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NOTIFICATION OF NEED TO AMEND THE FERNALD ENVIRONMENTAL MANAGEMENT PROJECT SITE TREATMENT PLAN

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NOTIFICATION

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Department of Energy

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APR 2 2 1996

DOE-0763-96

Mr. Paul Pardi, RCRA Group Leader
and FFCA Project Manager
Ohio Environmental Protection Agency
Division of Hazardous Waste Management
401 East 5th Street
Dayton, Ohio 45402-2911

Mr. Michael Savage, Assistant Chief
Ohio Environmental Protection Agency
Division of Hazardous Waste Management
1800 Watermark Drive
Columbus, Ohio 43216-1049

Dear Mr. Pardi and Mr. Savage:

NOTIFICATION OF NEED TO AMEND THE FERNALD ENVIRONMENTAL MANAGEMENT PROJECT SITE TREATMENT PLAN

This letter serves as notification to the Ohio Environmental Protection Agency (OEPA) by the Department of Energy, Fernald Area Office (DOE-FN) of the identification of a need to amend the Fernald Environmental Management Project (FEMP) Site Treatment Plan (STP). This notification is in accordance with the Director's Final Findings and Orders (DFO), Section V.1.D.i. issued October 4, 1995. The need to amend pertains to the Ohio Mobile Macroencapsulation Unit sub-system in the Ohio Mobile Chemical Treatment System preferred option described in Section 3.1.6 of the Plan Volume in the FEMP STP. The Ohio Mobile Macroencapsulation Unit sub-system treatment option identifies the use of a mobile macroencapsulation unit to perform treatment at the FEMP site to meet Land Disposal Restrictions (LDR) followed by shipment of the treated mixed waste for disposal at a mixed waste disposal facility (e.g., Envirocare). An additional option is being proposed by DOE-FN to ship lead solids, nickel-cadmium batteries, mercury batteries, and other inherently hazardous debris containing radioactive contamination, which cannot be decontaminated, to a mixed waste disposal facility (i.e., Envirocare) for macroencapsulation and disposal.

The additional option became available when the Mixed Waste Focus Area (MWFA) through the Department of Energy, Idaho Operations Office (DOE-ID) engaged Envirocare of Utah in a cooperative agreement to demonstrate polymer macroencapsulation of lead

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debris. Under the agreement the DOE complex could send up to 500,000 pounds of lead and debris for treatment. The demonstration is scheduled to be completed in 1996. The MWFA, DOE-ID allocated 40,000 pounds to the FEMP for shipment under this agreement.

The FEMP has evaluated the use of the Envirocare Macroencapsulation Demonstration treatment option per the STP Plan Volume Section 2.2 "Modification of Technologies", and the approved FEMP Mixed Waste Chemical Treatment Project General Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Work Plan, Section 4.3. The evaluation was performed consistent with the FEMP STP, Appendix A. A detailed evaluation and comparison of the Ohio Mobile Macroencapsulation Unit and the Envirocare Macroencapsulation Demonstration for the inherently hazardous debris is enclosed. The results of the evaluation and comparison are provided below:

- The Envirocare Macroencapsulation Demonstration alternative proved safer because no equipment would need to be erected, dismantled, and decontaminated thereby reducing exposure to laborers. The Envirocare Macroencapsulation Demonstration would also be more implementable due to the expedited schedule by which the waste will be treated and disposed. The available off-site alternative, Envirocare Macroencapsulation Demonstration, allows the FEMP to complete treatment of all the lead solids in 1996, two years earlier than currently scheduled without forfeiting work scheduled to be performed in 1996. The cost for the Envirocare Macroencapsulation Demonstration is less than the Mobile On-site Macroencapsulation System. Cost savings will be significant because the FEMP will only be responsible for transportation and disposal. Based on the cost estimates provided in the STP, the cost of the Envirocare Macroencapsulation Demonstration would be 62% or $161,000 less than the Ohio Mobile Macroencapsulation Unit. The options rate equally in the remaining criteria.

