AD-A271 371

...UMENTATION PAGE

Form Approved
OMB No. 0704-0188

2

REPORT DATE 03/00/90	DATES COVERED

4. FINAL DECISION DOCUMENT FOR THE INTERIM RESPONSE ACTION AT THE M-1 SETTLING BASINS ROCKY MOUNTAIN ARSENAL, VERSION 4.0

5. FUNDING NUMBERS

DAAA15 88 D 0022

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

WOODWARD-CLYDE CONSULTANTS

8. PERFORMING ORGANIZATION REPORT NUMBER

90072R03

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

ROCKY MOUNTAIN ARSENAL (CO.). PMRMA

10. SPONSORING MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

THE OBJECTIVE OF THE INTERIM RESPONSE ACTION AT THE M-1 SETTLING BASINS IS TO MITIGATE THE THREAT OF RELEASE OF CONTAMINANTS FROM THE BASINS WHICH ARE A DIRECT SOURCE OF AS CONTAMINATION TO THE GROUND WATER. THE PROPOSED IRA CONSISTS OF 1) CONSTRUCTION OF A 360 DEGREE SUBSURFACE BARRIER AND 2) TREATMENT OF THE WASTES WITH IN-SITU VITRIFICATION.

THIS DECISION DOCUMENT PROVIDES SUMMARIES OF:

1. ALTERNATIVE TECHNOLOGIES CONSIDERED
2. SIGNIFICANT EVENTS LEADING TO THE INITIATION OF THE IRA
3. THE IRA PROJECT
4. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, STANDARDS, CRITERIA, AND LIMITATIONS (ARAR'S) ASSOCIATED WITH THE PROGRAM.

14. SUBJECT TERMS

IRA'S, REGULATION, ARAR

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED			

...38 Rev. 2-89

FINAL DECISION DOCUMENT FOR THE INTERIM RESPONSE ACTION AT THE M-1 SETTLING BASINS ROCKY MOUNTAIN ARSENAL

MARCH 1990
CONTRACT NO. DAAA15-88-D-0022/0002
VERSION 4.0

Prepared by:

WOODWARD-CLYDE CONSULTANTS

Prepared for:

PROGRAM MANAGER FOR ROCKY MOUNTAIN ARSENAL

THE INFORMATION AND CONCLUSIONS PRESENTED IN THIS REPORT REPRESENT THE OFFICIAL POSITION OF THE DEPARTMENT OF THE ARMY UNLESS EXPRESSLY MODIFIED BY A SUBSEQUENT DOCUMENT. THIS REPORT CONSTITUTES THE RELEVANT PORTION OF THE ADMINISTRATIVE RECORD FOR THIS CERCLA OPERABLE UNIT.

THE USE OF TRADE NAMES IN THIS REPORT DOES NOT CONSTITUTE AN OFFICIAL ENDORSEMENT OR APPROVAL OF THE USE OF SUCH COMMERCIAL PRODUCTS. THIS REPORT MAY NOT BE CITED FOR PURPOSES OF ADVERTISEMENT.

TABLE OF CONTENTS

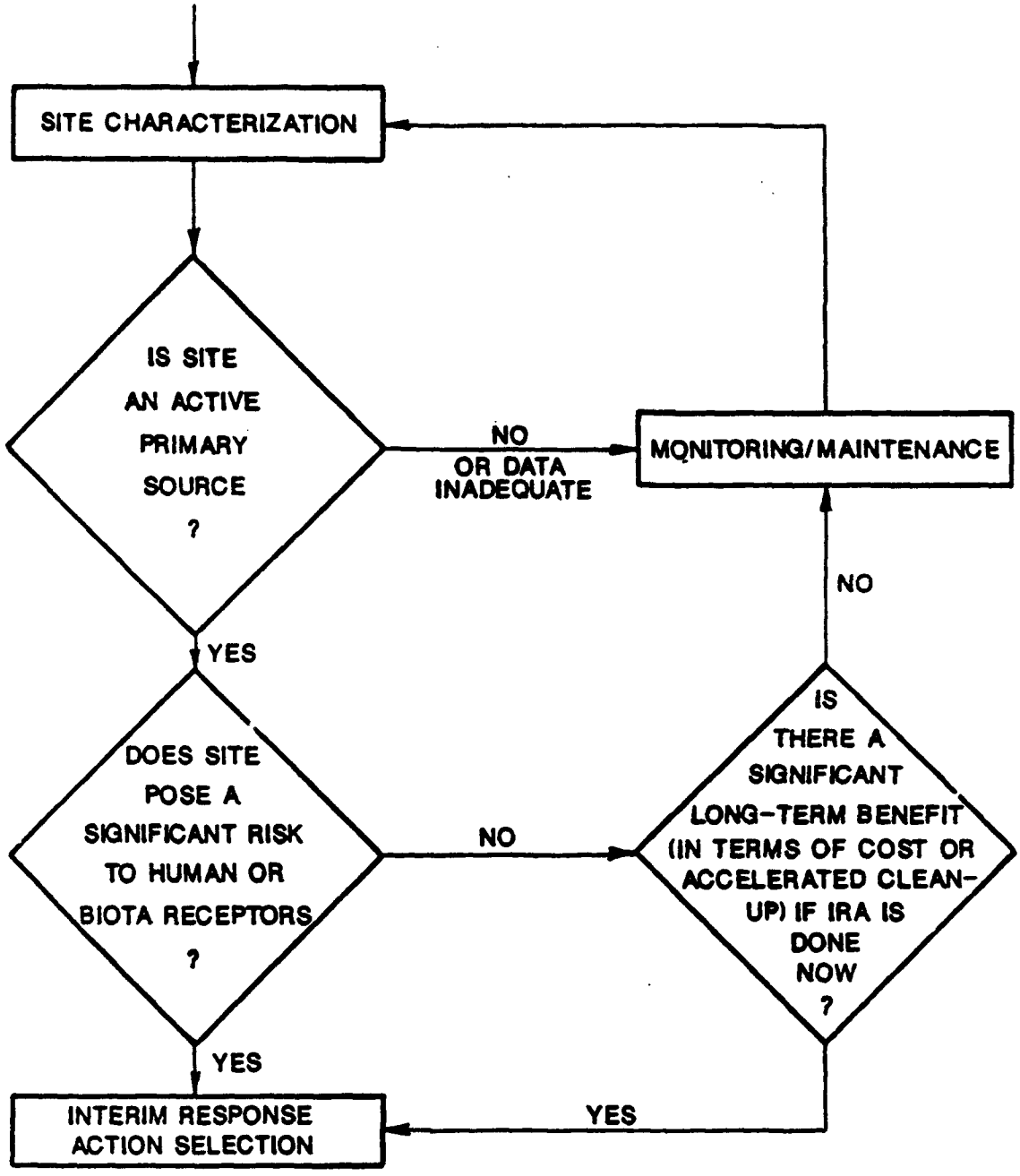
FIGURES

1.0 INTRODUCTION

The Interim Response Action (IRA) alternatives assessment and decision process for the M-1 Settling Basins at the Rocky Mountain Arsenal (RMA) is being conducted as part of the IRA process for RMA in accordance with the Federal Facility Agreement and the Technical Program Plan.

Determinations concerning the implementation of this IRA have been reached through a consideration of the objectives of Sections 2.3(a), 22.5, and 22.6 of the Federal Facility Agreement and by application of the Decision Flow Chart for Other Contamination Sources IRAs adopted by the Organizations and the State in the June 7, 1989 Subcommittee meeting (Figure 1-1).

Alternatives have been reviewed based on their overall protectiveness of human health and the environment; compliance to the maximum extent practicable with Applicable or Relevant and Appropriate Requirements (ARARs); reduction in mobility, toxicity, or volume; short-term and long-term effectiveness; implementability; and cost-effectiveness. The preferred IRA will consist of construction of a temporary 360-degree subsurface barrier such as a slurry wall or sheet pilings around the M-1 Settling Basins area, and the treatment of the waste materials in the basins with in situ vitrification.



Job No. : 22238-4100	DECISION FLOW CHART FOR OTHER CONTAMINATION SOURCES IRAs
Prepared by: K.A.S.	
Date: 12/18/89	Figure 1-1

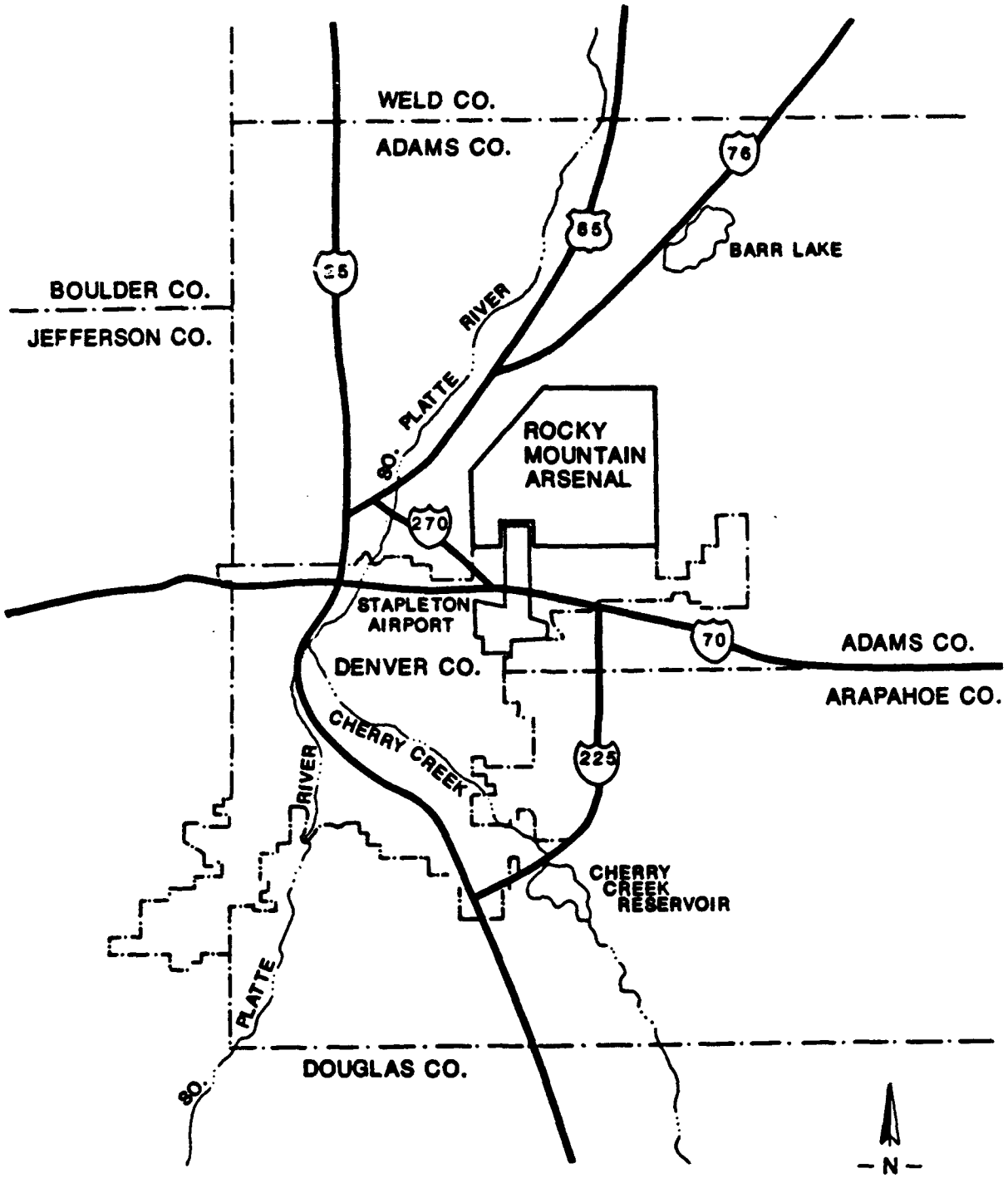
2.0
HISTORY OF THE M-1 SETTLING BASINS

Rocky Mountain Arsenal (RMA) occupies more than 17,000 acres (approximately 27 square miles) in Adams County, directly northeast of metropolitan Denver, Colorado (Figure 2-1). The property was purchased by the U.S. government in 1942 for use in World War II to manufacture and assemble chemical warfare materials, such as mustard and lewisite, and incendiary munitions. Starting in the 1950s, RMA produced the nerve agent GB (isopropyl methylphosphonofluoridate) until late 1969. A significant amount of chemical warfare materials destruction took place during the 1950s and 1960s. Since 1970, RMA has primarily been involved with the destruction of chemical warfare materials. The last military operations at RMA ended in the early 1980s. In November 1988, the RMA was reduced to inactive military status reflecting the fact that the only remaining mission at the Arsenal is contamination cleanup. In addition to these military activities, major portions of the plant facilities were leased to private industries, including Shell Oil Company, for the manufacture of various insecticides and herbicides, between 1947 and 1982.

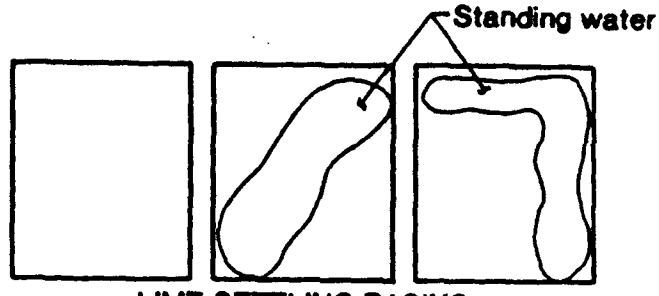
The M-1 Settling Basins are located in the South Plants area, just south of December 7th Avenue along the northern edge of the northwest quarter of Section 1. The basins and the berms surrounding them, all of which are now buried and partially built upon, occupy an area of approximately 34,500 square feet (Figure 2-2). For the purpose of the alternatives assessment it was estimated that approximately 6,400 cubic yards of sludge plus 2,600 cubic yards of soil overburden would be addressed by this IRA.

The M-1 Settling Basins were constructed to treat waste fluids from the lewisite facility. Two basins were constructed in 1942, and a third basin was constructed in 1943 when the original two filled with solids. All three were unlined, and each measured approximately 90 feet wide, 115 feet long, and 7 feet deep. In addition to the waste fluids from the lewisite disposal facility, the basins may have contained lesser amounts of waste materials from alleged spills within the acetylene generation building, the thionyl chloride plant, and the arsenic trichloride plant, which may have been routed through floor drains and the connecting piping to the basins (Ebasco 1987). The basins also received a considerable amount of mercuric chloride catalyst, possibly from a spill (Ebasco 1988).

The liquids discharged into the basins first passed through a set of reactor towers where calcium carbonate was added, then through a wood trough into the M-1 Settling Basins where the arsenic precipitated out of solution. The liquid from the settling basins was decanted through an 18-inch-diameter pipe to the Lime Settling Basins in Section 36 where final treatment occurred, before being routed to Basin A (Ebasco 1987).



