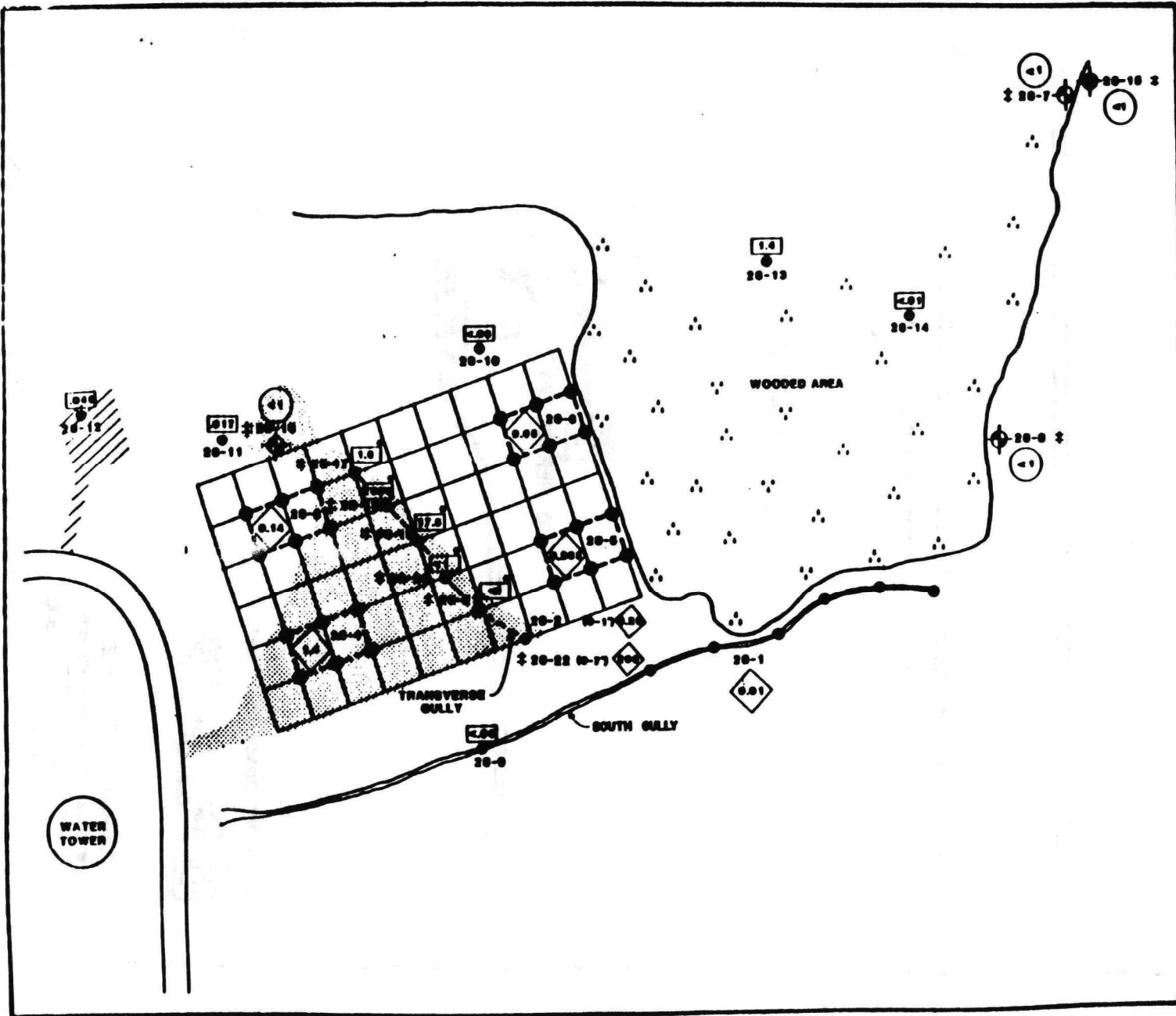
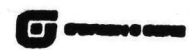
**SITE 2A  
WATER TOWER WINDFILL  
PHASE I & II**

**LEGEND**

**PCB CONCENTRATIONS**

- GRID SAMPLE SOIL, mg/kg WET WEIGHT
- AREAL SURFACE COMPOSITE SOIL, mg/kg WET WEIGHT
- WELL, ug/l
- SOIL, mg/kg WET WEIGHT 0-1' TEST PIT
- SHALLOW WELL
- DEEP WELL
- PHASE II SAMPLES
- AREA OF SITE ACTIVITY INDICATED ON 1968 AIR PHOTO
- AREA OF SITE ACTIVITY INDICATED ON 1988 AIR PHOTO

SCALE IN FEET



**CRAB ORCHARD NATIONAL WILDLIFE REFUGE  
METALS AREAS OPERABLE UNIT ROD**

**APPENDIX B  
TABLES**

TABLE 1

(Page 1. of 4.)