- The results of the evaluation conclude that the Envirocare Macroencapsulation Demonstration alternative is preferred to the Ohio Mobile Macroencapsulation Unit for the inherently hazardous debris described in the Technology Specific Work Plan for Decontamination of Mixed Waste Material. It is an excellent opportunity to cost effectively expedite treatment of mixed waste at the FEMP while aiding in the demonstration of a treatment technology. In the future, other wastes may be identified that will require macroencapsulation on-site.

- The inherently hazardous debris eligible for macroencapsulation will first undergo decontamination at the FEMP per the conditionally approved Technology Specific Work Plan for Decontamination of Mixed Waste Material. Waste meeting the free-release criteria will be recycled or managed as hazardous waste.

- The DOE-FN will submit within 30 days of this notification an amended STP. The amended STP will include on-site and off-site macroencapsulation as part of the Chemical Treatment Project.

If you should have any questions, please contact Robert Danner at (513) 648-3167.

Sincerely

Jack R. Craig
Director

FN:Danner

Enclosure: As Stated

cc w/enc:

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ENCLOSURE

2.6 PO - Ohio Mobile Chemical Treatment System

Option Description

The Ohio Mobile Chemical Treatment System was chosen as the Preferred Option to treat the waste streams listed in the Background Volume, Table 6. These waste streams are scheduled for treatment under the Chemical Treatment Project using currently available technologies and existing mobile vendors augmented by existing on-site facilities. Utilization of the mobile vendor option at the FEMP allows for timely input in managing the diverse wastes involved in this project and limits transportation risks. The Ohio Mobile Chemical Treatment System is the FEMP implementation of the Ohio Option. The FEMP will share engineering and other information with other Ohio DOE sites.

The Ohio Mobile Chemical Treatment System requires the utilization of one or more technologies to adequately treat the wastes to meet LDR treatment standards. The technologies require similar equipment. The treatment technologies may include, but are not limited to, the following:

Chemical/Wet Air Oxidation - used to destroy organics in solid waste streams

Deactivation - used to treat reactive characteristics of waste, thereby creating a non-hazardous waste

Macroencapsulation - utilized as a means of immobilization, primarily of metals waste

Pressurized Container Puncture Unit - used to puncture aerosol cans and gas containers to facilitate removal of liquid contents

Neutralization/Precipitation - used to treat acidic, caustic and metals laden waste

Amalgamation - used to treat elemental mercury and mercury contaminated waste

Ohio Mobile Chemical Treatment Sub-System Description

The Ohio Mobile Chemical Treatment System has been divided into six sub-systems each of which implement one of the six treatment technologies. The waste streams have been categorized into the six sub-systems based on LDR treatment standards. The six sub-systems along with the waste category assigned to each are discussed below.

Chemical/Wet Air Oxidation Unit - The general waste category assigned to this sub-system is **Solids with Organics**. Processes for treatment will be established following treatability studies of various representative samples of wastes.

The treatment processes necessary to treat the waste streams and meet LDR treatment standards are illustrated in:

1. Treatment Train G
2. Treatment Train I

These treatment trains and the LDR treatment standards are identified in Appendix C.

Deactivation Unit - The general waste category assigned to this sub-system is **Reactive Metals**. Deactivation is the LDR treatment standard for these waste streams.

The treatment process necessary to treat the waste streams and meet LDR treatment standards is illustrated in:

1. Treatment Train F

This treatment train and the LDR treatment standards are identified in Appendix C.

Ohio Mobile Macroencapsulation Unit - The general waste category assigned to this sub-system is **Elemental Lead, Batteries & Debris with Lead**. Macroencapsulation will be utilized as a means of immobilization for disposal of a limited number of waste streams. Several of these waste streams (such as lead-acid and nickel-cadmium batteries) have been identified to be recycled if radiological decontamination can be accomplished. The Ohio Mobile Macroencapsulation Unit is the FEMP implementation of the Ohio Option. Waste streams requiring macroencapsulation exist at the FEMP, Battelle and Mound.

