EPA/ROD/R07-98/168
1998

EPA Superfund
Record of Decision:

IOWA ARMY AMMUNITION PLANT
EPA ID: IA7213820445
OU 01
MIDDLETOWN, IA
03/04/1998

EPA 541-R98-168
<IMG SRC 981680>

INTERIM ACTION
RECORD OF DECISION
DECLARATION

SITE NAME AND LOCATION

Iowa Army Ammunition Plant (IAAAP)
Soils Operable Unit (OU)
Middletown, Iowa

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected interim remedial action for contaminated soils at 15 areas throughout the IAAAP in Middletown, Iowa. The interim remedial action was chosen in accordance with the Comprehensive Environmental Response. Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Contingency Plan (NCP). This decision is based on information in the site Administrative Record file, which is located in the following information repositories:

Iowa Army Ammunition Plant
Visitor Reception Area
Building 100-101
Middletown, Iowa 52683-5000
(319) 753-7710

Burlington Public Library
501 N. Fourth Street
Burlington, Iowa 52601
(319) 753-1647

Danville City Hall
105 W. Shepard
Danville, Iowa 52623
(319) 392-4685

The U.S. Army (Army) has coordinated selection of this interim remedial action with the U.S. Environmental Protection Agency (EPA). The Army is the lead agency for implementing the interim remedial action at the IAAAP. As the support agency, the EPA oversees the cleanup activities conducted by the Army to ensure that requirements of CERCLA/SARA, the NCP, and the Federal Facilities Agreement between the Army and the EPA have been met. EPA concurs with the selected remedy. The state of Iowa has not participated in the review of CERCLA clean up activities at the IAAAP and has declined to comment upon the preferred alternative presented in the Proposed Plan for this Interim Remedial Action.

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 Record of Decision, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The IAAAP has been divided into a soils OU and a groundwater OU to facilitate management of contaminated wastes at the site. The Remedial Investigation for the soils OU is effectively complete and has been followed by a Focused Feasibility Study (FFS). Additional data have been requested by the EPA to complete the investigation of the groundwater OU. The selected interim remedial action presented here addresses one of the principal threats posed by the soils OU by temporarily stockpiling, for future treatment, the most highly contaminated soils; and by permanently disposing the remaining contaminated soils. This Interim Action for the soils OU is expected to be a component of the final action for the soils OU. The Interim Action will provide for risk reduction at the site while evaluations of innovative technologies to potentially treat the principal threat wastes are being conducted. Pilot study tests are underway at the IAAAP to evaluate bioremediation technologies at the time of this record of decision (ROD). The most highly contaminated soils will be stockpiled in the on-site corrective action management unit (CAMU), which is constructed to specifications which meet Resource Conservation and Recovery Act (RCRA) Subtitle C landfill requirements. The CAMU will be used to temporarily store CERCLA remediation wastes as specified in the EPA Memorandum dated March 8, 1995 entitled "Designation of Corrective Action Management Unit, Iowa Army Ammunition Plant Site, Middletown, Iowa" (see Appendix F of the IAAAP FFS for the soils OU). The remaining contaminated soils will be permanently disposed in either the on-site Soil Repository, which is also constructed to RCRA Subtitle C landfill specifications, or the on-site Inert Landfill. A synthetic liner (HDPE) and geosynthetic clay liner (GCL) cover system will cover contaminated soils placed in the Soil Repository. The cover for the Inert Landfill will be similar to the Soil Repository cover, absent the GCL. Soils in both the Soil Repository and Inert Landfill will remain on site for long-term management. Included in the final remedy for the soils OU will be the treatment method for the following: soils being temporarily stockpiled as a result of this interim action: any long-term monitoring needed to evaluate the performance of the remedy; land usage restrictions as required, a closure plan to address the CAMU; and the identification and inclusion of any other contaminated areas requiring remediation.

The major components of the selected interim action include:

- Excavation of soils contaminated at levels exceeding remediation goals (RG)
- Verification sampling
- Segregation of contaminated soils according to contaminant type and risk level
- Temporary storage of contaminated soils with risk levels above 10 -5, or that fail land disposal restriction (LDR) criteria, in the designated CAMU on site, with a treatment method for these stockpiled soils to be specified in the final soils OU ROD
- Permanent disposal of contaminated soils with risk levels between 10 -3 and 10 -1 in the on-site Soil Repository
- Permanent disposal of contaminated soils with risk levels below 10 -6 and above the leaching RGs in the on-site Soil Repository or the on-site Inert Landfill
- Solidification/stabilization of contaminated soils containing metals at levels exceeding LDR criteria, and permanent disposal in the on-site Soil Repository

STATUTORY DETERMINATIONS

The selected interim action is protective of human health and the environment, complies with Federal and State of Iowa requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site, given the limited scope of the action. Because this action does not constitute the final remedy for the IAAAP soils operable unit, the statutory preference for remedies that employ treatment to reduce toxicity, mobility, or volume as a principal element will be addressed at the time of the final response action for the soils operable unit. A subsequent action is planned to fully address the principal threats posed by this operable unit.

Because this remedy will result in hazardous substances remaining on site with contamination levels exceeding pertinent health-based standards, 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. Because this is an interim action ROD, review of this site and of this remedy will be ongoing as final remedial alternatives for the IAAAP soils OU are developed.

INTERIM ACTION
RECORD OF DECISION

SOILS OPERABLE UNIT
IOWA ARMY AMMUNITION PLANT
MIDDLETOWN, IOWA

Prepared by:

U.S. Army Environmental Center
SFIM-AEC-IRA; Building E4480
Aberdeen Proving Ground, Maryland 21010-5401

October 1997

TABLE OF CONTENTS

Tables

Figures

ACRONYMS

ARAR	Applicable or relevant and appropriate requirement
Army	U.S. Army
BLRA	Baseline risk assessment
CAMU	Corrective action management unit
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Contaminants of concern
COPEC	Contaminant of potential ecological concern
CPF	Cancer potency factor
DL	Detection limit
DNT	Dinitrotoluene
DOD	Department of Defense
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
F	Fahrenheit
FFA	Federal Facilities Agreement
FFS	Focused Feasibility Study
FS	Feasibility Study
GCL	Geosynthetic clay liner
HAL	Health advisory level
HDPE	High-density polyethylene
HI	Hazard index
HIF	Human intake factor
HMX	High melting explosive
IAAAP	Iowa Army Ammunition Plant
kg	Kilogram
LAP	Load, assemble, and pack
LDR	Land disposal restriction
Mg	Milligram
NB	Nitrobenzene
NCP	National Contingency Plan
NPL	National Priorities List
NTC	Non-time critical
OU	Operable unit
PA	Preliminary assessment
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
RDX	1,3,5-Trinitro-1,3,5-triazacyclohexane
RfD	Reference dose
RG	Remediation goal
RI	Remedial Investigation
RME	Reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SI	Site inspection
SVOC	Semi-volatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TNB	Trinitrobenzene
TNT	Trinitrotoluene
TSCA	Toxic Substance Control Act
UCL	Upper confidence limit
VOC	Volatile, organic compound
yd 3	Cubic yard

1.0 Site Name, Location, and Description

The Iowa Army Ammunition Plant (IAAAP) is a load, assemble, and pack (LAP) munitions facility located in Middletown, a rural area of eastern Iowa, 10 miles west of Burlington in Des Moines County, and approximately nine miles northwest of the Skunk and Mississippi Rivers (see Figure 1). Croplands comprise about 60 percent of the county; the remaining area is composed of 10 percent urban use, eight percent pasture use, and 22 percent woodland or idle land. The IAAAP is located on about 20,000 acres. Approximately 8,000 acres are leased for agricultural use, about 7,500 acres are forested, and the remaining area is used for administrative and industrial operations. Deer hunting is regulated at the IAAAP through the use of permits. Approximately 43 housing units have been transferred to the city of Middletown.

The northern area of the IAAAP consists of gently undulating terrain. The central portion is characterized by rolling terrain dissected by a shallow drainage system, while the southern area of the site contains drainage ways with steep slopes down to the creek beds. Elevations within the IAAAP range from 730 feet above mean sea level in the north to 530 feet in the south. There are four principal aquifers in Des Moines County. These include a shallow or surficial aquifer (drift aquifer) in unconsolidated Recent Pleistocene sediments, and bedrock aquifers occurring in the Mississippian, Devonian, and Cambro-Ordovician units.

The IAAAP contains four watersheds. Brush Creek drains the central portion of the site, exits at the southeastern boundary, and flows into the confluence of the Skunk and Mississippi Rivers. The creek's floodplain at the southern boundary of the site is estimated to be 200 feet wide. Spring Creek drains the eastern portion of the site, exits at the southeastern corner, and flows off site directly into the Mississippi River. The creek's floodplain at the southeastern boundary of the site is estimated to be 400 feet wide. Long Creek drains the western portion of the IAAAP, exits at the southwestern boundary, and joins the Skunk River just south of the site. The Skunk River then flows into the Mississippi River. The Long Creek drainageway has been dammed near the center of the site to create the 85-acre George H. Mathes Lake. Use of this lake by the plant as a water source was discontinued in January 1977. A campsite and a boat ramp used by fishermen are present at the lake. North of Mathes Lake is the 7-acre

Stump Lake, which was built to serve as a sediment control for Mathes Lake. The floodplain of Long Creek is widest (500 feet) at the southern plant boundary. The Skunk River is located south of the IAAAP, bordering the site's perimeter on the southwest corner. The Skunk River provides year-round recreational use.

The 15 areas within the IAAAP that require interim remedial action are impacted with various contaminants and contain an estimated volume of over 42,000 cubic yards (yd 3) of contaminated soils. Table 1 provides specific information on types of contaminants and estimated volumes of contaminated soils for each of these 15 areas. Figure 2 shows the locations of these 15 areas within the IAAAP.

2.0 Site History and Enforcement Activities

The IAAAP produced munitions for World War II from the plant's inception in September 1941 until August 1945, and munitions for military activities in Southeast Asia in the 1960s and early 1970s. Activities at the IAAAP continued at a reduced level during peacetime. Day & Zimmerman Corporation operated the plant from 1941 - 1946. The former Atomic Energy Commission operated at Line 1 from 1948 through mid-1975. Plant operations reverted to U.S. Army (Army) control from 1946 - 1951. The Army continues to own the IAAAP, which has been operated by the private contractor Mason & Hanger Corporation since 1951. The IAAAP currently is operating to LAP munitions, including projectiles, mortar rounds, warheads, demolition charges, anti-tank mines, anti-personnel mines, and the components of these munitions, including primers, detonators, fuses, and boosters. Only a few of the production lines are in operation.

The primary source of contamination at the site is attributable to past operating practices in which explosives-contaminated wastewater and sludge were discharged to uncontrolled, on-Site lagoons and impoundments. Pink/red wastewater from trinitrotoluene (TNT) operations is a listed hazardous waste (K047) according to the Resource Conservation and Recovery Act

(RCRA).
The U.S. Environmental Protection Agency (EPA) added the IAAAP to the National Priorities List (NPL) in 1990. The NPL is the EPA's list of sites that appear to pose the greatest threat to human health and the environment, based on the site assessment process. The Department of Defense (DOD) established the Defense Environmental Restoration Account to address sites under the Comprehensive Environmental Response. Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), that are within the responsibility of the DOD. The Defense Environmental Restoration Account has been renamed Environmental Restoration, Army (ERA). The Army, as an agency within the DOD, is the lead agency for implementing the interim remedial action at the IAAAP. As the support agency, the EPA oversees cleanup activities conducted by the Army to ensure that the requirements of CERCLA/SARA and the National Contingency Plan (NCP) have been met. The EPA and the Army signed a Federal Facilities Agreement (FFA) for site cleanup, which became effective December 10, 1990, following public comment. The FFA provides a framework for CERCLA response actions to be performed at the IAAAP, including the investigation and cleanup of contamination. The State of Iowa has declined to participate as a signatory party to this FFA.