Job No. : 22238-4100	LOCATION MAP RMA
Prepared by: K.A.S.	
Date: 12/18/89	Figure 2-1

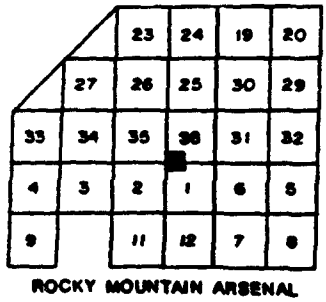


LIME SETTLING BASINS

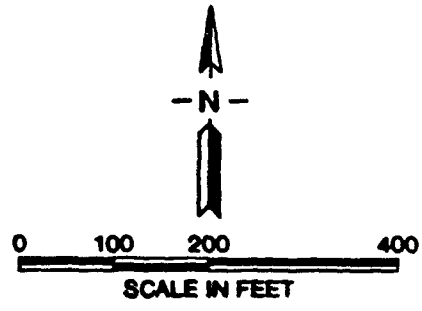
D Street

December 7th Avenue

M-1 SETTLING BASINS



ROCKY MOUNTAIN ARSENAL
KEY MAP



SCALE IN FEET

Job No. : 22238-4100	M-1 SETTLING BASINS AND LIME SETTLING BASINS AREA MAP
Prepared by : K.A.S.	
Date : 12/18/89	Figure 2-2

The M-1 Settling Basins were backfilled, probably in 1947, and are now covered with soil. Portions of the basins are covered with structures. These structures will be relocated before implementation of the IRA.

Based on several investigations, the contaminants in the waste material in the M-1 Settling Basins are primarily arsenic (about 8 percent) and mercury (about 0.5 percent), with the bulk of the material being oxides or carbonates of calcium. Organochlorine pesticides and other organics have also been found in the near-surface soils (Ebasco 1988). The bottoms of the basins appear to be about 7 feet below ground surface, based on as-built drawings and field investigations. The groundwater elevation in the vicinity of the M-1 Settling Basins is approximately 8 feet below ground surface, with some seasonal variation that may bring the water table into contact with the basin contents during parts of the year. The M-1 Settling Basins are a source of arsenic contamination to the groundwater (RMA data base and WCC 1989b).

On February 1, 1988, a proposed Consent Decree was lodged in the case of United States v. Shell Oil Company with the U.S. District Court in Denver, Colorado. The proposed Consent Decree was revised after public comments were received, and a modified proposed Consent Decree was lodged with the Court on June 7, 1988. In February 1989, a Federal Facility Agreement was entered into between five federal agencies: the U. S. Environmental Protection Agency (EPA), the Army, the Department of the Interior, the Department of Health and Human Services, and the Department of Justice, which established procedures for implementing the Arsenal cleanup program as specified in the Technical Program Plan, and incorporated many provisions of the modified proposed Consent Decree. The Army and Shell Oil Company agreed to share certain costs of the remediation to be developed and performed under the oversight of the EPA, with opportunities for participation by the State of Colorado. The long-term remediation is a complex task that will take several years to complete. The Federal Facility Agreement specifies 13 Interim Response Actions (IRAs) determined to be necessary and appropriate. The Remediation of Other Contamination Sources is one of the 13 IRAs. The M-1 Settling Basins area is one of several sites being addressed by the remediation of other contamination sources IRA. The action at this site consists of assessment and, as necessary, the selection and implementation of an interim action.

3.0 INTERIM RESPONSE ACTION OBJECTIVE

The objective of the Interim Response Action (IRA) Alternatives Assessment for the M-1 Settling Basins is to assess whether immediate action at this site is appropriate and to recommend, if necessary, an IRA alternative to mitigate the threat of release from the M-1 Settling Basins on an interim basis, pending determination of the final remedy in the Onpost Record of Decision (ROD).

The IRA alternatives have been evaluated based on the following criteria:

- Overall protectiveness of human health and the environment
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) to the maximum extent practicable
- Reduction of mobility, toxicity, or volume
- Short-term and long-term effectiveness
- Implementability
- Cost

This decision document provides a summary of the alternative technologies considered, a chronology of the significant events leading to the initiation of the IRA, a summary of the IRA project, and a summary of the ARARs (legal and regulatory standards, criteria, or limitations) associated with the program.

As specified in the Federal Facility Agreement, this IRA will, by containing and treating a contamination source, to the maximum extent practicable, be consistent with and contribute to the efficient performance of the Final Response Action.

4.0 INTERIM RESPONSE ACTION ALTERNATIVES

This section describes the Interim Response Action (IRA) alternatives developed in the IRA Alternatives Assessment for the M-1 Settling Basins (WCC 1989a). These alternatives included:

- No Action
- Monitoring
- Institutional Controls
- Slurry Wall with Cap
- Multilayered Cap
- In Situ Vitrification
- Chemical Fixation with Onsite Storage
- Chemical Fixation with Offsite Disposal

All of these alternatives were subject to an evaluation in the IRA Alternatives Assessment. The IRA Alternatives Assessment for the M-1 Settling Basins concludes that there appears to be both a long-term technical and cost benefit in performing an IRA now since treatment after arsenic has spread becomes both more complex and costly insofar as a larger area must be addressed.

Following is a description and a brief summary of the evaluation of each alternative. All of the alternatives can be designed and implemented to meet Applicable or Relevant and Appropriate Requirements (ARARs) to the maximum extent practicable. Details of the evaluation can be found in the IRA Alternatives Assessment for this site (WCC 1989a).

4.1 NO ACTION

This alternative consists of taking no action to contain or treat contaminated soil and sludge at the M-1 Settling Basins. This alternative is not considered protective of human health and the environment and would not reduce contaminant mobility, toxicity, or volume. This alternative has no short-term impacts, however, it also has no long-term effectiveness. It could be easily implemented at no cost. The no action alternative would not be inconsistent with any final remedy at the site.

4.2 MONITORING

This alternative consists of conducting upgradient and downgradient groundwater sampling and analysis. Monitoring would allow continued tracking of contaminant movement, thereby providing additional information which could be used to continue to evaluate the protection of human health and the environment. Monitoring would not reduce contaminant mobility, toxicity, or volume. It would have minimal short-term impacts on workers during monitoring well installation, which could be mitigated through the use of personal protective equipment. The long-term effectiveness of this alternative is limited to its use as an indicator of future impact at sensitive receptors. It could be easily implemented at a relatively low cost. The monitoring alternative would not be inconsistent with any final remedy at the site. Groundwater monitoring would also be included in all following alternatives.

4.3 INSTITUTIONAL CONTROLS

This alternative consists of constructing a chain-link fence with controlled access points around the M-1 Settling Basins. In addition, groundwater monitoring would be conducted. The monitoring aspect of this alternative would allow continued tracking of contaminant movement, thereby providing additional information which could be used to continue to evaluate the protection of human health and the environment. It would not reduce contaminant mobility, toxicity, or volume. This alternative would also have minimal short-term impacts during fence construction, which could be mitigated through the use of personal protective equipment. RMA currently has limited access maintained by physical barriers and security personnel, therefore, additional site restrictions would be of limited effectiveness. These institutional controls would not be inconsistent with any final remedy at the site, and could be easily implemented at a relatively low cost.

4.4 SLURRY WALL WITH CAP

This alternative consists of constructing a slurry wall around the M-1 Settling Basins. In addition, groundwater monitoring would be conducted. The slurry wall would be anchored a minimum of 5 feet into the Denver Formation, which would provide a relatively impermeable base for the contained area. This would limit horizontal migration of contamination as a result of alluvial groundwater flow that is periodically in contact with the M-1 Settling Basins. A multilayered cap would then be constructed over the M-1 Settling Basins. For the purposes of this study only, it has been assumed that the cap would consist of, from the base upwards, an 18-inch-thick layer of low permeability clay, a flexible membrane liner, a synthetic drainage net, a geotextile filter fabric, and a 1-foot-thick protective soil layer. The cap would be sloped from the center of the basins to facilitate runoff. The cap would reduce infiltration of precipitation and surface water.

This alternative is considered protective of human health and the environment, since the waste material is isolated from the environment. Both vertical and horizontal contaminant migration would be greatly inhibited. However, this alternative does not affect the toxicity of the material and may actually increase the volume of material that may ultimately require remediation, since some of the containment materials may come in contact with the sludge. Any minimal short-term impacts to workers or the community could be addressed through the use of personal protective equipment and engineering controls. The long-term effectiveness of this alternative is limited since this is a containment technology that does not actually remove or treat the source of contamination. This alternative could be implemented with straightforward construction techniques at a relatively moderate cost. Containment would be consistent with the final remedy because it would reduce potential contaminant migration.

4.5 MULTILAYERED CAP

This alternative would consist of constructing a multilayered cap over the M-1 Settling Basins as described in subsection 4.4. In addition, groundwater monitoring would be conducted. The cap would inhibit infiltration of precipitation and surface water. However, a cap would not address the horizontal flow of the alluvial aquifer through the M-1 Settling Basins, which is probably a more significant migration pathway in this area than downward migration by infiltration.

This alternative is considered protective of human health and the environment. The cap would limit the downward mobility of the contaminants. However, it would have no effect on the toxicity of the sludge and may actually increase the volume of contaminated material that would ultimately have to be treated, since some of the cap materials would come in contact with the sludge. There would be minimal short-term impacts associated with the implementation of this alternative, which can be addressed through the use of personal protective equipment and engineering controls. Since this is a containment alternative, the long-term effectiveness is limited. This alternative could be implemented with straightforward construction techniques at a relatively low cost. Containment would be consistent with the final remedy because it would reduce potential contaminant migration.

4.6 IN SITU VITRIFICATION

This alternative consists of constructing a temporary 360-degree subsurface barrier such as a slurry wall or sheet pilings around the M-1 Settling Basins to temporarily hydraulically isolate the site from the surrounding aquifer. The soil/sludge in the M-1 Settling Basins would then be vitrified by introducing an electric current through a square array of electrodes set in the sludge. The electric current raises the temperature of the sludge to approximately 1600 degrees centigrade, forming a melt that subsequently cools to an impermeable

glass. Any organics in the sludge are either pyrolyzed in the melt, rapidly oxidized at the surface of the melt, or captured in the offgas treatment system. Most of the mercury and possibly some arsenic would be vaporized and subsequently condensed in the offgas treatment system. The remainder of the arsenic and the other metals would be incorporated into the glass. Air monitoring would be conducted during implementation of this alternative. Groundwater monitoring would also be conducted to evaluate the continued effectiveness of this alternative.

This alternative would be protective of human health and the environment. Contaminants would either be destroyed in the melt process, captured in the offgas treatment system, or permanently incorporated in the glass. The process significantly reduces the contaminant mobility, toxicity, and volume. There are some short-term impacts associated with the implementation of the process that can be mitigated through the use of personal protective equipment during construction and setup, and through proper design of the offgas treatment system. This alternative provides for long-term effectiveness because, for those soils and sludges vitrified, it is a permanent treatment and leaves no untreated waste or toxic and mobile residuals on site. The technology has gone through treatability testing, which has shown its effectiveness on M-1 Settling Basins sludge. Implementation of in situ vitrification would require offgas monitoring to ensure the effectiveness of the air pollution control equipment. Due primarily to the significant power requirements to maintain the melt, the costs for this alternative are relatively high. Implementation of this alternative would be consistent with and contribute to the efficient performance of the final response action by providing significant interim remediation of a source of contamination.

4.7 CHEMICAL FIXATION WITH ONSITE STORAGE

This alternative consists of excavating the soil and sludge in the M-1 Settling Basins by sections or subareas, mixing the excavated materials with one or more fixation agents to immobilize the contaminants, testing the treated portions to ensure treatment effectiveness, and placing the treated soil/sludge in an onsite temporary waste pile. The sequence would be repeated for successive subareas until the entire area to be chemically fixed is treated. In addition, groundwater monitoring would be conducted.

An onsite aboveground temporary waste pile would be constructed to store the chemically fixed materials. For the purposes of this study, the bottom liner and leachate collection system would consist of, from the base upward, an 18-inch-thick compacted clay layer, a flexible membrane liner, a synthetic drainage net, and a geotextile filter fabric. The bottom layer would be sloped at a minimum of 2 percent toward a leachate collection sump. Once the chemically fixed materials have been placed in the waste pile, a cap would be constructed to close the temporary waste pile. The cap design would be the same as that used in the multilayered cap alternative (subsection 4.4).

This alternative is considered to be protective of human health and the environment since the contaminants would be immobilized by the fixation process. The toxicity of the material would be reduced by the chemical fixation, however, the volume of material would increase. This alternative provides for long-term effectiveness because, for the fixed materials, it is a permanent treatment and leaves no untreated waste or toxic and mobile residuals on site. There would be some short-term impacts associated with implementation which could be addressed through the use of personal protective equipment and engineering controls for odor and dust. Although fixation technology is well established at sites with similar wastes, treatability testing would be required to establish the effectiveness of the technology on the specific contaminants at the site. This alternative could be implemented at moderate cost. Implementation of this alternative would be consistent with and contribute to the efficient performance of the final response action by providing interim remediation of a source of contamination.

4.8 CHEMICAL FIXATION WITH OFFSITE DISPOSAL

This alternative would consist of excavating the sludge and soil in the M-1 Settling Basins and chemically fixing the materials in the same manner described in subsection 4.7. The chemically fixed materials would then be transported to an offsite hazardous waste landfill for disposal. In addition, groundwater monitoring would be conducted to evaluate the continued effectiveness of this alternative.

This alternative is considered to be protective of human health and the environment since the contaminants would be immobilized by the fixation process. The toxicity of the material would be reduced by the chemical fixation, however, the volume of material would increase. This alternative provides for long-term effectiveness because, for the materials fixed, it is a permanent treatment and leaves no untreated waste or toxic and mobile residuals on site. There would be some short-term impacts associated with implementation which could be addressed through the use of personal protective equipment and engineering controls for odor and dust. Although fixation technology is well established at sites with similar wastes, treatability testing would be required to establish the effectiveness of the technology on the specific contaminants at the site. The costs associated with this technology are relatively high, primarily due to offsite transportation and disposal. Implementation of this alternative would be consistent with and contribute to the efficient performance of the final response action by providing interim remediation of a source of contamination.

4.9 CONCLUSIONS

In situ vitrification is the preferred alternative. A treatment is preferable to a containment alternative at this site because the source volume is known, the waste characteristics are well-defined, there are high concentrations of contaminants, and because the site is a groundwater contamination source. The advantages

of in situ vitrification are that the metals are either immobilized or captured and that any organic contaminants are destroyed, thereby reducing the mobility, toxicity, and volume of the material. In situ vitrification will effectively prevent future potential contaminant migration from the M-1 Settling Basins. Therefore, implementation of this action now will yield a technical benefit and possibly a cost benefit, and will be consistent with and contribute to the efficient performance of the final response action. In addition, data resulting from implementation of in situ vitrification at this site is beneficial because it will contribute to the alternatives assessment for the Feasibility Study.

Although the containment alternatives are less costly in the short-term, the treatment costs during any subsequent final remediation would increase due to the increased volume of material, which would then include the containment construction materials. Chemical fixation with onsite storage is a less expensive treatment technology, but again, the chemically fixed materials, as well as the waste pile construction materials, may need to be moved during the final remedy. Chemical fixation with offsite disposal is as costly as the in situ vitrification, but it does not have the advantage of actually destroying the organic contaminants, it could result in some short-term impacts during initial excavation activities, and there is some potential for transportation risks.

5.0 CHRONOLOGY OF EVENTS

The significant events leading to the proposed decision to remediate soils in the M-1 Settling Basins as described in Section 6.0 of this report are presented below.

