DOE/EA-0821

ENVIRONMENTAL ASSESSMENT FOR THE OPERATION OF THE GLASS MELTER THERMAL TREATMENT UNIT AT THE U.S. DEPARTMENT OF ENERGY'S MOUND PLANT, MIAMISBURG, OHIO

JUNE, 1995

U.S. DEPARTMENT OF ENERGY

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

TABLE OF CONTENTS

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED
DC

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

ACFM	actual cubic feet per minute
ACGIH	American Conference of Governmental Industrial Hygienists
ACN	acrylonitrile
ALARA	as low as reasonably achievable
aq.dis.	aqueous discharge
AQCR	Air Quality Control Region
atm	atmosphere
avg.	average
AZS	aluminum zirconium silicate
bldg.	building
Btu	British thermal unit
C	Celsius
^{14}C	carbon-14
carcin.	carcinogen
CCA	criticality control area
CDC	Centers for Disease Control
CDD	chlorinated dibenzo-p-dioxins
CDF	chlorinated dibenzofuran
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
Ci	curie(s)
CIF	consolidated incinerator facility
cm	centimeter
CNS	central nervous system
CO	carbon monoxide
Co	cobalt
CO_2	carbon dioxide
CO_x	oxide of carbon
$COCl_2$	phosgene
comb.	combustible
conc.	concentration
CRC	Chemical Rubber Company
Cs	cesium
CVS	cardiovascular system
d	day
DAPC	Division of Air Pollution Control, Ohio EPA
DCG	derived concentration guideline
decomp.	decomposition
d/min	disintegrations per minute
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
dP	differential pressure

ACRONYMS AND ABBREVIATIONS, continued

DRE	destruction and removal efficiency
DSm^3	dry standard cubic meter
E	east
EA	Environmental Assessment
EG&G	Edgerton, Germeshausen and Grier
EIS	Environmental Impact Statement
ENE	east - northeast
EPA	Environmental Protection Agency
ESE	east - southeast
F	Fahrenheit
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Act
FIRM	flood insurance rate map
FONSI	Finding of No Significant Impact
fps	feet per second
ft	foot (feet)
FWS	Fish and Wildlife Service
g	gram(s)
gal	gallon(s)
GI	gastrointestinal
GM	glass melter
gpd	gallons per day
gpm	gallons per minute
GSX	Chemical Services, Inc.
h	hour
^3H	tritium
HARM	Hazardous Atmospheric Release Model
H_c	heat of combustion
HCl	hydrogen chloride
HCN	hydrogen cyanide
HEPA	high efficiency particulate air
HMTA	Hazardous Materials Transportation Act
H_xCDD	hexachlorodibenzo-p-dioxins
ID	identification
IDLH	Immediately dangerous to life and health
in.	inch
INEL	Idaho National Engineering Laboratory
ISC	Industrial Source Complex
K	Kelvin
kcal	kilocalorie(s)
kg	kilogram(s)
km	kilometer(s)
^{85}Kr	krypton-85
kW	kilowatt(s)

ACRONYMS AND ABBREVIATIONS, continued

L	liter(s)
lb	pound(s)
LD_{50}	dose that is lethal for 50% of the test subjects
LSA	low specific activity
m	meter(s)
m, o, p	meta, ortho, para
MAGLC	maximum acceptable ground level concentration
max	maximum
mg	milligram(s)
mi	mile(s)
min	minute(s)
mL	milliliter
Mn	manganese
mph	miles per hour
MRC	Monsanto Research Corporation
mrem	millirem
MWI	municipal waste incinerators
N	north
NAAQS	National Ambient Air Quality Standards
nCi	nanocurie(s)
NE	northeast
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Act
NIOSH	National Institute of Occupational Safety and Health
NNE	north - northeast
NNW	north - northwest
NO	nitrous oxide
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
NW	northwest
O_3	ozone
ORGDP	Oak Ridge Gaseous Diffusion Plant
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAG	EPA Protective Action Guides
part.	particulate
Pb	lead
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran

ACRONYMS AND ABBREVIATIONS, continued

pCi	picocurie(s)
PEL	permissible exposure limit
pg	picogram
pH	symbol for degree of acidity or alkalinity of a solution
PHA	preliminary hazards analysis
PM-10	particulate matter of less than 10-micron diameter
PNS	peripheral nervous system
POHC	principal organic hazardous constituent
ppb	parts per billion
ppm	parts per million
psi	pounds per square inch
PTPLU	Point-Plume
Pu	plutonium
Pub. L.	public law
q_1	potency factor or unit cancer risk
RAPCA	Regional Air Pollution Control Agency
RBC	red blood cells
RCRA	Resource Conservation and Recovery Act
resp. sys.	respiratory system
R&D	research and development
S	south
sec	second(s)
SAIC	Science Applications International Corporation
SARA	Superfund Amendments and Reauthorization Act
SCBA	self-contained breathing apparatus
SD	sanitary disposal
SE	southeast
SHPO	State Historic Preservation Office
SNLA	Sandia National Laboratory, Albuquerque
SO_2	sulfur dioxide
sp. wt.	specific weight
SRS	Savannah River Site
SSE	south - southeast
SSW	south - southwest
stnd.	standard
SW	southwest
TC	thermocouple
TCDD	tetrachlorodibenzo-p-dioxin
TEMA	Tennessee Emergency Management Agency
temp	temperature
Th	thorium
TLD	thermoluminescent dosimeter
TLV	threshold limit value
TLV-TWA	threshold limiting value as a time weighted average

ACRONYMS AND ABBREVIATIONS, continued

TNT	trinitrotoluene
T/S/D	treatment, storage and disposal
TSP	total suspended particulates
U	uranium
UCR	unit cancer risk
unsat. hy	unsaturated hydrocarbons
USGS	U.S. Geological Survey
W	west
WB	whole body
WD	waste disposal
wk	week
WNW	west - northwest
WSW	west - southwest
wt	weight
WTF	waste treatment facility
WWTF	waste water treatment facility
y	year(s)
mCi	microcurie(s)
mg	microgram(s)

PREFACE

The Department of Energy has prepared an environmental assessment, DOE/EA-0821, for the operation of the Glass Melter Thermal Treatment Unit at the Mound Plant in Miamisburg, Ohio. As originally proposed by the Department, and as analyzed in this environmental assessment, the glass melter would have processed mixed (radioactive and hazardous) waste stored at the Mound Plant ("backlog" waste) and hazardous and mixed waste generated from Plant operations. Since the analysis in the environmental assessment was conducted, however, the Department has decided to close the Mound Plant. The Department now proposes to use the glass melter only for mixed waste backlog.

The environmental assessment states that the backlog could have taken as long as six years to process. The backlog waste has not been fully characterized for radioactive contamination levels, however, and, if after characterization, the radiation level of the waste is low enough to be well within the National Emission Standards for Hazardous Air Pollutants and Mound's health physics limitations, the schedule for treatment of the backlog waste could be as short as one year (i.e., could be controlled by the capacity of the glass melter).

The environmental impacts of the proposed treatment of only Mound Plant mixed waste backlog are adequately covered and are bounded by the analysis in the environmental assessment, as calculations of radiological exposures and impacts were based on conservative assumptions of waste radioactivity content. (The annual source terms for tritium and plutonium-238 used in the analysis are greater than estimates of their total activity in the mixed waste backlog).

If the Department later proposed to use the glass melter to treat other than the mixed waste backlog, it will undertake further review under the National Environmental Policy Act.

1.0 INTRODUCTION

This environmental assessment evaluates the proposed use of an existing glass melter thermal treatment unit (also known as a Penberthy Pyro-Converter joule-heated glass furnace) for the treatment of hazardous and mixed wastes (waste containing both hazardous and radioactive material) at the U.S. Department of Energy's (DOE's) Mound Plant in Miamisburg, Ohio. The glass melter thermal treatment unit will be referred to hereafter as the glass melter.

In a series of test operations funded by the Department of Energy, Mound Plant has demonstrated the capability of the glass melter to thermally treat waste organic materials defined as hazardous by the Resource Conservation and Recovery Act (RCRA). Glass melter treatment not only destroys RCRA hazardous organics to the degree necessary to meet hazardous waste incinerator standards, but also immobilizes most toxic metals and radioactive isotopes by incorporating them into a glass by-product.