The Army has conducted numerous investigations at the site from 1975 to the present. The following briefly summarizes the investigations conducted since the FFA was signed.

The Army conducted Preliminary Assessments (PA) and Site Inspections (SI) at the IAAAP to identify areas of potential contamination. The Army, based on previous investigations or knowledge of operational and waste handling practices, identified 43 areas of known or suspected contamination during the PA. In August 1991, an SI was conducted for each of the 43 areas. Limited soil, sediment, groundwater, and surface water sampling was conducted in an effort to determine whether chemical constituents were present at levels of concern at suspected source areas and in associated migration pathways. Data obtained during the PA/SIs were used to supplement data previously obtained by the Army to develop the list of areas to be investigated within the Remedial Investigation (RI). The presence of chemical constituents above analytical reporting limits indicated a need for further evaluation.

The Army conducted the Phase I RI from July through November 1992. The Phase I investigation included an expanded characterization of background levels of metals in soils, a soil gas sampling effort in order to discern the extent of contamination by volatile organic compounds (VOC), base-wide surface water and sediment sampling, base-wide groundwater sampling, installation of temporary groundwater monitoring wells (piezometers), off-post residential well sampling, field screening for metals and explosives in soils, and fixed laboratory analyses of approximately 20 percent of the field screening samples collected and analyzed. The results of the off-post residential well sampling effort indicated the presence of explosives in excess of EPA health advisory levels (HAL) in five of the wells sampled. Contaminated wells were located southwest of the site near the town of Augusta, and off-site In the Brush Creek watershed. As an interim action, the Army provided affected residences with bottled water. The Army then contracted with the local public water supply company to have potentially impacted residences located south of the IAAAP boundary connected to the rural water supply district.

Results of the Phase I RI were used to refine the soil and groundwater investigation in the Phase II RI, which commenced in April 1993. During the Phase II RI, 13 soil borings were advanced to depths of approximately 15 feet below ground surface to obtain additional information regarding subsurface conditions at five areas. A total of 80 groundwater monitoring wells were placed at the site during the RI. During placement of each well, soil samples were obtained at the soil/groundwater interface and submitted for fixed laboratory analysis. Following placement of monitoring wells, each well was sampled for chemical constituents indicated by previous data obtained and knowledge of past operational and waste handling practices specific to that site.

The Draft RI Report, which included data obtained during the Phase I and Phase II RI, was submitted by the Army in 1993 to the EPA for review and comment. It was subsequently determined that collection of additional data was necessary to complete the site characterization. The Follow-On Sampling field effort was conducted in April through August 1995 to obtain additional data to characterize the nature and extent of on-site contamination. The Follow-On Sampling consisted of the placement of 28 additional soil borings and 26 groundwater monitoring wells, soil sample collection adjacent to previously unsampled explosives wastewater sumps, shallow soil sampling to verify positive results from the soil gas sampling during the Phase I RI, and collection of stream gauging data and shallow groundwater levels in an effort to characterize the hydraulic connection between surface water and shallow groundwater. Following the additional field sampling effort, the Draft-Final RI Report was submitted in November 1995. The Army received and incorporated comments from the EPA on this document, and the Revised Draft-Final RI Report dated May 21, 1996 was accepted as final in accordance with the FFA.

A Focused Feasibility Study (FFS) and Proposed Plan for Interim Action for the soils operable unit (OU) were prepared by the Army and submitted for public comment in June 1997. The EPA has requested that additional data be collected to complete the investigation of the groundwater OU. It is anticipated that these data gaps will be filled during the 1997 sampling season to complete the groundwater characterization. A Feasibility Study (FS), Proposed Plan, and Record of Decision (ROD) for the groundwater OU will be prepared and submitted for public review and comment. A Final ROD will be issued for the site that encompasses all contaminated areas of concern, including those not addressed as part of this interim action.

Based on data collected at the site, the Army has initiated non-time critical (NTC) removal actions at the IAAAP to address soil contamination at several areas across the IAAAP. including the Pesticide Pit, the Explosives-Contaminated Sumps, the former Fire Training Pit, the Inert Landfill, and the Line 1 Impoundment and Line 800 Pink Water Lagoon sub-sites.

Approximately 150 yd 3 of pesticides-contaminated soils were excavated in the spring of 1995 from the former Pesticide Disposal Pit and disposed of at an approved off-site waste disposal facility.

Explosives-contaminated soils associated with over 50 abandoned wastewater sumps also were excavated in the spring of 1995. These contaminated soils were temporarily stored in a lined stockpile near the Inert Landfill at the IAAAP, and were moved to the Soil Repository for permanent disposal in the spring of 1997.

An NTC removal action to address an estimated 1,000 yd 3 of soils contaminated with VOCs from various fuel and solvent sources at the former Fire Training Pit is being planned by the Army for the 1997 construction season. The Army has evaluated soil-vapor extraction and on-site low- temperature thermal desorption as possible remediation technologies to complete this cleanup. An Action Memorandum to document the selected action will be published prior to initiating clean up activities.

In the fall of 1996, the Army began activities to construct a low permeability cover on the 17- acre Inert Landfill site. The cover will consist of a geonet drainage layer and a low permeability geomembrane with appropriate vegetative cover. The liners will prevent infiltration of precipitation into the landfill material and the subsequent transport of contaminants from wastes to groundwater. Industrial and municipal-type wastes had been disposed in the Inert Landfill by the Army prior to the advent of current-day waste management regulations. The migration of contaminants leaching from these wastes to groundoundwater represents a continuous source of contaminants that will be mitigated by the construction of the cover.

The Line 1 Impoundment and Line 800 Pink Water Lagoon sub-sites are considered to be the greatest sources of explosive contamination at the IAAAP. As a part of the NTC removal actions for the Line 1 Impoundment and the Line 800 Pink Water Lagoon, which are on-going at the time of this ROD, soils have been sampled, analyzed, and segregated according to the risk or contaminant level detected. Depending on the concentration of explosives in the excavated soils, the soils have been placed in one of three areas: in the Soil Repository constructed adjacent to the IAAAP Inert Landfill, in the designated Corrective Action Management Unit (CAMU) also constructed adjacent to the Inert Landfill; or beneath the cap at the Inert Landfill as random fill to achieve final grade. Contaminated soils at the Line 1 Impoundment and Line 800 Pink Water Lagoon were excavated and segregated in August 1997. Site restoration activities are scheduled to be complete by early 1998.

In addition to the areas discussed above for which NTC removal actions have been undertaken, the Army has identified 15 additional areas with soils containing chemical constituents at concentrations greater than cleanup goals for the site. The evaluation of potential remedial alternatives and the identification of a preferred alternative to address these areas was the subject of the Proposed Plan for Interim Action for the IAAAP soils OU. A listing of the areas proposed for cleanup within the scope of the soils OU interim remedial action and their respective contaminant types is presented in Table 1. Other areas within the soils OU may ultimately require remedial actions to address soil contaminants. However, the nature of any such activities is not currently well defined due to the absence of definitive data or a thorough evaluation of risks that may be posed by contaminants that are present. The cleanup of any additional areas that may be found to pose unacceptable risk and that are not addressed in the soils OU Interim Action will be specified as part of the final soils OU ROD.

3.0 Highlights of Community Participation

The RI/FS and Proposed Plan for the soils OU were released to the public in November 1996 and May 1997, respectively. These documents were made available to the public in both the administrative record and the site information repositories. The notice of availability for the Proposed Plan was published in the Burlington-Hawkeye on May 21, 1997. A public comment period was held from May 22, 1997 to June 21, 1997. In addition, a public meeting was held on June 5, 1997 at the Danville Community Center. At this meeting representatives from the Army and EPA were available to the public to discuss concerns, accept comments, and answer questions regarding the preferred alternative presented in the Proposed Plan. There were no written or verbal comments regarding the Proposed Plan submitted to the Army at this meeting or during the comment period. The remedy selected for the IAAAP is based on the information contained in the Administrative Record for the site, and on public comments.

The Administrative Record is available for review during normal business hours at the Iowa Army Ammunition Plant, Visitor Reception Area, Building 100-101; the Burlington Public Library; and the Danville City Hall.

4.0 Scope and Role of Operable Units

Due to the complexity of the problems associated with the IAAAP, the site has been divided into two OUs to facilitate project management. These are the:

- Soils OU, to address contamination in the soils, and the
- Groundwater OU, to address contamination of the groundwater aquifers, contaminated surface water and sediments, VOC contaminated media, and ecological risks.

This Interim Action for the soils OU addresses the contaminated soils in 15 areas at the IAAAP (see Table 1). These areas of the site pose the principal threat to human health and the environment due to risks from possible ingestion or dermal contact with soils, and due to potential contaminant leaching from soil to groundwater. This Interim Action will address the principal threat and reduce risks at the site while a final remedial action for the IAAAP soils OU is being developed. The Interim Action will contain, in on-site landfill facilities. soils contaminated at levels posing a potential health threat, or acting as a potential source of continuing groundwater contamination.

Since this is an interim action, several elements of the final remedy have been deferred to the final ROD for the soils OU. Other contaminated areas within the soils OU may ultimately require remedial actions, however, conclusive sampling data in these areas has not been evaluated to date and therefore the nature of any potential remedial activities is not currently well defined. The cleanup of any additional areas that may be found to pose unacceptable risk that are not addressed in this Interim Action will be included as part of the final soils OU ROD. Other elements which will be addressed in the final soils OU ROD would include long-term actions, such as institutional controls to restrict access and land usage at the Inert Landfill Area and to restrict remediated areas to commercial / industrial land usage in the future, consistent with the cleanup goals. In addition, the final remedy for the soils OU will include a long-term monitoring plan for the IAAAP Inert Landfill Area to monitor the performance and integrity of the Soil Repository and the Inert Landfill, and will specify means by which the CAMU will be ultimately closed.

Contaminated groundwater is a principal threat at this site due to the potential for direct ingestion of drinking water from wells that contain contaminants above health-based levels. Additional data have been requested by the EPA to complete the investigation of the groundwater OU. It is anticipated that these data gaps will be filled during the 1997 sampling season to complete the groundwater investigation. An FS, Proposed Plan, and ROD for the groundwater OU will be prepared and submitted for public review and comment. A Final ROD will be issued for the site that encompasses all contaminated areas of concern, including those not addressed as a part of this soils OU interim remedial action.

5.0 Summary of Site Characteristics

The RI performed by the Army from 1992 through 1995 focused primarily on identifying sources of contamination resulting from previous facility operations and waste handling practices associated with the production of ammunition, and on generally determining the extent of the contamination in surface and subsurface soils, surface water, sediments, and groundwater. Results of the soil investigation indicate that with the exceptions of the Line 1 Impoundment. Line 800 Pink Water Lagoon. Fire Training Pit. and Pesticide Pit areas, contamination at the site generally consists of explosives and lead found in soils adjacent to source areas at depths of up to approximately three feet below ground.

Groundwater has been found to exceed cleanup criteria at Lines 1, 2, 3, 3A, and 6; the Line 800 Pink Water Lagoon; the Explosives Demolition Area/East Burn Pads, Firing Site, and Inert Landfill; and the Fire Training Area. Surface water and sediment quality have been impacted by previous discharges of explosives-contaminated wastewater from washing down the ammunition load lines. It is suspected that the surface water and shallow groundwater within the various IAAAP watershed areas are hydraulically interconnected. The relationship between the surface water, shallow groundwater, and chemical constituents in base-wide sediments is being investigated as a part of a Supplemental Hydrogeologic Study during the 1997 sampling season.