The Envirocare Macroencapsulation Demonstration was identified on December 22, 1995 as an alternative to the Ohio Mobile Macroencapsulation Unit for certain waste streams identified for macroencapsulation. These waste streams include: lead solids; nickel-cadmium batteries; mercury batteries; and, other inherently hazardous debris containing radioactive contamination. The unit is located at the Envirocare of Utah facility in Clive, Utah. The use of this alternative facility was not an option at the time of the original evaluation of alternatives. The unit has the capability to treat the same waste streams as the Ohio Mobile Macroencapsulation Unit. The Demonstration is expected to be completed within FY96.

The treatment process necessary to treat the waste streams and meet

LDR treatment standards is illustrated in:

1. Treatment Train J

This treatment train and the LDR treatment standards are identified in Appendix C.

Pressurized Container Puncture Unit - The general waste category assigned to this sub-system is **Compressed Gas**. There is a single waste stream of pressurized containers (i.e., aerosol cans) to be treated. The volume is currently a single drum. Five year volume is calculated to be an additional 1 1/2 drums. No Ohio Option exists for this sub-system. The unit is currently at the FEMP and is operational.

The treatment process necessary to treat the waste stream and meet LDR treatment standards is illustrated in:

1. Treatment Train L

This treatment train and the LDR treatment standards are identified in Appendix C.

Neutralization/Precipitation Unit - The general waste category assigned to this sub-system is **Solids/Liquids with Metals**. This general waste category consists of several waste streams. Neutralization is the LDR treatment standard for one waste stream, the others are concentration based.

The treatment process necessary to treat the waste stream and meet LDR treatment standards is illustrated in:

1. Treatment Train H

This treatment train and the LDR treatment standards are identified in Appendix C.

Ohio Mobile Amalgamation Unit - The general waste category assigned to this sub-system is **Elemental Mercury & Debris with Mercury**. Amalgamation is the LDR treatment standard and will be utilized to immobilize a number of waste streams. The Ohio Mobile Amalgamation Unit is the FEMP implementation of the Ohio Option. Waste streams requiring amalgamation exist at the FEMP, Battelle, Mound, Portsmouth and USEC.

The treatment process necessary to treat the waste streams and meet LDR treatment standards is illustrated in:

1. Treatment Train M

This treatment train and the LDR treatment standards are identified in further detail in Appendix C.

Option Evaluation Summary

Potential treatment options for FEMP mixed waste streams identified in Table 6 of the Background Volume include the following:

Ohio Mobile Chemical Treatment System (Preferred Option)
Ohio Mobile Incinerator (Viable Option)
TSCA Incinerator (Viable Option)
Ohio Mobile Stabilization System (Viable Option)
Portsmouth Wastewater Treatment System
FEMP UNH Treatment System
FEMP Hydrofluoric Acid Neutralization System
Portsmouth Evaporation
Mound Packed Bed Reactor
FEMP Wastewater Treatment System
LANL Mobile Amalgamation Unit
LANL Mobile Decontamination Trailer

The Ohio Mobile Chemical Treatment System was chosen as the Preferred Option because this option allows for the treatment of the designated waste to meet LDR treatment standards on-site with medium cost effectiveness relative to other options. The use of the Ohio Mobile Chemical Treatment System also provides an equitable solution for Ohio and other states when comparing this option with out-of-state treatment options. The Ohio Mobile Chemical Treatment System will treat debris and solid waste which could potentially use incineration technologies. Supplemental information supporting this option evaluation is provided in Section 3.2. This option was chosen to expedite the FEMP treatment schedule. The FEMP has started the process for identifying vendors to provide chemical treatment services.

The Ohio Mobile Incinerator Option was not chosen for those waste streams identified for the Chemical/Wet Air Oxidation sub-system. This option is the least cost effective and is expected to lack public acceptance.