On the basis of these demonstrations, Mound Plant is proposing to apply this treatment technology to problem wastes which are currently in storage at Mound, and, as excess capacity and efficiency of operation dictates, to other wastes presently being generated at the plant.[1]

The analysis presented in this assessment considers the no-action alternative (continuance of existing practices at Mound for the handling of hazardous and mixed wastes), as well as other alternatives involving on-site treatment and off-site treatment and disposal.

1.1 PURPOSE AND NEED FOR ACTION

As will be described in Section 2, the Mound Plant has an inventory of radioactive mixed waste. Although being stored in a RCRA "interim status" storage facility, this material presents a degree of risk to human health and the environment, since most of the waste is in the liquid state and much of it is combustible. A fire, although an unlikely event, would present the danger of significant radioactivity and hazardous material

[1] Since this EA was written, DOE has decided to close the Mound Plant. The Glass Melter would, therefore, only be used for backlog waste. The impacts of the new proposed mission would be bounded by the impacts discussed in this EA.

release to the environment as a result both of the fire, and of ensuing fire fighting operations.

Mound's stored radioactive mixed waste not only poses environmental concerns, but also presents legal problems for the Plant. This RCRA hazardous waste is being stored at Mound for the sole reason that no treatment and disposal options for it have yet been identified. RCRA Land Disposal Restriction (LDR) regulations as recorded in 40 CFR 268.50 do not allow storage of LDR waste for this reason unless a specific storage extension for the waste has been granted by the Environmental Protection Agency. Such extensions, even if granted, are by law of limited duration.

Treatment of Mound radioactive mixed waste by means of the glass melter offers a route toward correction of Mound's RCRA waste storage violation, and also a means to greatly minimize hazards associated with temporary storage of mixed waste by destruction of organic material and immobilization of many inorganic RCRA hazardous and radioactive constituents.

1.2 BACKGROUND

The Mound Plant occupies a 306-acre site in Montgomery County in southwestern Ohio. The site is located on the southern boundary of the city of Miamisburg, 16 km (10 mi) south-southwest of Dayton, Ohio, and 50 km (31 mi) north-northeast of Cincinnati, Ohio, at 39° 37' 42"N, and 84° 17' 15"W (Figure 1.1-1). Mound was previously operated by Monsanto Research Corporation, a subsidiary of the Monsanto Company, for the DOE Albuquerque Operations Office. Since October 1, 1988, the facility has been operated by EG&G Mound Applied Technologies.

In October 1980, at the request of the Low-Level Waste Management Program branch office of DOE, Mound began a study to determine the feasibility of using a glass melter for treatment of low-level radioactive wastes generated at commercial nuclear power facilities (Alexander and Klingler, 1981). As a result of this study, the glass melter was put into operation at Mound in early January 1982. Except for a downtime of 24 weeks preparing for radioactive experiments and another downtime of 4 weeks for furnace repair, the melter was in operation or was being maintained at an idle temperature for a period of nearly 3 years. During that time, 2,000 kg (2.2 tons) of materials were successfully processed in the furnace (Klingler and Armstrong, 1985). This evaluation of the glass melter demonstrated that the unit, coupled with an appropriate offgas system, can provide an effective and desirable means of treating low-level radioactive wastes.

The use of the glass melter for treating hazardous wastes was evaluated in later studies. In January 1985, while operating under Resource Conservation and Recovery

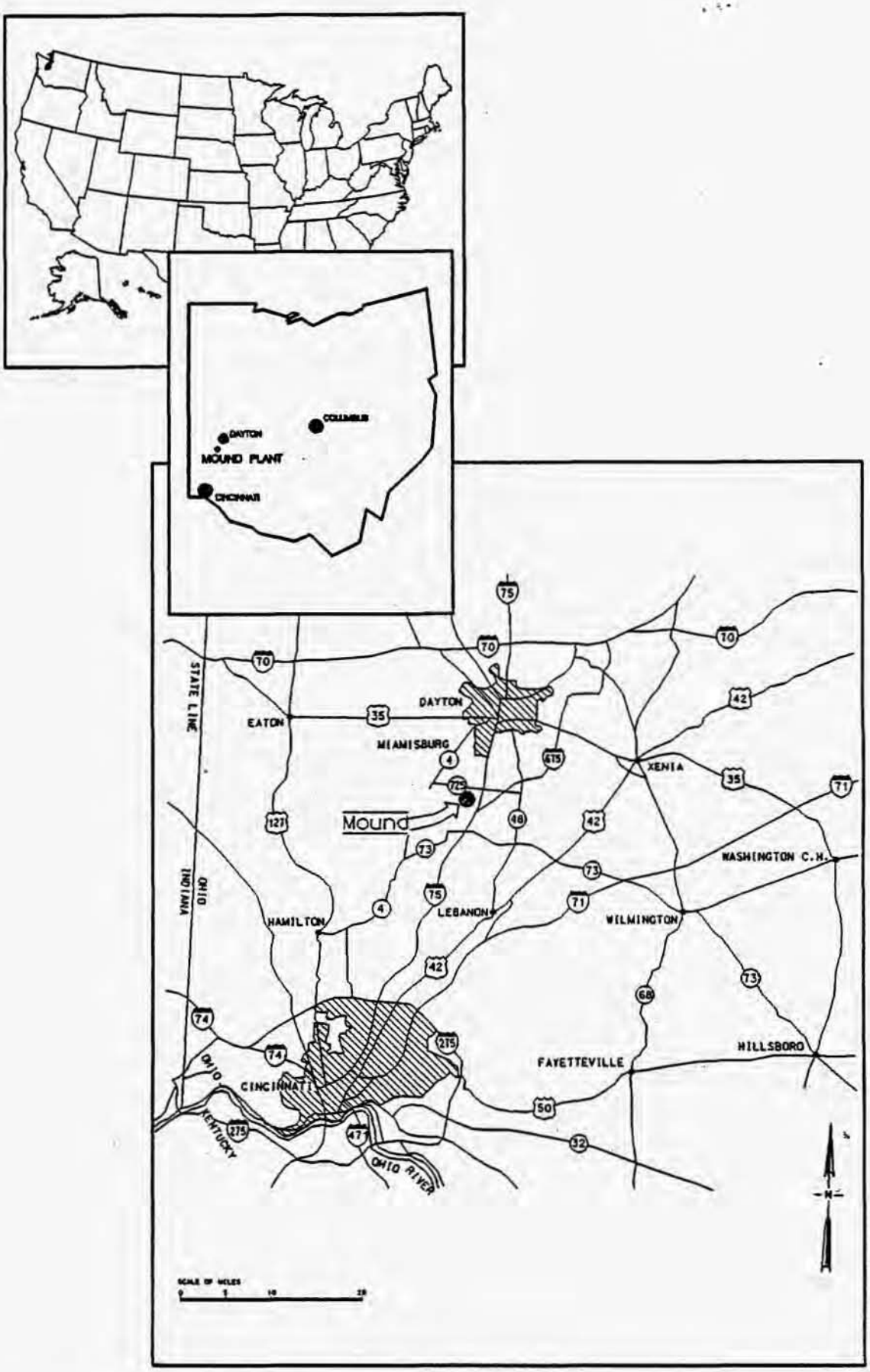

Figure 1.1-1. Southwestern Ohio and Location of Mound Plant

Act (RCRA) Interim Status, a series of experimental burns was conducted in which RCRA Appendix VIII-listed hazardous constituents were included in simulated wastes that were treated in the glass melter. During these experiments, full process monitoring and offgas monitoring were conducted, pursuant to Environmental Protection Agency (EPA) protocol for a trial burn. During these experimental burns, RCRA hazardous organic waste component destruction and removal efficiencies (DREs), as well as hydrogen chloride and particulate removal efficiencies, readily met regulatory requirements for incinerators.

In June 1987, Mound processed other mixtures in the glass melter which simulated the waste streams generated at the Mound Plant explosive powder production facility. Methylene chloride was selected as a principal organic hazardous constituent (POHC) for these tests. Results again showed that the glass melter could meet regulatory incinerator standards, including that of destruction of difficult-to-burn hazardous organics, even with highly aqueous waste. Destruction and removal efficiencies and hydrogen chloride removal efficiencies met regulatory standards (Mound, 1987). Following these studies the glass melter was placed in cold shutdown mode at Department of Energy direction pending completion of the NEPA process. It has been maintained in this state since June 1987.

Glass Melter test results effectively demonstrated the utility of the glass melter in the treatment of both hazardous and low-level radioactive wastes. While the glass melter has never been used to treat mixed wastes, the fact that it has been used successfully to treat both hazardous and low-level radioactive materials indicates that it will also be useful for treatment of mixed wastes.