As discussed previously, 15 areas have been identified with soils containing chemical constituents at concentrations that exceed the cleanup goals for the site. Within these 15 areas, there are numerous sub-areas that are represented by as few as one surface or subsurface soil sample result that exceeds the cleanup goals for the site. The extent of contamination has not been typically defined in these isolated areas of contamination. Therefore, the Army has calculated estimated volumes of contaminated soil that may need to be removed based on the physical setting (e.g., boundaries formed by buildings and other adjacent structures) and knowledge of the site gained during previous removal actions. Such as the Explosives- Contaminated Sumps removal action conducted in 1995. The extent of soil contamination will be further defined during the design phase for the interim remedial actions.

Table 1 provides a listing of the contaminant types and the estimated volumes of soils to be removed from the interim remedial action sites. A detailed description of the nature and extent of contamination at these sites is included in the Revised Draft-Final RI Report and in appendices B and E of the Soils OU FFS for the IAAAP. A brief summary of the locations, types, and levels of contamination is presented below:

Line 1. At Line 1, there are 25 separate areas from which contaminated soils will be removed. Soils to be removed are adjacent to explosives production buildings, a vacuum pump house, and a cooling tower. Contaminants include explosives, metals, and semi-volatile organic compounds (SVOC). The radionuclides actinium 228 and bismuth 214 were detected in soils along the north side of Building 1-155-1 (a cooling tower) at concentrations that exceed site cleanup criteria. Bismuth 214 was detected in soils at the southeast corner of Building 1-70-1 (a filter building). The bulk of the contaminated soil volume at Line 1 is due to explosives and lead. Total levels of royal demolition explosive (RDX) and TNT are near 1000 parts per million (ppm), and range as high as 9000 ppm. Lead levels generally range from 2000 ppm, to 5000 ppm.

Line 2. At Line 2, there are 18 areas adjacent to explosives production buildings, assembly areas, and shipping areas that require remediation. Contaminants include explosives, at levels totaling 500 - 1000 ppm, with percentage levels in and around sump locations, and lead ranging from 1500 - 2000 ppm.

Line 3. At Line 3, there are 22 areas of contamination. These areas are located near a solvent storage building, the explosives production buildings, pump houses, and a filter house. Contaminants include explosives, metals, and SVOCs. Bismuth 214 was detected in one sample collected south of the x-ray bay at Building 3-10. Explosives and lead are the predominant contaminants. Explosives levels total 500 - 1000 ppm in some areas, ranging as high as percentage levels in and around sump locations. Lead contamination is as high as 6000 ppm.

Line 3-A. At Line 3A, there are eight areas of contamination located adjacent to explosives production buildings and a pump house. Contaminants detected at concentrations that exceed cleanup criteria include explosives and lead. Explosives generally are found at 200 - 500 ppm in contaminated areas of Line 3A.

Lines 4A/4B. At Line 4A, one sample obtained from a drainageway south of Building 4A-07, down gradient from a sump, contained lead at a concentration of 1160 ppm, which exceeds cleanup criteria. None of the samples analyzed for metals at Line 4B contained concentrations exceeding cleanup criteria for the site.

Lines 5A/5B. At Lines, 5A and 5B, 10 areas of concern were identified. These areas are located adjacent to the tetryl screening and blending facility, the tetryl pelleting operations, the explosives assembly area, and pump house areas. Contaminants that exceed cleanup criteria include explosives at percentage levels in sump locations, lead at 1100 ppm, and arsenic.

Line 6. None of the soil samples collected adjacent to the Building 6-19 sump contained explosives at levels exceeding cleanup criteria for the site. Lead ranging from 3000 - 8000 ppm, and antimony were detected at concentrations exceeding cleanup criteria in samples obtained from soils adjacent to the Building 6-96 sump.

Line 8. At Line 8, lead was detected at concentrations ranging from 1000 - 2000 ppm adjacent to Foundation X and at the southwest corner of Building 8-81-4 (an ammonium nitrate kettle house).

Line 9. At Line 9, beryllium was detected from the excavation area of a former sump at levels exceeding RGs. Lead at 1270 ppm was detected adjacent to Building 9-58, a mixing building.

Line 800. There are four areas of contamination at Line 800 that exceed cleanup criteria. These areas include the settling ponds associated with the Line 800 Pink Water Lagoon (explosives), the northwest corner of Building 800-04 (explosives), an area adjacent to the east end of Building 800-04 (lead), and an area along the west side of Building 800-191 (lead). Explosives are found in the range of 1500 - 2000 ppm. Lead was detected at 1800 ppm.

Explosives Demolition Area/ East Burn Pads. At the Explosives Demolition Area and East Burn Pads, explosives were detected in sediment samples collected from drainageways on the east and west sides of the burn pads. Explosives also were detected in soils at 16 locations associated with the burn pads. Explosives levels range from 1500 - 2000 ppm, to percentage levels in some pad locations. Based on practices at the site and the contaminant levels found, the possibility exists that solid phase explosives are present at the Burn Pads.

Demolition Area/ Deactivation Furnace. Lead was detected at 6400 ppm at a location along the southeast corner of the deactivation furnace.

Burn Cages/West Burn Pads Area. Low levels of explosives (less than 10 ppm) and lead at 2000 - 5000 ppm were detected at concentrations that exceed cleanup criteria in the Ash Disposal Landfill, the west burn pads, and west burn pads landfill, and along the southeast corner of Building BG-13 near a truck loading dock.

North Burn Pads. Lead, arsenic, and antimony were detected at concentrations that exceed cleanup criteria for the site adjacent to Pad 1-N. Lead was detected at 12000 ppm.

Roundhouse Transformer Storage Area. Polychlorinated biphenyl (PCB) 1260 was detected at 20 ppm, exceeding cleanup criteria for the site at two locations in the northeast corner of the former pad location.

6.0 Summary of Site Risks

A baseline risk assessment (BLRA) to assess the potential effects of contamination resulting from past operations at the IAAAP on human health and the environment was prepared by the Army, and is included in the Revised Draft-Final RI Report. The BLRA was conducted in accordance with appropriate EPA guidance.

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

6.1 Human Health Risks

Within the BLRA for the IAAAP, the reasonable maximum exposure (RME) to chemical constituents at the site was evaluated. The following is a summary of the four steps used to assess the site-related human health risks.

6.1.1 Contaminant Identification

Contaminants of concern (COC) that are in surface and subsurface soils, groundwater, surface water, and sediments were selected as part of the BLRA, using data previously collected at the site. Initially, any chemical constituent detected in a medium was considered a potential COC. Eighty-eight potential COC were identified. Chemical constituents were eliminated from consideration in the BLRA if they were detected infrequently or if they are essential nutrients and are nontoxic at the levels encountered at the IAAAP. Seventy-seven COC were ultimately selected. Appendix 1 in Volume 11 (Risk Assessment) of the 1996 Revised Draft-Final RI Report for the IAAAP presents the COC in each medium of concern, and the concentrations of the COC on which the risk assessment was based.

6.1.2 Exposure Assessment

Based on a review of site conditions, including current and anticipated future land use, contaminant distribution, and human activity patterns, the populations most likely to be exposed to chemical constituents at the IAAAP are on-site workers, off-post residents (both adults and children), and on-site visitors. The following exposure pathways were judged to be the most important:

- Ingestion of contaminated groundwater, soils, surface water, and sediments,
- Dermal contact with groundwater, soils, surface water, and sediments, and
- Inhalation exposure to VOCs released from groundwater to indoor air.

As an addendum to the BLRA, exposure scenarios were evaluated to address future land use conditions at the site. Reasonably anticipated future land use at the IAAAP is expected to be of the commercial/industrial type. Risks associated with future land use are similar in nature but greater in magnitude than risks associated with current use. The leaching of contaminants to shallow groundwater and human consumption of the contaminated groundwater by workers in a commercial/industrial future land use scenario represents the greatest potential human health risk associated with the site.

Exposure points were selected based on assumed activity patterns of potentially exposed populations at each area of the IAAAP. Calculations of exposure point concentration (EPQ) were based on the 95 percent upper confidence limit (UCL) of the arithmetic mean concentrations of chemicals in each medium. assuming that each data set is log-normally distributed. It was further assumed that EPCs would remain constant over the next 30 years. Data associated with duplicate samples were averaged. Further adjustments to data sets were made for non-detects. Detection limits (DL), analogous to EPA sample quantitation limits, were used to evaluate non-detects. If a chemical was detected at least once in a medium at an exposure point, the chemical was assumed to be present in that medium, and the UCL of the arithmetic mean was calculated using one-half the DL for nondetects. If the calculated arithmetic mean exceeded the maximum detected value, the maximum detected value was used as the EPC. If a chemical was never detected in a medium, it was assumed to be absent, and the EPC was assumed to be zero.

The following briefly describes the derivations of the EPCs for the various media. EPCs for contaminated soils were derived from analytical data for surface soil samples only, to a depth of 0.5 foot. It was assumed that exposure at each area is equally likely at any part of the site, and that the entire site is as contaminated as the areas sampled. Exposure points selected for surface water exposure were Mathes Lake and the Pink Water Lagoon. All surface water samples associated with Mathes Lake were included in the calculation of EPCs for Mathes Lake surface water. EPCs for the Pink Water Lagoon surface water were derived from the maximum plausible exposure scenario presented in the endangerment assessment prepared by the Army In 1989. Sediment samples collected from near shore in Mathes Lake were used to calculate sediment EPCs for Mathes Lake sediment. Each groundwater EPC is based on analytical data from a single off-site groundwater well currently used as a source of domestic water. The EPC for indoor air was derived from an assumed air to water concentration ratio of 0.5 for VOCs in off-site domestic wells (the only VOC detected in off-site wells is chloroform).

Derivation of human intake factor (HIF) included the following exposure variables: contact rate, body weight, exposure frequency, exposure duration, and averaging time. HIFs were calculated to account for RMEs for each pathway. Average daily intakes were then calculated using HIFs and EPCs. Adjustments were made for radionuclides, whereby HIFs did not include body weight or averaging time variables.

6.1.3 Toxicity Assessment

Cancer potency factors (CPF) or slope factors have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CSFs, which are expressed in units of (milligrams per kilograms-day [mg/kg-day]) -1 are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPFs. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer slope factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

For those chemicals for which slope factors have not been developed (specifically, some polynuclear aromatic hydrocarbons [PAH]), each chemical was evaluated by assigning a relative potency factor based on structure-activity relationship studies. All radionuclides were evaluated as known human carcinogens. The CPFs for COCs at the IAAAP that are carcinogens are presented in Table 4-3 of the 1996 Revised Draft-Final RI Report for this site.

EPA has developed reference doses (RfD) for indicating the potential for adverse health effects
from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from, contaminated drinking water) can be compared to the RfD. Reference doses are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

RfD values for the BLRA for the IAAAP were derived from published oral and inhalation RfD values. RfDs for some PAHs were extrapolated from values available for structurally similar PAHs. The RfDs for COCs at the IAAAP that have noncarcinogenic effects are presented in Tables 4-1 and 4-2 of the 1996 Revised Draft-Final RI Report for this site.

Dermal exposure toxicity values were calculated based on absorbed doses, rather than exposure doses. Dermal toxicity values were approximated by extrapolating from oral toxicity values (i.e.. multiplying oral RfD values by an oral absorption fraction, or dividing oral slope factors by an oral absorption fraction). Absorption fractions are chemical-specific, and were derived from published toxicological studies, with the assumption that equally absorbed doses are equitoxic. The absorption fraction for organic COCs and arsenic was assumed to be 1.0. Absorption fractions associated with metals are chemical-specific, and range from 0.001 to 0.6 for COCs at the IAAAP.