The TSCA Incinerator option was not chosen because of potential state-to-state equity issues. The TSCA Incinerator is limited to the incineration of liquid waste streams. Modifications to the TSCA Incinerator in order to incinerate soft solids have been estimated at $15,000,000. The modifications are not funded. Incineration of those wastes identified for the Chemical/Wet Air Oxidation sub-system to treat the hazardous component would receive less benefit in terms of volume reduction and treatment residue relative to the incineration of organic liquids which have been identified for treatment at the TSCA Incinerator. Ash and residue management at the TSCA Incinerator is reduced significantly by reducing the solids content sent to the TSCA Incinerator. Supplemental information on the decision-making process utilized in determining the FEMP mixed wastes to be sent to the TSCA Incinerator is provided in Section 3.2.

Ohio Mobile Stabilization System was not chosen to treat waste identified in the Ohio Mobile Chemical Treatment System because the technology does meet the LDR treatment standards for all identified waste. The option was only compared to three applicable sub-systems within the Ohio Mobile Chemical Treatment System. This option was not chosen for treating elemental lead, batteries, and debris with lead, reactive metals, or solid/liquids with metals because of the volume increase, the requirement of additional treatment steps, and inflexibility of the system.

The Envirocare Macroencapsulation Demonstration was not chosen as the (or part of the) preferred option in the original evaluation of technologies/ treatment systems because the facility was not constructed until after the submittal of the Proposed Site Treatment Plan to the State of Ohio. The use of this unit would represent a cost and schedule savings within the Chemical Treatment Project at the FEMP. The cost of treatment of the identified waste streams (up to 40,000 pounds of waste) will be paid by DOE EM-50 under a demonstration of the new unit which was partially funded by the DOE. The Demonstration is expected to be completed within FY96. The Envirocare Macroencapsulation Demonstration is evaluated further on the following pages.

Evaluation of Viable Options

The viable options evaluated for each sub-system are listed below.

Chemical/Wet Air Oxidation Unit Waste Matrix - Solids with Organics
Viable Option: A. Ohio Mobile Chemical Treatment System (Chemical/Wet Air Oxidation Unit) B. Ohio Mobile Incinerator C. TSCA Incinerator

Deactivation Unit Waste Matrix - Reactive Metals
Viable Option: A. Ohio Mobile Chemical Treatment System (Deactivation Unit) B. Ohio Mobile Stabilization System

Ohio Mobile Macroencapsulation Unit Waste Matrix - Elemental Lead, Batteries & Debris with Lead
Viable Option: A. Ohio Mobile Chemical Treatment System (Mobile Macroencapsulation Unit) B. Ohio Mobile Stabilization System C. Envirocare Macroencapsulation Demonstration

Pressurized Container Puncture Unit * Waste Matrix - Compressed Gas
Viable Option: A. FEMP Compressed Gas Puncture Unit

Neutralization/Precipitation Unit Waste Matrix - Solids/Liquids w/ Metals
Viable Option: A. Ohio Mobile Chemical Treatment System (Neutralization/ Precipitation Unit) B. Ohio Mobile Stabilization System

Ohio Mobile Amalgamation Unit * Waste Matrix - Elemental Mercury & Debris with Mercury
Viable Option: A. Ohio Mobile Chemical Treatment System (Mobile Amalgamation Unit)

* Only one viable option was identified. No comparison evaluation was performed.

A comparison of these evaluations is summarized in Figures A-6.1 through A-6.4. The differences in ratings are discussed below.

<u>Ohio Mobile Incinerator (Solids with Organics)</u> - This option rated lower for treatment of solids with organics in the following criteria.

Public Acceptance - The general public within the vicinity of the site is expected to react negatively to the establishment of an incinerator at the FEMP.

Life-Cycle Cost - A mobile incinerator would incur higher cost to establish on-site.

<u>TSCA Incinerator (Solids with Organics)</u> - This option rated lower for the treatment of solids with organics in the following criteria.

Equity Issues - This option would create potential state-to-state equity issues due to the treatment of waste at an out-of-state DOE facility.

<u>Ohio Mobile Stabilization System (Reactive Metals)</u> - This option rated lower for treatment of reactive metals in the following criteria.

Volume reduction - This option will increase the volume for disposal.

Flexibility - Input criteria for this option is not diverse enough to manage the variety of waste in this category.