1.3 THE PROPOSED ACTION

Because of the demonstrated effectiveness of the glass melter, DOE is now considering incorporating this facility into its hazardous and mixed-waste treatment and disposal program for Mound operations. The present document helps meet the National Environmental Policy Act (NEPA) compliance requirements by providing an evaluation of environmental impacts associated with the proposed action (the operation of the glass melter for hazardous and mixed-waste treatment) compared with the no-action alternative (the continuance of existing practices at Mound for the treatment of hazardous and mixed wastes) and other on-site treatment and off-site disposal alternatives.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

DOE operations at Mound Plant result in the generation of hazardous and radioactive mixed wastes. Hazardous wastes are currently being shipped off site for treatment and disposal. There are, however, no suitable disposal options for the radioactive mixed wastes, and this material is being stored on site. Since current mixed-waste storage capacity at Mound Plant has been exhausted and present storage of the waste is in violation of RCRA land disposal restriction regulations, other options for handling this material have been examined. One option available to DOE is to make use of the Mound Plant glass melter. This unit has been in cold shutdown mode since June 1987 when the last set of experimental tests of the unit were completed. Under the proposed action, DOE would bring this unit out of cold shutdown mode and use it for treating both hazardous and mixed wastes generated at Mound Plant. The following subsections provide a general engineering description of the proposed action, a detailed characterization of wastes to be processed, and resulting emissions and effluents (source terms).

2.1.1 Engineering Description

The glass melter is designed to destroy hazardous organic constituents in radioactive mixed waste and hazardous waste streams and to convert the waste residue into a form suitable for ultimate disposal. Its proposed operation is intended solely for use in the treatment of wastes generated at Mound Plant. The glass melter unit is housed in an annex of the liquid waste disposal (WD) building (Figure 2.1-1) and consists of a burn chamber of stainless steel lined with refractory material (Figure 2.1-2) connected to an offgas scrub train.

In the proposed operational mode, waste in sealed drums would be transported by truck as needed from either the hazardous waste storage building (Building 72) or the radioactive mixed-waste storage building (Building 23). The drums would be temporarily staged on a concrete pad adjacent to the annex, then moved individually to a fume hood in the WD annex (WDA) so that contents could be transferred into a feed system, ready for processing in the melter. Waste would be transferred to a glass melter feed system either manually or by pumping, depending on the drum's contents.