There are six chemicals for which no toxicity values exist. Lead was evaluated using EPA's "PRG Screen" model for non-resident adults. The other five chemicals (aluminum, cobalt, dibenzofuran, iron, and sulfate) were not evaluated.

6.1.4 Risk Characterization

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (such as 1x10 -6). An excess lifetime cancer risk of 1x10 -6 indicates that, as an upper bound, an individual has a one in a million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a Estimated cancer risks from exposure to the chemical constituents present at the site for current off-post residents using groundwater from supply wells for household purposes range from lx10 -5 to 5x10 -5. Explosives have been detected in off-post supply wells at levels exceeding EPA HALs. Cancer risks for workers at various IAAAP areas range from 7x10 -8 to 3x10 -4 and for IAAAP visitors risks range from 10 -8 to 4x10 -7. These risks are attributable to incidental ingestion of contaminated soils.

Evaluation of noncarcinogenic risk is accomplished by comparing a calculated intake with an acceptable intake for each chemical constituent and for each pathway that contributes to a population's exposure. The ratio of the calculated intake to the acceptable intake is the hazard index (HI). An HI value exceeding one indicates a potential for harmful noncarcinogenic effects. No HI values were greater than one for any current off-post residential or on-site visitor population evaluated at the IAAAP, indicating that exposures of these populations to chemical constituents do not appear to be significant. For workers, the HI values range as high as 30. These non-carcinogenic risks are also attributable to incidental ingestion of contaminated soils. Chemicals that contribute to these HIs in excess of one include 2,4,6-TNT and RDX. On this basis, exposed site workers may be at risk from the noncarcinogenic effects of these chemical constituents.

Assumptions and factors used in the BLRA for the IAAAP may have resulted in uncertainties that may lead to either an overestimate or an underestimate of risk. Uncertainties in the BLRA are associated with the following primary factors: selection of COCs, data quality, calculation of EPCs, nonquantification of some exposure pathways, determination of exposure levels, uncertainties in modeling, determination of transport pathways, evaluation of bioavailability, and toxicity values.

6.2 Environmental Risks

An ecological risk assessment also was conducted for the IAAAP (see Volume 11 of the 1996 Revised Draft-Final RI Report). In this ecological risk assessment, a qualitative evaluation of contaminant release, migration, and fate was conducted using the contaminant of potential ecological concern (COPEC) that were identified for the site. Possible exposure pathways and receptors were evaluated, as well as known ecological effects of the COPECs. A qualitative determination of the ecological populations most at risk was developed and endpoints were recommended for further study. Endangered or threatened species and associated habitats known or suspected to be present at the site also were evaluated.

Potentially exposed populations at the IAAAP include plants growing in contaminated soils; soil invertebrates; wildlife (amphibians. reptiles, mammals and birds), aquatic invertebrates and plants; and fish. Historical, biological studies and the IAAAP management plans indicate a wide array of stresses are important at this site. These include:

- Facility management practices (pest control, weed control, habitat manipulation, controlled burning, etc.) and mechanical disturbance associated with normal operations.

- Erosion and siltation.

- Sewage treatment plant discharges from off-site locations to streams draining the site.

- Nutrient and pesticide loading to streams, and

- Thermal discharges.

The ecological risk assessment concludes that the potential exists for toxic effects in terrestrial plants, invertebrates, wildlife, and aquatic benthic organisms. Because these conclusions were derived based on screening evaluations using known levels of chemical constituents at the site, the ecological risk assessment suggested that further quantitative toxicity testing and tissue sample collection be conducted in the event that additional information is needed to support remediation decisions. Further evaluation of the potential ecological risks associated with the IAAAP will be conducted as part of the additional investigations associated with the groundwater OU. Any unacceptable ecological risks identified will be addressed, as appropriate, in the groundwater OU.

7.0 Description of Alternatives

The following is a summary of the remedial alternatives proposed in the FFS for remediation of soils OU at the IAAAP.

7.1 Alternative 1

This alternative involves excavation, on-site thermal treatment, solidification/stabilization, on-site disposal of ash from the incineration process, and on-site disposal of soils treated by solidification/stabilization. Rotary kiln incineration has been successfully demonstrated for treatment of explosives-contaminated soils. Based on the volume of soils to be treated, it is anticipated that a transportable on-site incinerator would be more cost effective than a fixed unit that would remain at the IAAAP. The implementation of incineration remedies has proven problematic at many Superfund sites. Process prove-in, including a trial burn, is typically required prior to beginning the incineration of contaminated soils. Additionally, incineration typically is not well accepted by the public, requiring close coordination and explanation to gain a level of trust and credibility. It is estimated that Alternative 1 would require 18 - 24 months to implement at IAAAP.

The primary components of this alternative are:

1. Excavation of all targeted areas, which include approximately 42,742 yd 3 of soils containing an estimated 168,471 kg of contaminants.

2. Verification sampling to ensure that all soils contaminated above remediation goals (RG) are excavated. RGs are identified in Section 9.2.

3. Backfilling and restoration of excavated areas with clean soils, from a borrow source on site.

4. Segregation of excavated soils into three groups, depending on the type of contaminants present (see Table 1):

    A. Metals and Radionuclides (4,992 yd 3),

    B. Explosives, SVOCs, Explosives/SVOCs, and PCBs (33,737 yd 3), and

    C. Metals/ Explosives (4,013 yd 3).

5. Solidification/stabilization of Group A soils. This process would immobilize both metals and radionuclides within the soil matrix.

6. Incineration of Group B soils. This process would effectively treat all the compounds in this group to a destruction removal efficiency of over 99.99 percent.

7. Incineration of Group C soils to treat the explosives, followed by solidification/stabilization to immobilize the metals.

8. Permanent disposal in the Soil Repository of all treated soils and ash.

7.1.1 Technology Description

The two main technologies used with this alternative are incineration and solidification/stabilization. Incineration is a thermal treatment method in which organic compounds are oxidized at elevated temperatures (combusted) for the purpose of their decomposition into basic products of combustion such as carbon dioxide, water vapor, and (in some cases) inorganic gases. In most incinerator applications, an auxiliary heat source such as fossil fuel-fired burners is used to achieve the temperature necessary to evaporate water from the feed material and combust the organic compounds.

Rotary kiln incineration is the most common method used in incineration of contaminated soils. The kiln consists of a horizontal rotating cylinder lined with firebrick insulation. The kiln is tilted slightly from the horizontal to induce a "downhill" tumbling motion of the feed material. Seals at the feed and discharge ends of the kiln allow the introduction of feed material and combustion air, mounting of auxiliary burners, and discharge of ash and off-gases through fixed equipment. Combustion air for both the auxiliary burners and organic compound combustion is provided through dedicated forced draft blower systems.

Off-gases pass through an air pollution control system that may consist of a secondary combustion chamber (afterburner) where organic compounds remaining in the kiln off-gases are burned, a cyclone and/or baghouse for particulate removal, and a wet scrubber for further particulate removal, chemical scrubbing of inorganic compounds, and cooling of the off-gases prior to their discharge into the atmosphere. The entire system is maintained under a slight negative pressure gradient by means of an inducted draft blower.

The three critical parameters for successful incineration are residence time of the feed material at an elevated temperature, chamber temperature, and air turbulence within the chamber. The organic compounds must be exposed to the elevated temperature of the incineration chamber for sufficient time to allow their complete thermal decomposition. The chamber must be maintained at a minimum temperature consistent with the concentration and composition of organic compounds in the feed material in order to allow the thermal decomposition to be driven to completion. Typically, incinerator chamber temperature setpoints are in the 14005 Fahrenheit (F) - 18005 F range, with secondary chamber setpoints of 18505 F - 23005 F. Because incineration is an oxidation process, sufficient combustion air and turbulence must be provided to ensure that all organic compounds present are exposed to an oxidizing atmosphere. This usually requires the addition of excess air over and above the "stoichiometric" air required to combust the compounds at 100 percent efficiency. A trial burn usually is performed in order to determine operational parameters that will ensure that the incinerator effluent are within acceptable limits.

Solidification/stabilization is a technology designed to immobilize organic and inorganic contaminants, thereby reducing the mobility and leaching potential of these constituents in contaminated soils, sludges, and ash. It can be said that, in general, solidification refers to the physical consolidation of contaminated materials into a hard, rock-like material. Stabilization refers to the chemical immobilization of hazardous contaminants. The Toxicity Characteristic Leaching Procedure (TCLP) test is often used to analyze the resulting mixture and to evaluate if the immobilization process accomplished the desired results.

Solidification/stabilization, is generally performed by mixing contaminated materials with one or more reagents to accomplish the desired immobilization. Examples of these reagents include Portland cement, kiln dust, fly ash, and specific and proprietary reagents on occasion. The appropriate reagents and proportions, as well as appropriate mixture contents, are generally determined by performing treatability studies.

Solidification/stabilization can be accomplished in-situ or ex-situ. The main advantage of ex-situ solidification/stabilization is that the mixing process and, therefore, the final characteristics of the structure, is much better controlled than if the mixing takes place in-situ. Alternative 1 will utilize ex-situ solidification/stabilization.

7.2 Alternative 2

This alternative is similar to Alternative 1, except that bioremediation is used for treating explosives and SVOCs instead of incineration. Bioremediation is not considered to be an effective technology to treat PCBs. A pilot study would be required to implement bioremediation at the IAAAP. An estimated 18 - 24 months would be required to implement this alternative. Specific processes are the following:

1. Excavation of all targeted areas, which include approximately 42.742 yd 3 of soils containing 168.471 kg of contaminants.

2. Verification sampling to ensure that all soils contaminated above RGs are excavated.

3. Backfilling and restoration of excavated areas with clean soils, from a borrow source on site.

4. Segregation of soils into four groups, depending on the type of contaminants present (see Table 1):

   A. Metals and Radionuclides (4.992 yd 3),

   B. Explosives, SVOCs, and Explosives/SVOCs (33.138 yd 3),

   C. Metals/Explosives (4,013 yd 3). and

   D. PCBs (599 yd 3).

5. Solidification/stabilization of Group A soils. This process would immobilize both metals and radionuclides within the soil matrix.

6. Bioremediation, specifically composting, of Group B soils. This process would effectively treat all the organic compounds in this group.

7. Composting followed by solidification/stabilization of Group C soils.

8. Permanent disposal in the Soil Repository of treated soils from Groups A, B, and C.

9. Permanent disposal in the Soil Repository of Group D soils, without treatment. This presumes the soils are contaminated with PCBs at levels less than 50 ppm, which appears likely based on available data. Should bulk soil contaminant levels exceeding 50 ppm PCBs be detected, disposal requirements of 40 CFR 761.60 will be further evaluated.

7.2.1 Technology Description

The major technologies used in this alternative are composting and solidification/ stabilization. The latter technology was described during discussion of Alternative 1. Composting is a technology that produces a final product in which explosives are bound to the soil matrix.

The Army Environmental Center has conducted several pilot-scale composting studies to evaluate this technology for explosives-contaminated soils and sediments. Three methods of composting (static pile, mechanical agitated vessel, and windrow) have been studied, with the windrow method proving to be the most effective and cost efficient. The studies conducted for windrow composting found the optimum rate of soil loading to be 30 percent using locally available amendments. Windrows were turned daily using a commercially available windrow turning machine. The duration of biological activity required to reduce the mobility and toxicity of the mixture to acceptable levels was approximately 30 days.

The U.S. Army at the Umatilla Army Deport Activity in Hermiston, Oregon implemented a full-scale remedial action, where composting was successfully utilized to treat over 14,000 tons of explosives-contaminated soils. Based on results from the Umatilla Army Deport Activity remedial action, it is unlikely that composting will be able to achieve RDX concentrations below the leaching remediation goal of one ppm established for the IAAAP. Therefore, management of composting treatment residuals is likely to be needed. A pilot study would be required at IAAAP in order to define critical parameters required to implement full-scale composting operations.