## TWC OPERABLE UNITS

## COST ESTIMATE

(U.S. EPA  
QUANTITY)

ITEM	QUANTITY	↓ UNITS	UNIT COST	TOTAL COST (U.S. EPA Total Cost)
<b>INCINERATION RESIDUES LANDFILL</b>				
<b>INCINERATION RESIDUE WITH METALS</b>				
Site 17 Residue with Metals	800	CY		
Site 28 Stabilized Residue @ 1.3 volume inc.	1,300	CY		
Area 9 Residue with metals	5,000	CY		
Subtotal	7,100	CY		
<b>DIRECT CAPITAL COSTS INCINERATION RESIDUE LANDFILL (10 FT DEPTH)</b>				
<b>LINER AND INSTALLATION</b>				
Buy/haul/place/compact 2.0 feet soil with maximum permeability of 1 E-7 cm/sec	2,130 (900)	CY	\$20	\$42,600 (\$ 18,000)
Buy and place Geotextile Filter Fabric	19,170 (12,200)	SF	\$0.20	\$3,834 (\$ 2,440)
Buy/haul/place 6 inches drainage layer	355 (225)	CY	\$15	\$5,325 (\$ 3,375)
Buy and place Geotextile Filter Fabric	19,170 (12,200)	SF	\$0.20	\$3,834 (\$ 2,440)
<b>CAP MATERIALS AND INSTALLATION</b>				
Buy/haul/place/compact 2.0 feet soil with maximum permeability of 1 E-7 cm/sec	1,420 (900)	CY	\$20	\$28,400 (\$ 18,000)
Buy and place Geotextile Filter Fabric	19,170 (12,200)	SF	\$0.20	\$3,834 (\$ 2,440)
Buy/haul/place 6 inch drainage layer	355 (225)	CY	\$15	\$5,325 (\$ 3,375)
Buy and place Geotextile Filter Fabric	19,170 (12,200)	SF	\$0.20	\$3,834 (\$ 2,440)
Buy/haul/place 6 inches gravel	355 (225)	CY	\$10	\$3,550 (\$ 2,250)
Buy/Haul/Place 1.5 ft Embankment	1,065 (900)	CY	\$5	\$5,325 (\$ 4,500)
Buy/Haul/Place 0.5 ft Topsoil	355 (225)	CY	\$15	\$5,325 (\$ 3,375)
Seed, fertilizer and mulch	2,130 (1,740)	CY	\$1	\$2,130 (\$ 1,340)
<b>LEACHATE COLLECTION SYSTEM</b>				
Leachate holding tank	Lump Sum	Lump Sum	\$3,000	\$3,000 (\$ 4,000)
Pipes, pumps, etc.	Lump Sum	Lump Sum	\$1,000	\$1,000 (\$ 1,500)
Landfill Subtotal				\$117,316 (\$ 67,975)
<b>OTHER COSTS INCINERATION RESIDUE LANDFILL</b>				
Safety Program	Lump Sum	Lump Sum	\$25,000	\$25,000 (\$ 10,000)
Equipment Decontamination	Lump Sum	Lump Sum	\$2,500	\$2,500 (\$ 2,000)
Mobilization/Demobilization	Lump Sum	Lump Sum	\$15,000	\$15,000 (\$ 5,000)
Fencing Landfill, Tank	450	LF	\$10	\$4,500 (\$ 4,500)
Monitoring Wells (4 wells @ 20 ft)	80	LF	\$60	\$4,800 (\$ 4,800)
Subtotal Other Costs				\$51,800 (\$ 26,300)
<b>ESTIMATED DIRECT CAPITAL COST INCINERATION RESIDUE LANDFILL</b>				<b>\$169,116 (\$ 94,275)</b>