Date	Event
June 1987	State of Colorado, Shell Oil Company EPA, and the Army develop and agree, in a June 1987 report to the Court, to a prospective hot spot list which identifies candidate Interim Response Actions (IRAs) to be conducted. The hot spot list consists of five areas (the Section 36 Trenches, the Section 36 Lime Pits, the M-1 Settling Basins, the Motor Pool Area, and the Railroad Housing Track in the Rail Classification Yard) referred to as Other Contamination Sources in the proposed Consent Decree (Section 9.1, paragraph l), and in the Federal Facility Agreement, paragraph 22.1 (l).
January 31, 1989	The Army instructs Woodward-Clyde Consultants (WCC) to develop plans for interim action investigation work in response to the hot spot list. Interim action investigation work includes the M-1 Settling Basins.
April 13, 1989	A draft final Task Plan, including the work for the M-1 Settling Basins, is submitted by the Army to the Organizations and the State for comment.
April 17, 1989	Field investigations begin for the other contamination sources IRA. Work includes investigation of the contaminant source(s) within the M-1 Settling Basins.
June 29, 1989	A final Task Plan is issued by the Army with comments incorporated.
September 7, 1989	Draft Final Alternatives Assessment of Interim Response Actions for other Contamination Sources - M-1 Settling Basins and draft ARARs are distributed by the Army to the Organizations and the State for comment.
September 11, 1989	Field investigation completed.

November 27, 1989	Draft Final Results of Field and Laboratory Investigations Conducted for the Remediation of Other Contamination Sources Interim Response Action is distributed by the Army to the Organizations and the State.
November 27, 1989	Final Alternatives Assessment of Interim Response Actions for Other Contamination Sources - M-1 Settling Basins, is distributed by the Army to the Organizations and the State with comments incorporated.
November 27, 1989	Proposed Decision Document for the Interim Response Action at the M-1 Settling Basins at the Rocky Mountain Arsenal is distributed by the Army to the Organizations and the State for comment.
December 7, 1989	Public meeting on the Proposed Decision Document for the Interim Response Action at the M-1 Settling Basins at the Rocky Mountain Arsenal.
February 28, 1990	Draft Final Decision Document for the Interim Response Action at the M-1 Settling Basins at the Rocky Mountain Arsenal is distributed by the Army to the Organizations and the State with comments incorporated.
March 28, 1990	The Decision Document for the Interim Response Action at the M-1 Settling Basins at the Rocky Mountain Arsenal is finalized and distributed by the Army to the Organizations and the State.

6.0
SUMMARY OF THE INTERIM RESPONSE ACTION

Performing in situ vitrification at the M-1 Settling Basins is the chosen alternative. This is a technically feasible alternative that destroys the organic contaminants and permanently immobilizes or captures the metals present in the M-1 Settling Basins. This alternative provides for long-term effectiveness because, for the soils and sludges vitrified, it is a permanent treatment and leaves no untreated waste or toxic and mobile residuals on site.

Prior to conducting the in situ vitrification operations, several tanks currently situated over the M-1 Settling Basins will be relocated to an adjacent area of the South Plants to await a demolition and disposal determination in the final Onpost Record of Decision (ROD). Sampling of the tanks may be required prior to their relocation for health and safety reasons. The method and quantity of sampling will be determined during the design of this IRA.

A temporary 360-degree subsurface barrier, such as a slurry wall or sheet pilings, will be constructed around the M-1 Settling Basins and keyed into the Denver Formation. This will provide a temporary barrier to hydraulically isolate the material in the basins from the surrounding aquifer during the in situ vitrification process. An in situ vitrification demonstration test will then be performed on site.

Following completion of the demonstration test, the sludge will then be vitrified in stages by introducing an electric current through a square array of electrodes (approximately 20 feet by 20 feet square) set in the sludge. The electric current will raise the temperature of the sludge and surrounding soil to approximately 1600 degrees centigrade, forming a melt that subsequently cools to form an impermeable glass. Any organics in the sludge are either pyrolyzed in the melt or captured in the offgas treatment system. Most of the arsenic and the heavy metals will be incorporated into the glass. Most of the mercury and some of the arsenic will be vaporized and subsequently condensed in the offgas treatment system. The vitrification will be performed to a depth at least to the bottom of the basins. If the groundwater table is below the bottom of the basins, the melt may extend to a maximum depth equal to the groundwater table elevation. The exact depth will be determined during the design and implementation of this IRA.

The vitrification process will be conducted under a hood that will be operated under vacuum conditions and be designed with redundancy to prevent any releases of the offgas to the atmosphere. The offgas control system will cool, scrub, and filter the vapors collected from the offgassing melt.

Assuming this process drives off the water fraction of the sludge, condensed water, will be recovered. The condensate will have elevated concentrations of arsenic and mercury, as well as an alkaline pH. This will require treatment to reduce arsenic and mercury levels to acceptable discharge limits. Mercury may be in a recoverable form. Actual wastewater treatment will be determined during design and may be performed at the CERCLA Wastewater Treatment System.

Noncondensed gases will be absorbed in a packed scrubber column. As a final step in the air pollution control sequence, the exhaust gases will pass through an activated carbon absorber prior to venting to the atmosphere.

Air monitoring will be conducted during implementation of this alternative. A groundwater monitoring program will also be implemented to evaluate the continued effectiveness of this alternative.

6.1 HEALTH & SAFETY PLAN

A Health & Safety Plan has been developed for the prevention of occupational injuries and illnesses during field activities at RMA. This plan addresses health and safety requirements of contractors and their authorized subcontractors. Compliance with this plan will be compulsory, and the contractors will be responsible for self-enforcement and compliance with this plan. The Health & Safety Plan was developed taking into consideration known hazards as well as potential risks. Comprehensive environmental monitoring and site-specific personal protection are combined in an effort to best protect workers.

A site-specific Health & Safety Plan for work to be performed on the M-1 Settling Basins during implementation of this IRA will be developed.

7.0
INTERIM RESPONSE ACTION PROCESS

With respect to the Interim Response Action (IRA) for the remediation of other contamination sources for the M-1 Settling Basins at Rocky Mountain Arsenal (RMA), the IRA process is as follows:

1. The scope of the IRA is described in the June 5, 1987 report to the Court of the United States (the Army and EPA), Shell, and the State in United States v. Shell Oil Co. A similar description is included in the proposed Consent Decree, paragraph 9.1 (l), and the Federal Facility Agreement (FFA), paragraph 22.1 (l).

2. The Organizations and DOI shall have the opportunity to participate, at the RMA Committee level, in the identification and selection of Applicable or Relevant and Appropriate Requirements (ARARs) that may be applicable to IRAs.

3. The Army issues the proposed Decision Document for the IRA for the interim remediation of other contamination sources, M-1 Settling Basins, for a 30-day public comment period. During the 30-day comment period, the Army will hold one public meeting addressing the IRA decision. The proposed Decision Document is supported by an administrative record.

4. Promptly after the close of the comment period, the Army shall transmit to the other Organizations, Department of Interior (DOI), and the State, a Draft Final IRA Decision Document for the remediation of other contamination sources, M-1 Settling Basins.

5. Within 20 days after the issuance of a Draft Final IRA Decision Document for the interim remediation of other contamination sources, M-1 Settling Basins, an Organization (including the State if it has agreed to be bound by the Dispute Resolution process, as required by the FFA, or DOI under the provisions set forth in the FFA) may invoke Dispute Resolution.

6. After the close of the period for invoking Dispute Resolution, if Dispute Resolution is not invoked, or after the completion of Dispute Resolution, if invoked, the Army shall issue a Final IRA Decision Document to the other Organizations, DOI, and the State. The Army shall also notify the public of the availability of the Final IRA Decision Document with the supporting administrative record. Only preliminary design work for the IRA may be conducted prior to the issuance of the Final IRA Decision Document.

7. The IRA Decision Document for the remediation activity at the M-1 Settling Basins will be subject to judicial review in accordance with Section XXXIX of the Federal Facility Agreement except where such review is barred by Sections 113 and 121 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. Sections 6913 and 9621.

8. Following issuance of the final IRA Decision Document, the Army shall be the lead party responsible for designing and implementing the IRA in conformance with the Decision Document. The Army shall issue a draft IRA Implementation Document to the DOI, the State, and the other Organizations for review and comment. The draft Implementation Document shall include final drawings and specifications, final design analysis, a cost estimate, and IRA deadlines for implementation of the IRA.

9. If any Organization (including the State) or the DOI believes that the IRA is being designed or implemented in a manner that will not meet the objectives for the IRA set forth in the Final IRA Decision Document, or is otherwise not being properly implemented, it may so advise the others and shall recommend how the IRA should be properly designed or implemented. Any Organization (including the State, if it has agreed to be bound by the process of Dispute Resolution, as required by the FFA, or the DOI under the circumstances defined in the FFA) may invoke Dispute Resolution to resolve the disagreement.

10. As Lead Party for the design and implementation of this IRA, the Army will issue the final Implementation Document, as described above, and will be responsible for implementing the IRA in accordance with the IRA Implementation Document.

8.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE REMEDIATION OF OTHER CONTAMINATION SOURCES- M-1 SETTLING BASINS INTERIM RESPONSE ACTION

8.1 INTRODUCTION

These Applicable or Relevant and Appropriate Requirements (ARARs) address the M-1 Settling Basins, a specific area identified for remediation prior to the issuance of a Record of Decision (ROD) for the Onpost Operable Unit of the Rocky Mountain Arsenal. The action described in this document is interim, subject to further remediation as identified in the Onpost ROD.

8.2 AMBIENT OR CHEMICAL-SPECIFIC ARARS

Ambient or chemical-specific requirements set concentration limits or ranges in various environmental media for specific hazardous substances, pollutants, or contaminants. Such ARARs either set protective cleanup levels for the chemicals of concern in the designated media or indicate an appropriate level of discharge based on technological considerations.

The objectives of this IRA are discussed in the Final Assessment Document and Draft Final Decision Document. This IRA will be implemented prior to the final remediation to be undertaken in the context of the Onpost Operable Unit ROD. The media of concern here are the air emissions from the system hood, the liquid effluent remaining after completion of the off-gas control process (see Section 6.0), any liquid generated through dewatering of the area, and the soils which will be subject to the vitrification process. However, no ambient or chemical-specific ARARs were identified concerning levels of contaminants for soils which have been vitrified. Section 8.4 discusses action-specific ARARs for the vitrified mass that remains after treatment. The liquid effluent and any other liquids generated are to be treated by the CERCLA Wastewater Treatment System under development at the Arsenal and treatment standards for liquids treated by that system are contained in the Proposed Decision Document for that IRA. These standards do not become final until the completion of the decision document process for that IRA, which is currently underway. The selected alternative does not include a groundwater treatment system.

8.2.1 Air Emissions

The treatment system will result in air emissions, which result from the treatment process. These emissions will be contained during the treatment process, be subject to treatment themselves and then be released to

the atmosphere after treatment. The standards identified below address the emissions from the emissions control system which will operate as part of this IRA treatment system.

The standards contained at 40 CFR Part 50 were reviewed and determined to be neither applicable nor relevant and appropriate to apply in the context of this IRA. These standards apply to Air Quality Control Regions, large air masses which are markedly dissimilar from the area that may be affected by the operation of an off-gas control system which is intended to be used for treatment by this IRA system. The specific compounds addressed by these standards, sulfur oxides, carbon monoxide, ozone, nitrogen oxide and lead are not anticipated to be contained in significant amounts in any potential air emissions. These standards are defined in terms of measurements in large air masses and not generally applied to specific emissions sources, such as smokestacks and automobile tailpipes, but to the AQCR as a whole, so are not considered relevant and appropriate to apply to the type of emission source which is intended to be utilized in the context of this IRA. Other specific standards have been identified as being appropriate to apply to this IRA treatment system and are identified below.

The standards contained at 40 CFR Parts 60 and 61 were reviewed and determined not to be applicable to operations conducted as part of the treatment by this IRA system. These standards apply to specific sources of the listed pollutants. For example, Subpart E of 40 CFR Part 61 applies to sources which process mercury ore to recover mercury and other specific processes and the arsenic provisions of Subparts O and P of this part apply to very specific plants, smelters or facilities. Since the operations contemplated by this IRA treatment system are extremely dissimilar from the processes identified above as described in 40 CFR Part 61, these standards were also not considered to be relevant and appropriate to apply to this IRA treatment system. However, Subpart N of Part 61 applies to glass melting furnaces which use commercial arsenic as raw material. The treatment system contemplated by this IRA is neither a glass melting furnace nor uses commercial arsenic as raw material, making this subpart not applicable. The vitrification process does result in the creation of a glass-like material in the ground and there is a significant amount of arsenic in the soil which will undergo vitrification. These considerations lead to the determination that the arsenic emissions from the vitrification process should be subject to the emissions limitations contained in 40 CFR § 61.162(b)(2) and this section is considered relevant and appropriate to apply to this IRA. Accordingly, arsenic emissions will be conveyed to a control device and reduced by at least 85%. Specific monitoring and control devices to be utilized will be developed during the design and implementation process, as more information and test data is available.

The Army has identified the standard contained in 5 CCR 1007-3, regulation 8, as relevant and appropriate to apply to mercury emissions from the treatment system and as more stringent than comparable federal requirements. This regulation is not applicable since the IRA treatment system will not use mercury, as

defined by the regulation. Mercury emissions will not exceed 2300 grams/five pounds per day, consistent with this requirement.

The Army has identified the standard for particulate emissions contained in 40 CFR § 264.343 as relevant and appropriate to apply to this IRA treatment system. This requirement is not applicable since it applies to incinerators, which are different from the treatment system to be installed as part of this IRA. However, the particulate emission standard is considered relevant and appropriate to apply to this IRA treatment system. Accordingly, particulate emissions from the treatment system will be limited to 0.08 grains per dry standard cubic foot.

The Army intends to develop performance standards for the system hood during the design and implementation phase of this IRA when more data is available concerning the specific equipment which is to be utilized for this IRA. The Army will coordinate this action with the other Organizations and the State.

Other standards for total organic destruction efficiency and opacity are discussed in section 8.4, action-specific ARARs.

8.3 LOCATION-SPECIFIC ARARS

Location-specific requirements set restrictions on activities, depending on the characteristics of the site or the immediate environment, and function like action-specific requirements. Alternative remedial actions may be restricted or precluded, depending on the location or characteristic of the site and the requirements that apply to it.

Paragraph 44.2 of the Federal Facility Agreement provides that "wildlife habitat(s) shall be preserved and managed as necessary to protect endangered species of wildlife to the extent required by the Endangered Species Act (16 U.S.C. 1531 et seq.), migratory birds to the extent required by the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.), and bald eagles to the extent required by the Bald Eagle Protection Act, 16 U.S.C. 688 et seq."

While this provision is not an ARAR, the statutory requirements themselves are ARARs, applicable to this IRA and will be complied with. Based on where this treatment system is likely to be located the Army believes that this IRA will have no adverse impact on any endangered species or migratory birds or on the protection of wildlife habitats. Coordination will be maintained with the U.S. Fish and Wildlife Service to ensure that no such adverse impact arises from implementation of this IRA.

The Army considers relevant and appropriate and will comply with 40 CFR 6.302(a) and (b) concerning the location of this treatment system, avoiding the construction of such system in a manner the would have an adverse impact on wetlands or be within a flood plain.

The regulations at 40 CFR 230 were reviewed and determined not to be applicable within the context of this IRA because no discharge of dredged or fill material into waters of the United States is contemplated. Because these regulations address only the disposal of such materials into the waters of the United States, which is not contemplated, they are not considered to be relevant and appropriate to apply in the context of this IRA.

The regulations at 33 CFR 320-330 were reviewed and determined to be neither applicable nor relevant and appropriate because they address actions affecting the waters of the United States. No such actions are contemplated within the context of this IRA.

8.4 ACTION-SPECIFIC ARARS

8.4.1 Description

Performance, design, or other action-specific requirements set controls or restrictions on activities related to the management of hazardous substances, pollutants, or contaminants. These action-specific requirements may specify particular performance levels, actions, or technologies as well as specific levels (or a methodology for setting specific levels) for discharged or residual chemicals.