Facilities to be used at the IAAAP could include an asphalt pad and a temporary structure to protect the windrows from precipitation and temperature fluctuations. Conventional equipment (front end loader, dump trucks) and the commercially available windrow turning machine would be used in the composting process.

7.3 Alternative 3

This alternative involves excavation of all contaminated soils, segregation of soils based on risk levels and contaminant type, management of those soils in the existing IAAAP landfills, including the CAMU, the Soil Repository, and the Inert Landfill, and solidification/stabilization of soils that fail land disposal restriction (LDR) criteria. An estimated 6-9 months would be required to implement this alternative subject to access constraints associated with IAAAP production schedules. Additional response actions would he required beyond those specified in Alternative 3 to provide treatment of the soils stored in the CAMU. This soil treatment would require additional time for implementation, perhaps to include pilot studies, and would entail additional costs of $1,000,000 to $1,500,000. Specific processes are as follows:

1. Excavation of all targeted areas, which include approximately 42.742 yd 3 of soils containing 168,471 kg of contaminants.

2. Verification sampling to ensure that all soils contaminated above RGs are excavated.

3. Backfilling and restoration of excavated areas with clean soils, from a borrow source on site.

4. Segregation of soils into the following groups, based on the risk level and the type of contaminants present:

   A. Highly contaminated soils with risk levels greater than 10 -5 and that pass LDR criteria.

   B. Moderately contaminated soils with risk levels between 10 -5 and 10 -6, and that pass LDR criteria.

   C. Lightly contaminated soils with risk levels below 10 -6, with contaminant concentrations above Summers' model RGs (described in Section 9.0 of this ROD), and that pass LDR criteria.

   D. Soils that fail LDR or Toxic Substance Control Act (TSCA) criteria for constituents other than metals.

   E. Soils that fail LDR criteria for metals.

   F. Soils that pass LDR criteria for lead, but have lead concentrations exceeding 1,000 ppm.

5. Temporary storage in the CAMU of Groups A and D soils to await appropriate treatment or disposition.

6. Permanent disposal in the Soil Repository of Group B soils without treatment.

7. Permanent disposal in the Soil Repository or the Inert Landfill of Groups C and F soils, as needed to achieve final grade for each of these landfills.

8. Solidification/stabilization of Group E soils and permanent disposal of the treated soils in the Soil Repository.

7.3.1 Technology Description

The CAMU has been constructed to meet RCRA Subtitle C requirements for hazardous waste landfills. The bottom liner system of the CAMU consists of a low-permeability geosynthetic clay liner (GCL), two 60 mil high-density polyethylene (HDPE) liners, a geonet leachate collection laver, and a leachate collection sump. The CAMU will be covered to prevent exposure of contaminants to the elements and to minimize the infiltration of precipitation. The cover will consist of a 40 mil HDPE geomembrane, a geonet collection layer, and a separation/filtration geotextile. The cover also will be secured with 18 inches of clean, graded soil, six inches of topsoil, and a stone protection toe-drain. The treatment method for contaminated soils temporarily stockpiled in the CAMU will be specified in the final soils OU ROD.

The Soil Repository has been constructed to meet RCRA Subtitle C requirements for hazardous waste landfills. The bottom liner system includes a low-permeability GCL and two 60 mil HDPE liners to eliminate the potential migration of contaminants to underlying soils and groundwater. The bottom liner also includes a geocomposite drainage layer for leak detection and additional drainage and leachate collection features. The Soil Repository will be covered by an extension of the cover to be placed on the Inert Landfill after the trench has been filled, but will include an underlying GCL to further improve performance.

The Army began activities to construct a low permeability cover on the 17-acre Inert Landfill site in the fall of 1996. The cover will include a geonet drainage layer and a 40 mil HDPE liner. The cover system will prevent infiltration of precipitation into the landfill material and the subsequent transport of contaminants from wastes to groundwater.

8.0 Summary of Comparative Analysis of Alternatives

This section evaluates the performance of the three alternatives relative to the nine criteria established in the NCP. The purpose of this analysis is to identify the relative advantages and disadvantages of each alternative.

The first step of this, analysis is to ensure that the alternative satisfies the threshold criteria established in the NCP. The two threshold criteria are: 1) overall protection of public health and the environment, and 2) compliance with applicable or relevant and appropriate requirements (ARAR). In general, alternatives that do not satisfy these two criteria are rejected and not evaluated further. However, compliance with ARARs may be "waived" if site-specific circumstances warrant such a waiver as described in Section 300.430(f)(1)(ii)(C) of the NCP.

The second step is to compare the alternative against a set of balancing criteria. The NCP establishes the following five balancing criteria:

1) long-term effectiveness and permanence
2) reduction in toxicity, mobility, or volume achieved through treatment
3) implementability
4) short-term effectiveness
5) cost

The third and final step of the analysis is to evaluate the alternative on the basis of the NCP modifying criteria. The two modifying criteria are: state and community acceptance. These final two criteria cannot be evaluated fully until the state and public have commented on the alternatives and their comments have been analyzed.

8.1 Overall Protection of Human Health and the Environment

All of the alternatives evaluated would satisfy the threshold criterion of protecting human health and the environment. Each alternative would utilize the same remediation goals to achieve the remedial action objectives, and would thereby achieve the same level of protectiveness. Alternatives 1 and 2 would utilize treatment to attain the cleanup objectives, while Alternative 3 would employ a combination of containment and treatment to achieve these objectives. For Alternative 3, a smaller volume of contaminated soils would be treated relative to Alternatives 1 and 2. This treatment would not be accomplished as a part of this action, but would be specified as a part of the final soils OU ROD.

8.2 Compliance with Applicable or Relevant and Appropriate Requirements

All of the alternatives considered would comply with the respective ARARs of federal and State of Iowa environmental laws. These ARARs, and a summary indicating how the alternatives attain compliance with identified ARARs are presented in Appendix A of the IAAAP FFS for the soils OU. Alternative 3 complies with RCRA LDRs by utilizing a CAMU for temporary management of the most highly contaminated soils excavated from the 15 remediation areas. Treatment of these highly contaminated soils will ultimately be required to satisfy LDRs.

In addition, EPA has evaluated whether contaminated soils at the sub-sites addressed in this Interim ROD contain hazardous waste. This determines whether the RCRA LDRs (40 CFR part 268) would be applicable to the management of the contaminated soil.

EPA's "contained-in" policy regarding the management of environmental media, such as soil, which has been contaminated with RCRA hazardous waste addresses this issue. The soil itself is not considered hazardous but is managed as hazardous waste under RCRA Subtitle C regulations because it contains hazardous waste. At some point, soil that has been contaminated with hazardous waste is no longer considered to contain hazardous waste. Upon this determination, the soil no longer needs to be managed as RCRA regulated waste. The point at which this occurs or may be determined is dependent on whether the hazardous waste contaminating the soil is a characteristic hazardous waste or a listed hazardous waste.

Soil, which is contaminated with characteristic hazardous waste, is regulated under RCRA Subtitle C only if the contaminated soil exhibits a hazardous waste characteristic, such as "toxicity" for example. For such potentially "toxic" characteristic wastes, this means that the waste contaminated soil is not regulated as RCRA hazardous waste unless TCLP analysis shows the toxic characteristic contaminant concentration meets or exceeds the defining level set out in 40 CFR º261.24. Contaminated soil ceases to be regulated as RCRA hazardous waste when the concentration is reduced below the defining regulatory level and therefore ceases to exhibit a characteristic. However, after Chemical Waste Management v. EPA. 976 F.2d 2 (D.C. Cir. 1992), cert. denied 113 U.S. 1961 (1993), a more conservative approach is to address not only the hazardous waste characteristic, but also any underlying hazardous constituents. Characteristic wastes may contain treatable levels of other hazardous constituents. Before land disposal, the underlying hazardous constituents in hazardous waste must be treated to appropriate standards (TC Rule Preamble, 59 Fed. Reg. p. 47982. September 19, 1994).

Soil, which is contaminated with listed hazardous waste, must be managed as RCRA regulated hazardous waste "as long as the material contains the listed hazardous waste. " This determination is outlined in the "Contained-in Interpretation" (OSW Memorandum dated November 13, 1986), cited in Superfund LDR Guide # 5, Directive 9347.3-05FS. July 1989. Under the EPA "contained-in policy".

"The EPA or an authorized state has the discretion to determine contaminant-specific health-based levels, such that if the concentrations of the hazardous waste constituents were below those levels, the media would no longer be considered to contain the waste. The health-based levels used in making contained-in determinations are made on a site-specific basis (Letter from Michael Shapiro, Director, Office of Solid Waste, EPA, to T. L. Nebrich, OSWER 9441.1994(04), March 22, 1994). "

This is sometimes called a "contained-out" determination. EPA has usually specified conservative, risk-based "contained-out" levels using standard conservative exposure assumptions (usually based on unrestricted access) or site specific risk assessments (See

Memorandum from Sylvia K. Lowrance to Jeff Zelikson, EPA Region IX, January 24, 1989).

Soils at the IAAAP LAP facilities. including Lines 1, 2, 3, 3A, 5A, 5B, and 800 may have been contaminated by the discharge of pink/red water from TNT operations. As defined at 40 CFR º 261.32. pink/red water from TNT operations is included in the RCRA List of Hazardous Wastes from Specific Sources as K047. K047 waste is a listed hazardous waste. It is listed as RCRA hazardous solely on the basis of the characteristic of reactivity (See 40 CFR º 261.30 and º 261.32).

The Army has sampled the soils at the above-listed sub-sites and found that, even though the soils are contaminated with TNT, they do not exhibit the characteristic of reactivity.

In cases where the waste is listed only for reactivity, and the contaminated soil is not reactive and does not exhibit any other characteristics, the contaminated soil may contain hazardous "constituents" and thereby contain the listed waste. Consistent with the contained-in policy previously outlined, an authorized state or EPA may establish health-based levels for any hazardous constituents present in the contaminated soil below which the contaminated soil would no longer contain the listed waste.

K047 is listed as a hazardous waste solely due to the characteristic of reactivity. No hazardous constituents are identified in Appendix VII to Part 261 as a basis for listing K047 as a hazardous waste.

Also there are no hazardous constituents for K047 identified in the LDR treatment standards provisions at 40 CFR º 268.40 ff. The only treatment standard identified for K047 waste is technology based--deactivation (40 CFR º 268.42). According to the tests conducted to date on soil samples from the various LAP sites, the soils are already "deactivated" because they do not exhibit the characteristic of reactivity.

Other possible explosive contaminants and degradation products, which may be present in the soils, include: high melting explosive (HMX); RDX; 2,4,6-TNT; 1,3,5-TNB; 2,4-Dinitrotoluene (DNT) (D030); Nitrobenzene (NBO (D036); 1,3-dinitobenzene (DNB); and 2,6-dinitrotoluene (DNT). The first three, HMX, RDX, and 2,4,6-TNT, are not identified as Hazardous Constituents in Appendix VIII to Part 261 of RCRA and therefore, do not need to be considered in making a "contained-out" determination. The latter five contaminants are identified as Appendix VIII Hazardous Constituents. These are the five constituents, which must be considered in making a determination that the excavated soil no longer contains K047 Listed Hazardous Waste.

Two other explosive contaminants, which might be present in soils contaminated by pink/red water from TNT operations at concentrations that would make them RCRA characteristic hazardous waste due to the toxicity characteristic, are 2,4-DNT (EPA HW No. D030) and NB (EPA HW No. D036). Alternative 3 proposes to conduct additional sampling to evaluate the presence of these potentially characteristic hazardous wastes during the excavation of the soils.