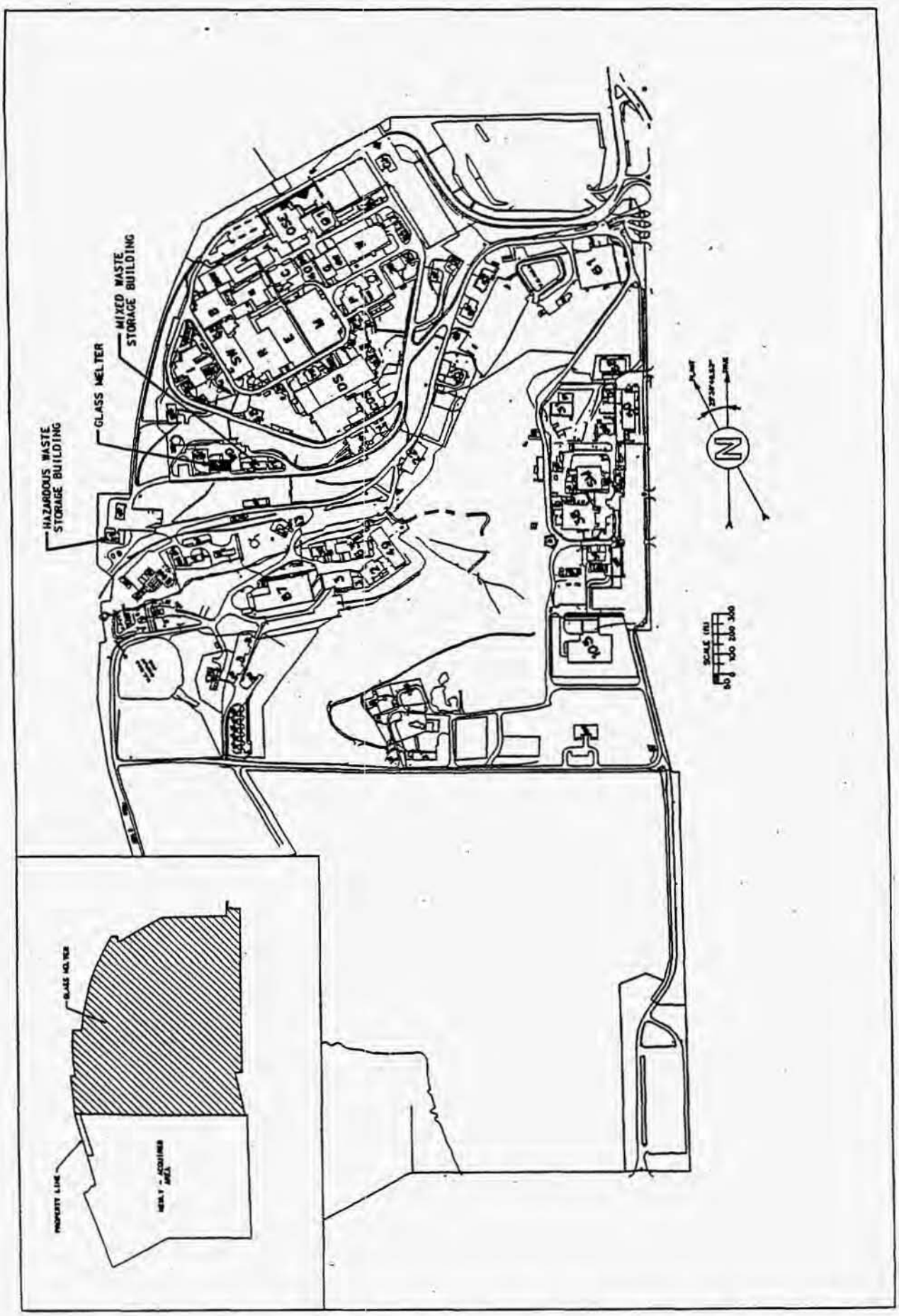

Figure 2.1-1. Location of Glass Melter System and Waste Storage Buildings

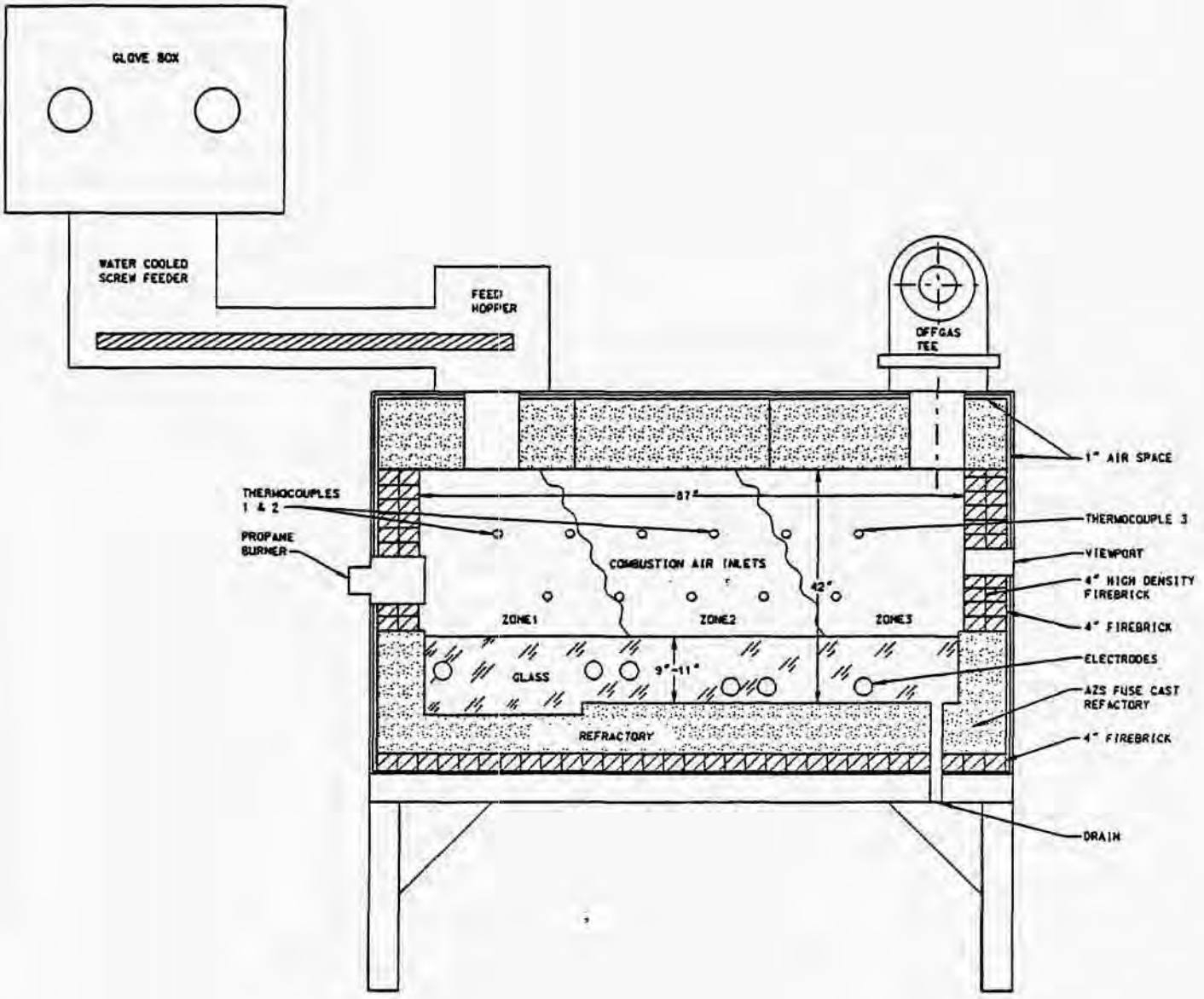

Figure 2.1-2. Schematic of Glass Melter

During cold startup of the glass melter, soda-lime silica glass cullet (glass manufacturing scrap) is heated in the burn chamber by means of a propane burner. Once the glass has been melted, it is maintained in the molten state by electrode heating. For waste processing, when the melt has reached a temperature of 1,800 - 2,400°F, waste would be introduced into the burn chamber via the feed-port opening on the glass melter roof. Ash from the combustion process falls to the glass surface, where it would be incorporated into the melt. When glass chemistry or radioactivity loading dictates, waste glass would be discharged from the melter into 5-gal containers.

The gaseous combustion products exit the furnace and continue on to the offgas wet scrubbing system. Scrubbed gases from the offgas system would be discharged through an existing high efficiency particulate air (HEPA) filter with a removal efficiency of 99.97% (0.3-micron particulates). Scrubbing solution would be filtered, cooled, pH adjusted, and recirculated to the scrubbing equipment. Particulate matter removed by the scrubbing system filter would be pressure backwashed from the filter. The sludge generated would be sampled for hazardous components as required on the basis of waste feed composition and relevant treatment standards, then transferred by pipeline 1) back to a glass melter feed port for reprocessing through the glass melter, 2) to an existing cementation process for immobilization in concrete, or 3) to container storage for any subsequent additional treatment required by RCRA land disposal restrictions (LDR).

Filtered liquid effluent would be characterized as required on the basis of feed composition and treatment standards. Depending on the components present, it would then be 1) pumped to an existing wastewater treatment facility, 2) pumped to a cementation process for immobilization as concrete, or 3) containerized for subsequent additional treatment as required to meet RCRA land disposal restrictions. For most waste processing it is anticipated that sludge would meet LDR treatment standards and could be land disposed as generated. It is expected that most liquid effluent could be treated at Mound's radioactive wastewater treatment facility and released via an NPDES regulated outfall. Liquid effluent cementation would be required for scrub liquid generated during the processing of waste with significant tritium contamination. Facilities for cementation of both scrubber system residue and tritium contaminated wastewater are currently in use at Mound Plant and would not be significantly impacted by the additional feed from glass melter operations.

By-products of radioactive mixed waste treatment would in some cases also be defined as radioactive mixed waste by application of the RCRA "derived from" rule [45 Fed. Reg. 33096 (May 19, 1980)]. Present planning calls for the shipment of some glass and other solidified by-product waste to a radioactive mixed waste land disposal facility as treatment by-product meeting LDR requirements. Since no land disposal facilities meeting DOE requirements are currently available, it might be necessary to temporarily store this by-product waste on site until suitable facilities are permitted (see Section 2.2.2). Storage of RCRA hazardous waste which has been treated to meet LDR treatment standards, however, would no longer be subject to LDR storage time limitations, and would, in addition, no longer present fire, explosion, or leakage concerns.

As an alternative to the need to dispose of certain radioactive mixed waste by-products in a mixed waste landfill, regulations provide the opportunity to petition the EPA to "delist" the waste, allowing it to be disposed of at a site authorized to accept low-level wastes. Unless the delisting process is modified, however, the process is so cumbersome at present as to be an impractical option. Modifications to the RCRA "derived from" rule currently under EPA consideration are expected to offer new alternatives for glass melter treatment residue disposal.

Table 2.1-1 summarizes operational conditions which have been set for the glass melter, based on past performance experience (Mound, 1987). The glass melter and offgas system process parameters would be monitored on a continuous basis during operation. Waste feed cutoff would be initiated automatically when selected measurements fall outside prescribed ranges. Table 2.1-2 summarizes proposed cutoff limits for the process safeguard system. Final limits would be established as part of the RCRA permitting process. System ventilation is designed to ensure that negative pressures relative to the glass melter room are maintained at all times in the hoppers, furnace chamber, and offgas system.

2.1.2 Source Terms

Mound Plant currently generates approximately 39,000 kg/year of mixed wastes and nonradioactive solvent wastes suitable for processing by the glass melter. Table 2.1-3 characterizes these wastes. Mound Plant has an existing backlog of approximately 43,000 kg of mixed wastes (Table 2.1-4). It is Mound Plant's proposal to use the glass melter to process this backlog mixed waste at a rate consistent with radioactive safety requirements, and to use excess treatment capacity to process suitable newly generated plant wastes.[2] Annual capacity of the glass melter is estimated at 48,000 kg of wastes (based on an average throughput of 23 kg/h, and a 2,080-h work year). On the basis of conservative estimates of backlog waste radioactivity content, and applicable worker safety standards and emission limits, it is anticipated that the backlog can be eliminated within approximately 6 years, while continuing to process new wastes as generated.

Routine operation of the glass melter will result in the generation of treated offgas, caustic scrubber liquid effluent, and several solid waste streams. Mound personnel have generated substantial data characterizing the discharges from glass melter operation. These data are presented in several documents, notably Klingler and Armstrong (1985) and Klingler (1990). Table 2.1-5 summarizes the results of these studies as applied to the proposed operation of the glass melter. The following subsections further characterize the gaseous and solid waste discharges from the glass melter, and the heavy metal and radioactive material content of the discharges.

---

[2] Since this EA was written, DOE has decided to close the Mound Plant. The Glass Melter would, therefore, only be used for backlog waste. The impacts of the new proposed mission would be bounded by the impacts discussed in this EA.

2.1.2.1 Gaseous Emissions

Gaseous emissions (i.e., offgas) from the glass melter vary depending on the composition of the wastes being fed to the glass melter. Table 2.1-6 summarizes the results of a series of tests conducted using a range of feed materials characteristic of wastes generated at Mound, as reported by Klingler and Armstrong (1985). This study indicated that for every kilogram of waste processed, the glass melter will generate 10 kg of offgas. These results serve to provide an upper bound on the chemical composition of the offgas. With respect to particulate matter entering the offgas scrubber system, the highest concentration reported was 2,499 mg/DSm^3. Based on observed scrubber removal efficiencies in the range of 61 to 95% (Mound, 1987), the discharge to the HEPA filters will be in the 1,000 to 125 mg/DSm^3 range. The HEPA filters have a rated efficiency of 99.97% removal for 0.3 micron particulates (Mound, 1987). Assuming an overall efficiency of 99.9%, after the HEPA filter the particulate levels for atmospheric emission will be in the 1.0 to 0.1 mg/DSm^3 range.

The RCRA Part B Permit Application reports results of a series of test runs conducted to investigate the POHC destruction by the glass melter. Various hazardous waste mixtures (acetonitrile, kerosene, xylene, chlorobenzene, carbon tetrachloride, phenol, and water), wastewater sludges, and solvent wastes (ethylene chloride, acetone, ethanol, and water) were evaluated. DREs were at least 99.999% for all materials tested except for xylene. The averaged xylene DREs ranged from 99.99 to 99.999%. The EPA performance standard for POHCs is >99.99% DRE [40 CFR Part 264.343 (a) (i)].