8.4.2 Construction of Treatment System

8.4.2.1 Air Emissions

The construction of an in-situ vitrification system does not involve significant excavation in the area on the M-1 Basins, providing very little potential for the generation of air emissions during construction. On the remote possibility that there may be air emissions during the course of the construction of this treatment system, the Army has reviewed all potential ambient or chemical-specific air emission requirements. As a result of this review, the Army found that there are, at present, no National or State ambient air quality standards currently applicable or relevant and appropriate to any of the volatile or semivolatiles chemicals in the ground water found in the area in which construction is contemplated.

In the context of this IRA, there is only a very remote chance of any release of volatiles or semivolatiles and, even if such a release did occur, it would only be intermittent and of very brief duration (because the activity that produced the release would be stopped and modified appropriately if a significant air emission, based upon specific standards contained in the Health and Safety Plan, was detected by the contractor's air monitoring specialist). The Army has significant experience with the construction of slurry walls, extraction and reinjection wells, which involve greater excavation than the construction of the treatment system contemplated by this IRA, and has not experienced any problems from air emissions during construction of such facilities. The site-specific Health and Safety Plan will adequately address these concerns. This plan to be developed for use in the IRA will detail operational modifications to be implemented in the event monitoring detects specific levels of such emissions.

The National Emissions Standards for Hazardous Air Pollutants (NESHAPS) were evaluated to determined whether they were applicable or relevant and appropriate to apply in the context of construction of this IRA. These standards were not considered applicable because they apply to stationary sources of these pollutants, not to construction activity. These standards were not considered relevant and appropriate because they were developed for manufacturing processes, which are significantly dissimilar to the short-term construction activity contemplated by this IRA.

The provisions of 40 CFR 50.6 will be considered relevant and appropriate. This standard is not applicable because it addresses Air Quality Control Regions, which are areas significantly larger than and different from the area of concern in this IRA. Pursuant to this regulation, there will be no particulate matter transported by air from the site that is in excess of 50 micrograms per cubic meter (annual geometric mean) and the standard of 150 micrograms per cubic meter as a maximum 24-hour concentration will not be exceeded more than once per year.

8.4.2.2 Worker Protection

The provisions of 29 CFR 1901.120 are applicable to workers at the site because these provisions specifically address hazardous substance response operations under CERCLA. It should be noted that these activities are presently governed by the interim rule found at 29 CFR 1910.120 but that by the time IRA activity commences at the site, the final rule found at 54 FR 9294 (March 6, 1989) will be operative. (The final rule becomes effective on March 6, 1990.)

8.4.2.3 General Construction Activities

The following performance, design, or other action-specific State ARARs have been preliminarily identified by the Army as applicable to this portion of the IRA and more stringent than any applicable or relevant and appropriate federal standard, requirement, criterion, or limitation:

- Colorado Air Pollution Control Commission Regulation No. 1, 5 CCR 1001-3, Part III(D)(2)(b), Construction Activities:

  a. Applicability -- Attainment and Nonattainment Areas

  b. General Requirement -- Any owner or operator engaged in clearing or leveling of land or owner or operator of land that has been cleared of greater than one (1) acre in nonattainment areas for which fugitive particulate emissions will be emitted shall be required to use all available and practical methods which are technologically feasible and economically reasonable in order to minimize such emissions, in accordance with the requirements of Section III.D. of this regulation.

  c. Applicable Emission Limitation Guideline -- Both the 20% opacity and the no off-property transport emission limitation guidelines shall apply to construction activities; except that with respect to sources or activities associated with construction for which there are separate requirements set forth in this regulation, the emission limitation guidelines there specified as applicable to such sources and activities shall be evaluated for compliance with the requirements of Section III.D. of this regulation. (Cross Reference: Subsections e. and f. of Section III.D.2 of this regulation).

  d. Control Measures and Operating Procedures -- Control Measures or operational procedures to be employed may include but are not necessarily limited to planting vegetation cover, providing synthetic cover, watering, chemical stabilization, furrows, compacting, minimizing disturbed area in the winter, wind breaks, and other methods or techniques.

- Colorado Ambient Air Quality Standards, 5 CCR 1001-14, Air Quality Regulation A, Diesel-Powered Vehicle Emission Standards for Visible Pollutants:

  a. No person shall emit or cause to be emitted into the atmosphere from any diesel-powered vehicle any air contaminant, for a period greater than 10 consecutive seconds, which is of

such a shade or density as to obscure an observer's vision to a degree in excess of 40% opacity, with the exception of Subpart B below.

b. No person shall emit or cause to be emitted into the atmosphere from any naturally aspirated diesel-powered vehicle of over 8,500 lbs gross vehicle weight rating operated above 7,000 feet (mean sea level), any air contaminant for a period of 10 consecutive seconds, which is of a shade or density as to obscure an observer's vision to a degree in excess of 50% opacity.

c. Diesel-powered vehicles exceeding these requirements shall be exempt for a period of 10 minutes, if the emissions are a direct result of a cold engine start-up and provided the vehicle is in a stationary position.

d. This standard shall apply to motor vehicles intended, designed, and manufactured primarily for use in carrying passengers or cargo on roads, streets, and highways.

- Colorado Noise Abatement Statute, C.R.S. Section 25-12-103:

a. Each activity to which this article is applicable shall be conducted in a manner so that any noise produced is not objectionable due to intermittence, beat frequency, or shrillness.

Sound levels of noise radiating from a property line at a distance of twenty-five feet or more there from in excess of the db(A) established for the following time periods and zones shall constitute prima facie evidence that such noise is a public nuisance:

Zone	7:00 a.m. to next 7:00 p.m.	7:00 p.m. to next 7:00 a.m.
Residential	55 db(A)	50 db(A)
Commercial	60 db(A)	55 db(A)
Light Industrial	70 db(A)	65 db(A)
Industrial	80 db(A)	75 db(A)

b. In the hours between 7:00 a.m. and the next 7:00 p.m., the noise levels permitted in subsection (1) of this section may be increased by ten db(A) for a period of not to exceed fifteen minutes in any one-hour period.

c. Periodic, impulsive, or shrill noises shall be considered a public nuisance when such noises are at a sound level of five db(A) less than those listed in Subpart (a) of this section.

d. Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority or, if no time limitation is imposed, for a reasonable period of time for completion of the project.

e. For the purpose of this article, measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than five miles per hour.

f. In all sound level measurements, consideration shall be given to the effect of the ambient noise level created by the encompassing noise of the environment from all sources at the time and place of such sound level measurements.

In substantive fulfillment of Colorado Air Pollution Control Commission Regulation No. 1, this IRA will employ the specified methods for minimizing emission from fuel burning equipment and construction activities. In substantive fulfillment of Colorado's Diesel-Powered Vehicle Emission Standards, no diesel motor vehicles associated with the construction shall be operated in manner that will produce emissions in excess of those specified in these standards.

The noise levels pertinent for construction activity provided in C.R.S. Section 25-12-103 will be attained in accordance with this applicable Colorado statute.

8.4.2.4 Wetlands Implications

Through estimation of the general area where any system would be located, the Army does not believe that any wetlands could be adversely affected. However, until a final design is selected and a final siting decision made, it cannot be definitively determined that no impact on wetlands will occur. If the final site selection and/or design results in an impact on wetlands, the Army will review the regulatory provisions concerning wetlands impact and other appropriate guidance, and will proceed in a manner consistent with those provisions. Coordination will be maintained with the U.S. Fish and Wildlife Service concerning any potential impacts on wetlands.

8.4.2.5 Land Disposal Restrictions and Removal of Soil and Debris

There are no action-specific ARARs that pertain to the excavation of soil during the construction of this treatment system which can be specifically identified at this time. In any event, very little such activity is contemplated by this IRA.

EPA is currently developing guidance concerning the Land Disposal Restrictions (LDR). While guidance is limited, the Army has not, at this time, made a determination that any materials subject to LDR will be present in the influent treated or soil removed by this IRA. More listings are scheduled to be completed prior to the implementation of this IRA and the Army will review these as they are released. If it is determined that a restricted disposal waste is present, the Army will act in a manner consistent with EPA guidance then in effect for the management of such within the context of CERCLA actions.

Soil removal from the area will be performed in accordance with the procedures set forth in the Task No. 32 Technical Plan, Sampling Waste Handling (November 1987), and EPA's July 12, 1985, memorandum regarding "EPA Region VIII Procedure for Handling of Materials from Drilling, Trench Excavation and Decontamination during CERCLA RI/FS Operations at the Rocky Mountain Arsenal." While not an ARAR, EPA's July 12, 1985 guidance memorandum applies to this action as a TBC. Soils generated by excavation during the course of this IRA, either at surface or subsurface, may be returned to the location from which they originated (i.e., last out, first in). Any materials remaining after completion of backfilling that are suspected of being contaminated (based on field screening techniques) will be properly stored, sampled, analyzed, and ultimately disposed as CERCLA hazardous wastes, as appropriate.

Hazardous waste resulting from construction activities will be managed in accordance with substantive Resource Conservation and Recovery Act (RCRA) provisions. These substantive provisions include but are not limited to: 40 CFR Part 262 (Subpart C, Pre-Transport Requirements), 40 CFR part 263 (Transporter Standards), 40 CFR Part 264 (Subpart I, Container Storage and Subpart L, Waste Piles) and any more stringent substantive provisions of comparable state regulations contained in 6 CCR 1007-3. The specific substantive standards applied will be determined by the factual circumstances of the accumulation, storage or disposal techniques actually applied to any such material.

As part of this IRA, some structures and remains of structures will be removed, resulting in debris. The Army will analyze this material to determine whether it is hazardous or subject to any restrictions concerning disposal. In managing and disposing of this material, the Army will act consistent with the EPA guidance then in effect concerning such material generated on CERCLA sites. Material determined to be hazardous will be managed and disposed of as discussed above.

8.4.2.6 Operation of Treatment System

As described in Section 6.0 of this document, the proposed treatment system will provide significant air pollution controls including a packed scrubber column and activated carbon adsorber.

The Army has identified the requirements of 40 CFR § 264.343 concerning the removal of organics as relevant and appropriate to apply as a performance standard for this IRA system. This requirement is not applicable because it specifically applies only to incinerators. In substantive fulfillment of this requirement, the IRA treatment system will be constructed to provide 99.99% destruction and removal of organics, as calculated from the total in the soil before treatment through the venting of treated air to the atmosphere. The complete process will be designed to attain this requirement.

The regulations contained in 40 CFR Parts 60 and 61, and the comparable State regulations were reviewed to determine whether any action-specific requirements were either applicable or relevant and appropriate to apply to this IRA treatment system. Chemical-specific determinations are discussed in Section 8.2, above. The processes discussed in those regulations were not considered sufficiently similar to the In Situ Vitrification process to make any action-specific provision relevant and appropriate to apply to this IRA. For example, Subparts F, I, Na and OOO of Part 61 were recommended for review by EPA in their comments on the Proposed Decision Document. These Subparts were reviewed and found to address very specific processes and to contain varying standards, indicating that the standards were developed specifically for the processes identified and were not appropriate to apply to other processes which are not extremely similar to the identified process. The primary focus of these provisions is on particulate emissions and opacity. The Army has identified a particulate emission standard for this IRA of 0.08 grams per dry standard cubic foot based on the incineration standard, as noted in Section 8.2, above. The Army considers the opacity standard contained in Colorado Air Pollution Control Regulation No. 1, Section II, as relevant and appropriate to apply to this IRA. Accordingly, the emissions from this IRA treatment system will not exceed 20% opacity.

8.2.4.7 Management of Vitrified Soil

The vitrified soil will remain, pending determination of final remedial action in the ROD for the On Post Operable Unit. During this period, the extensive Endangerment Assessment and Feasibility Study processes underway for the On Post Operable Unit will be used to evaluate the need for and type of further action appropriate for the vitrified soil. These processes will address most of the matters contained in 40 CFR Part 264, Subpart X. The Army will comply with the substantive requirements of 40 CFR §§ 264.15, 264.33,

264.75 and 264.77 during the period of management of the vitrified soil while final remedial action is undergoing development.

The Army will comply with the substantive requirements of 40 CFR § 264.97 in conducting groundwater monitoring in the area of the M-1 Settling Basins in order to monitor the effectiveness of the vitrification process and determine any impacts on area groundwater from the vitrified mass.

8.4.2.8 Soil Treatment and Disposal

These proposed remedial actions do not include the possibility for onsite or offsite disposal of soils, debris or contaminated material excavated pursuant to this IRA, except those that may be generated from the construction activities discussed above.

8.5 COMPLIANCE WITH THE OTHER ENVIRONMENTAL LAWS

As is evident from the various portions of this document, this IRA was prepared in substantive compliance with 40 CFR 1502.16 (the regulations implementing the National Environmental Policy Act of 1969).

9.0
SCHEDULE

The Draft Implementation Document is scheduled for completion on 28 December 1990. The construction schedule will be contained in the Draft Implementation Document for this Interim Response Action (IRA). This milestone has been developed based upon the Final Assessment Document and the assumption that no dispute resolution will occur. If events that necessitate a schedule change or extension occur, the change will be incorporated in accordance with the Federal Facility Agreement.

10.0 CONSISTENCY WITH THE FINAL REMEDIAL ACTION

The Federal Facility Agreement states that all Interim Response Actions (IRAs) shall "to the maximum extent practicable, be consistent with and contribute to the efficient performance of Final Response Actions" (paragraph 22.5).

The alternatives assessment criteria (WCC 1989) were used to evaluate the alternatives. The selected alternative, by providing significant interim remediation of a source of contamination, will be consistent with any Final Response Action.

11.0 REFERENCES

D. P. Associates, Inc. 1986. October. Rocky Mountain Arsenal, Geohydrology Chemical Data: 1979-1985, Volume 5 (Sections 34-36).

RMA Data Base. August 11, 1989.

Ebasco Services, Inc. 1988. September. Final Phase I Data Presentation Report, Army Spill Sites, South Plants Manufacturing Complex, Task No. 24, Version 3.2. RIC 88286R10.

GeoSafe Corp. 1989. 31 August. Treatability Test Report for Application of In Situ Vitrification Technology to Pesticide-, Arsenic-, and Mercury-Contaminated Soils from the M-1 Ponds Site of Rocky Mountain Arsenal, Colorado.

Woodward-Clyde Consultants. 1989a. Final Alternative Assessment of Interim Response Actions for Other Contamination Sources M-1 Settling Basins.

Woodward-Clyde Consultants. 1989b. Final Results of Field and Laboratory Investigations Conducted to Evaluate Interim Response Actions for Other Contamination Sources.

APPENDIX A
COMMENTS AND RESPONSES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2405

Bruce

Ref: 8HWM-SR DEC 27 1989

Mr. Donald L. Campbell
Office of the Program Manager
Rocky Mountain Arsenal
ATTN: AMXRM-PM
Commerce City, Colorado 80022-2180

Re: Rocky Mountain Arsenal (RMA) Proposed Decision Document for the Interim Response Action at the M-1 Settling Basins, November 1989.

Dear Mr. Campbell:

We have reviewed the above referenced report and have the enclosed comments. We have several major concerns with the status of this IRA. These include, but are not limited to: the need to carefully evaluate the potential of dewatering as a cost-effective approach to assist the implementation of the in-situ vitrification process; the depth to which the process will reach; the selection of air ARARs; the need for a risk analysis on any emissions from around the hood, and further air pollution control devices to ensure protection of human health and the environment; the need for selection of an ARAR as a performance standard for the operation of the hood; the need for a monitoring system for both air and groundwater; the need to specify the fate and ARARs for structures now on a portion of the M-1 Basins; and the potential need for further testing of the selected process. We encourage discussion with the RMA parties before preparation of the next version of the Decision Document.