## ONE OPERABLE UNIT

## COST ESTIMATE

ITEM	QUANTITY	U.S. EPA (quantity) ↓ UNITS	UNIT COST	TOTAL COST (U.S. EPA Total Cost)
<b>INDIRECT CAPITAL COSTS</b>				
Contingency Allowance at 25% direct capital cost				\$97,726 (\$74,555)
Engineering Fees at 15% direct capital cost				\$58,636 (\$44,733)
Legal Fees at 5% direct capital cost				\$19,545 (\$14,911)
Estimated Indirect Capital Cost				\$175,908 (\$134,199)
<b>TOTAL ESTIMATED CAPITAL COST</b>				<b>\$566,813 (\$432,419)</b>
<b>ANNUAL OPERATING AND MAINTENANCE COSTS</b>				
Groundwater sampling	4	mandays	\$250	\$2,000 (\$1,000)
Sample analysis (16 x \$56)	Lump Sum	Lump Sum	\$4,800	\$4,800 (\$396)
Site moving	52	mandays (26)	\$250	\$13,000 (\$6,500)
Site inspection	4	mandays	\$250	\$1,000 (\$1,000)
Miscellaneous site work	36	mandays (10)	\$250	\$9,000 (\$2,500)
Site work materials	Lump Sum	Lump Sum	\$4,000	\$4,000 (\$0)
Leachate treatment	Lump Sum	Lump Sum	\$5,000	\$5,000 (\$0)
Insurance at 1% direct capital cost	Lump Sum	Lump Sum	\$3,909	\$3,909 (\$2,982)
Reserve fund at 1% direct capital cost	Lump Sum	Lump Sum	\$3,909	\$3,909 (\$2,982)
Estimated Annual Operating and Maintenance Costs				\$46,618 (\$17,860)
PRESENT WORTH OF ANNUAL OPERATING MAINTENANCE COSTS FOR 30 YRS (i=5%)				\$716,614 (\$274,545)
<b>LANDFILL TOTAL COST</b>				<b>\$1,283,427 (\$706,964)</b>

Cost information sources include:  
 R.S. Means Co., Inc., 1987. Building Construction Cost Data - 1988.  
 O'Brien & Gere Engineers, Inc. - Professional Experience

U.S. EPA estimated costs

Two operable units \$ 982,362

One operable unit \$ 706,964

TABLE 2

(page 1. of 2.)

## ONE OPERABLE UNIT

## COST ESTIMATE

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL COST
<b>DIRECT CAPITAL COSTS LANDFILL</b>				
<b>INCINERATION RESIDUE</b>				
Site 17 Residue with Metals	800	CY		
Site 28 Stabilized Residue @ 1.3 volume inc.	1,300	CY		
Area 9 Residue with metals	5,000	CY		
<b>SOIL AND SEDIMENT</b>				
Stabilized Site 15 Soil	364	CY		
Stabilized Site 22 Soil	6,760	CY		
Stabilized Site 29 Soil	4,420	CY		
Site 29 non-EP Toxic soil	11,200	CY		
Stabilized Area 9 Soil	1,040	CY		
Subtotal	30,884	CY		
<b>INDUSTRIAL LANDFILL (15 FT DEPTH)</b>				
<b>LINER AND INSTALLATION</b>				
Buy/haul/place/compact 2.0 feet soil with maximum permeability of 1 E-7 cm/sec	6,177 (3200)	CY	\$20	\$123,536 (\$ 64,000)
Buy and place Geotextile Filter Fabric	55,591 (42500)	SF	\$0.20	\$11,118 (\$ 8,580)
Buy/haul/place 6 inches drainage layer	1,029 (900)	CY	\$15	\$15,442 (\$ 12,000)
Buy and place Geotextile Filter Fabric	55,591 (42500)	SF	\$0.20	\$11,118 (\$ 8,580)
<b>CAP MATERIALS AND INSTALLATION</b>				
Buy/haul/place/compact 2.0 feet soil with maximum permeability of 1 E-7 cm/sec	4,118 (3200)	CY	\$20	\$82,357 (\$ 64,000)
Buy and place Geotextile Filter Fabric	55,591 (42500)	SF	\$0.20	\$11,118 (\$ 8,580)
Buy/haul/place 6 inch drainage layer	1,029 (900)	CY	\$15	\$15,442 (\$ 12,000)
Buy and place Geotextile Filter Fabric	55,591 (42500)	SF	\$0.20	\$11,118 (\$ 8,580)
Buy/haul/place 6 inches gravel	1,029 (900)	CY	\$10	\$10,295 (\$ 8,000)
Buy/Haul/Place 1.5 ft Embankment	3,088 (2400)	CY	\$5	\$15,442 (\$ 12,000)
Buy/Haul/Place 0.5 ft Topsoil	1,029 (900)	CY	\$15	\$15,442 (\$ 12,000)
Seed, fertilizer and mulch	6,177 (4600)	SY	\$1	\$6,177 (\$ 4,600)
<b>LEACHATE COLLECTION SYSTEM</b>				
Leachate holding tank	Lump Sum	Lump Sum	\$3,000	\$5,000 (\$ 3,000)
Pipes, pumps, etc.	Lump Sum	Lump Sum	\$1,000	\$2,000 (\$ 7,500)
Landfill Subtotal				\$335,606 (\$ 233,420)
<b>OTHER COSTS</b>				
Safety Program	Lump Sum	Lump Sum	\$25,000	\$25,000 (\$ 20,000)
Equipment Decontamination	Lump Sum	Lump Sum	\$3,000	\$3,000 (\$ 3,000)
Mobilization/Demobilization	Lump Sum	Lump Sum	\$15,000	\$15,000 (\$ 25,000)
Fencing Landfill	750 (1200)	LF	\$10	\$7,500 (\$ 12,000)
Monitoring Wells (4 wells @ 20 ft)	80	LF	\$60	\$4,800 (\$ 4,800)
Subtotal Other Costs				\$55,300 (\$ 64,800)
<b>ESTIMATED DIRECT CAPITAL COST LANDFILL</b>				<b>\$390,906 (\$ 298,220)</b>