The removal efficiencies for gaseous hydrogen chloride (HCl) and other chlorides were also measured during these tests. Minimum removal efficiencies were 99.5% for HCl and 99.9% for chlorides. The EPA performance minimum is 99% for HCl removal [40 CFR Part 264.343 (b)].

2.1.2.2 Solid Wastes

Operation of the glass melter results in four solid waste streams: glass blocks, scrubber sludge, scrubber effluent liquid, and maintenance wastes. The ratio of by-product generated to waste feed varies greatly as a function of the chemical composition of the waste feed. Data from a study by Klingler and Armstrong (1985) for one waste stream indicated that for every 1,000 kg (1,036 L volume for this waste) of waste feed processed, the glass melter will produce 66 kg (26 L) of waste glass block, 16 kg (14 L) of 25% solids sludge, and 750 kg (600 L) of scrubber liquid effluent. Based on this data, if 48,000 kg of Mound waste were treated per year, 3,168 kg (1,248 L) of glass, 768 kg (672 L) of 25% solids sludge, and 36,000 kg (28,800 L) of liquid scrubber effluent would be generated. It is anticipated that the glass by-product of the process would meet treatment standards for land disposal for most waste components and be suitable for radioactive disposal in either a Subtitle C or a Subtitle D landfill, depending on waste feed composition. Residual sludge from offgas scrubbing would either be piped back to the glass melter for reprocessing or immobilized by means of a cementation process. It is anticipated that the cement product would meet treatment standards for most feeds, and

would be suitable for land disposal in either a Subtitle C or Subtitle D landfill. The cementation process would generate approximately 1,309 kg (923 L) of immobilized sludge.

Scrubber liquid disposition would be dependent on waste radioactivity contamination. It is expected that scrubber liquid generated from the processing of waste contaminated with transuranic isotopes could be effectively treated in Mound's wastewater treatment facility, and then could be subsequently released via an NPDES outfall. Tritium-contaminated scrubber effluent liquid, however, would require immobilization of the liquid in cement prior to disposal in a radioactive Subtitle C or Subtitle D landfill. Based on an assumption that one-half of Mound Plant's radioactive waste contains tritium, and one-sixth of this waste would be treated per year, approximately 5,670 kg (4,894 L) of cement immobilized tritium scrub liquid would be generated annually. Residue from treatment of other wastewater would generate approximately 1,947 kg (1,681 L) of cement immobilized sludge at the treatment facility. In addition to these process streams, historical data for the offgas system (Klingler, 1981), and projections of glass melter refractory life indicate that routine maintenance of the melter would result in an annual production of 1,926 kg (6,714 L) of maintenance wastes (filters, replacement parts, etc.). Thus, operation of the glass melter at full capacity could be expected to result in an approximated total of 14,020 kg (15,460 L) of wastes. By the RCRA by-product rule, some of this by-product waste would potentially be listed as hazardous, and require disposal in a RCRA regulated Subtitle C radioactive landfill. Until such time as a mixed waste disposal facility is available for DOE wastes, RCRA hazardous by-product wastes resulting from the processing of listed mixed wastes would be stored onsite (see section 2.2.2). The immediate value of glass melter treatment for this waste would be its conversion from a form which is primarily liquid and combustible to a safe, stable, inorganic state, which can be stored onsite indefinitely without violation of RCRA land disposal regulations.

Most of the waste generated by glass melter processing would eventually require transportation to a radioactive waste land disposal facility. The projected transport would require one partial shipment (approximately 76 drums) per year. The trip distance would be approximately 2,750 km (1,709 miles) if the waste is shipped to the Nevada Test Site (see subsection 2.2.2.8).

2.1.2.3 Stack Emissions of Heavy Metals and Radioactivity

Table 2.1-7 provides data on heavy metals and Table 2.1-8 lists radionuclide species which may be present in wastes processed by the glass melter. Some data are available for certain species whose redistribution was studied in radioactive-waste burning tests (Klingler and Armstrong, 1985, 1988). Table 2.1-9 presents data from these experiments. The mass balance boundary for the purposes of these radionuclide distribution runs is at the furnace proper. The offgas was sampled as it left the furnace prior to entering the offgas treatment system. No sampling was done downstream of the offgas treatment system. By comparing metal vaporization temperatures for the four species considered in these tests with those for the species potentially

present in the waste, some idea of the redistribution of heavy metal and radionuclide species through the glass melter system can be obtained. On this basis, two primary distribution types can be recognized. These are:

Cs distribution type — arsenic, mercury, osmium, cesium, selenium, silver, polonium;

Co/Mn distribution type — antimony, cadmium, copper, lead, manganese, iridium; and nonvolatile elements as barium, beryllium, chromium, cobalt, nickel, thallium, vanadium, zinc, plutonium, thorium, uranium, actinium, americium, californium, and curium.

Based on these groupings, one can project metal behavior for distribution throughout the glass melter/offgas system. The heavy metal and radionuclide species distribution should parallel the corresponding results given in Table 2.1-9. The nonvolatile type should follow the Co/Mn grouping. The unknown vapor-pressure metals would most likely fall in the Co/Mn grouping. Although not quantifiable with the available data, the result of metal solubility in the sodium hydroxide aqueous offgas spray solution would be to remove metals from the offgas stream.

The potential exists for radionuclide-contaminated offgas scrub solution to be entrained in the exiting offgas. In particular, the cesium-type metals would be potentially susceptible to such entrainment. The venturi scrubber system has been shown to have a particulate removal efficiency in the 61 to 95% range (Mound, 1987). Downstream of this scrubber system is a HEPA filter system with 99.97% removal efficiency for 0.3 micron particles. In order to upper bound the offgas release of metals by entrainment, a worst-case-condition scenario approach was taken. It was assumed that all of the metal not trapped in the glass or scrub solution would be released to the environment by offgas entrainment. Thus, no credit was given for refractory retention of metals or scrubber system removal of refractory released metals. It was further assumed that the overall HEPA particulate removal efficiency was 99.9% instead of 99.97%. Under this conservative worst-case scenario, the percentage metal stack release to the atmosphere would be:

Cs-type: 0.02%

Co/Mn-type: 0.02%

Thus, downstream of the HEPA system the worst-case level for metals release would be 0.02% of the glass melter waste-feed level.

The tritium (^3H) radionuclide component of Mound waste would also leave the glass melter as a gas or vapor. This gaseous species would be effectively captured by the offgas scrub system, but could be re-entrained as water vapor in flue gases. Losses would be relative to scrub liquor concentration and offgas temperatures. Based on a series of test runs using ^3H-contaminated dry solid waste (Klingler and Armstrong, 1988),

the tritium distribution was characterized for the system. Tritium loss to the stack is estimated at 14% of feed (Table 2.1-9).

In light of the waste metal and radioactive constituent levels estimates in Tables 2.1-7 and 2.1-8, the distribution predictions provided in Table 2.1-9, the above grouping and assumptions, and a system throughput of approximately 48,000 kg of waste per year (2,080 h/year x 23 kg/h), release quantities resulting from glass melter operation should not exceed the values provided in Table 2.1-5. It should be noted that the expected waste feed influent ^{3}H and plutonium-238 (^{238}Pu) curies (Ci) per year, based on burning one-sixth of the backlog per year (Table 2.1-4) combined with the annual waste volume (Table 2.1-3), are at the 47 and 0.09 Ci levels, respectively, as compared to the respective upper boundary 240 and 0.5 Ci levels assumed by the Table 2.1-5 approach. Thus, the source terms for ^{3}H and ^{238}Pu in Table 2.1-5 are a factor of five higher than the planned waste inventory burning.

2.1.3 Maximum Credible Accident Scenario

Possible accident scenarios were developed to identify the conditions and the event which would result in the most harmful releases to the environment. The accident with the maximum harmful release is termed the maximum credible accident. From an analysis of potential events, the maximum credible accident scenario was determined to be that which would involve the largest accumulation of waste materials, at the location providing the least protection for waste containers. Under planned operation, the only point at which waste will accumulate outside of permitted storage facilities at Buildings 23 and 72 (locations where the wastes are currently stored), is at the staging pad adjacent to WDA. The maximum credible number of waste containers which could be in that location under any foreseeable conditions was selected as ten 55-gallon drums. The accident selected was that of a fire in this drum staging area resulting in the complete vaporization of all contents of the ten drums. This accident would result in airborne releases of both radioactive and nonradioactive contaminants. Section 4.1.5.2 provides a quantitative and qualitative estimate of those releases. The probability of occurrence for this accident is estimated at 0.00001 (Appendix D).