Alternative 3 specifies that the excavated contaminated soil be segregated according to cumulative risk levels. Soils which are above a risk level of 10 -5 (based on the site-specific isk assessment), exhibit a characteristic, or exceed the LDR treatment standards, will be stockpiled in a RCRA temporary stockpile for eventual treatment which will be determined in subsequent ROD. Soil between the 10 -5 and 10 -6 risk levels will be disposed of in the on-site Soil Repository. Soil below the 10 -6 risk level and above the Summers Model soil-to-groundwater "leaching" action level will be placed in either the Soil Repository or under the ap proposed for the Inert Landfill.

EPA has determined that soils which are below the 10 -5 cumulative risk level, do not exhibit any RCRA characteristics (reactivity or toxicity), and do not exceed LDR levels, when managed appropriately, do not pose a substantial threat to human health and the environment. Therefore these soils should not be considered to contain RCRA hazardous waste and as such, would not require management as RCRA hazardous waste.

Alternative 3 anticipates the possibility that some excavated soil might exhibit a characteristic such as reactivity or contain 2,4-DNT (D030) or NB (D036) at concentrations making them Toxicity Characteristic hazardous wastes subject to RCRA regulation. Since soil containing such hazardous wastes would be sent to the stockpile for storage, the temporary stockpile would be subject to LDR unless designated by EPA as a CAMU. Such a CAMU designation was made by EPA in a memorandum entitled "Designation of CAMU, IAAAP Site, Middletown, Iowa, dated March 8, 1995.

Soils from other IAAAP sub-sites addressed by Alternative 3, including Lines 4A. 4B, 6, 8, and 9, the EDA-East Burn Pads, the Demolition Area, the West Burn Cages/Burn Pads, the North Burn Pads, and the Roundhouse Transformer storage area do not contain RCRA listed wastes, but may be contaminated at levels which constitute a characteristic waste. Alternative 3 requires that the soils from all areas addressed by this Interim Action be evaluated for possible RCRA characteristics so that the soils are managed consistent with LDRs.

8.3 Long-Term Effectiveness and Permanence

Alternative 1 provides the highest degree of permanence, as the majority of the contaminants would be permanently destroyed via incineration. Alternative 2 provides permanence by utilizing composting to stabilize explosives-contaminated soils in combination with long-term management of the treatment residuals. The degree to which composting may be considered a long-term irreversible process for stabilizing explosives-contaminated soils requires additional evaluation through pilot testing. Alternative 3 provides for effective containment of contaminated soils by utilizing conservative landfill design measures. These measures, when combined with treatment of the contaminated soils as part of the final remedy, will provide for permanent, significant contaminant reduction of the principal threat. Alternatives 2 and 3 rely on adequate maintenance of the CAMU and Soil Repository to ensure long-term effectiveness in the management of treatment residuals and remediation wastes.

8.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

The alternatives evaluated utilize treatment to reduce contaminant toxicity, mobility, or volume in varying degrees. Alternative 1 utilizes incineration to permanently destroy the toxicity and mobility of the COCs. Alternative 2 reduces the toxicity and mobility of contaminants via stabilization/composting, but actually increases the volume of the contaminated media. Alternative 3 specifies containment for permanent disposal of lesser contaminated materials, while more highly contaminated materials posing the principal threat are temporarily stored pending the final soils OU ROD. Alternative 3, in conjunction with the final remedy for the site, proposes to utilize treatment to reduce the toxicity and mobility of the soils posing the principal threat.

8.5 Short-Term Effectiveness

Each of the alternatives requires excavation and ex-situ management of contaminated soils. Short-term risks associated with Alternative 3 are attributed to such excavation and subsequent transport of these soils to the on-site management facilities. Alternatives 1 and 2 specify additional handling of the soils to accomplish treatment objectives. Risks associated with emissions due to incineration specified by Alternative 1 will be managed by emission abatement technologies. It would be necessary to demonstrate to the local community the effectiveness of the emissions control equipment.

8.6 Implementability

Alternative 3 is the most readily implementable alternative, as the on-site containment structures have been constructed as a component of other response actions at the site and are presently available to receive contaminated material. Alternatives 1 and 2 are implementable. but would require construction of treatment facilities. The time frame to implement Alternative 3 would be less than either Alternatives 1 or 2, which are estimated at 1.5 to 2 years for completion. Each of the alternatives will require coordination with IAAAP operations to ensure that access is available to the areas of concern and to ensure that conflicts with IAAAP production schedules are minimized.

8.7 Cost

Costs to implement each alternative, as estimated in Sections 3.4.1 - 3.4.3 of the FFS, are as follows:

- Alternative 1: $24,086,000 (see Table 4)
-
- Alternative 2: $26,408,000 (see Table 5)
-
- Alternative 3: $2,513,000 (see Table 6)

Following the FFS and Proposed Plan but concurrent with the writing of this ROD additional information regarding implementation costs have become available to the Army. This information is a based on costs associated with on-going removal actions at the Line 1. Impoundment and Line 800 Pink Water Lagoon sub-sites at IAAAP, which are discussed in Section 2.0 of this ROD. As a result of this information, the cost estimates developed in the FFS have been re-evaluated. Additional costs of approximately $7,000,000 have been found to be required to implement each or the alternatives considered. For Alternative 3. an additional $2,000,000 would be required for operations and maintenance activities over an presumed 30-year lifetime. Thus, revised comparative cost estimates, including capital and operations & maintenance for implementation of each of the alternatives is provided below:

- Alternative 1: S31.166.400 (see Table 7)

- Alternative 2: S33.488.400 (see Table 8)

- Alternative 3: S11.532.000 (see Tables 9 and 10)

Supporting information describing the revised cost estimates are discussed further in Table 7 - 10 and Section 11.0 of this ROD. In addition, it is noted that Alternative 3 specifies that treatment of soils stored in the CAMU will be required as an element of the final action for the soils OU. Additional costs associated with this treatment are estimated at approximately $1,250,000, based on the treatment of 2500 cubic yards of soil at a treatment cost of approximately $500/yd 3.

8.8 State/Support Agency Acceptance

The EPA, as the support agency, has expressed support for Alternative 3 as evidenced by their review comments and acceptance of the RI, FFS, and Proposed Plan. The State of Iowa has declined to comment on the Proposed Plan for this Interim Remedial Action and is not a signatory to the IAAAP Federal Facility Agreement.

8.9 Community Acceptance

Community acceptance of the selected alternative is assessed in this ROD. No public comments were submitted to the Army during the public comment period, which was held May 22, 1997 to June 21, 1997. In addition, no members of the public attended the public meeting on the Proposed Plan held at the Danville Community Center on June 5, 1997. Based on the nature of the public response, the preferred alternative identified in the Proposed Plan is acceptable to the community.

9.0 Selected Remedy

Based on information included in the Administrative Record, and criteria set forth in CERCLA/SARA and the NCP, the Army, with support from EPA, has selected Alternative 3 as the alternative to address soil contamination as an Interim Action for the IAAAP soils OU.

9.1 Major Components

The selected interim remedy consists of the following primary elements:

1 Excavation of soils contaminated at levels exceeding RGs from the 15 remediation areas noted in Table 1.

2. Verification sampling to ensure that RGs are met in the 15 remediation areas. Restoration of excavated areas to original conditions.

3 Segregation of the excavated soils according to contaminant type and concentration.

4. Temporary storage of the most highly contaminated soils in the on-site CAMU. Treatment of soils stored in the CAMU as specified in the final ROD for the soils OU.

5. Permanent disposal of soils contaminated at lesser levels in the on-site Soil Repository or in the on-site Inert Landfill.

6. Solidification/stabilization of metals-contaminated soils at levels exceeding LDR criteria, and permanent disposal in the on-site Soil Repository.

During the remedial design phase, additional sampling will be performed in the areas to be remediated to ensure that the extent of contamination is completely defined.

Since this is an interim action, several elements of the final remedy have been deferred to the final ROD for the soils OU. These would include long-term actions such as institutional controls to restrict access and land usage at the Inert Landfill Area and to restrict remediated areas to commercial / industrial land usage in the future, consistent with the cleanup goals. In addition, the final remedy for the soils OU will specify a long-term monitoring plan for the Inert Landfill Area to monitor the performance and integrity of the Soil Repository and the Inert Landfill, and will specify means by which the CAMU will be ultimately closed.

9.2 Remediation Goals

Remediation goals for the IAAAP have been established based on risk considerations (see Table 2). These include criteria associated with ingestion of and dermal contact with contaminated soils by the reasonably maximum exposed individual, as well as criteria to evaluate possible leaching of contaminants from soils to groundwater at unacceptable levels. For the IAAAP, RGs were established at a target carcinogenic risk of 10 -6, consistent with the NCP. The NCP states that RGs should be established for individual constituents within the risk range of 10 -4 to 10 -6, with a preference for the most protective values. Commercial/industrial land use is the current and reasonably anticipated future land use at the site upon which the RGs have been based. RGs for additional constituents which may be detected at levels of concern subsequent to the RI, such as during pre-design sampling activities, will be determined using the method which was used to determine the RGs for constituents in Table 2. This method is outlined in detail in the FFS.

In addition to risk-based soil RGs for protection of human health, the impact to groundwater from residual soil contamination was evaluated. The Summers' model was utilized to estimate the level at which contaminant concentrations in soils will produce groundwater contamination at concentrations above acceptable levels.

The Summers' model assumes that a percentage of rainfall at the site will infiltrate the surface and desorb contaminants from soils, based on an equilibrium of soil and water partitioning. It is further assumed that this contaminated infiltration will mix completely with the groundwater below the site, resulting in an equilibrium groundwater concentration with all contaminants in the final mixture from the infiltration.

The Summers' model was used to determine acceptable levels for the explosives RDX and 2.4.6-TNT in soils, which are found in on- and off-site groundwater. The model was not used for metals, as metals are relatively immobile in the clay soils found at the IAAAP. Further, TNT and RDX are the most prevalent and most mobile contaminants found at the site. The site-specific "leaching" RGs for these major contributing explosives are presented in Table 3. These RGs represent contaminant levels in soils that are considered protective of human health and protective of groundwater. These values are utilized as the RGs for RDX and 2.4.6-TNT, superseding the values presented in Table 2 which are based solely on soil ingestion and dermal contact criteria.

9.3 Cost

The cost for the selected remedy, Alternative 3, is summarized in the FFS and in Sections 8.7 and 11.0 of this ROD. The basis of the estimate is as follows:

1. Excavate 42,742 yd3 of contaminated soils, transport to an on-site treatment area, backfill and compact excavation. Assumed unit cost is $25.50/yd 3.

2. Solidification/stabilization of soils from Group E. The unit cost is calculated based on a typical range of $50/yd 3 to $170/yd 3. Because there is no indication that the soils have any particular characteristics that may make them either unsuitable or more suitable to solidification/stabilization, a unit cost of $154/yd 3 is assumed for this process.

3. For cost estimating purposes, and because the volume of soils in Group E is not known, it has been assumed that soils with lead concentrations above 2,000 ppm will undergo solidification/stabilization. Based on the data presented in Appendix D of the IAAAP FFS for the soils OU, the amount of soils that will require stabilization is estimated at 3,860 yd 3.

4. Analytical costs will be incurred in order to verify the extent of excavation in each area. It has been assumed that an average of eight soil samples per area will be taken and analyzed for explosives and metals.

The total cost of implementation for Alternative 3, including capital and operations & maintenance costs is estimated at $11,532,000.