Extensive revisions to address our concerns may result in a need to reissue the Proposed Decision Document or otherwise modify the schedule for the Draft Final Decision Document.

Please contact Linda Jacobson at (303) 294-7093, if you have questions on this matter.

Sincerely,

Connally Mears

Connally Mears
EPA Coordinator for RMA Cleanup

Enclosure

RMA 89-1895 1/2

cc: Col. Dan Voss, RMA-PMO
J. D. Smith, RMA-PMO
Jeff Edson, CDH
David Shelton, CDH
Brad Beckham, CDH-Air
John Clouse, CDH-Air
Vicky Peters, CAGO
Lt. Col. Scott Isaacson
Chris Hahn, Shell
George Role, Shell
Robert Foster, DOJ

RESPONSE TO COMMENTS FROM THE EPA ON THE PROPOSED DECISION DOCUMENT FOR THE M-1 SETTLING BASINS NOVEMBER 1989

Comment 1: The groundwater elevation has been estimated on Figure 2-2, yet the saturated thickness of alluvium with seasonal variations, which affects several alternative actions, is not discussed.

Response: The text has been revised to discuss this point (Section 2.0). Figure 2-2 has been revised. The groundwater elevations have been removed since they are not relevant to the location map.

Comment 2: The subsurface barrier for the "Slurry Wall and Cap" alternative would extend about five feet into the Denver Formation; whereas, the slurry wall for the in situ vitrification (ISV) would extend only two feet into the Denver Formation. This difference should be explained.

Response: The subsurface barrier for in situ vitrification is intended to serve only as a temporary hydraulic barrier during the ISV process, rather than as a contaminant containment system. The Proposed Decision Document stated that the subsurface barrier would be constructed to 15 feet below ground surface. However, because of comments from the EPA and the State, the Army has agreed to construct the subsurface barrier for the ISV alternative to be keyed into the Denver Formation. The contact between the Denver Formation and the alluvium is between 11 and 19 feet below ground surface in this area. Exact installation depth for the subsurface barrier will be determined during design.

Comment 3: Section 4.9, Conclusions, the text does not mention the requirement for a slurry wall for the In-Situ Vitrification Alternative. Section 4.6, In-Situ Vitrification, and Section 6.0, Summary of the Interim Response Action, do not discuss the reasons for a slurry wall. The slurry wall has at least two benefits, which should be mentioned in the text: 1) it provides a barrier for dewatering the mass to be vitrified (dewatering is usually less expensive than removing the water as steam during vitrification) and 2) it provides a long term barrier against leaching of contaminants away from the vitrified mass.

Response: Subsection 4.6 and Section 6.0 both discuss the fact that the subsurface barrier is constructed to temporary hydraulic barrier to isolate the site from the surrounding aquifer. Subsection 4.9 discusses the reasons ISV is the preferred alternative and does not address specific implementation steps for this alternative.

Dewatering is not anticipated to be necessary for this alternative. The vitrification process produces an inert glass. It is not necessary to provide a long-term barrier because contaminants will not leach from this glass. A toxic characteristic leach procedure (TCLP) test was performed on the vitrified soil using the grind and sieve method rather than the monolith method. The glass

passed the TCLP test for both arsenic and mercury, which are the more difficult metals to immobilize (GeoSafe Corp. 1989).

Comment 4: The cost of melting a unit weight of soil is approximately equal to the cost of removing the same unit weight of water as steam; therefore, the installation of the slurry wall in combination with dewatering wells, possibly with some blind wells or "wicks" through the sludge may be the most economical design. If dewatering is used, the water will require treatment; however, if the slurry trench is properly installed and keyed adequately into the Denver Formation, the water requiring treatment will be minimized. The dewatering option should be carefully evaluated before release of the Draft Final Decision Document, especially since the depth of contamination extends into the saturated zone.

Response: The melt will be maintained to a minimum depth equal to the bottom of the sludge material. If the groundwater table exists below the bottom of the sludge material during operation, the melt may be allowed to extent to a maximum depth equal to the groundwater table elevation. The Army does not intend to attempt to vitrify saturated soils beneath the M-1 Settling Basins, nor does it intend to dewater the aquifer for purposes of vitrifying soils beneath the M-1 Settling Basins. The exact depth of the melt will be determined during the design and implementation of this IRA.

Comment 5: Final design of any slurry trench at this site should be based on a few additional geotechnical borings with continuous sampling across the Denver Formation contact in combination with cone penetration tests (correlated to the borings) along the alignment of the wall to accurately establish the penetration requirements of the slurry wall into the Denver Formation.

Response: These recommendations will be considered during the design of this IRA.

Comment 6: The Decision Document does not specify the depth to which the M-1 Settling Basis will be vitrified under the preferred alternative. The Decision Document needs to specify that vitrification will be performed to a depth below the depth of known contamination. If all the contaminants were not vitrified, the results would be a glass cap over the contaminated soils, which is not acceptable since it would not be consistent with a final cleanup remedy, since it would leave a continued source of contamination basically inaccessible to further remediation. A sound scenario must be developed to ensure the source of contaminants will be remediated.

Response: The text has been revised to specify that vitrification will be performed at least to the bottom of the basins. If the groundwater table is below the bottom of the basins, the melt may extend to a maximum depth equal to the groundwater table elevation. The exact depth will be determined during the design and implementation of this IRA.

Comment 7: The preferred alternative of In-Situ Vitrification has aspects which are similar to incineration alternatives. As such, the Decision Document needs to specify the actions to be taken to prevent emissions of organics or metals to the atmosphere. The Decision Document should specify the

destruction and removal efficiencies to be achieved during the implementation of the preferred alternative.

The quantity of mercury that may be emitted from the sludge could be as great as 40 tons, although that represents less than 0.5% of the sludge mass (page 2-17 of the Alternatives Assessment). The Decision Document should address the vaporization and condensation of available mercury and arsenic (there is apparently 700 tons of arsenic in the sludge), whether or not the existing-design offgas control system can handle the estimated quantities and whether or not estimated quantities should be considered "traces" (On page 6-1, third paragraph, the text describes them as "trace contaminants", while the fourth paragraph says they will be "elevated").

There should be extensive information and operating requirements on the hood performance specified to ensure that the contaminants are captured through the system and do not escape from around the hood, etc. The performance of the hood should be analyzed for the ability to comply with opacity, VOCs, NESHAPs, etc. ARARS. There should be a risk analysis performed regarding any escaping contaminants from the hood and the air pollution control devices so health-based emissions limits can be derived. (See specific ARARs comments below.)

Response: The Army agrees that these issues are important and will need to be addressed during the design phase of this IRA. However, these issues do not preclude the selection of ISV as the preferred alternative at this site.

A risk analysis for the processes involved in this IRA will be performed.

Comment 8: The proposed site remedy, in-situ vitrification, is likely to be at least a significant part of the permanent remedy for the M-1 Settling Basins themselves (but not the resulting plume). The public should be made aware of that. This is a source destruction and immobilization alternative which does not address the existing plume, but if employed would reduce the potential of further groundwater impacts.

Response: ISV will result in destroying the contaminants in the M-1 Settling Basins or permanently immobilizing contaminants in an inert glass. The final Onpost Record of Decision (ROD) will determine whether this inert glass can be left in place and considered a final remedy for the M-1 Settling Basins, or whether some additional action is required. Groundwater contamination will be addressed in the final ROD.

Comment 9: The final Record of Decision will have to address the Army's plans for the vitrified mass after completion of the action.

Response: Agreed.

Comment 10: The Decision Document needs to establish a comprehensive monitoring program for both air and groundwater emissions, the objectives of which include the following:

- what long-term restrictions (institutional controls) may have to be placed on the vitrified mass;

- whether the IRA action is indeed a final action;

- whether the IRA is operating successfully;

- whether there is any change or impact to regional groundwater flow.

Such issues will have to be decided in the final Record of Decision and revisited during the mandatory post-ROD five-year reviews, as well.

Response: The groundwater and air monitoring program will be established during the design of this IRA. The objectives suggested by the EPA will be taken into consideration at that time. The Army agrees that these issues will be revisited during the mandatory post-ROD five-year reviews.

Comment 11: Results of Field and Laboratory Investigations Conducted for the Remediation of Other Contamination Sources IRAs, November, 1989, stated there are currently structures located on the M-1 Settling Basins. No other information was presented on this fact in other documents on this IRA. It is necessary to fully discuss these structures and their treatment relative to the ISV process. The ARARs regarding the treatment of these structures must appear in the subsequent decision document.

Response: The structures referred to include several large tanks in a concrete bermed area on the east basin. These structures will be relocated before implementation of the ISV process The Draft Final Decision Document was revised to discuss relocation of these structures (Section 6.0). Specific procedures for relocation will be part of the implementation document. The ARARs regarding these structures are discussed in the revised Decision Document.

Comment 12: In conclusion, ISV technology is classified by EPA as an innovative technology: one that has been developed to large-scale and is ready for commercial deployment, but for which there is not a significant commercial experience base. It is necessary to thoroughly evaluate all aspects of ISV applicability for a specific site prior to commitment to large-scale operation. Geosafe recommends that treatability testing be performed as an important part of the applicability evaluation. The objectives of the treatability testing include generation of specific operational performance data needed to support operating parameters/compliance efforts and generating of data to support community relations efforts. Depending on the results of the treatability testing, Geosafe may determine that demonstration testing is also advisable.

The RMA parties need to discuss the potential of further treatability testing and demonstration testing to determine emissions of arsenic and mercury and to revise the risk analysis of this cleanup alternative for the M-1 basins.

Response: Two treatability tests have been successfully performed on the M-1 Settling Basins sludge. Results of these tests have been discussed with and distributed to the Organizations and the State. Results show that ISV is an effective treatment process for the M-1 Settling Basins sludge.

The Army has agreed to perform a demonstration test immediately prior to implementation. The Army will keep the Organizations and the State informed during this additional testing.

SPECIFIC COMMENTS

Comment 1: P. 8-1 Depending on what is later to be done with the vitrified mass, there are possible standards in 40 CFR, Part 264, including Subpart X, that could be utilized for monitoring or analysis of the process.

Additionally, there is no specific dewatering scenario set for the in the discussion. Due to the presence of arsenic, the dewatered liquids could be handled by the CERCLA Wastewater Treatment System.

Response: Condensate from the hood of the in situ vitrification treatment system and any other liquids generated by this IRA will be handled by the CERCLA Wastewater Treatment System.

Comment 2: P. 8-3 We disagree with the statement that there are no air ARARs. NESHAP levels for arsenic and mercury are relevant and appropriate. The remedial action will include a stationary point source of air emissions from the vent exhaust and may involve fugitive emissions escaping the hoods.

The Proposed Decision Document indicates that the waste material in the M-1 Basins are 8% arsenic and 0.5% mercury. If we estimate that the sludge weighs 2700 lb/yd^3 and there are 6,400 yds. of sludge at 8% arsenic and 0.5% mercury, there are potential emissions (assuming that everything is emitted within a 1 year time frame) of 43 tons of mercury and 700 tons of arsenic within a one year period.

The NESHAP regulations permit emissions of only approximately 3,000 g/day of mercury from mercury smelters, chloralkali plants, and sewage sludge incinerators/dryers. Potential emissions from the ISV before controls is approximately 100,00 grams/day if spread over a one year period. Since the operation will be done in less than one year, the control efficiency for mercury must be greater than 97% if emissions are not to exceed those required by the NESHAP. Control efficiency should be discussed in the documents.

The Arsenic NESHAP regulation for glass manufacturing limits emissions to approximately 900 lb/year or >85% control. The approximate quantity of arsenic to be dealt with by the ISV operation is approximately 1,400,000 lb/yr. Assuming 90% is retained in the melt, potential emissions are approximately 140,000 lb/yr. To reduce these emissions below 900 lb/yr, >99%

control efficiency would be necessary. Control efficiency and melt retention of arsenic should be discussed in the documents.

Since the NESHAP regulations are concerned with these levels of emissions, one might expect that greater emission levels of arsenic and mercury might threaten public health in the area. The ISV cleanup of the M-1 basins has potential for such emissions and yet these were not considered in the selection process. A risk analysis of the air emissions should be considered in the selection of the cleanup alternative to ensure all emissions limitations protect human health and the environment.

Response: The arsenic NESHAPS for glass manufacturing is identified as relevant and appropriate in the Final Decision Document. The State standard, outlined in 5 CCR 1007-3 Regulation 8 for mercury is also identified as relevant and appropriate.

Comment 3: P. 8-3, first paragraph, this paragraph seems to be a "boilerplate" statement. It is not accurate with regard to NAAQS applying to Air Quality Control Regions which are dissimilar to this IRA area, and with regard to applicability to large air masses. See previously agreed to language for past IRAs.

Response: This section has been revised to reflect the Army's determination that NAAQS standards are neither applicable nor relevant and appropriate to apply to a specific emissions source such as this treatment system.

Comment 4: P. 8-3, 2nd paragraph, Assuming that the 40 CFR Parts 60 and 61 regulations were developed to prevent ambient air concentrations of mercury and arsenic (thereby to protect public health), these ambient concentration standards need to be reanalyzed as potential ARARs. The appropriate background documents need to be reviewed to determine the mercury and arsenic concentrations which may have been the goals behind these regulations.

The CERCLA Compliance with Other Laws Manual (EPA/540G-8/009) on pages 2-5 and 2-6 list NESHAP emission rates for mercury and arsenic. These rates, while applicable to mercury smelters, chloralkali plants, sewage sludge incinerators/dryers or glass manufacturing, show a concern by EPA for emissions of mercury and arsenic. Potential emissions from the ISV remediation could be far greater than these NESHAP emission rates and therefore may have the potential for exceeding the goal ambient concentrations behind the NESHAP regulations. The NESHAPS rates should be selected as relevant and appropriate standards for the ISV process, unless heath-based standards are more stringent.

Response: See response to EPA's Specific Comment No. 2.

Comment 5: Page 8-4 The report does not recognize that emissions from the in-situ vitrification process could be subject to "Action-Specific ARARs". The report discusses construction type emissions and ignores emissions resulting from the operation of the vitrification process.

Response: The Final Decision Document addresses emissions from the operation of the in situ vitrification process under action-specific ARARs. This information can be found in the Operation of Treatment System Section of the Action-Specific ARARs. Chemical-specific ARARs are also selected. See Response to EPA's Specific Comment No. 2.

Comment 6: Page 8-4, Section 8.4, An ARAR(s) needs to be selected in the Draft Final Decision Document that will be the standard of performance for the capture efficiency of the hood. The parties need to discuss as potential ARARs: the AQCR Regulation No. 1, Section II, Smoke and Opacity, and EPA's Ne Source Performance Standards for relevant and appropriate subparts, such as NSPS, Part 60, Subpart I, Hot Mix Asphalt, 60.92(a)2; Subpart F, Portland Cement, 60.62(b) (2); and Part 60, Subpart Na, Standards of Performance for Secondary Emissions from Basic Oxygen Process Steel-making, 60.142(a)(1), fugitive emission control, 10% opacity; and Subpart 000, Standards of Performance for Nonmetallic Mineral Processing Plants.

Response: The Final Decision Document addresses ARARs for the capture efficiency of the IRA treatment system.

Comment 7: Page 8-5, second paragraph, this canned statement may be appropriate for the construction phase of this IRA. However, it is irrelevant to the operation of the process since the process cannot be shut down quickly and involves heating of soils, not installation of wells.

Response: This paragraph only addresses the construction phase of this IRA and the related excavation of material and is contained in that section of the document. The treatment system will be designed to prevent the emission of 99.99 percent of the organics in the ground at the beginning of the treatment process. Air pollution controls include a packed scrubber column and activated carbon absorber.