Table 2.1-1. Glass Melter Operational Conditions

Item	Operational Conditions
CO in Stack Gas	<100 ppm
Waste Feed Rate	$<10^6$ Btu/h
Combustion Zone Temperature	1500 - 2750 °F
Furnace Gas:	
Velocity	<50 fps
Flow Rate	600 ACFM (max)
Residence Time	>1.56 sec
HCl Removal Efficiency	>99%

Note: Fugitive emissions and radioactive releases are controlled by negative furnace pressure.

Table 2.1-2. Process Safeguard System

Parameter	Warning	Warning and Feed Shutdown
High CO	500 ppm peak	1000 ppm peak 100 ppm one hour rolling average (or equivalent)
Low furnace, chamber: room dP		0.25 in. water column
High furnace, chamber: room dP		6.00 in. water column
Low furnace, chamber temperature (offgas end TC)		1500°F
High furnace chamber temperature (offgas end TC)		2600°F
High furnace chamber temperature (feed end TC)	2650°F	2750°F
Low scrub pH	7.0	3.0
Low venturi dP		25 in. water column
High venturi dP		55 in. water column
High offgas temperature (after spray tank)	200°F	205°F
High offgas temperature (after venturi)	190°F	200°F
High liquid feed flow		0.4 gal/min
Low liquid feed flow		0.03 gal/min
Low flue gas flow rate		100 ft/min

dP differential pressure
TC thermocouple

Table 2.1-3. Typical Wastes To Be Processed Through the Glass Melter Annually

Component	Amount	Component	Amount	Component	Amount
Radioactive Mixed Wastes				**Nonradioactive Waste Solvents**	
Oils and Other Nonhazardous Organics Contaminated with Solvents		Scintillation Vials		Methyl isobutyl ketone	127 kg/year
				Methylene chloride	3735 kg/year
Glycol	18.6 kg/year	Xylene	38.5 kg/year	Methanol	756 kg/year
Octane	18.6 kg/year	Toluene	38.5 kg/year	Isopropanol	3447 kg/year
Hydrocarbon oil	1690.0 kg/year	Water	131.0 kg/year	Acetone	5571 kg/year
Water	108.0 kg/year	Nonhazardous organics (glycol, oils)	76.0 kg/year	Ethanol	4553 kg/year
Trichloroethane	1.9 kg/year	Alkylpolyethoxyethanol and arylhydrocarbons	44.1 kg/year	Diacetone alcohol	113 kg/year
Gasoline	1.9 kg/year	1,4-Dioxane	18.7 kg/year	Trichloroethylene	513 kg/year
Trichloroethylene	0.89 kg/year	Naphthalene	20.9 kg/year	Water	5640 kg/year
Freon	3.7 kg/year	2,5-Diphenyloxazole	0.154 kg/year	Trichloroethane	976 kg/year
Methylene chloride	1.9 kg/year	Pseudocumene	52.3 kg/year	Toluene	640 kg/year
Acetone	0.89 kg/year	Synthetic organic surfactants	34.9 kg/year	Trichlorotrifluoroethane	1335 kg/year
Ethyl alcohol	3.7 kg/year	Tritium	2.18 Ci/year	Hexane	204 kg/year
Stoddard solvent	3.7 kg/year	Plutonium-238	0.00436 Ci/year	Heptane	244 kg/year
Carbon tetrachloride	1.9 kg/year			Methyl ethyl ketone	87 kg/year
Kerosene	1.9 kg/year			Cyclohexanone	51 kg/year
Lead	0.0081 kg/year			Petroleum naphtha	11 kg/year
Tritium	9.32 Ci/year			Tetrachloroethylene	95 kg/year
Plutonium-238	0.0186 Ci/year			Tetrachloroethane	36 kg/year
				Mineral spirits, oil	221 kg/year
				Chlorobenzene	91 kg/year
				Mineral spirits	127 kg/year
				Chlorobenzene	91 kg/year
				Mineral spirits	127 kg/year
				Xylene	36 kg/year
				Acetonitrile	3491 kg/year
				Tetrahydrofuran	3491 kg/year
				Dimethylsulfoxide	1091 kg/year
				Butylacetone	327 kg/year
Total Annual Throughput	1858 kg/year		455 kg/year		37,009 kg/year
Total Activity	9.34 Ci/year		2.18 Ci/year		
Grand Totals					39,322 kg/year
					11.5 Ci/year

Table 2.1-4. Existing Waste Backlog To Be Processed Through the Glass Melter

Components	Amount
Radioactive Mixed Waste	
Oils and other Nonhazardous Organics Contaminated with Solvents	
Glycol	251 kg
Octane	251 kg
Hydrocarbon oil	22885 kg
Water	1457 kg
Trichloroethane	25 kg
Gasoline	25 kg
Trichloroethylene	12 kg
Freon	50 kg
Methylene chloride	25 kg
Acetone	12 kg
Ethyl alcohol	50 kg
Stoddard solvent	50 kg
Carbon tetrachloride	25 kg
Kerosene	25 kg
Lead	0.110 kg
Tritium	126 Ci
Plutonium-238	0.251 Ci
Totals	25,143 kg 126 Ci
Radioactive Mixed Waste	
Scintillation Vials	
Xylene	1502 kg
Toluene	1502 kg
Water	5101 kg
Nonhazardous organics (glycol, oils)	2964 kg
Alkylpolyethoxyethanol and arylhydrocarbons	1717 kg
1,4-Dioxane	727 kg
Naphthalene	815 kg
2,5-Diphenyloxazole	6 kg
Pseudocumene	2040 kg
Synthetic organic surfactants	1360 kg
Tritium	85 Ci
Plutonium-238	0.170 Ci
Totals	17,734 kg 85.2 Ci
Grand Totals	42,877 kg 211 Ci

Table 2.1-5 Source Terms

Category	Item	Melter Influent Content	Melter Discharge Content			
			Offgas to scrubber	Offgas to HEPA	Aqueous	Solid
HAZARDOUS WASTE AND COMPONENT OF MIXED WASTE	POHC	(a)		<0.1% [c]	<0.1%[c]	<0.1%[c]
	HCl	◆	◆◆	<0.01 lb/hr [d]	◆◆	NA
	NO_x	◆	◆◆	<100 ppm [e]	◆◆	NA
	CO	◆	◆◆	<1 ppm [e]	◆◆	NA
	Unsaturated hydrocarbons	◆	◆◆	<1 ppm	◆◆	NA
	Particulate	◆	◆◆	<1 mg [f]	◆◆	NA
	Aqueous Discharge	◆	◆◆	<0.0001%		NA
	Polychlorinated Dibenzodioxins	0.0	BDL	BDL	◆◆	NA
	pH	◆	◆◆		8-10	NA
		ppm	g/year [b]		µg/L [b]	ppm [b]
	Arsenic	5.0	56	◆◆	1.8	43
	Cadmium.	2.0	22	◆◆	0.034	23
	Chromium	10	110	◆◆	0.17	120
	Lead	100	1100	◆◆	1.7	1200

Notes:

NA = Not Applicable
BDL = Below Detection Limits
a = The potential organic hazardous constituent (POHC) composition of the waste feed stream is given in Tables 2.1-3 and 2.1-4.
b = The distribution of inorganic waste feed constituent in discharge is based on EA Section 2.1.2 assumptions.
c = Based on EA section 2.1.2 DRE results.
d = Based on Table 2.1-1.
e = Based on Table 2.1-6. As an upper bound, a value of <1 was assumed for ppm values.
f = Based on 99.9% HEPA efficiency.
◆ = Values will vary for each drum.
◆◆ = Insufficient data collected to characterize.