10.0 Statutory Determinations

In accordance with the statutory requirements of Section 12l of CERCLA, remedial actions that are selected are required to:

- Protect human health and the environment

- Comply with applicable or relevant and appropriate requirements (ARARs)

- Be cost effective

- Use permanent solutions and alternative treatment technologies to the maximum extent practicable

- Satisfy the preference for treatment that reduces contaminant toxicity, mobility, or volume, as a principal element

The manner in which the IAAAP soils OU interim remedial action satisfies the above requirements is discussed in the following sections.

The selected remedy will be reviewed, at a minimum, every five years as specified in CERCLA 121(c) because hazardous substances will remain on-site after the remedy is implemented.

10.1 Protection of Human Health and the Environment

The selected remedy will meet the remediation goals and remedial action objectives for the Interim Action by preventing human contact with contaminants of concern in soils at levels posing a threat, and by minimizing potential impacts associated with contaminants leaching from soils to groundwater. Contaminated soils will be managed according to the risks posed.

Low- to mid-level contaminated soils posing unacceptable human health risks will be permanently contained in the on-site Soil Repository or under the Inert Landfill cap. The most highly contaminated soils will be temporarily contained in the on-site CAMU, and will be treated to reduce contaminant toxicity, mobility, or volume at a date consistent with the final action for the IAAAP soils OU. Remediation goals for contaminants of concern at the IAAAP have been established based upon the most protective of the following criteria: a carcinogenic risk of 10 -6, a hazard index of 1, or on the leachability of contaminants from soil to groundwater. Maintenance of the containment structures will determine the effectiveness and permanence of the selected remedy. A five-year review will be performed following implementation of the selected remedy to ensure that the principal threats to human health and the environment are addressed. The five-year review is required to document that the interim remedial action has effectively minimized the potential for human exposure to contamination and has eliminated the contributions of the 15 areas addressed in this Interim ROD to shallow groundwater contamination.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will comply with all ARARs that are location, chemical, and action specific. The ARARs are presented below.

10.2.1 Location-Specific ARARs

Applicable

- Endangered Species Act, 16 U.S.C. 1531 et seq., and Fish and Wildlife Coordination Act, 16 U.S.C. 661 et seq.

- Bald Eagle Protection Act, 16 U.S.C. 668 et seq.

- Migratory Bird Treaty Act of 1972, 16 U.S.C. Section 703

- National Archeological and Historical Preservation Act, 16 U.S.C. Section 469

- Native American Graves and Repatriation Act, 25 U.S.C. Section 3001

- Fish and Wildlife Coordination Act, 16 U.S.C. 661 et seq.

- I.A.C., Title XI, Natural Resources; Subtitle 6, Wildlife; Chapter 481A, Wildlife Conservation

10.2.2 Chemical-Specific ARARs

Applicable Soils

- TSCA, 15 U.S.C. 2601 et seq. [PCB spill cleanup policy]

Air

- [EQA, I.A.C., Division 567, Title II, Chapter 28. Ambient Air Quality Standards

[Ambient Air Quality Standards]

- [EQA, I.A.C., Division 567, Title II, Chapter 23. Emission Standards for Contaminants

[Emission Standard for Fugitive Dust]

Surface Water

- FWPCA, 33 U.S.C. Section 402 (NPDES permit]

- IEQA, I.A.C., Division 567, Title III, Chapter 62. Effluent and Pretreatment Standards: Other Effluent Limitations or Prohibitions [NPDES permit]

- 1EQA. I.A.C., Division 567, Title IV, Chapter 61. Surface Water Quality Criteria [anti-degradation policy: water quality criteria]

Groundwater

- Solid Waste Disposal Act, as amended by RCRA, 42 U.S.C. 6901 et seq. [groundwater protection standards for permitted hazardous waste facilities]

Relevant and Appropriate
Soils

- Iowa Underground Storage Tanks Acts, I.A.C., Division 567, Title X, Chapter 135, Iowa Underground Storage Tanks Regulations [levels of corrective action for petroleum contamination]

Surface Water

- SDWA, 42 U.S.C. 300 et seq. [MCLs: MCLGs]

- EPA, Office of Water. "Drinking Water Regulations and Health Advisories," October 1996 [MCLs]

- EQA, I.A.C., Division 567, Title III, Chapter 41, Iowa Drinking Water Regulations [MCLs]

Groundwater

- SDWA, 42 U.S.C. 300 et seq. [MCLs: MCLGs]

- EPA, Office of Water. "Drinking Water Regulations and Health Advisories," October 1996 [MCLs]

- Solid Waste Disposal Act, as amended by RCRA, 42 U.S.C. 6901 et seq. [groundwater protection standards for solid waste disposal facilities]

- [EQA, I.A.C., Division 567, Title III, Chapter 41, Iowa Drinking Water Regulations [MCLs]

TO-Be-Considered

Soils

- Proposed Rule, 55 Federal Register, July 27, 1990, "Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities," Appendix A - Examples of Concentrations Meeting Criteria for Action Levels [proposed soil action levels]

- EPA, OSWER Directive 9355.4-02, September 7, 1989, "Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites" [soil lead cleanup guidance levels]

- EPA, OSWER Publication 9285.7-01B, December 1991, "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals"

Surface Water

EPA, Office of Water, "Drinking Water Regulations and Health Advisories," October 1996 [proposed MCLs and proposed MCLGs]

Groundwater

EPA, Office of Water. " Drinking Water Regulations and Health Advisories." October 1996 [proposed MCLs and proposed MCLGs]

10.2.3 Action-Specific ARARs

Applicable

TSCA, 15 U.S.C. 2601 et seq. [PCB disposal requirements]

Relevant and Appropriate

Solid Waste Disposal Act, as amended by RCRA, 42 U.S.C. 6901 et seq. [LDRs]

IEQA, I.A.C., Division 567, Title X, Chapter 141. Hazardous Waste, adoption of 40 CFR 261.21-261.24 and Table I [criteria for identifying the characteristics of RCRA hazardous wastes]

IEQA, I.A.C., Division 567, Title X, Chapter 141. Hazardous Waste, adoption of 40 CFR 261.32 [criteria for listing RCRA hazardous wastes]

IEQA, I.A.C., Division 567, Title X, Chapter 141, adoption of 40 CFR 264.14 (security requirements]

IEQA, I.A.C., Division 567, Title X, Chapter 141, adoption of 40 CFR 264.17(a) and (b) [general requirements for ignitable, reactive, or incompatible wastes]

IEQA, I.A.C., Division 567, Title X, Chapter 141, adoption of 40 CFR Part 264, Subpart F [requirements for groundwater protection for land disposal units]

IEQA, I.A.C., Division 567, Title X, Chapter 141, adoption of 40 CFR Part 264, Subpart G [closure and post-closure requirements]

IEQA, I.A.C., Division 567, Title X, Chapter 141, adoption of 40 CFR Part 264, Subpart I [requirements for use and management of containers]

IEQA, I.A.C., Division 567, Title X, Chapter 141, adoption of 40 CFR Part 264, Subpart L [requirements for storage of hazardous waste in piles]

IEQA, I.A.C., Division 567, Title X, Chapter 141, adoption of 40 CFR Part 264, Subpart N [requirements for disposal of hazardous waste in landfills]

IEQA, I.A.C., Division 567, Title X, Chapter 141, adoption of 40 CFR Part 264, Subpart S [corrective action tor solid waste management units]

IEQA, I.A.C., Division 567, Title II, Chapter 23. Emission Standards for Contaminants [fugitive dust controls]

To-Be-Considered

EPA, OSWER Directive 9347.3-06FS, July 1989, "Obtaining a Soil and Debris Treatability Variance for Remedial Actions" [treatability variance process to comply with LDRs]

10.3 Cost-Effectiveness

The selected remedy will provide overall effectiveness and protection of human health and the environment proportional to its costs. The selected remedy will effectively eliminate unacceptable risks to human health and the environment at an estimated cost of $11,532,000, which is approximately 60% less costly than the other alternatives considered. The remedy specifies containment of low-level threat material, with storage and ultimate treatment of the high-level or principal threat material. The approach of treating only the principal threat material reduces the cost of the selected alternative significantly relative to other alternatives considered, where treatment of the entire volume of contaminated soil is evaluated. Based on estimates in the FFS, the combination of containment and treatment will provide for treatment of approximately 70% of the total contaminant mass by treating less than 10% of the contaminated soil volume. The selected remedy utilizes existing facilities at the IAAAP to the maximum extent practical to achieve significant cost advantages.

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

The selected remedy meets the statutory requirement to utilize permanent solutions and treatment technologies to the maximum extent practicable. The selected remedy provides the best balance of tradeoffs among alternatives, which are protective and ARAR-compliant relative to the five primary balancing criteria. These balancing criteria are:

- Long-Term effectiveness and permanence
- Reduction of toxicity, mobility or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

The selected remedy utilizes a combination of containment and treatment technologies to address unacceptable risks. The most highly contaminated soils will be temporarily stored in a secure containment structure that will effectively eliminate potential human exposures and minimize the migration of contaminants. It is estimated that six percent of the total volume of contaminated soils to be addressed by this interim action or a total of approximately 2500 yd^3 of soils, will be stored in the CAMU in the implementation of the selected remedy. Nearly 70 percent of the total contaminant mass addressed by the selected remedy is contained in this volume. Treatment of the most highly contaminated soils provides a cost-effective and permanent approach to mitigate the principal threat. Moderately contaminated soils will be permanently disposed in the on-site Soil Repository and under the cap of the Inert Landfill.

Several of the balancing criteria were critical in selecting Alternative 3 for this interim action. Cost /cost-effectiveness was a significant consideration. Estimated costs to implement Alternative 3 were approximately 60% less costly than the other alternatives considered. Although additional costs associated with the treatment of soils temporarily managed in the CAMU will be incurred to complete Alternative 3, these costs would be anticipated to be relatively small due to the minimal total volume of CAMU material. Costs associated with this treatment may approach $1,250,000 (assumes 2500 yd^3 Of Soil to be treated at a cost of $500/ yd^3). The reduced volume of soil-to be treated in Alternative 3 provides for treatment of approximately 70% of the total contaminant mass by stockpiling and treating only the most contaminated soil. Thus the statutory preference for reduction in contaminant toxicity, mobility, or volume through treatment is adequately addressed in Alternative 3, with significant cost benefits. Long-term effectiveness and permanence is addressed in Alternative 3, as the containment structures are constructed with liner systems consisting of several synthetic hydraulic barriers and are also equipped with leachate collection systems. Alternative 3 is the most implementable of the alternatives considered, as facilities currently available at the IAAAP are utilized fully.

During the public comment period, the community did not identify any concerns regarding the selected remedy.

A review of the selected remedy will be performed since the selected remedy will require management of contaminated soils on-site. The review will be conducted no less often than every five years after commencement of the remedial action to ensure the remedy continues to provide adequate protection of human health and the environment.

10.5 Preference for Treatment as a Principal Element

For this site, soils contaminated at carcinogenic risk levels exceeding 10^{-5} have been considered to act as a principal threat. This consideration is primarily based on the toxicity and mobility of the explosives found at the site, which are the predominant contaminants of concern in soil and groundwater at the IAAAP. Soils contaminated with explosives at risk levels near 10^{-1} may leach contaminants to groundwater at unacceptable levels. These explosives have been found in groundwater supply wells off-site at levels of concern. The soils which are contaminated at levels which constitute a principal threat will not be treated as a component of this interim action, but will be temporarily stored in the CAMU and will ultimately be treated to reduce the contaminant toxicity, mobility, or volume to satisfy requirements of CERCLA Section 121(b). The nature of this treatment will be specified in the final soils OU ROD according to the schedule and procedures outlined in the IAAAP FFA.