<u>Ohio Mobile Stabilization System (Elemental Lead, Batteries, and Debris) and (Solids/Liquids w/Metals)</u> - This option rated lower for treatment of elemental lead, batteries, debris with lead, and solids/liquids w/metals than the Preferred Option in the following criteria.

Volume reduction - This option will significantly increase the volume for disposal relative to the Preferred Option.

Destruction, Removal, and Demobilization - It is uncertain that this option will effectively immobilize the toxic constituents. Additional treatment would be required to treat this waste relative to the Preferred Option.

Flexibility - Input criteria for the option will require significant physical treatment of the waste prior to acceptance for stabilization.

Other Option Evaluations

In addition to the options which were evaluated above, the following facilities were evaluated and removed from consideration due to their inability to meet LDR treatment standards for the waste streams:

- Portsmouth Wastewater Treatment System
- FEMP UNH Treatment System
- FEMP Hydrofluoric Acid Neutralization System
- Portsmouth Evaporation
- Mound Packed Bed Reactor
- FEMP Wastewater Treatment System

The LANL Mobile Amalgamation Unit was not evaluated based on lack of availability for FEMP use. This unit will be dedicated for use by DOE sites within the Albuquerque Field Office until the year 2005.

The LANL Mobile Decontamination Trailer was not evaluated based on lack of availability for FEMP use. The unit has been deployed within the Albuquerque Field Office DOE sites. There is no scheduled use of the unit outside of these sites.

Figure A-6.1

Comparison of Options for the Treatment of Solids with Organics

CRITERIA	OHIO MOBILE CHEMICAL TREATMENT SYSTEM (CHEMICAL/WET AIR OXIDATION)	OHIO MOBILE INCINERATOR	TSCA INCINERATOR
REGULATORY COMPLIANCE	H	H	H
ENVIRONMENTAL/PUBLIC HEALTH	H	H	H
NON-OPERATIONAL WORKER HEALTH AND SAFETY	H	H	H
OPERATIONAL WORKER HEALTH AND SAFETY	M	M	M
TRANSPORTATION RISK	M	M	M
PUBLIC ACCEPTANCE	H	L	H
EQUITY ISSUES	H	H	M
VOLUME REDUCTION	M	H	H
SECONDARY WASTE GENERATION	M	M	M
DESTRUCTION, REMOVAL & DEMOBILIZATION	H	H	H
FLEXIBILITY	H	H	H
FINAL WASTE FORM	M	M	M
ABILITY TO BE SHIPPED	M	M	M
SYSTEM IMPLEMENTABILITY	H	H	H
AVAILABILITY	H	H	H
SCALABILITY	H	H	H
SCHEDULE FOR WASTE TREATMENT	H	H	H
LIFE-CYCLE COST	H	M	H
MARKET FOR TECHNOLOGY	M	M	M
PRIVATE SECTOR INVOLVEMENT	H	H	H

Treatment Selection Guide (Table A-1)

H - High
M - Medium
L - Low

Figure A-6.2

Comparison of Options for the Treatment of Reactive Metals

CRITERIA	OHIO MOBILE CHEMICAL TREATMENT SYSTEM (DEACTIVATION UNIT)	OHIO MOBILE STABILIZATION SYSTEM
REGULATORY COMPLIANCE	H	H
ENVIRONMENTAL/PUBLIC HEALTH	H	H
NON-OPERATIONAL WORKER HEALTH AND SAFETY	H	H
OPERATIONAL WORKER HEALTH AND SAFETY	M	M
TRANSPORTATION RISK	M	M
PUBLIC ACCEPTANCE	H	H
EQUITY ISSUES	H	H
VOLUME REDUCTION	M	L
SECONDARY WASTE GENERATION	H	H
DESTRUCTION, REMOVAL & DEMOBILIZATION	H	H
FLEXIBILITY	H	M
FINAL WASTE FORM	H	H
ABILITY TO BE SHIPPED	H	H
SYSTEM IMPLEMENTABILITY	H	H
AVAILABILITY	H	H
SCALABILITY	H	H
SCHEDULE FOR WASTE TREATMENT	H	H
LIFE-CYCLE COST	H	H
MARKET FOR TECHNOLOGY	M	M
PRIVATE SECTOR INVOLVEMENT	H	H