Table 2.1-5 Source Terms (Continued)

Category	Item	Melter Influent Content Ci/Kg	Melter Discharge Content		
			Gas Ci/year	Aqueous Ci/L	Solid Ci/Kg
RADIOACTIVE COMPONENT OF MIXED WASTE	Americium-241	*	**	***	****
	Cobalt-60	*	**	***	****
	Cesium-137	*	**	***	****
	Hydrogen-3	$5x10^{-3(g)}$	$3.4x10^{+1(h)}$	$7.4x10^{-3(h)}$	0
	Plutonium-238	$1x10^{-5(g)}$	$1.0x10^{-4(i)}$	$2.4x10^{-7(i)}$	$1.2x10^{-4}$
	Plutonium-239	*	**	***	****
	Plutonium-240	*	**	***	****
	Plutonium-241	*	**	***	****
	Thorium-228	*	**	***	****
	Thorium-230	*	**	***	****
	Thorium-232	*	**	***	****
	Uranium-235	*	**	***	****
	Uranium-238	*	**	***	****

Notes:

g = Based on Table 2.1-8

h = $5x10^{-3}$ Ci/Kg x $4.8x10^{+4}$ Kg burned (max)/year = 240 Ci/year.
From Table 2.1-9, 86% in liquid, 14% in gas.
^{3}H content in liquid = 86% x 240 = 206 Ci/year = $206/2.8x10^{+4}$ L/year = $7.4x10^{-3}$ Ci/L.
^{3}H content in gas = 14% x 240 = 34 Ci/year.

i = Based on Table 2.1-9 and the worst-case approach as discussed in Section 2.1.2.3, the distribution for ^{238}Pu would be 78% in glass Block, 21% in gas, and 1.4% in liquid.
$1.0x10^{-5}$ Ci/Kg x $4.8x10^{+4}$ Kg waste burned (max)/year = 0.5 Ci/year.
^{238}Pu in liquid = $1.0x10^{-5}$ x $4.8x10^{+4}$ x $0.014/2.8x10^{+4}$ = $2.4x10^{-7}$.
^{238}Pu in gas = $1.0x10^{-5}$ x $4.8x10^{+4}$ x 0.21x(1-0.999) = $1.0x10^{-4}$ Ci/year.

* = Based on Table 2.1-8, the combined radionuclide content for these nuclides will be $<3.3x10^{-6}$ Ci/Kg.

** = The combined radionuclide release for these nuclides will be $<3.3x10^{-5}$ Ci/year

*** = The combined radionuclide release for these nuclides will be $<6.0x10^{-8}$ Ci/year

**** = The combined radionuclide release for these nuclides will be $<4.0x10^{-5}$ Ci/year of glass.

Table 2.1-6. Summary of Gaseous, Pre-Scrubber Concentrations

Flue Gas	Concentration
CO_2	3% avg. (8.3% max)
CO	<100 ppm average[a]
NO_x	35 ppm avg. (0.05% lb/h)[b]
Unsaturated Hydrocarbons	zero ppm [c]
Combustibles	zero ppm [c]

Note: Normal waste feed rate was 23 kg/h and air flow rate was 12 to 415 DSm^3/h (dry standard cubic meters per hour).

a In a separate series of tests (Mound, 1987), the 4-minute averages of CO levels before the scrubber ranged between 1.4 and 16.8 ppm.

b Without dilution air, concentration could be up to 2.8 times higher, but total lb/h would be the same.

c At standard operating conditions. (Conditions which will be imposed by the Part B permit.)

Table 2.1-7. Heavy Metals That Are Expected To Be Present in Wastes Processed by the Glass Melter

Heavy Metal	Content* (ppm)
Arsenic	5
Cadmium	2
Chromium	10
Lead	100

Source: Weston Services, Inc., 1990.

* Values are based on EPA not-to-exceed limits for classifying waste oils as nonhazardous.

Table 2.1-8. Radionuclides That Are Expected To Be Present in Radioactive Wastes Processed by the Glass Melter

Radionuclide	Comments	Concentrations (Ci/kg)
Americium-241	Minor contaminant of ^{238}Pu	•
Cobalt-60	R&D, environmental samples	•
Cesium-137	R&D, environmental samples	•
Hydrogen-3	Production, environmental samples, contaminated materials	5×10^{-3}
Plutonium-238	Heat source grade-samples and contaminated materials	1×10^{-5}
Plutonium-239	Weapons-grade samples and contaminated materials; minor contaminant of ^{238}Pu	•
Plutonium-240	Minor contaminant of ^{238}Pu	•
Plutonium-241	Minor contaminant of ^{238}Pu	•
Thorium-228	Minor contaminant of ^{232}Th	•
Thorium-230	Minor contaminant of ^{232}Th	•
Thorium-232	Environmental samples, contaminated materials	•
Uranium-235	Minor contaminant of ^{238}U	•
Uranium-238	Environmental samples, contaminated materials	•

• Hydrogen-3 and heat source grade Plutonium-238 are the primary radionuclides present in Mound's radioactive mixed wastes. Quantities of other transuranic isotopes, Cobalt-60, and Cesium-137 combined will comprise less than 25% of the total nontritium radioactivity in wastes (i.e., $<3.3 \times 10^{-6}$ total Ci/kg). These levels of radioactivity are considered negligible.

R&D research and development

Table 2.1-9. Distribution of Radioactive Isotopes in Melter System

	% of Total Curies			
	Glass	Scrub Solution	Carryover	Refractory Uptake*
^{137}Cs	58[b]	21.1[d]	—**	20.9*
^{60}Co	78[a,b]	1.4[c]	—**	20.6*
^{54}Mn	79[b]	1.4[c]	—**	19.6*
^{3}H	—	86	14	—

Sources: Klingler and Armstrong, February 1985.
Klingler and Armstrong, first draft 1988.

* Based on difference [e.g., 100 - (58 + 21.1) = 20.9]
** By difference definition there is no value for this item

Notes:

a Spike retention data were used. Cobalt apparently absorbs rapidly onto the lower floor refractory.

b Only runs prior to the electrode replacement were used. There were obvious short-term mixing problems after installation of larger electrodes.

c The larger average resulting from Method 5 sampling was used since the insolubility of the oxide in alkaline scrub solution introduces scrubber sampling errors.

d Due to high solubility of cesium in the scrub solution, the scrub solution sample data were selected as the most accurate indicator of furnace loss. The loss is obviously one of continuing vaporization. Only runs prior to the electrode replacement were used.

2.2 ALTERNATIVES

Mound personnel have reviewed their waste disposal requirements and have consolidated several disposal options. Based on this review, alternatives to the proposed action have been considered. These include both on-site and off-site alternatives. These alternatives are briefly described in the following sections.

2.2.1 On-Site Alternatives

2.2.1.1 No-Action Alternative

The no-action alternative assumes the continuation of present practices of waste storage and disposal. With respect to wastes that would be fed to the glass melter under the proposed action, a total of 143 m^3 of hazardous waste is presently being shipped off site each year. Currently, these hazardous wastes are being shipped to disposal facilities in Pinewood and Roebuck, South Carolina; Eldorado, Arkansas; and Pecatonica, Illinois.

An additional eight 55-gal drums of mixed waste (approximately 1.6 m^3, or 56 ft^3) are currently being generated annually and stored on site in Building 23. The storage capacity of Building 23 based on spill capacity has been exhausted. Mound personnel indicate that at the rate mixed wastes are likely to be generated as a result of lab cleanouts and decontamination/decommissioning activity, physical storage capacity will also be exhausted in the near future unless some consolidation of wastes can be accomplished. Since no other storage capacity suitable for these wastes is available on site, adoption of the no-action alternative would require the construction of additional storage capacity. If 55-gal drums have a base diameter of 0.6 m and are stored four to a pallet, stacked two pallets high, then the total annual storage requirement for the mixed wastes is about 1.5 m^2. A structure the size of the existing mixed-waste storage building (approximately 23 m^2, or 247 ft^2) would provide about 15 years of storage capacity. Under normal circumstances, a minimum of six years are required to plan, obtain funding, complete safety and environmental studies, and complete such new construction. RCRA permitting activity may take additional time.

2.2.1.2 Administrative Action

The initiation of administrative actions to reduce the generation of radioactive mixed waste provides an alternative for waste control. The Mound Plant has established and formalized a waste minimization and pollution prevention awareness program (EG&G, 1990). A Waste Minimization Committee and Chairman have been selected from members of management. A waste minimization plan (*Waste Minimization and Pollution Prevention Awareness Plan,* MD-81501) has been developed and issued plant-wide. Training needs have been identified, and a training and communication program has been developed to ensure that all employees understand their obligation to minimize waste generation in all processes and operations.

A program for reviewing all plant processes to fully characterize waste generation and individual waste streams has been put into place at Mound Plant. Technical Manual

MD-81502, "Process Waste Assessment Plan," specifies activities and methods that will be employed for this program. The primary goal of the program will be to identify, screen, and analyze options to reduce the generation of waste. This program has resulted in the elimination of RCRA hazardous scintillation cocktail waste and a number of solvents, and is expected to significantly reduce all new radioactive mixed waste generation at Mound Plant.