11.0 Documentation of Significant Changes

As discussed in section 8.7 of this ROD, the Army has utilized additional information to provide updated estimates of the costs associated with the implementation of each of the interim actions considered in the FFS and Proposed Plan. These revised estimates add approximately $7,000,000 to the cost of each alternative evaluated, with an additional

$2,000,000 added to the estimate for Alternative 3 associated with operations and maintenance. The basis for these additional costs are summarized in Table 7, 8, 9, and 10.

Operations and maintenance costs for Alternative 3 were not included in the original costs estimates in the FFS. O&M costs are estimated here assuming a 30 year operational lifetime and an interest rate of 7%, to determine the net present worth associated with annual operations and maintenance.

These revised cost estimates have been reflected in Sections 8.7 and 9.3 of this ROD. The revised cost estimates do not effect the comparison of alternatives conducted in the Proposed Plan and do not warrant a re-evaluation of the interim action selected. While the revised cost estimates are a significant change to the information presented in the Proposed Plan, the revised cost estimates will not require additional public notice or comment per EPA Guidance ("Guide to Addressing Pre-ROD and Post-ROD Changes" - Publication 9355.3-02FS-4).

12.0 Responsiveness Summary

The final component of the ROD is the Responsiveness Summary. The Responsiveness Summary provides a summary of the public's comments, concerns, and questions received concerning the selected interim remedial action for contaminated soils at 15 areas throughout the IAAAP.

12.1 Overview

At the time of the public comment period, the Army had endorsed a preferred alternative for the interim remedial action for contaminated soils at 15 areas throughout the IAAAP. IAAAP's selected alternative was excavation of all contaminated soils, segregation of soils based on risk levels and contaminant type, management of those soils in the existing IAAAP landfills, including the, CAMU, the Soil Repository, and the Inert Landfill, and solidification/stabilization of soils that fail LDR criteria.

The Army has coordinated selection of this interim remedial action with EPA. The Army is the lead agency for implementing the interim remedial action at the IAAAP. As the support agency, the EPA oversees the cleanup activities conducted by the Army to ensure that requirements of CERCLA/SARA, the NCP, and the Federal Facilities Agreement between the Army and the EPA have been met. EPA concurs with the selected remedy. The state of Iowa has not participated in the review of CERCLA clean up activities at the IAAAP and has declined to comment upon the preferred alternative presented in the Proposed Plan for this Interim Remedial Action.

12.2 Community Involvement

The RI/FS and Proposed Plan for the soils OU were released to the public in November 1996 and May 1997, respectively. These documents were made available to the public in both the administrative record and the site information repositories. The notice of availability for the Proposed Plan was published in the Burlington-Hawkeye on May 21, 1997. The Administrative Record is available for review during normal business hours at the IAAAP, Visitor Reception Area. Building 100-101: the Burlington Public Library; and the Danville City Hall. A public comment period was held from, May 22, 1997 to June 21, 1997. In addition, a public meeting was held on June 5, 1997 at the Danville Community Center. At this, meeting representatives from the Army and EPA were available to the public to discuss concerns, accept comments, and answer questions regarding the preferred alternative presented in the Proposed Plan. There were no written or verbal comments regarding the Proposed Plan submitted to the Army at this meeting or during the comment period.

TABLE 1

Site	Metals	Explosives	Metals/ Explosives	SVOCs	Radio-nuclides	Explosives/SVOCs	PBCs	TOTAL
Line 1 (R01)	219	4,853	1,486	587	266			7,411
Line 2 (R02)	885	769	294					1,948
Line 3 (R03)	546	1,884	835		119	109		3,493
Line 3A (R04)		1,352	684					2,036
Lines 4A & 4B (R05)	153							153
Lines 5A & 5B (R06)	80	626	25					731
Line 6 (R07)	445							445
Line 8 (R09)	476							476
Line 9 (R10)	469							469
Line 800 (R11)	117	1,208						1,325
EDA/East Burn Pads (R12)		21,411						21,411
Demolition Area	753							753
Burn Cages/ West Burn Pads Area (R24)	423	339	689					1,451
North Burn Pads (R25)	41							41
Roundhouse Transformer Storage Area (R28)							599	599
TOTAL	4,607	32,442	4,013	587	385	109	599	42,742

TABLE 2
Soil Remediation Goals: Human Health

Chemical	PRG (Ig/g)
Antimony	816
Arsenic	30
Beryllium	5
Cadmium	1,000
Chromium VI	10,000
Lead	1,000
Thallium	143
Benzo(a)anthracene	8.1
Benzo(a)pyrene	0.81
Benzo(b)fluoranthene	8.1
Dibenz(a,b)anthracene	0.81
Total PCBs	10
1,3,5- Trinitrobenzene	102
2,4-Dinitrotoluene(2,4-DNT)	8.7
2,4,6-TNT	196
RDX	53
HMX	51,000
Radionudides	PRG (pCi/g)
Actinium 228	0.014
Bismuth 214	0.008
Potassium 40	0.74

TABLE 3
Soil Remediation Goals: Leaching

Chemical	PRG (Ig/g)
RDX	1
246-TNT	47

TABLE 4
Alternative 1: Cost Estimate from FFS

Activity	Unit	Quantity	Unit Cost	Cost
Earth Moving				
Excavation and transport to treatment facility. Backfill and compact excavation.	yd 3	42,742	$25.50	$1,090,000
Treatment				
Incineration	yd 3	37,750	$473.20	$17,863,000
Solidification/stabilization	yd 3	4,607	$154.00	$709,000
Subtotal				$18,572,000
Analytical: 122 sites, 8 samples/site	sample	976	$420.00	$410,000
Subtotal				$20,072,000
Contingency (20%)				$4,014,000
Total				$24,086,000

TABLE 5
Alternative 2: Cost Estimate from FFS

Activity	Unit	Quantity	Unit Cost	Cost
Earth Moving				
Excavation & transport to treatment facility. Backfill and compact excavation.	yd 3	42,742	$25.50	$1,090,000
Treatment				
Bioremediation/composting	yd 3	37,143	$498.13	$18,502,000
Solidification/Stabilization	yd 3	13,018	$154.00	$2,005,000
Subtotal				$20,507,000
Analytical: 122 sites, 8	sample	976	$420.00	$410,000
Subtotal				$22,007,000
Contingency (20%)				$4,401,000
Total				$26,408,000

TABLE 6
Alternative 3: Cost Estimate from FFS

Activity	Unit	Quantity	Unit Cost	Cost
Earth Moving				
Excavation and transport to treatment facility. Backfill and compact excavation.	yd 3	42,742	$25.50	$1,090,000
Treatment				
Solidification/stabilization	yd 3	3,860	$154.00	$594,000
Analytical: 122 sites, 8 samples/site	sample	976	$420.00	$410,000
Subtotal				$2,094,000
Contingency (20%)				$419,000
Total				$2,513,000

TABLE 7

Alternative 1: Revised Cost Estimate

Activity	Unit	Quantity	Unit Cost	Cost
Earth Moving				
Excavation and transport to treatment facility. Backfill and compact excavation.	yd 3	42,742	$25.50	$1,090,000.00
Treatment				
Incineration	yd 3	37,750	$473.20	$17,863,000.00
Solidification/stabilization	yd 3	4,607	$154.00	$709,000.00
Analytical: 122 sites, 8 samples/site	sample	976	$420.00	$410,000.00
Support Activities - Preparation of Health and Safety Plans, Sampling and Analysis Plans, Quality Assurance Plans, Work Plans, Scheduling, Revisions to Work Plans. Project management costs.				$2,000,000.00
Sampling and analytical costs for establishing actual extent of contamination.				$1,000,000.00
Utility identification, avoidance, and relocation.				$200,000.00
Environmental mitigation of cultural resources at the East Burn Pads area.				$100,000.00
Surface water control and treatment.				$500,000.00
Construction of decontamination pads.				$250,000.00
Borrow source development and reclamation.				$500,000.00
Monitoring well abandonment and relocation.				$200,000.00
Site restoration activities.				$150,000.00
Road repair and maintenance				$1,000,000.00
Subtotal				$25,972,000.00
Contingency (20 %)				$5,194,400.00
Total Revised Cost for Alternative 1				

TABLE 8

Alternative 2: Revised Cost Estimate

Activity	Unit	Quantity	Unit Cost	Cost
Earth Moving				
Excavation and transport to treatment facility. Backfill and compact excavation.	yd 3	42,742	$25.50	$1,090,000.00
Treatment				
Incineration	yd 3	37,750	$473.20	$17,863,000.00
Solidification/stabilization	yd 3	4,607	$154.00	$709,000.00
Analytical: 122 sites, 8 samples/site	sample	976	$420.00	$410,000.00
Support Activities - Preparation of Health and Safety Plans, Sampling and Analysis Plans, Quality Assurance Plans, Work Plans, Scheduling, Revisions to Work Plans. Project management costs.				$2,000,000.00
Sampling and analytical costs for establishing actual extent of contamination.				$1,000,000.00
Utility identification, avoidance, and relocation.				$200,000.00
Environmental mitigation of cultural resources at the East Burn Pads area.				$100,000.00
Surface water control and treatment.				$500,000.00
Construction of decontamination pads.				$250,000.00
Borrow source development and reclamation.				$500,000.00
Monitoring well abandonment and relocation.				$200,000.00
Site restoration activities.				$150,000.00
Road repair and maintenance				$150,000.00
Subtotal				$27,907,000.00
Contingency (20 %)				$5,581,400.00
Total Revised Cost for Alternative 2				$33,488,400.00

TABLE 9

Alternative 3: Revised Cost Estimate

Activity	Unit	Quantity	Unit Cost	Cost
Earth Moving				
Excavation and transport to treatment facility. Backfill and compact excavation.	yd 3	42,742	$25.50	$1,090,000.00
Treatment				
Solidification/stabilization	yd 3	3,860	$154.00	$594,000.00
Analytical: 122 sites, 8 samples/site	sample	976	$420.00	$410,000.00
GAC system hardwater and installation				$500,000.00
Support Activities - Preparation of Health and Safety Plans, Sampling and Analysis Plans, Quality Assurance Plans, Work Plans, Scheduling, Revisions to Work Plans. Project management costs.				$2,000,000.00
Sampling and analytical costs for establishing actual extent of contamination.				$1,000,000.00
Utility identification, avoidance, and relocation.				$200,000.00
Environmental mitigation of cultural resources at the East Burn Pads area.				$100,000.00
Surface water control and treatment.				$500,000.00
Construction of decontamination pads.				$250,000.00
Borrow source development and reclamation.				$500,000.00
Monitoring well abandonment and relocation.				$200,000.00
Site restoration activities.				$150,000.00
Road repair and maintenance				$1,000,000.00
Subtotal				$8,494,000.00
Contingency (20 %)				$1,698,800.00
Total Revised Cost for Alternative 3				$10,192,800.00

Table 10

Alternative 3: Annual Operations and Maintenance Costs

ACTIVITY	ESTIMATED COST
Mowing	$1,500.00
Reseeding	$3,000.00
Settlement and Subsidence Control	
Surveys	$8,000.00
Fill Material	$10,000.00
Access Roads	$8,000.00
Fence Maintenance	$7,000.00
Leachate Collection and Treatment	$40,000.00
Cover Maintenance	$2,500.00
Miscellaneous	$10,000.00
SUBTOTAL Annual Maintenance Cost	$90,000.00
Contingency (20%)	$18,000.00
TOTAL Annual Maintenance Cost	$108,000.00
Net Present Worth (30 years, 7% interest rate, P/A = 12.4)	$1,339,200.00

Alternative 3: TOTAL ESTIMATED COSTS = Capital costs (Table 9) + O&M costs (Table 10)
Alternative 3: TOTAL ESTIMATED COSTS = $10,192,800 + $1,339,200 = $11,532,000

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