Treatment Selection Guide (Table A-1)

H - High
M - Medium
L - Low

Figure A-6.3

Comparison of Options for the Treatment of
Elemental Lead, Batteries & Debris with Lead

CRITERIA	OHIO MOBILE CHEMICAL TREATMENT SYSTEM (MACROENCAPSULATION)	ENVIROCARE MACROENCAPSULATION DEMONSTRATION	OHIO MOBILE STABILIZATION SYSTEM
REGULATORY COMPLIANCE	H	H	H
ENVIRONMENTAL/PUBLIC HEALTH	H	H	H
NON-OPERATIONAL WORKER HEALTH AND SAFETY	H	H	H
OPERATIONAL WORKER HEALTH AND SAFETY	M	H	M
TRANSPORTATION RISK	M	M	M
PUBLIC ACCEPTANCE	H	H	H
EQUITY ISSUES	H	H	H
VOLUME REDUCTION	M	M	L
SECONDARY WASTE GENERATION	H	H	H
DESTRUCTION, REMOVAL & DEMOBILIZATION	H	H	M
FLEXIBILITY	H	H	M
FINAL WASTE FORM	H	H	H
ABILITY TO BE SHIPPED	H	H	H
SYSTEM IMPLEMENTABILITY	H	H	H
AVAILABILITY	H	H	H
SCALABILITY	H	H	H
SCHEDULE FOR WASTE TREATMENT	H	H	H
LIFE-CYCLE COST	H	H	H
MARKET FOR TECHNOLOGY	M	H	M
PRIVATE SECTOR INVOLVEMENT	H	H	H

<u>Treatment Selection Guide Rating (Table A-1)</u>

H - High
M - Medium
L - Low

Figure A-6.4

Comparison of Options for the Treatment of Solids/Liquids w/Metals

CRITERIA	OHIO MOBILE CHEMICAL TREATMENT SYSTEM (NEUTRALIZATION/ PRECIPITATION)	OHIO MOBILE STABILIZATION SYSTEM
REGULATORY COMPLIANCE	H	H
ENVIRONMENTAL/PUBLIC HEALTH	H	H
NON-OPERATIONAL WORKER HEALTH AND SAFETY	H	H
OPERATIONAL WORKER HEALTH AND SAFETY	M	M
TRANSPORTATION RISK	M	M
PUBLIC ACCEPTANCE	H	H
EQUITY ISSUES	H	H
VOLUME REDUCTION	M	L
SECONDARY WASTE GENERATION	H	H
DESTRUCTION, REMOVAL & DEMOBILIZATION	H	M
FLEXIBILITY	H	M
FINAL WASTE FORM	H	H
ABILITY TO BE SHIPPED	H	H
SYSTEM IMPLEMENTABILITY	H	H
AVAILABILITY	H	H
SCALABILITY	H	H
SCHEDULE FOR WASTE TREATMENT	H	H
LIFE-CYCLE COST	H	H
MARKET FOR TECHNOLOGY	M	M
PRIVATE SECTOR INVOLVEMENT	H	H

Treatment Selection Guide Rating (Table A-1)

H - High
M - Medium
L - Low

Secondary Waste Streams

As a result of chemical treatment of mixed waste, the original waste volume is anticipated to double. This estimate represents the high end of the anticipated waste volume increase range. Technology evaluation and treatability testing are expected to demonstrate higher processing efficiency. The treated waste form is anticipated to have a volume one and a half times greater than the untreated waste form. The remaining 50% volume increase will result from generation of secondary mixed waste. These secondary mixed wastes will be treated by other treatment identified in the PSTP. Figure 3.1.6A in the Background Volume provides a graphic of the anticipated waste volume increases and the calculation factors for estimating the quantity of secondary waste generation.

Note that secondary low level waste, such as personal protective equipment generated from activities associated with bulking, packaging, shipping and treatment of mixed waste on-site, is assumed to be equal to five percent of the total waste to be processed.