## TWO OPERABLE UNITS

## COST ESTIMATE

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL COST	(U.S. EPA) (Total Cost)
<b>INDIRECT CAPITAL COSTS INCINERATION RESIDUE LANDFILL</b>					
Contingency Allowance at 25% direct capital cost				\$42,279	(\$ 23,569)
Engineering Fees at 15% direct capital cost				\$25,367	(\$ 14,141)
Legal Fees at 5% direct capital cost				\$8,456	(\$ 4,564)
Estimated Indirect Capital Cost				\$76,102	(\$ 42,274)
<b>TOTAL ESTIMATED CAPITAL COST</b>				<b>\$245,218</b>	<b>(\$ 136,549)</b>
<b>ANNUAL OPERATING AND MAINTENANCE COSTS INCINERATION RESIDUE LANDFILL</b>					
Groundwater sampling	4	mandays (2)	\$250	\$2,000	(\$ 1,000)
Sample analysis (16 x \$20)	Lump Sum	Lump Sum	\$4,800	\$4,800	(\$ 320)
Site moving	52	mandays (26)	\$250	\$13,000	(\$ 6,500)
Site inspection	4	mandays	\$250	\$1,000	(\$ 1,000)
Miscellaneous site work	36	mandays (18)	\$250	\$9,000	(\$ 2,500)
Site work materials	Lump Sum	Lump Sum	\$4,000	\$4,000	(\$ 0)
Leachate treatment	Lump Sum	Lump Sum	\$3,500	\$3,500	(\$ 0)
Insurance at 1% direct capital cost	Lump Sum	Lump Sum	\$1,691	\$1,691	(\$ 943)
Reserve fund at 1% direct capital cost	Lump Sum	Lump Sum	\$1,691	\$1,691	(\$ 943)
Estimated Annual Operating and Maintenance Costs				\$40,682	(\$ 13,206)
<b>PRESENT WORTH OF ANNUAL OPERATING MAINTENANCE COSTS FOR 30 YRS (i=5%)</b>				<b>\$225,369</b>	<b>(\$ 203,004)</b>
<b>INCINERATION RESIDUE LANDFILL TOTAL COST</b>				<b>\$870,587</b>	<b>(\$ 339,553)</b>