21 Dec 89
10:35
akp

Shell Oil Company

One Shell Plaza
P.O. Box 4320
Houston, Texas 77210

December 19, 1989

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-PM: Mr. Donald L. Campbell
Rocky Mountain Arsenal, Building 111
Commerce City, Colorado 80022-2180

Dear Mr. Campbell:

Enclosed herewith are Shell Oil's comments on the Proposed Decision Document for the Interim Response Action at the M-1 Settling Basins, November, 1989, Version 2.0. Shell's comments on ARAR's are being sent under separate cover.

Sincerely,

R. D. Lundahl
Manager Technical
Denver Site Project

/ajg

Enclosure

cc: (w/enclosure)
Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-PM: Col. Daniel R. Voss
Bldg. E-4460
Aberdeen Proving Ground, MD 21010-5401

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-RP: Mr. Kevin T. Blose
Rocky Mountain Arsenal, Building 111
Commerce City, CO 80022-2180

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-IA: Mr. Bruce M. Huenefeld
Rocky Mountain Arsenal, Building 111
Commerce City, CO 80022-2180

BRHM8935202 - 0001.0.0

RMA 89-1852 1/2

cc: Mr. Bradley S. Bridgewater
Department of Justice
c/o Acumenics Research & Technology
999 18th Street
Suite 501, North Tower
Denver, CO 80202

Department of the Army
Environmental Litigation Branch
Pentagon Room IC480
ATTN: DAJA-ELL: Major Lawrence E. Rouse
Washington, DC 20310-2210

Victoria L. Peters, Esq.
Assistant Attorney General
CERCLA Litigation Section
1560 Broadway, Suite 250
Denver, CO 80202

Mr. Robert L. Duprey
Director, Hazardous Waste Management Division
U.S. Environmental Protection Agency, Region VIII
One Denver Place
999 18th Street, Suite 500
Denver, CO 80202-2405

Mr. Connally Mears, 8HWM-SR
EPA Coordinator for Rocky Mountain Arsenal
US EPA, Region VIII, Superfund
999 18th Street, Denver Place, Suite 500
Denver, CO 80202-2405

Mr. Thomas P. Looby
Assistant Director
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220

Mr. Jeff Edson
Hazardous Materials and Waste Management Division
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220

RESPONSE TO COMMENTS FROM SHELL OIL COMPANY ON PROPOSED DECISION DOCUMENT FOR THE INTERIM RESPONSE ACTION AT THE M-1 SETTLING BASINS VERSION 2.0, NOVEMBER 1989

GENERAL COMMENT

Comment 1: In Shell's opinion, data presented in the recently issued report[1] describing 1989 laboratory and field investigations of the M-1 Settling Basins fail to validate the undocumented conclusion used by the Army in preparing the Alternative Assessment that this site is an active source of arsenic contamination[1]. Although elevated concentrations of arsenic were detected in wells immediately downgradient of both the M-1 and Lime Settling Basins, arsenic concentrations decline very rapidly short distances downgradient of these wells. Since these basins have existed since 1942, the data suggest that arsenic, in the form present in the basins is relatively immobile. Studies[2] in the literature on arsenic mobility support that certain inorganic species of arsenic are essentially immobile in soil.

Even if the M-1 Basins are considered an active source, because of the very slow movement of arsenic it seems unlikely that a long term technical or cost benefit would be gained by conducting an interim response action at this site. Shell urges the Army to reconsider whether any action other than Monitoring/Maintenance would be appropriate, i.e., is the site an active source and, if so, specifically what benefit(s) would be expected from an interim response action? Pursuant to the Decision Flow Chart, Monitoring/Maintenance is the appropriate action if either the site is not an active primary source, data are inadequate to determine whether it is an active source, or there is no clear identifiable benefit from conducting an interim response action.

Notwithstanding the above, Shell has the following comments on the evaluation of alternatives as presented in the Proposed Decision Document.

Although in-situ vitrification may be an applicable technology for a remedial response action at this site, Shell believes that, based on Federal Facility Agreement and CERCLA guidelines, the Slurry Wall with Cap alternative is clearly the better choice of the two for

---

[1]"Results of Field and Laboratory Investigations conducted for the Remediation of Other Contamination Sources Interim Response Action November, 1989, Version 2.0. This report, which was issued concurrently (November 27, 1989(with the Proposed Decision Document, presents studies on which the Army concluded in the Alternative Assessment Document that this site is an active source.

[2]See Shell's comments, dated December 19, 1989, to D. L. Campbell, on the report listed in footnote No. 1.

an interim response action, if more than monitoring/maintenance between the two is deemed necessary.

The Slurry Wall with Cap alternative fully satisfies the IRA objective of mitigating the release of contaminants from this site. Thus, it is protective of human health and the environment. The other threshold criteria, compliance with ARARs, should not be a problem because of the relative simplicity of, and experience with, the technologies involved. It scores much higher than the In-situ Vitrification alternative on implementability with respect both to timing and ease of implementation. Slurry Wall with Cap also scores higher on short-term effectiveness because of much lower potential for emissions and no residual treatment wastes.

A major cost component of Slurry Wall with Cap if the slurry wall, which is a common element in both alternatives. Thus, a major portion of the cost of this alternative is compatible with in-situ vitrification or other technology alternatives requiring a slurry wall if they were applied to this site as a final response action.

Shell encourages continued development of in-situ vitrification for possible application to this and other RMA sites. It believes, however, that implementation of this technology in the framework of an IRA at the M-1 Settling Basins is unnecessary since the Slurry Wall with Cap alternative meets the IRA objective and guidelines, is compatible with possible future use of in-situ vitrification technology, and at less than a fifth of the estimated cost (with substantially greater upside cost risk associated with in-situ vitrification). Further, carrying the in-situ vitrification technology forward in the FS, rather than as an IRA, will ensure consistency with final response actions (e.g., will the block of vitrified residue be compatible with other response actions and with land use?). In addition this technology, which has not yet been applied commercially, entails potential risks which clearly could be better managed in the context of the final remedy. These risks relate to potential emissions from the work site and downstream emission control systems and the residual wastes produced.

Shell believes that because of these potential risks and limited commercial experience with this technology, implementation of the in-situ vitrification alternative would entail substantially greater time and cost than envisioned by the Proposed Decision Document.

Response: Based on available data, the M-1 Settling Basins appear to be an active source of arsenic contamination to the groundwater. The Army agrees that the arsenic appears to be attenuating rapidly. However the M-1 Settling Basins are a highly concentrated, well-defined area of contamination. The groundwater table apparently intersects this contamination during parts of the year. There is a benefit in performing an IRA at this site to eliminate the contact of the groundwater with this highly contaminated source. There is also a benefit in performing treatment instead of containment because the area is well-defined, and the treatment process chosen for this IRA is one of the few appropriate treatment processes for the combination of contaminants at this site (high concentrations

of metals, pesticides in surface soils, and the possible presence of Army agents or agent degradation products).

The Army acknowledges that the slurry wall and cap alternative would meet the objective of mitigating the release, and be easier and less costly to implement. However, ISV will also satisfy technology investigation objectives of the Feasibility Study. Although not required by the Federal Facility Agreement, the Army is choosing to coordinate the "hot spots" IRA with the Feasibility Study. Several potential benefits of this coordination exist, which the Army believes justify the additional costs. Primarily, the benefits the Army sees are potential application at other sites and the potential that ISV of the M-1 Settling Basis might be considered a final remedy by the final Onpost ROD. For this reason and the reasons stated above, the Army is committed to pursuing the design and implementation of ISV as the IRA for the M-1 Settling Basins.

ISV will result in permanently immobilizing the contaminants in the M-1 Settling Basins in an inert glass. The Record of Decision (ROD) will determine whether this inert glass can be left in place and considered a final remedy for the M-1 Settling Basins, or whether some additional action is required.

SPECIFIC COMMENTS

Comment 1: Page 2-1, first paragraph.

In the last sentence, the time period between 1947 and 1982 applies to the manufacturing period, not the lease period.

Response: The text has been changed.

Comment 2: Page 2-4, last paragraph.

Shell Oil Company is a signatory of the Federal Facility Agreement.

> "The Federal Facility Agreement specifies 13 Interim Response Actions (IRA's) determined to be necessary and appropriate."

However, for the Remediation of Other Contamination Sources IRA, the Federal Facility Agreement states that "This action consists of assessment and, as necessary, the selection and implementation of an IRA for the . . . M-1 Settling Basins . . ." (Article 22.1(1); emphasis added).

Response: The Army interprets the FFA's definition of an IRA to be the process which consists of assessment and, as necessary, the selection and implementation of an interim action. Therefore, assessment of the 13 IRAs is necessary, but implementation of an interim action may or may not be necessary, as determined by the assessment for this site.

The Army conducted the IRA Alternatives Assessment of the M-1 Settling Basins and has determined that the interim action alternative chosen for implementation is necessary and appropriate.

Comment 3: Page 4-1, 4.0 Interim Response Action Alternatives.

Alternatives

Although long-term effectiveness is less important for an interim response action than for a final response action, this criterion seems to receive major emphasis in these summaries, whereas short-term effectiveness (e.g., impact on workers and the community) is hardly mentioned.

Response: The text has been changed to provide a more balanced summary of the detailed evaluation presented in the IRA Alternatives Assessment for the M-1 Settling Basins (WCC 1989a).

Comment 4: Page 4-2, 4.4 Slurry Wall with Cap.

The multilayered cap described for inhibiting surface infiltration is far more complex than is necessary for short-term use. A contoured, low-permeability layer of clay plus a vegetative cover would substantially reduce infiltration.

Response: The cap described in this section is for evaluation purposes only. The Army agrees that a less complex cap may be appropriate for this site. Cap specifications would be considered further in the design and implementation phase of this IRA if this alternative was chosen.

Comment 5: Page 4-3, 4.6 In-situ Vitrification

"This is a technically feasible alternative that destroys the organic contaminants . . ."

Some organics will be carried away in the offgas, and their fate will depend on the downstream control technologies employed.

Response: The offgas treatment system will be designed to capture and address any organic contaminants not destroyed by the ISV process.

Comment 6: Page 4-4, 4.9 Conclusions.

As discussed under General Comments, on the basis of results of the 1989 field and laboratory investigations, the Army should reconsider the Monitoring/Maintenance alternative.

Response: See response to Shell's General Comment No. 1.

Comment 7: Page 5-1, 5.0 Chronology of Events.

Reference to the report issued on 1989 field investigations should be included in this chronology.

The entry for February 1988 should be deleted, because it is outside the process prescribed by the FFA. See paragraph 22.7 of the FFA. If the entry is to be retained, a date should be provided for the request, so that the Organizations may verify that such a request was in fact made. The March 7, 1989 letter from David L. Anderson to Edward J. McGrath includes a summary of the status of various requests for ARAR identifications, but does not mention any request in connection with this IRA.

Response: The text has been changed to include reference to the field and laboratory report. The entry for February 1988 has been deleted.

Comment 8: Page 6-1, first paragraph.

See specific comments 3 and 5.

Response: See responses to Shell's Specific Comment Nos. 3 and 5.

Comment 9: Page 6-1, second paragraph.

Since the contamination zone extends below the groundwater table, wouldn't a dewatering step be required? If so, treatment and disposal of groundwater would be necessary.

> "Most of the arsenic and the other metals will be incorporated into the glass. All of the mercury and possibly some arsenic will be vaporized and subsequently condensed in the offgas treatment system."

These two sentences are contradictory with respect to mercury. Based on the relatively high volatility of most arsenic compounds, volatilization of the arsenic present is possible. Determination of arsenic fate should be a key objective of the treatability study.

Response: The melt will be maintained to a minimum depth equal to the bottom of the sludge material. If the groundwater table exists below the bottom of the sludge material during operations, the melt may be allowed to a maximum depth equal to the groundwter table elevation. The Army does not intend to attempt to vitrify saturated soils beneath the M-1 Settling Basins nor does it intend to dewater the aquifer for purposes of vitrifying soil beneath the M-1 Settling Basins. The exact depth of the melt will be determined during the design and implementation of this IRA.

The text has been changed to state that "most of the arsenic and the heavy metals will be incorporated into the glass. Most of the mercury and some of the arsenic will be vaporized . . ." Determination of arsenic fate was a key objective of the treatability study.

Comment 10: Page 6-1, third paragraph.

In addition to toxic metals, it should be noted that the sludge, soil and groundwater in and near the M-1 Basins contain some highly oderiferous compounds. The ability of a vacuum hood with redundancy to constantly capture essentially all of the offgas would need to be carefully considered.

Why is a glycol system for condensing offgas specified at this time? Why is indirect condensation specified at this time (versus, for example, quench cooling)? These specifications are unnecessary at this time and should be left for design decisions.

Response: The vacuum hood will be designed to capture essentially all of the off-gas. The glycol cooling system is a standard integral part of the proprietary process. Indirect condensation was referenced since it was the control method used during treatability testing. However, other methods can be reviewed during design.

Comment 11: Page 6-1, fourth paragraph.

> "Any sludge generated in the wastewater treatment will be added to unvitrified soil/sludge for subsequent vitrification."

It is unnecessary and, since the wastewater treatment will be determined during pilot testing, premature to make this statement. For example, if constituents in the recycled sludge partition strongly to the offgas, they will merely recycle.

Treatment and disposal of scrubber effluent would also have to be dealt with during design.

Response: This statement has been removed from the text. Treatment and disposal of scrubber effluent will be addressed during design.

Comment 12: Page 7-1.

Paragraphs 2. and 3. should be eliminated, because they do not apply to the M-1 portion of the "Hot Spots" IRA.

Response: These paragraphs have been deleted.

Comment 13: Page 7-1, paragraph 4.

To conform to paragraph 22.7 of the FFA, replace "The Army, Shell, and State are given the opportunity to identify, on a preliminary basis," with "The Organizations and DOI shall have the opportunity to participate, at the RMA Committee level, in the identification and selection of."

Response: The text has been changed.

Comment 14: Page 8-2, fifth paragraph.

> "... this interim response action, which is not intended to be ... a final response action ..."
>
> In-situ vitrification should be considered only if such treatment can reasonably be expected to constitute the final response action for this site. It would be very difficult and costly to conduct a further remedial action on a large block of embedded vitrified soil/sludge.

In addition to arsenic and mercury, some organic compounds would also be present in liquid effluent.

Response: It would be possible to consider ISV a final remedy. However, the final disposition of the vitrified soil/sludge will be determined by the Onpost Record of Decision (ROD).

Comment 15: Page 8-3, second paragraph.

In the penultimate line of this paragraph, Section 3 should probably be 8.4.

Response: The text has been changed.

Comment 17: Page 8-4, last paragraph.

> "The construction of an in-situ vitrification system does not involve significant excavation in the area on the M-1 Basins, providing very little potential for the generation of air emissions during construction".

Installation of a slurry wall around this site, as proposed in the in-situ vitrification alternative, will involve substantial excavation into contaminated soil.

Response: The Army disagrees that the construction of the subsurface barrier has the potential to result in significant air emissions which could not be adequately monitored and controlled through the Health and Safety Plan for this IRA as is other construction activity. The narrow excavation necessary for installation of a barrier is very unlikely to result in large amounts of soil being exposed in a manner which would cause volatilization of compounds which may be present in those soils.

Comment 18: Page 10-1, last sentence.

See comment 6.

Response: See response to Shell's General Comment No. 1.