Efforts to reduce waste generation at Mound cannot totally eliminate the generation of radioactive mixed wastes, however. Hazardous waste generating materials are already in radioactive systems, and will eventually become waste. Replacement of some hazardous materials will not be easy to accomplish under Mound's DOE mission requirements. Waste reduction will not affect waste already in storage. The need for disposal options will persist.

2.2.2 Off-Site Alternatives

All of the following off-site alternatives require transportation from the Mound facility to the designated option site. Transportation of hazardous and radioactive wastes is conducted in compliance with Department of Transportation (DOT) and state regulations regarding the shipment of such wastes. Annual off-site disposal of approximately 39,000 kg of wastes would require approximately four shipments. These shipments would include three hazardous waste shipments and one mixed-waste shipment. These materials would be shipped from Mound to one or more of the designated option sites.

The Mound Plant retains a share of the legal responsibility for any environmental problems resulting from transportation, storage, treatment, and land disposal of wastes shipped off-site.

2.2.2.1 Off-Site Hazardous Waste Disposal

Hazardous wastes not contaminated with radioactivity could be shipped off-site for treatment and disposal. Mound currently uses the services of Laidlaw Environmental Inc. which is a full service waste treatment company specializing in the disposal of hazardous wastes. This service handles the evaluation, transportation, temporary storage, and disposal (or subcontracting for disposal) of all hazardous wastes, including those not suitable for glass melter treatment. Mound currently makes three to five shipments of hazardous waste annually. Laidlaw does not handle mixed wastes, so this disposal option does not address Mound's primary concern, that of stored and newly generated mixed wastes.

Use of the Laidlaw option would involve shipment of hazardous wastes to any of several sites used by Laidlaw. Trip distance for these sites ranges from 1,240 km (771 miles) to 3,000 km (1,865 miles). The average distance traveled per trip is 1,100 km (684 miles). This results in an approximate total travel distance of 3,300 km (2,050 miles) for

the three hazardous waste shipments (of glass melter suitable waste) required to meet Mound Plant's disposal requirements.

2.2.2.2 Quadrex HPS, Inc.

Quadrex HPS, Inc., located in Gainesville, Florida, is a waste-handling and storage company that can offer the disposal of scintillation fluids and nonradioactive ignitable hazardous wastes. The facility cannot accept non-scintillation mixed wastes, and could accept only those scintillation fluid wastes containing carbon-14, tritium, and other short-lived hospital/research lab type isotopes of concentrations no greater than 0.05 microcuries per gram of medium. Quadrex contracts with waste brokers to transport the various waste components to Gainesville. The liquid scintillation vials are shredded, rinsed, and transported to a sanitary landfill. The fluids are collected, analyzed, and used for fuel in a rotary kiln incineration system. The ignitable hazardous wastes are collected, tested, and used for fuels. The following Mound waste constituents could be burned at the Quadrex facility provided they are components of scintillation fluid which meet the restrictions above, or are not radioactively contaminated:

acetone,
carbon disulfide,
chlorobenzene,
cyclohexanone,
ethanol,
1,4-dioxane,
hexane,
methanol,
methyl ethyl ketone,
methyl isobutyl ketone,
methylene chloride,
naphthalene,
tetrachloroethylene,
toluene,
1,1,1-trichloroethane,
trichloroethylene, and
xylene (m,o,p types).

While the Quadrex facility cannot accept non-scintillation mixed wastes, and could accept only a portion of Mound's tritium contaminated scintillation fluid waste, it could accept the three annual shipments of glass melter suitable waste currently being sent to the Laidlaw Environmental facilities (Section 2.2.2.1). The Quadrex facility is located approximately 1,450 km (900 miles) from Mound Plant. Transport of the three annual hazardous waste shipments to Quadrex would involve a total annual travel distance of 4,350 km (2,703 miles).

2.2.2.3 Diversified Scientific Services, Inc.

Diversified Scientific Services, Inc. (DSSI), located in Kingston, Tennessee, operates an industrial boiler and expects to accept a variety of listed and characteristic RCRA hazardous wastes as fuel for electricity generation. DSSI has a RCRA permit for storage of hazardous and radioactive mixed waste. DSSI's radioactive materials license allows it to accept most of the hazardous and radioactive mixed wastes generated and stored at Mound. Treatment of the Mound waste by DSSI, however, may be greatly restricted by DSSI air permit conditions, and by impacts of the new Boiler and Industrial Furnace (BIF) regulations. An operating permit issued by the Tennessee Air Pollution Control Board in October, 1990, specifically limits the types of fuel that may be used by DSSI for its boiler to D001 solvents, natural gas, and liquid propane, and specifically forbids the use of solvents containing halogens or heavy metals. A temporary operating permit issued August, 1991, allowed the addition of F001-F005 solvents to the fuel list, but specifies that it is not a permit to operate. New BIF rules effective August, 1991 require boiler burners to meet the destruction and removal efficiency standards for hazardous waste incinerators. The ability of the DSSI unit to meet those standards and obtain the required BIF license is unknown at this time.

In addition to the permitting unknowns, system capacities are extremely limited at the present time, and the waste acceptance priorities have not been defined. For DSSI and all other commercial facilities, the requirements of DOE Order 5820.2A restricting DOE radioactive waste disposal to DOE facilities must be considered.

2.2.2.4 Idaho National Engineering Laboratory

The Idaho National Engineering Laboratory (INEL) has a permitted incinerator facility, the Waste Experimental Reduction Facility (WERF), capable of burning low-specific-activity (LSA) radioactive material and hazardous waste. The current waste acceptance criteria (WAC) for WERF prohibit receipt of wastes containing alpha emitters at levels greater than 0.1 nanocuries per gram media, PCBs at levels greater than 50 parts per million, or any free liquids. Waste chloride content must be controlled to limit the chloride release rate to no more than four pounds per hour. These criteria would prohibit the acceptance at WERF of almost all of the waste proposed for treatment in the Glass Melter (Tables 2.1-3 and 2.1-4). The WAC for alpha emitters cannot be increased without substantial upgrades to address safety concerns. The WAC for chlorinated solvents are limited for corrosion protection and cannot be increased without the addition of further protective devices to the stack. Finally, the current liquid injection system would also require substantial upgrades to accept free liquids. WERF was shut down in February 1991 to correct potential safety problems. Operation of WERF is contingent on completion of NEPA review and approval of a Safety Analysis Report.

2.2.2.5 Los Alamos National Laboratory

The Los Alamos incinerator facility in New Mexico is in the process of being permitted. A RCRA trial burn is currently planned for 1994. The priority for this facility will be the burning of transuranic waste, although some low-level radioactive mixed wastes

generated on site may be treated. Current operational plans do not include acceptance of off-site wastes, and the current LANL RCRA permit prohibits treatment of off-site waste.

2.2.2.6 Savannah River Site

The Savannah River Site is currently constructing the Consolidated Incinerator Facility (CIF). The CIF will be capable of handling both solid and liquid wastes that are RCRA hazardous, radioactive, or radioactive mixed (including scintillation fluids). DOE is preparing an EIS on waste management at SRS, which will include further analysis of operation of the CIF and other volume reduction alternatives. Trial burns and operation of the CIF are being deferred until the completion of the EIS process. The construction permit from the State of South Carolina, however, does not allow out-of-state waste to be treated in the CIF.

2.2.2.7 Oak Ridge Gaseous Diffusion Plant

The incinerator at the Oak Ridge Gaseous Diffusion Plant (ORGDP) facility in Oak Ridge, Tennessee is currently in use for the disposal of mixed wastes. Priorities for handling waste in this facility are as follows:

1. Use the incinerator for wastes generated within the immediate ORGDP complex.

2. Accept other wastes generated in Oak Ridge.

3. Make the incinerator available for the acceptance of DOE wastes generated in the region.

The ORGDP incinerator has a substantial backlog of wastes that will take several years to destroy. Thus, this alternative would not be available to Mound Plant for several years and will not meet the Mound immediate needs.

2.2.2.8 Nevada Test Site

Disposal of mixed waste at the Nevada Test Site is considered a possible alternative to treatment in the Glass Melter. Land disposal restriction under the Resource Conservation and Recovery Act would require, however, that any mixed waste be treated before disposal. The Nevada Test Site would only, therefore, be a reasonable alternative for Mound waste already treated at another facility. DOE has not yet decided to what extent the Nevada Test Site would be used for future disposal of offsite waste; such decisions will be made after completion of the Environmental Management Programmatic Environmental Impact Statement and the Nevada Test Site Sitewide Environmental Impact Statement.