## TWO OPERABLE UNITS

## COST ESTIMATE

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL COST	
(U.S. EPA Quantity)					
(U.S. EPA Total Cost)					
METALS LANDFILL					
-----					
SOIL AND SEDIMENT CONTAINING METALS					
Stabilized Site 15 Soil	364	CY			
Stabilized Site 22 Soil	6,760	CY			
Stabilized Site 29 Soil	4,420	CY			
Site 29 non-EP Toxic Soil	11,200	CY			
Stabilized Area 9 Soil	1,040	CY			
	-----				
Subtotal	23,784	CY			
DIRECT CAPITAL COSTS METALS LANDFILL (15 FT DEPTH)					
-----					
LINER AND INSTALLATION					
Buy/haul/place/compact 2.0 feet soil with maximum permeability of 1 E-7 cm/sec	4,757	CY	\$20	\$95,136	
Buy and place Geotextile Filter Fabric	42,811	SF	\$0.20	\$8,562	
Buy/haul/place 6 inches drainage layer	793	CY	\$15	\$11,892	
Buy and place Geotextile Filter Fabric	30,767	SF	\$0.20	\$6,153	
CAP MATERIALS AND INSTALLATION					
Buy/haul/place/compact 2.0 feet soil with maximum permeability of 1 E-7 cm/sec	3,171 (2816)	CY	\$20	\$63,424 (\$ 56,316)	
Buy and place Geotextile Filter Fabric	42,811 (39013)	SF	\$0.20	\$8,562 (\$ 7,603)	
Buy/haul/place 6 inch drainage layer	793 (704)	CY	\$15	\$11,892 (\$ 10,559)	
Buy and place Geotextile Filter Fabric	42,811 (39013)	SF	\$0.20	\$8,562 (\$ 7,603)	
Buy/haul/place 6 inches gravel	793	CY	\$10	\$7,928 (\$ 0)	
Buy/Haul/Place 1.5 ft Embankment	2,378 (2112)	CY	\$5	\$11,892 (\$ 10,559)	
Buy/Haul/Place 0.5 ft Topsoil	793 (704)	CY	\$15	\$11,892 (\$ 10,559)	
Seed, fertilizer and mulch	2,643 (4124)	SY	\$1	\$2,643 (\$ 4,224)	
LEACHATE COLLECTION SYSTEM					
Leachate holding tank	Lump Sum	Lump Sum	\$4,000	\$4,000 (\$ 3,000)	
Pipes, pumps, etc.	Lump Sum	Lump Sum	\$1,500	\$1,500 (\$ 750)	
				-----	
	Landfill Subtotal			\$254,039	(\$ 232,916)
OTHER COSTS METALS LANDFILL					
Safety Program	Lump Sum	Lump Sum	\$25,000	\$25,000 (\$10,000)	
Equipment Decontamination	Lump Sum	Lump Sum	\$2,500	\$2,500 (\$ 2,000)	
Mobilization/Demobilization	Lump Sum	Lump Sum	\$15,000	\$15,000 (\$ 5,000)	
Fencing Landfill	700	LF	\$10	\$7,000 (\$ 7,000)	
Monitoring Wells (4 wells @ 20 ft)	80	LF	\$60	\$4,800 (\$ 4,800)	
				-----	
	Subtotal Other Costs			\$54,300	(\$ 28,800)
ESTIMATED DIRECT CAPITAL COST METALS LANDFILL				\$308,339	(\$ 261,716)

## TWO OPERABLE UNITS

## COST ESTIMATE

ITEM	(U.S. EPA Quantity) QUANTITY ↓ UNITS	UNIT COST	TOTAL COST (U.S. EPA Total Cost)
<b>INDIRECT CAPITAL COSTS</b>			
-----			
Contingency Allowance at 25% direct capital cost			\$77,085 (\$ 65,429)
Engineering Fees at 15% direct capital cost			\$46,251 (\$ 39,257)
Legal Fees at 5% direct capital cost			\$15,417 (\$ 13,086)
Estimated Indirect Capital Cost			\$138,752 (\$ 117,772)
TOTAL ESTIMATED CAPITAL COST			\$447,091 (\$ 379,489)
<b>ANNUAL OPERATING AND MAINTENANCE COSTS</b>			
-----			
<b>METALS LANDFILL</b>			
Groundwater sampling	4 mandays (2)	\$250	\$2,000 (\$ 1000)
Sample analysis (16 x \$56)	Lump Sum Lump Sum	\$3,000	\$3,000 (\$ 896)
Site mowing	52 mandays (26)	\$250	\$13,000 (\$ 6,500)
Site inspection	4 mandays	\$250	\$1,000 (\$ 1,000)
Miscellaneous site work	36 mandays (10)	\$250	\$9,000 (\$ 2,500)
Site work materials	Lump Sum Lump Sum	\$4,000	\$4,000 (\$ 0)
Leachate treatment	Lump Sum Lump Sum	\$4,000	\$4,000 (\$ 0)
Insurance at 1% direct capital cost	Lump Sum Lump Sum	\$3,083	\$3,083 (\$ 2,617)
Reserve fund at 1% direct capital cost	Lump Sum Lump Sum	\$3,083	\$3,083 (\$ 2,617)
Estimated Annual Operating and Maintenance Costs			\$42,167 (\$ 17,130)
PRESENT WORTH OF ANNUAL OPERATING MAINTENANCE COSTS FOR 30 YRS (i=5%)			\$648,188 (\$ 263,321)
METALS LANDFILL TOTAL COST			\$1,095,279 (\$ 642,809)
TOTAL COST BOTH LANDFILLS			\$1,965,866 (\$ 982,362)