RESPONSES TO COMMENTS FROM SHELL OIL COMPANY ON THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE REMEDIATION OF OTHER CONTAMINATION SOURCES (M-1 SETTLING BASINS) INTERIM RESPONSE ACTION

Comment 1: Shell disagrees that the MCLs for arsenic and mercury are relevant and appropriate and apply at the point of discharge of treated liquid effluent. As stated by the Army, treatment utilized by or constructed for this IRA will not provide drinking water and will not be a public water system. Further, this IRA is not intended to be a comprehensive groundwater remedial action or final response action. MCLs, which are intended to protect drinking water at the tap, are irrelevant to this IRA. Nevertheless, Shell does not object to the concentration levels identified as ARAR levels ad operational criteria.

Response: The Final Decision Document reflects that liquids generated by this IRA treatment system will be treated by the CERCLA Wastewater Treatment System.

Comment: Shell questions why the Army cites Regulation 3, Section IV(D)(3)(a) as relevant and appropriate. The Army provides no discussion of which, or why, the PSD requirements are relevant and appropriate.

Response: The Final Decision Document has been revised in response to this comment.

Kay
29 Dec 89
1:30
pm

STATE OF COLORADO

COLORADO DEPARTMENT OF HEALTH
4210 East 11th Avenue
Denver, Colorado 80220
Phone (303) 320-8333

Roy Romer
Governor

Thomas M. Vernon, M.D.
Executive Director

December 27, 1989

Mr. Donald Campbell
Deputy Program Manager
Rocky Mountain Arsenal
AMXRM-PM, Bldg. 111
Commerce City, Colorado 80022-2180

Re: State Comments on Proposed Decision Documents for Other Contamination Sources - M-1 Settling Basins and Lime Settling Basins

Dear Mr. Campbell:

Enclosed are the State's comments on the above-referenced documents. In-situ vitrification (ISV) appears to be a good choice for the remediation of the M-1 Settling Basins. It should effectively reduce the toxicity, mobility, and volume of the contaminants and treat the organics and inorganics simultaneously. According to the M-1 Settling Basins Alternative Assessment document, the treatment can be implemented quickly to minimize further contamination of the groundwater.

The Lime Settling Basins may also be suitable for ISV. Although the Army has chosen to cap and build a slurry wall around the Lime Settling Basins as the Interim Response Action (IRA), this will not preclude the use of ISV (or other treatment methods) as the final treatment for these basins. Because ISV is a relatively unproven technology we approve of the Army's cautious approach in using the process at a small site (the M-1 Settling Basins), with the possibility of scaling up to the larger Lime Settling Basins, if shown to be successful.

A major concern not addressed in these Proposed Decision Documents is the arsenic and mercury contamination in the groundwater in the area of the M-1 and Lime Settling Basins. As the State has commented previously, the Army should explore treatment of inorganics in the groundwater prior to the final remedy, at the sources or at the Basin A neck groundwater intercept/treatment system.

Some of the comments being provided at this time are more relevant to the design and implementation stage of the IRAs. The State feels that by submitting these comments at this time, the Army may be better able to utilize them.

AMA 90-0003 1/2

If you have questions or wish to discuss these issues, please feel free to call me.

Sincerely,

Jeff Edson
RMA Project Manager
Hazardous Materials and
Waste Management Division

JTE:jmb
C:\WS2000\RMA\CAMPBEL3.LTR

Enclosures

cc: Michael Hope, Esq.
John Moscato, Esq.
Chris Hahn, Shell
Edward J. McGrath, Esq.
Connally Mears, EPA
Bruce Ray, EPA
Major Lawrence E. Rouse
Tony Truschel, GeoTrans

RESPONSE TO COMMENTS FROM THE STATE OF COLORADO ON THE PROPOSED DECISION DOCUMENT FOR OTHER CONTAMINATION SOURCES IRA M-1 SETTLING BASINS

GENERAL COMMENTS

Comment 1: The Army has expressed its reluctance to treat groundwater contamination from the M-1 Settling Basins. However, Arsenic contamination remains a problem. As the State has previously and repeatedly asserted, the Army should explore the possibility of treating inorganics, if not immediately down-gradient of the M-1 Settling Basins, then at the Basin A neck.

Response: The Army acknowledges that groundwater in this area is contaminated with both organics and inorganics. However, groundwater treatment is not within the scope of this IRA. The treatment process for Basin A Neck is not part of this IRA specifically, and comments on the operation of the Basin A Neck system should be referred to that IRA.

Comment 2: In the Treatability Test Report for Application of In Situ Vitrification Technology to Pesticide-, Arsenic-, and Mercury-Contaminated Soils from the M-1 Ponds Site of Rocky Mountain Arsenal, Colorado (Treatability Document), Table 4 and the Addendum show that a mass balance calculated the results of the pilot test indicates a 37% deficit of arsenic, and a 54% deficit of mercury. In the Addendum it was hypothesized that the missing arsenic and, although not explicitly mentioned, the missing mercury was in the melt. According to the explanation offered, the amounts of these metals in the melt were underestimated because the concentration of these metals varied across the melt. If the melt is not homogeneous then the degree of variation should be ascertained through additional samples of the pilot test melt, so that (1) it can be determined if this can reasonably account for the missing metals and (2) TCLP tests can be repeated on enough different pieces of the melt of the M-1 Basins during implementation to insure that the results are representative of the entire melt.

Response: Geosafe has been conducting follow-up analytical work in an attempt to reduce the mass balance deficits for mercury and arsenic reported in the referenced document.

There are several areas where significant accuracy margins were or could have been introduced during test preparation:

- Sludge Volume

  The sludge was placed in the test container concurrent with the placement of the surrounding soils. An open-ended square cardboard box was utilized to segregate the sludge from the surrounding soils during the placement process. Once the sludge and soil had been placed, the box was withdrawn, leaving a square column of sludge surrounded by soil. During waste placement, the electrodes occupied the inside corners of the box. Geosafe neglected to subtract the volume occupied by the electrodes before

calculating the total mass of the sludge (based upon density and volume). In addition, the volume between the electrodes and the corners of the box was observed to be empty during waste placement. By subtracting these volumes from the amount of waste reported to be placed, the total amount of mercury and arsenic present in the test container prior to the test was less than that which was used to calculate mass balances in the report.

- Sludge Density

The dry density of the lime sludge from the site was provided to Geosafe prior to the test and was assumed to be 1.1 g/cm^3. Because of the nature of the sludge, the dry density of the waste is variable. It was noted in the field that, after the sludge was excavated and placed in a drum, settling was observed. If a sample were taken of sludge which had settled, the dry density (based upon the wet volume) would be higher than that for sludge which had not settled.

When Geosafe placed the sludge into the test container at its facility in Seattle, it was moved with a small trowel. The act of moving the sludge in this manner slurried the sludge and probably resulted in a dry density (based upon wet volume) which was lower than that for the waste prior to being disturbed. If the density of the sludge in the test container was lower than 1.1 g/cm^3, the net effect of this phenomenon would mean that there was less mercury and arsenic present in the test container prior to the test than that which was reported. Geosafe believes that this was the case.

- Arsenic Concentration in Glass

The results of the neutron activation analysis (NAA) showed that arsenic concentrations varied from approximately 400 ppm to 1345 ppm. Since the glass samples were collected from the central portion of the glass monolith, it is reasonable to assume that there was glass in the monolith with arsenic concentrations greater than and less than the measured amounts. It is probable that, as bubbles (which contained vaporized arsenic) rose in the melt, the vaporized arsenic in the gas bubbles was absorbed by the melt on its way to the surface. During the test, bubbles were seen to reside near the surface after rising through the melt and a frothy layer of glass was observed in the upper portion of the solidified monolith. Based upon these observations, it is possible that a higher arsenic concentration is present near the top of the monolith.

Geosafe will soon be conducting another treatability test on soils contaminated with arsenic. In this test extensive horizontal and vertical sampling will be performed to determine if there is any preferential concentration of arsenic in the monolith. They will attempt to gain permission to share the results of this test with the Army.

New calculations, which take into account the corrected starting volume of sludge and a new assumed dry density of 0.9 g/cm reduce the mass balance deficits for arsenic to 14% and mercury to 34.7%.

An additional area where systematic accuracy ranges could have had an influence during placement of the sludge, was in the measurement of the sludge volume. Minor irregularities on the soils surface upon which the sludge was placed and minor irregularities on the surface of the sludge when its depth was measured could have resulted in a sludge volume which was less than that which was measured. If this margin of error was only 0.25 in., the effect would be to reduce the mass balance deficit for arsenic to 3% and reduce the mercury deficit to 30%. These mass balance figures are low enough to account for other expected systematic accuracy ranges which could occur throughout the treatability test process (such as measurement of offgas flow volume).

The analytical results from the carbon and the desiccant used in the test show low concentrations of mercury. This is what was expected. If high concentrations of mercury were found in these media, then the offgas sampling accuracy would be open to question. With the low concentrations of mercury found in the carbon and desiccant, Geosafe believes that the offgas sampling procedures were valid.

The results of an energy dispersive spectroscopy (EDS) analysis showed that mercury did not amalgamate with the stainless steel offgas pipes.

The X-ray diffraction analysis performed on the sludge, which collected in the condensate tank during the test, showed that arsenic trioxide was present. Several experts examined the diffractograms and determined that mercury compounds were not present at detection limits. Mercury is a liquid (and therefore amorphous) at room temperature and X-ray diffraction is not capable of detecting amorphous materials. This would suggest that mercury found in the sludge (using cold vapor atomic absorption) is in the elemental stage.

In summary, GeoSafe has continued efforts to reduce the mass balance deficits for mercury and arsenic reported after the treatability testing of the M-1 Settling Basins sludge. Several areas have been identified where significant accuracy margins were or could have been introduced during test preparation, which could affect the mass balance. In addition, GeoSafe will soon be conducting another treatability test on arsenic contaminated soils, and will perform extensive horizontal and vertical sampling to determine if there is any preferential concentration of arsenic in the monolith. Finally, a full-scale ISV demonstration test will be performed prior to implementation to alleviate state concerns.

Comment 3: Results of the Toxicity Characteristic Leaching Procedure (TCLP) were shown for only mercury and arsenic. The TCLP should be run on samples of the melt from the M-1 test, with analyses for all of the other contaminants which are listed in the proposed TCLP regulations and known to be present in the sludge or surrounding soil.

Response: Mercury and arsenic are among the most difficult metals to fix. It is assumed that, if these elements are successfully fixed, other inorganics would be fixed even more efficiently. Virtually all organics are destroyed in the approximately 1700 ° C temperature of the melt. The balance would be vaporized and collected in the offgas treatment system.

Comment 4: Incinerators operating at temperatures as high as those found in the melt are significant sources of NOx. The interior of the melt is probably a reducing environment but the hot surface of the melt, exposed to oxygen in the ambient air (the stack gases were found to contain 20.9% oxygen) may be the source of NOx emissions. Additionally, the air above the melt may be hot enough to oxidize the atmospheric nitrogen. In response to earlier State questions on NOx emission (December, 1989) it was stated that previous ISV testing had resulted in non-detectable NOx emissions. However, because incomplete citations were given, it was not possible for the State to determine if operating conditions during these tests were comparable to those proposed for the ISV of the M-1 Settling Basins. Specifically, (1) were these tests done with the same large amount of excess air flowing through the hood and over the melt?, and (2) was the air above the melt during the tests maintained at a similar temperature to what is expected during the ISV of the Basins?

Response: It is true that incinerators are significant sources of NOx. This is because large volumes of air are heated to maximum processing temperatures and maintained at these temperatures for significant periods of time. During ISV, the only place where air can be exposed to temperatures sufficient for production of NOx is within a few centimeters of the melt. During small- and large-scale processing, the melt is covered with a ceramic insulating blanket which minimizes heat loss. This blanket is several inches thick.

It was correctly stated that conditions in the melt are strongly reducing and the NOx is reduced to N_2 and O_2. While it is possible that NOx could be produced at the surface of the melt, the very small region (when compared to incinerators) at which this could take place, the high flow-through of excess air, the inhibited air mobility at the melt surface and the reduced heat loss resulting from the insulating blanket all contribute to inhibited NOx production. The result is NOx concentrations consistently below detection limits.

The chemistry of the waste being melted will determine the melt temperature, and hence, the temperature of the air above the melt. In the large-scale test cited in the report, soils from the Hanford site were melted. These soils have SiO_2 concentrations of about 65%. The RMA waste (consisting of a mixture of soil and sludge) has SiO_2 concentrations which are considerably less and has a high (20% to 30%) calcium concentration. The calcium acts as a flux for the melt and results in a lower melt temperature than that from tests conducted on Hanford soil. As a result, the temperature of the air above the melt in the RMA project is expected to be lower than that for the test conducted on Hanford soil. The bulk hood temperature for the M-1 project is expected to be 150 degrees centigrade.

The full-scale tests conducted on Hanford soil were done with roughly twice the volume of air flow-through as that which is anticipated for full-scale operations at the RMA site.

Comment 5: A major concern in the design of the ISV system should be the capability of the hood to withstand the forces that may occur during operation. A tear in the hood would result in the dangerous emission of untreated organics and volatile metals and metal compounds. Even if the electric power to the melt were immediately cut off, the melt would emit hazardous substances for several hours while cooling. Is there a back-up to the hood? Is there a chance for hot-spots in the melt that might superheat small areas of the hood or the possibility that large bubbles of hot gases might pressurize the hood? Is there a chance of flames? ISV is a relatively unproven technology and we believe that a large measure of redundancy in the design of the hood or other safety precautions is required to minimize the risks from unforeseen events which could potentially compromise the hood's integrity. The State also believes some type of emergency response plan should be prepared to assist in responding to this type of event.

Response: The hood is a steel superstructure with a high temperature fiberglass skin. The forces required to damage this hood would likely come from the pressure increase associated with contact between the melt and a drum of flammable liquid. However, the site history and field investigations at this site do not indicate that any drums would be encountered. The hood is operated under negative pressure. The system will be designed with redundant vacuum blowers as well as standby electrical power generation capability for the offgas treatment system.

An emergency response plan will be prepared and delivered with the Implementation Document. This plan will be tied into the RMA emergency response plan.

Comment 6: The offgas treatment has been loosely described in the Proposed Decision Document. Properly designed it should be capable of effectively cleaning the effluent gases. The pilot plant report indicates that only aldrin, dieldrin, mercury and arsenic were monitored in the offgases. In the pyrolysis process large organic molecules are first broken down into smaller organic molecules before final molecular decomposition. Thus the low levels in the offgases of the high molecular weight pesticides, aldrin and dieldrin, cannot be interpreted to mean that all organics have been destroyed to the same extent.

Proper design will include consideration of the presence of other contaminants, i.e., smaller, less easily absorbed (on carbon) organics and the presence of other metals, including cadmium. Cadmium is present in the sludge at concentrations of up to 3900 ug/g according to Table 2-1 in the Final Alternatives Assessment. In a recent paper by Buelt (1989) the ratio of the cadmium originally in the waste to the amount evolved from the soil (as a gas) in a ISV pilot test was between 3 and 4 to 1, i.e. 20% to 25% of the cadmium present in the treated soil was transferred into the offgases.

Buelt, J.L., 1989. "Molten-Glass Processes," in Freeman, H.M., ed., Standard Handbook of Hazardous Waste Treatment and Disposal. McGraw-Hill.

Response: The principals affecting the behavior of organic vapors during ISV are such that they are drawn into the melt and experience temperatures equivalent to melt temperatures. No known organic material can survive these temperatures (1600 to 2000 degrees centigrade) which means that

all organic material exposed to these temperatures are converted to their atomic or diatomic form such as hydrogen, carbon, and chlorine. There is a possibility that organic materials could escape destruction during start-up if they were at or very near the surface. These materials are effectively captured in the scrubber and/or the activated carbon filter in the offgas system. By conducting start-up in a layer of clean soil overlying the contaminated material, the possibility of releasing any organic material to the offgas system is reduced to near zero. A detailed discussion of the behavior of organic materials is included in the Theoretical Discussion section of the report.