Secondary waste streams from this project will be managed under the Chemical Treatment Project as follows:

- Liquid waste is designated to be treated at the TSCA Incinerator.
- Debris will be shipped directly for disposal at Envirocare or NTS.
- Fines will be managed in the Ohio Mobile Stabilization System (Portsmouth).

Cost Estimates

Cost estimates were prepared for the PO, Ohio Mobile Chemical Treatment System, and for each sub-system including management of secondary waste. No separate cost estimates were prepared for individual elements of the treatment trains as these costs are reflected in the overall project cost. LLW disposal costs were not included in any estimate.

Ohio Mobile Chemical Treatment System	Cost in Dollars
Pre-operations	2,445,000
Construction	415,000
O&M ($905,000/yr X 2yr)	1,810,000
D&D	210,000
Contracted services	7,880,000
Off-site treatment	210,000
Transportation	580,000
Total Cost	13,550,000

Ohio Mobile Chemical Treatment System	Annual Budget in Dollars	Annual Budget in Dollars
YEAR	CAPITAL	OPERATING
1	415,000	4,195,000
2		1,750,000
3		1,750,000
4		1,750,000
5		1,750,000
6		1,940,000

Note: The annualized costs are based on the actual project cost estimate and the project schedule (6 years) as prepared for the PSTP.

Cost Estimates (Continued)

The individual cost estimates for each of the six sub-systems were prepared for the Ohio Mobile Chemical Treatment System using an average of the total cost per cubic meter of waste to be treated. These cost estimates are rounded upward to the next one hundred dollar increment. Cost estimates for Ohio Mobile Stabilization System and Ohio Mobile Incinerator are based on cost to treat per unit volume.

Chemical/Wet Air Oxidation Unit Waste Matrix - Solids with Organics		
Viable Option:		
A.	Ohio Mobile Chemical Treatment System (Chemical/Wet Air Oxidation Unit)	$11,841,500
B.	Ohio Mobile Incinerator	$13,750,000
C.	TSCA Incinerator	$ 750,000*

* This cost estimate does not include the FEMP share of the TSCA Incinerator modification to incinerate soft solids. The cost of these modifications is estimated at $15,000,000.

Deactivation Unit Waste Matrix - Reactive Metals		
Viable Option:		
A.	Ohio Mobile Chemical Treatment System (Deactivation Unit)	$ 5,500
B.	Ohio Mobile Stabilization System	$ 7,800

Ohio Mobile Macroencapsulation Unit Waste Matrix - Elemental Lead, Batteries & Debris with Lead		
Viable Option:		
A.	Ohio Mobile Chemical Treatment System (Mobile Macroencapsulation Unit)	$ 269,500
B.	Ohio Mobile Stabilization System	$ 76,500
C.	Envirocare Macroencapsulation Demonstration	$ 108,500*
*	Represents the major portion of the waste streams within the project. Other waste streams may be identified that will require macroencapsulation on-site at a later date.	

Pressurized Container Puncture Unit Waste Matrix - Compressed Gas		
	Viable Option:	
	A. FEMP Compressed Gas Puncture Unit	$ 5,500

Cost Estimates (Continued)

Neutralization/Precipitation Unit Waste Matrix - Solids/Liquids w/ Metals		
	Viable Option:	
	A. Ohio Mobile Chemical Treatment System (Neutralization/ Precipitation Unit)	$ 1,320,000
	B. Ohio Mobile Stabilization System	$ 374,400

Ohio Mobile Amalgamation Unit Waste Matrix - Elemental Mercury & Debris with Mercury		
	Viable Option:	
	A. Ohio Mobile Chemical Treatment System (Mobile Amalgamation Unit)	$ 132,000

Basis of Cost Estimates

The cost estimate for the Preferred Option was prepared by the FEMP based on the actual project schedule. The cost of the sub-systems and the comparison costs were developed using an average cost to treat per unit volume for the project. No annualized costs were developed for the individual sub-systems due to uncertainties in the scheduling sequence which will actually be used. The sequence will be determined following treatment studies for waste categories.