Cost information sources include:

R.S. Means Co., Inc., 1987. Building Construction Cost Data - 1988.

O'Brien &amp; Gere Engineers, Inc. - Professional Experience

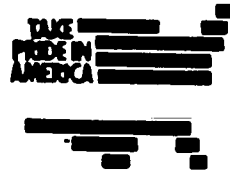
**CRAB ORCHARD NATIONAL WILDLIFE REFUGE  
METALS AREAS OPERABLE UNIT ROD**

**APPENDIX C  
SUPPORT AGENCY CONCURRENCE**



# United States Department of the Interior

OFFICE OF THE SECRETARY  
WASHINGTON, D.C. 20240



Mr. Valdas V. Adamkus  
Regional Administrator  
U.S. Environmental Protection Agency  
Attention 5RA-14  
Region 5  
230 South Dearborn Street  
Chicago, Illinois 60604

MAR 30 1990

O: WMD -  
CC: RF  
WESTLAKE

Re: Metals Areas Operable Unit ROD  
Crab Orchard National Wildlife Refuge

Dear Mr. Adamkus:

This is to advise you that the Department of the Interior (DOI) has reviewed the proposed finalized Record of Decision (ROD) for the Metals Areas Operable Unit.

We concur with the remedy proposed in the ROD. Nevertheless, in accordance with CERCLA, the Department of Defense (DOD) is an essential party which should be afforded a full opportunity to review, to comment upon and to concur and/or object to the proposed ROD for this Formerly Used Defense Site (FUDS). We insist that DOD be a full participant in the selection, implementation, and investigation of all future remedial activities at the site. Further, the site should be eligible for Defense Environmental Restoration Program (DERP) funding. Finally, DOD is responsible under Section 120 of CERCLA as the agency owning or operating this federal facility at the time when hazardous wastes were disposed of at the facility.

We appreciate the commitment of U.S. EPA to support DOI's position that DOD is an essential party to the Crab Orchard Inter-agency Agreement (IAG). Your staff has advised us that it is their opinion that the IAG is the key document that sets out the relationships among the participating governmental entities, which in this case are U.S. EPA, Illinois EPA, DOD and DOI.

To consummate an IAG, it is necessary that these parties work together now. I am aware that U.S. EPA, like DOI, is anxious to begin actual clean-up of contamination at Crab Orchard National Wildlife Refuge. It is essential that DOD be a signatory to any IAG because of DOD's significant involvement in activities that led to the disposal of hazardous wastes which must now be cleaned up. This is to advise you that unless DOD becomes a full member of any IAG developed with respect to this site, DOI is unwilling to enter into an IAG. We at DOI have been in communication with DOD, and it is now time for U.S. EPA, formally and directly, to request DOD's participation.

RECEIVED

APR 04 1990

U.S. EPA REGION 5  
OFFICE OF REGIONAL AND WASTE MANAGEMENT

We continue to appreciate the cooperative spirit exhibited by the U.S. EPA regional staff. We look forward to further discussions with a view to resolving matters of mutual concern at the site.