In the cited information: In Situ Vitrification of Transuranic Waste: An Updated Systems Evaluation and Applications Assessment, PNL-4800 Suppl. 1, p. 57, shows that the release of cadmium in the large-scale test was associated with gaseous events. This means that when large volumes of gas were released to the offgas system (as bubbles from the melt), the contained vaporized cadmium did not have a chance to be absorbed by the melt before reaching the surface. The information also shows that cadmium release was slower during periods when gas was not being released in significant volumes. In addition, the offgas system captures substantially all of the cadmium released from the melt and concentrates it in the scrub solution which is filtered. The filters are then processed in a subsequent melt to allow for additional absorption of cadmium. Cadmium is not released to the atmosphere. This can be demonstrated with appropriate offgas sampling. Since large quantities of combustible material or other gas-generating material is absent of the M-1 waste, cadmium retention in the melt is expected to be high.

Comment 7: In the November 1989 Results of Field and Laboratory Investigations Conducted for the Remediation of Other Contamination Sources Interim Response Action (M-1 Field Report), the thickness of the alluvium in the vicinity of the M-1 Basins was reported to vary from 12 feet in the southwestern corner of the site, to 20 feet in the southeastern corner (Figure 2-2). Therefore, the slurry wall completion depth, if keyed into the Denver Formation, would also vary across the site. The Army has indicated that the slurry wall would be constructed to a 15-foot depth (M-1 Assessment Document, p. 4-5), and that keying into the Denver would not be necessary. However, this would result in a maximum dewatering depth of 15 feet, and allow underflow to come in contact with the melt. The possibility exists that during field implementation, it may be necessary to apply ISV to depths greater than initially estimated. Therefore, as a conservative measure, and to isolate the melt from surrounding groundwater, the slurry wall should be securely keyed into the Denver Formation.

Response: The subsurface barrier for in situ vitrification is intended to serve only as a temporary hydraulic barrier, rather than a contaminant containment system. This barrier will isolate the material in the basins from the surrounding aquifer during the ISV process. However, because of comments from the EPA and the State, the Army has agreed to construct the subsurface barrier for the ISV alternative to be keyed into the Denver Formation. The type of subsurface barrier, either slurry wall or sheet pilings, will be determined during design.

Comment 8: Because dewatering will be necessary to lower the water table below the base of the ISV zone, the design of the dewatering system must be included in the implementation document.

Response: The melt will be maintained to a minimum depth equal to the bottom of the sludge material. If the groundwater table exists below the bottom of the sludge material during operations, the melt may be allowed to extend to a maximum depth equal to the groundwater table elevation. The Army does not intend to attempt to vitrify saturated soils beneath the M-1 Settling Basins, nor does it intend to dewater the aquifer for purposes of vitrifying soil beneath the M-1 Settling Basins. The exact depth will be determined during the design of this IRA.

Comment 9: In the lithologic descriptions presented by Woodward-Clyde for the eight soil borings (SB) shown in Figure 4-2 (Section 4.1.2), depth to bottom of pits was not given for any of the three soil borings, SB Nos. 6, 7, or 8, that were completed within the M-1 Settling Basins. For example, SB No. 6 consisted of sands to a depth of 2 feet, sands and waste to 2.6 feet, waste only from 2.6 to 6.5 feet, mixed sand and waste from 6.5 to 7 feet, and wet sands to 15 feet. Where is the bottom of the pit located? How extensive is vertical migration of contaminants below bottom of pit? What contaminant concentrations were found with depth? (Table 4-3 does not list sample depths.) Since it is not clear where the bottoms of the pits are located, and since there appears to be significant contamination beneath the pits, the vertical extent of contamination, including soils beneath the waste pits. The Army, therefore, may have underestimated the depth and amount of material to be treated using ISV. Vertical extent of significant contamination should drive the selection of the depth of ISV treatment. The Army should propose criteria for determining the depth of treatment based on "significant contamination" in the implementation document. These criteria should be justified, and additional site characterization may be required if inadequate information is available.

Response: The bottom of the M-1 Settling Basins is approximately 7 feet below ground surface. Several soil borings will be drilled and sampled during design to more clearly evaluate the vertical depth of contamination. The vitrification will be performed to a depth at least to the bottom of the basins. If the groundwater table is below the bottom of the basins, the melt may extend to a maximum depth equal to the groundwater table elevation.

Comment 10: In the M-1 Assessment Document, the Army mentions that structures are present over certain areas of the M-1 Basins (page 2-1). Which structures are referenced and what is the status of the structure (interms of contamination)? Will these structures be moved or raised as part of the ISV process?

Response: The structures referred to include several large tanks in a concrete bermed area on the east basin. These structures will be relocated before implementation of the ISV process. The text of the Draft Final Decision Document was revised to discuss relocation of these structures (Section 6.0). Specific procedures will be part of the implementation document.

Comment 11: In the M-1 Field Document, SB No. 5 is located outside (approximately 20 feet to the south) of the M-1 Settling Basins (Figure 2-6). However, this boring had the highest concentrations

of the two volatiles and four of the five semivolatiles found in previous soil sampling programs (Table 2-1). After review of the as-built drawings and aerial photographs is the Boring SB No. 5 included within the area of the M-1 Basins? If not, further characterization of the soil contamination surrounding this boring will be required during the feasibility study.

Response: SB No. 5 is located outside the M-1 Settling Basins, as shown on Figure 2-6 of the M-1 Field Document. This IRA is intended to address the source material within the M-1 Settling Basins. Other soil contamination in the South Plants area will be addressed by the Onpost ROD.

Comment 12: In the M-1 Decision Document (page 6-1) the volume of water condensed in the offgas treatment system was estimated to be 700,000 gallons, (which includes a 15% contingency). In making this estimate it was assumed, erroneously, that the weight fraction of water in the sludge was equivalent to the volume fraction. Given a sludge density of 1.35 tons/yd^3 (as stated in the Final Alternatives Assessment of Interim Response Actions for Other Contamination Sources M-1 Settling Basins M-1 Assessment Document), the actual amount of condensate generated by the ISV of 6400 yd^3 of sludge would be 980,000 gallons, or 1.12 million gallons with a 15% contingency. (This is based on a sludge thickness of five feet, which may have to be modified based on depth of significant contamination in soils beneath the sludge.) For the design of the ISV system, the Army needs to modify the estimate of the volume of condensate which will be generated.

Response: The volume estimates in the IRA Alternatives Assessment were only used for cost estimating. More accurate water volume estimates would be calculated during design. These estimates will depend on the depth of the melt.

SPECIFIC COMMENTS

Comment 1: Please indicate the locations of trenches M-IT-3, M-IT-5, and M-IT-6 on Figure 4-2 of the M-1 Field Document. Additionally, please indicate waste material/soils contact on all soil borings and pits shown in the figure.

Response: This comment will be taken into consideration during revision of the field and laboratory investigation report.

Comment 2: The arsenic value for Well 36193 is listed as 3920 ug/l on page 4-15 of the M-1 Field Document, and 3420 ug/l in Figure 4-3. Please correct this inconsistency.

Response: This inconsistency will be corrected during revision of the field and laboratory investigation report.

Comment 3: Legends and units should be presented in Table 4-3, 4-4, 4-7, 4-8, 4-11, and 4-12. Please reference soil sample IDs in the same manner in the text as in the tables. Additionally, please list sampling intervals for all samples presented in the tables.

Response: This comment will be taken into consideration during revision of the field and laboratory investigation report.

RESPONSE TO COMMENTS FROM THE STATE OF COLORADO ON DRAFT APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE M-1 SETTLING BASINS INTERIM RESPONSE ACTION

GENERAL COMMENTS

Comment 1: To the extent that this document repeats text contained in previous Army draft ARARs documents without acknowledging prior comments offered by the parties, the State refers the Army to previous State ARARs comments.

Response: Please see the Army's previous responses to the State's comments.

SPECIFIC COMMENTS

Comment 1: P. 8-1, para. 3: The Army states that "The liquid effluent is to be treated for arsenic and mercury, which are the contaminants expected to remain with this effluent after completion of offgas control process." Nowhere in the proposed decision document does the Army list all products of the offgas control process. However, in "Response to Comments, State of Colorado Question on M-1 Basins, In Situ Vitrification (December 1989)," the Army stated that the following contaminants were present in the offgas: dieldrin, aldrin, mercury, carbon dioxide, oxygen, arsenic, arsine gas, carbon monoxide and particulates. Although the Army claims that treatment equipment will remove over 99 percent of particulates larger than 0.5 microns and 0.3 microns, and 99.9 percent of the volatile and semivolatile compounds, the Army should include ARARs for all these contaminants.

Response: The Final Decision Document addresses, in greater detail, ARARs for the anticipated air emissions from the in situ vitrification process.

Comment 2: P. 8-2, para. 1: The Army states that consistent with the Proposed National Contingency Plan, Maximum Contaminant Level Goals were not considered applicable, relevant or appropriate to apply in the context of the treatment system.

However, CERCLA itself, regulation (sic), requires that remedial actions at least achieve MCLG's. Moreover, even the proposed NCP does not categorically dismiss MCLG's as ARAR's.

The Congressional conferees who drafted § 121 of CERCLA (which was part of the 1986 CERCLA amendments) have been emphatic that CERCLA remedial actions are to achieve MCLG's as distinguished from MCL's. A March 27, 1987 letter from United States Representative James Florio (and other committee conferees) to Lee Thomas, former EPA Administrator, states:

"In any circumstances in which MCL's are relevant and appropriate, MCLG's are equally relevant and appropriate. Section 121(d) (2) (A) states:

"Such remedial action shall require a level of standard of control which at least attains Maximum Contaminant Level Goals established under the Safe Drinking Water Act and water quality control criteria are relevant and appropriate under the circumstances of the release or threatened release."

"The specific reference to MCLG's in the law makes it clear that these particular standards, where they are more stringent than the comparable MCL's, are the primary standards that must be attained by Superfund cleanups of groundwater."

"The reason the Congress chose to specify MCLG's is that under the Safe Drinking Water Act, the difference between the two requirements can be significant. In formulating MCL's the Agency considers feasibility (and especially cost) as well as health-based factors. MCL's consequently may offer significantly less protection of human health and the environment than MCLG's."

Response: As the cited statutory language reflects, MCLGs are to be attained where they are determined relevant and appropriate (emphasis added). EPA, as the federal agency responsible for implementing the statute, has issued the proposed NCP in order to implement the statute. EPA's stated policy, as cited in the proposed NCP is that MCLs are generally relevant and appropriate as cleanup standards. While individual members of the federal legislature may have expressed disagreement with EPA's interpretation of the statutory provision, this does not affect the validity of EPA regulatory guidance. Individual federal and state legislators do sometimes disagree with the implementation by federal and state agencies of particular statutes. If the federal or state legislature, as a body, determines that the implementation by the agency is not what was intended by the legislature, they may enact further legislation to clarify the statute or redirect the agency. The cited EPA policy has been in effect for several years and no legislative action has been taken to require change.

The State also appears to overlook the fact that this is an interim response action, not the final response action. There is no legislative or EPA guidance which implies MCLGs should be applied to such interim actions which are conducted in advance of final response actions. As the proposed NCP makes clear, site specific determinations can be made that establish different cleanup criteria for the specific site. The extensive RI/EA/FS process is designed to provide the basis for determining site specific criteria for final response actions and that process is underway at the Arsenal. Final cleanup criteria based upon the RI/EA/FS process, will be established for the Arsenal consistent with the CERCLA guidance developed by EPA.

Comment 3: P. 8-3, para. 2: The Army states that 40 C.F.R. § 61 was not considered applicable, relevant or appropriate to the IRA treatment system. However, 5 CCR 1007-3, regulation 8 lists emissions standards for mercury which are applicable to "all stationary sources which . . . incinerate or dry wastewater treatment plant sludge and to any other source using mercury in

any form." Although the treatment system does not by definition "use" mercury, the process is sufficiently similar for the emission standard in regulation 8 to apply as a relevant and appropriate requirement. In addition, the reporting requirements of 40 C.F.R. § 61 subpart P (arsenic) should also be considered relevant and appropriate.

Response: The Final Decision Document identifies ARARs for air emissions for both arsenic and mercury, identifying the State mercury standard.

Comment 4: P. 8-4, para. 6: The Army states that construction of an on-site vitrification system does not involve significant excavation in the area of the M-1 basins, with therefore little potential for air emissions during construction. However, the proposed decision document states that the system will include the construction of a slurry wall, which requires excavation. Therefore the construction clearly has the potential for release of air emissions during construction. The Army should expand its ARARs analysis to include standards for air emissions from the construction of the slurry wall.

Response: The Army disagrees that the construction of the subsurface barrier has the potential to result in significant air emissions which could not be adequately monitored and controlled through the Health and Safety Plan for this IRA as is other construction activity. The narrow excavation necessary for installation of a barrier is very unlikely to result in large amounts of soil being exposed in a manner which would cause volatilization of compounds which may be present in those soils.

Comment 5: P. 8-5, para. 1: The Army states that there are no national or state ambient air quality standards applicable, relevant or appropriate for any of the volatile or semivolatile chemicals in the groundwater in the M-1 area where construction is contemplated. However, methylene chloride, a volatile organohalogen compound, was found in the soil and/or sludge of the M-1 basins. The Army should therefore include 6 CCR 1007-3 regulation 7 in its ARAR's analysis for air emissions due to treatment system construction.

Response: The Army reviewed 6 CCR 1007-3 and found no regulation #7. Methylene chloride is listed in 5 CCR 1001-9 Regulation #7. However, in Section IIB (Exemptions), methylene chloride is exempt from Regulation #7. Also see response to the State's Specific Comment No. 4.

Comment 6: P. 8-5, para. 4: The Army states that the provisions of 40 C.F.R. § 50.06 are considered relevant and appropriate. However, the Army must also consider Colorado Regulation 1, which regulates all total suspended particulars (TSP) and is therefore stricter than the federal standard. The Army has also misstated the federal standard. The correct federal standard is that the particulate matter must not exceed 50 micrograms per cubic meter, not 75, as the Army states. The federal standard also list particulate emission for a 24 hour average at 150 micrograms per cubic meter.

Response: Fugitive particulate emissions requirements of Colorado Regulation 1 were considered. The Army recognizes this requirement and will use best practical technology to minimize such

emissions. This section has been revised to reflect the current standard in 40 CFR Part 50.6. This document also includes the State's specific standard in Regulation No. 1 for construction activity.

Comment 7: P. 8-5, para. 3: The Army states that the standards found in 40 C.F.R. § 61 ("NESHAPS") were not considered applicable, relevant or appropriate. The Army should consider NESHAPS relevant and appropriate if the contaminants subject to NESHAPS are emitted in quantities contemplated by the regulation.

Response: NESHAPS are process specific and are not considered relevant and appropriate to apply to any treatment system unless such system is similar to the specific process for which that standard was developed. The Final Decision Document does reflect the determination of an arsenic NESHAPS standard for glass manufacturing as relevant and appropriate to apply to this IRA treatment system.

Comment 8: P. 8-10, para. 4: The Army states that the IRA was prepared in substantive compliance with 40 C.F. R. § 1502.16, the regulations implementing the National Environmental Policy Act of 1969. The Army must also be in compliance with 32 C.F.R. pt. 651 which are Department of Army regulations dealing specifically with NEPA requirements at CERCLA sites.

Response: The Army is proceeding in accordance with the regulations contained in 32 CFR 651.