Sincerely,



John E. Schrote  
Deputy Assistant Secretary  
Policy, Management and Budget

cc: Mr. Lewis D. Walker  
Deputy Assistant Secretary  
Environmental, Safety and Occupational  
Health  
Department of the Army

Ms. Mary Logan  
Project Manager  
U.S. EPA - Region 5

Mr. Tim Thurlow  
Assistant Regional Counsel  
U.S. EPA - Region 5



Illinois Environmental Protection Agency P.O. Box 19276, Springfield, IL 62794-9276

217/782-6761

Refer to: LPC#1998620014--Williamson County  
Crab Orchard/Sangamo  
superfund/Technical

March 2, 1990

Mr. Norm Niedergang, Chief  
Remedial Enforcement Response Branch  
Waste Management Division USEPA  
230 South Dearborn  
Chicago, IL 60604

Dear Mr. Niedergang:

This Agency has reviewed your Draft Crab Orchard Metals Areas operable unit ROD dated February 14, 1990 and received by this Agency on February 16. Attached you will find a listing of specific comments by page of the ROD. I would like however to express this Agencies concern with USEPA's landfill design criteria chosen to be applied within this operable unit remedy.

It is this Agencies understanding that the landfill design undertaken by USEPA will be patterned after solid waste design requirements, those outlined in 40 CFR 241, Subpart B or 35 IAC Part 807. It is also the understanding of this Agency that the landfill will not only be utilized for "metals bearing" contaminated soil but also for other "organic and inorganic contaminants of less concern." It appears that this landfill cell would also, be utilized as the deposition area for ash generated during the proposed incineration of PCB contaminated soil.

Based on the lack of historical evidence available describing how existing wastes were generated (processes), it becomes difficult to discern if the waste is a listed RCRA hazardous waste as noted in Ill. Adm. Code, Title 35, Subpart D. It also becomes extremely difficult to test every cubic yard of contaminated material being deposited in the landfill for EP Toxicity. It is doubtful that the "other organics of less concern" will be rendered entirely inert during the treatment and solidification stage of the selected remedy. Based on this knowledge, the rising public concern surrounding this site, along with the "permanence" criteria outlined in the nine criteria utilized when selecting a remedy at an NPL site, a carefully designed secure cell is mandated to adequately protect the health, welfare and the environment within the State of Illinois.

Although existing Federal and State solid waste landfill design requirements are lacking when applied to liner and cap requirements, this Agency has consistently applied state liner and cap design standards outlined in Waste Management Facilities Design Criteria. At a minimum the landfill liner should contain a 10 foot (in situ, or placed and compacted clay soil liner exhibiting

a permeability of  $10^{-7}$  cm/sec in both horizontal and vertical planes). If a 10 foot clay liner is not available, then an artificial liner should be placed above a clay liner with a leachate detection and collection system being sandwiched between them.

It is the Agencies concern that a landfill designed to meet a strict interpretation or minimum requirements of solid waste regulations will not provide a permanent, long term remedy for the Crab Orchard Refuge site. However, I believe that a landfill can be designed that will adequately protect public health and the environment utilizing the States landfill design criteria or a modification of RCRA requirements.

It may not be within the States best interest to concur on the metals operable unit ROD thus setting a precedent of lowering our Solid Waste policy standards. I believe this issue warrants additional dialogue in the immediate future. Please contact me at your earliest convenience so that we can discuss this matter.

Sincerely,

*William Child*  
wp.

William Child, Manager  
Division of Land Pollution Control

WC:pss

Attachment

cc: Division File  
Terry Ayers  
Stephen Davis  
Greg Michaud  
Jim Mayka  
Mary Logan  
Charlie Zeal  
Rob Watson  
Ed Bakowski



IEPA Comment On:  
Draft Metals Areas Operable Unit ROD

1. Page 2, Paragraph 4: The February 1990 date should be changed to reflect the breakdown in IAG negotiations.
2. Page 2, Paragraph 5: Why is DOI reviewing the responses to 104 (e) letters by prospective PRP's when they themselves are considered a PRP in the ongoing action at the site?
3. Page 3, Paragraph 1: The IEPA has not assisted in conducting the community relations program at this site. Reference to the IEPA's participation should be deleted.
4. Page 28, first bullet: Groundwater and leachate monitoring for the on-site landfill should be in accordance with monitoring requirements outlined in RCRA 40 CFR 264, Subpart F, or Il. Adm. Code Subtitle G, 724, Subpart F, or a modification thereof.
5. See previous comments dated September 21, 1989.